MOLONY MILLAR
Consulting Civil and Structural Engineers

ENGINEERING REPORT

FOR

PROPOSED RESIDENTIAL DEVELOPMENT AT

RIVERSIDE, KILGOBBIN ROAD,

STEPASIDE, CO. DUBLIN

PROJECT NUMBER: 1285-8			Document Ref: Engineering Report			
Revision	**Description & Rationale**	**Originated**	**Date**	**Checked**	**Date**	**Date**
A	Draft	AM	19.01.2025	KA	19.01.2024	
B	Final	AM	07.07.2025	KA	07.07.2025	
C	Final (SUDS Audit edit)	AM	22.07.2025	RG	22.07.2025	
D	Catchment Area	AM	26.08.2025	RG	26.08.2025	

Architect: Downey

Client: KAVCO

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APPENDICES

1 INTRODUCTION

1.1 General Description

The proposed development is located at Riverside, Kilgobbin Road, Stepaside, Co. Dublin. The site is a 1.22 Ha greenfield site. The site is accessed from the west from Belarmine Vale. The Ballyogan Stream is located along the northern boundary, flowing in a west to east direction.

It is proposed to develop the site to provide 2 apartment blocks, block A and block B with 44 and 76 apartments respectively (total of 120 apartments) and associated access roads and residential facilities.

1.2 Scope of this Report

This report describes the proposed civil engineering infrastructure for the development and how it connects to the existing infrastructure serving the area. In particular, Foul and Surface Water Drainage and Water supply aspects are considered. This report should be read in conjunction with the following drawings submitted with the Planning Application:

1285-8-C01	Access Road & Parking Layout Plan;
1285-8-C02	Foul & Surface Water Drainage Layout Plan;
1285-8-C03	Watermain Layout Plan;
1285-8-C04	Road Typical Cross Section & Details;
1285-8-C04-1	Road Longitudinal Sections;
1285-8-C04-2	Road Markings and Signage
1285-8-C05	Surface Water SUDS & Attenuation Related Details:
1285-8-C05-1	Surface Water SUDS & Attenuation Related Details;
1285-8-C06	Foul & Surface Water Sewer Longitudinal Sections; and
1285-8-C20	SuDS Drainage Layout Plan
1285-8-C30	Catchment Area Layout Plan

2 ACCESS AND ROADS

2.1 General

It is proposed to provide a new junction access onto Belarmine Vale to the west of the site. Adequate kerb radii, entry treatment and pedestrian facilities are to be provided at the entrance.

The speed limit is 50km/h on Belarmine Vale. Road junction visibility requirements comply with the Design Manual for Urban Roads and Streets (DMURS). As per table 4.2 of DMURS, the required sightline at a setback of 2.4m is 45m (for 50km/h).

Drawing no. 1285-8 C01, Access Road & Parking Layout Plan, shows the layout of the access road and parking serving the development.

2.2 Design of Roads / Access

The main internal access roads are to be constructed as a conventional asphalt road and raised concrete footpath from Road 1 chainage 0 to 72m, with the remainder a shared surface with a 4.8m wide road carriageway and 2m wide pedestrian refuge. The pedestrian refuge is to be constructed from a coloured asphalt to delineate same. All internal roadways have been designed following the guidance of DMURS. Refer to drawing no. 1285-8 C01 for the Proposed Road Layout and drawing no. 1285-8 C04 for sections and details indicating proposed construction. The proposed pavement design is based on 5% CBR, which would need to be confirmed by a geotechnical investigation prior to detailed design stage.

All vehicle parking bays are to be constructed using permeable pavers.

3 SURFACE WATER DRAINAGE SYSTEM

3.1 Existing Surface Water Infrastructure

The Ballyogan Stream and tributary follow the western and northern boundaries of the site; it is partially culverted and partially open.

Refer to drawing 1285-8-C01 and the records of the existing services in Appendix I for further details.

Three soil infiltration tests were undertaken on site with all three failing, due to extremely poor infiltration. From excavations soil was found to be essentially clay. Refer to separate Site Investigation report by Site Investigations Ltd. for full details.

3.2 Proposed Site Surface Water Drainage System

It is proposed to culvert the Ballyogan tributary along the western boundary, under the proposed road and ESB substation, while retaining an open channel beyond, from the south western corner to the north western corner of the site.

The existing Ballyogan Stream is to be retained, un-altered, as an open stream along the north eastern corner of the site.

It is proposed to discharge surface water (SW) run-off from the site (after interception and attenuation – see Section 3.3 below) to the existing open Ballyogan Stream.

attenuation – see Section 3.3 below) to the existing open Ballyogan Stream.

The proposed development will comprise of a new surface water drainage system to collect surface water run-off and will treat the run-off at source by means of green blue roofs, tree pits, rain gardens, permeable paving and detention basin attenuation, before discharging to the existing Ballyogan Stream. The site is designed with both apartment blocks roofs as green blue/blue roofs, all parking bays are to be permeable paving, impermeable asphalt roads are provided with road gullies, discharging through a petrol interceptor to a detention basin. Landscaped areas are to promote natural infiltration, albeit poor, by the inclusion of tree pits and rain gardens, all connected by subsoil filter drains ultimately discharging to the detention basin.

Final discharge from the site is limited to the equivalent greenfield runoff rate (Q_{bar}) by a hydrobrake.

The surface water network will include the following:

- Roof runoff discharging to green/blue roofs;
- A detention basin, attenuating flows from:
  - Asphalt roads and concrete footpaths via tree pits and road gullies;
  - Landscaped areas collected in/on:
    - Tree pits;
    - Rain gardens;
    - Grasscrete permeable emergency vehicle paths; and
    - Filter drains
  - Car-parking bays with permeable paving;
- A bypass Petrol Separator; and
- A hydrobrake flow control device.

Refer to Molony and Millar Drawings 1285-8-C02 & 1285-8-C05 and Appendix III and IV for SW pipe design and SW attenuation calculations respectively.

3.3 Compliance with the Principles of Sustainable Urban Drainage Systems

Currently, the site is a greenfield site.

Final discharge from the site will be limited to the current greenfield discharge rate, or 2 l/s/ha, whichever is the greater. In order to both reduce and attenuate the flow; the proposed development will be designed in accordance with the principles of Sustainable Urban Drainage Systems (SUDS) as embodied in the recommendations of the Greater Dublin Strategic Drainage Study (GDSDS). The GDSDS addresses the issue of sustainability by requiring designs to comply with a set of drainage criteria which aim to minimize the impact of urbanization by replicating the run-off characteristics of a greenfield site. The criteria provide a consistent approach to addressing both rate and volume of run-off as well as ensuring the environment is protected from pollution that is washed off roads and buildings.

The requirements of SUDS are typically addressed by provision of the following:

- Interception storage;
- Treatment storage (not required if interception storage is provided);
- Attenuation storage;

- Long term storage (not required if growth factors are not applied to Q_{bar} when designing attenuation storage).

In the case of the subject site, interception storage will be provided, and a 20% climate change factor will be applied to the allowable discharge for the 100-year rainfall event.

3.3.1 Interception Storage

Interception storage is catered for as follows:

- Green/Blue Roofs;
- Tree pits;
- Rain gardens;
- Permeable Paving; and
- Grassed unlined Detention Basin.
- Swales in the Northern Catchment Area

Note:

- Swales were considered, in the Southern boundary. However, the presence of mature trees here, prevented their inclusion.

3.3.2 Attenuation Storage

Attenuation storage is provided for in the Green Blue / Blue Roofs, Permeable Paving aggregate and Detention Basin. Refer to Appendix IV for attenuation calculations for each of these elements.

The green blue roof aerial coverage complies with minimum coverage percentages.

Please refer to Studio Glasu Landscape Dwg. 03 in Appendix IV in summary.

Block A	**Roof**	
	Green Blue Extensive	73.5%
	Blue (Paved)	24.7%
	Fourth Floor Terrace	
	Green Blue Extensive	21.2%
	Green Blue Intensive	50.6%
	Blue (Paved)	27.2%

Block B	**Roof**	
	Green Blue Extensive	74.5%
	Blue (Paved)	23.4%
	Fifth Floor Terrace	
	Green Blue Extensive	21.2%
	Green Blue Intensive	50.4%
	Blue (Paved)	27.2%
	First Floor Terrace	
	Green Blue Extensive	27%
	Green Blue Intensive	50%
	Blue (Paved)	30%

HR Wallingford UKSuDS Greenfield runoff rate estimation tool was used to establish the Equivalent Greenfield runoff for the site (Qbar). Site specific data was included to determine a site specific Qbar = 9.1 l/s. Site specific data includes:

- the Standard Average Annual Rainfall (SAAR) of 1116 mm, based on the 1985-2025 SAAR Value for Ballyedmunduff House (a weather station near the site).
- The Site Investigation Report classified the soil as a gravelly silty CLAY with cobbles. This is a typical boulder clay with low permeability. Three soakaway tests carried out failed. Based on this we have classified the soil as SOIL Type 4.
- Note: For this calculation the positively drained area of the site (1.088 ha) is used to determine Q_{bar}.

Based on this, the final site outfall (hydrobrake) discharge is limited 9.1 l/s.

Refer to HR Wallingford UKSuDS Greenfield runoff rate estimation tool, in Appendix IV for details.

Because long term storage is not provided, the limiting value is used for the 100-year storm without growth factors being applied. The Calculations in Appendix IV show the attenuation requirements for these structures, for a 100-year return storm (+ 20% for climate change).

Attenuation provided is in excess of the minimum volume requirement, as shown in the calculations.

3.3.3 Catchment Area:

Th catchment area is shown on drawing 1285-8-C30. It is 1.088 ha. The entire site area is 1.22 ha. The catchment area comprises four main elements:

- Roads and footpaths
- Car bays
- Roofs
- Landscaping

There are 18 No. tree pits located alongside the roads and car bays as shown on drawing No. 1285-8-C20. These provide interception storage for the roads, footpaths and car bays.

The car bays will be formed in permeable paving which is also a form of interception storage.

The green/blue roofs and landscaping are considered to have interception storage intrinsically built in.

Due to the topography of the site, the Northern Road (Road 2) and car bays drain to the stream via tree pits, permeable paving, a swale, petrol interceptor and hydrobrake.

4 FOUL DRAINAGE SYSTEM

4.1 Existing Foul Sewer Infrastructure

A 375mm diameter foul sewer crosses the site, flowing eastwards along the northern boundary of the site.

See layout of existing drainage infrastructure on Molony Millar drawing 1285-8 C02 and existing service map in Appendix I for further clarity.

4.2 Proposed Foul Sewer/Drain System

Irish Water pre-connection enquiry has been submitted (reference CDS24009343) and the wastewater connection has been deemed as 'feasible without infrastructure upgrade', refer to Appendix II for a copy thereof.

It is proposed to provide a 225mm diameter uPVC foul collector sewer following the main access road, discharging to the existing 375mm diameter concrete foul sewer.

Number of Residential Units = 120.

@ 150 l/person/day & average occupancy ratio of 2.7 persons/dwelling *

Q = 48,600 l/day or 0.562 l/s DWF

Qpeak = 6DWF = 3.375 l/s

* Reference: Irish Water, Code of Practice for Wastewater Supply

Foul Sewer Network Pipe Sizes

Refer to attached Foul Sewer calculations in Appendix II.

4.3 Build Over Agreement

The proposed bicycle shed is located over the existing 375 mm diameter foul sewer. We have submitted a Building-over or Near an Uisce Eireann Asset Application Form to Uisce Eireann and a copy of this is included in Appendix 11.

5 WATER SUPPLY

5.1 Existing Watermain Infrastructure

An existing 100mm diameter CI watermain is located on Kilgobbin Road to the east of the site – see the existing watermain infrastructure records contained in Appendix I and Molony and Millar drawing 1285-8-C03 for further clarity.

5.2 Proposed Watermain and Service Connection

Irish Water pre-connection enquiry has been submitted (reference CDS24009343) and the water connection has been deemed as 'feasible without infrastructure upgrade', refer to Appendix II for a copy thereof.

It is proposed to provide a new 100mm diameter looped watermain following the main access road(s). It is proposed to provide an isolating sluice valve directly after the new connection onto the existing watermain with a water meter to be in compliance with Irish Water standards and specifications. This watermain is to be located no closer than 3m from any structure.

Four new hydrants are proposed, ensuring that no part of the apartment complex is further than 46m from a hydrant. The hydrants are to be located no closer than 6m from any of the buildings.

The water demand for the entire development is 46.605 m^3 (46,605 l/day) equivalent to the calculated total foul effluent discharge in Section 4.2 above.

6 HYDROLOGICAL MODEL

The worst case scenario for rainfall has been considered in designing the surface water network and SuDS. A hydrological model was set up using Site 3D and drainage simulation results for summer and winter were outputted. These results are included in Appendix V.

7 SITE INVESTIGATION REPORT

A Site Investigation Report was carried out by Site Investigation Limited. A copy of this report is included in Appendix VI.

APPENDIX I

RECORDS OF EXISTING SERVICES

Services on OS

9/30/2024

1:1,188

0 0.01 0.01 0.03 mi

0 0.01 0.03 0.05 km

Esri Community Maps Contributors, Esri UK, Esri, TomTom, Garmin, Foursquare, GeoTechnologies, Inc, METI/NASA, USGS, Sources: Esri, Airbus DS, USGS, NGA, NASA, CGIAR, N Robinson, NCEAS, NLS, OS, NMA, Geodatastyrelsen, Rijkswaterstaat, GSA, Geoland,

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

Storm Discharge Points
- Outfall
- Overflow
- Soakaway
- Other; Unknown

Surface Water Mains
- Surface Gravity Mains
- Surface Gravity Mains Private
- Surface Water Pressurised Mains
- Surface Water Pressurised Mains Private

Storm Inlets
- Gully
- Standard
- Other; Unknown
- Storm Culverts
- Storm Clean Outs
- Storm Weirs
- Storm Open Drains

- Storm Detention Areas
- Storm chambers

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

Sewer Discharge Points
- Outfall

- Overflow
- Soakaway
- Other; Unknown

Sewer Clean Outs
- Rodding Eye
- Flushing Structure
- Other; Unknown
- Waste Water Treatment plant
- Waste Water Pump station

Sewer Inlets
- Standard
- Catchpit
- Gully
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown
- Sewer Chambers

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

- Syphon - Foul
- Syphon - Overflow
- Overflow

Sewer Mains (Private)
- Gravity - Combined
- Gravity - Foul
- Gravity - Overflow
- Gravity - Unknown
- Pumping - Combined
- Pumping - Foul
- Pumping - Overflow
- Pumping - Unknown
- Syphon - Combined
- Syphon - Foul

- Syphon - Overflow
- Overflow
- Sewer Detention Areas
- Waste Water Asset Site Boundary
- Wastewater Discharge Authorisation Boundary

Network Meters
- Boundary Meter
- Bulk Meter
- Check Meter
- Group Scheme
- Source Meter
- Waste Meter
- Unknown Meter ; Other Meter

Flow Control Valves
- Non-Return
- PRV
- PSV

Line Valves
- Sluice Valve Open
- Sluice Valve Part Open
- Sluice Valve Closed
- Butterfly Valve Open
- Butterfly Valve Part Open
- Butterfly Valve Closed

Boundary Valves
- Sluice Valve Open
- Sluice Valve Closed
- Butterfly Valve Open

- Butterfly Valve Closed
- Scour Valves

Air Control Valves
- Single Air Control Valve
- Double Air Control Valve

Water Hydrants
- Fire Hydrant
- Fire Hydrant/Washout
- Washout
- Water Treatment Plant
- Abstraction Point

Reservoir
- Reservoir (Potable Water)
- Reservoir (Raw Water)
- Water Pump Stations

Water Network Structures
- Storage Cell
- Storage Tower
- Dosing Point
- Meter Station
- Water Pump
- Other; Unknown

Private Water Network Structures
- Storage Cell
- Storage Tower
- Dosing Point
- Meter Station
- Water Pump
- Other; Unknown

- Water Kiosk

Water Distribution Mains
- Irish Water
- Private

Trunk Water Mains
- Irish Water
- Private

Water Lateral Lines
- Irish Water
- Non IW
- Water Abandoned Lines
- Water Abandoned Points
- Water Distribution Chambers
- World Hillshade

APPENDIX II

FOUL SEWER DESIGN CALCULATIONS AND UISCE EIREANN

0.75 to 3 m/s — Self cleansing velocity when flowing half full:
0.6 for <420 Discharge Units (Intermittent Flow) — Pipe Roughness Co-efficient (K_s):
1.5 for >420 Discharge Units (Constant Flow)

References:
Code of Practice for Wastewater Infrastructure, Irish Water, 2017
Recommendations for Site Development Works, D.O.E. Nov. 1998
BS8301:1985, Table 4, 7.4.4.1

Pipe Run	Pipe Gradient	Pipe Diameter	Discharge Units for segment	Accumulative Discharge units	Actual Peak		Full Bore		Proportional flow	Discharge Velocity	Proportional Depth
					Flow Q	Velocity v	Flow Q_p	Velocity v_p	Q/Q_p		
	1 in	mm	units	units	l/s	m/s	l/s	m/s	OK?	OK?	OK?
F1-F2	22	225	616	616	6.737	1.419	97.463	2.451	YES	YES	YES
F2-F3	50	225	1064	1680	10.558	1.205	64.569	1.624	YES	YES	YES

*Allow 14 discharge units per dwelling unit

CONFIRMATION OF FEASIBILITY

Rakshit D Muddu

Molony Millar
Riverbank House
Ballyboden Road
Rathfarnham
Dublin
D14W2V1

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

Uisce Éireann
PO Box 448
South City
Delivery Office
Cork City

www.water.ie

4 March 2025

Our Ref: CDS24009343 Pre-Connection Enquiry
Kilgobbin Apartments, Riverside, Stepaside, Dublin

Dear Applicant/Agent,

We have completed the review of the Pre-Connection Enquiry.

Uisce Éireann has reviewed the pre-connection enquiry in relation to a Water & Wastewater connection for a Housing Development of 108 unit(s) at Kilgobbin Apartments, Riverside, Stepaside, Dublin, (the **Development)**.

Based upon the details provided we can advise the following regarding connecting to the networks;

- **Water Connection** - Feasible without infrastructure upgrade by Uisce Éireann

- The Development can be supplied from the existing 6" CI main along Kilgobbin Road.
- Connection main should be a 150mm ID pipe with a bulk meter and associated telemetry installation.
- A pressure reducing valve may be required for the connection.

- **Wastewater Connection** - Feasible without infrastructure upgrade by Uisce Éireann

- As per Uisce Éireann GIS records (please see Section B of this letter), Uisce Éireann assets are present on the site. The Developer must demonstrate that proposed structures and works will not inhibit access

for maintenance or endanger structural or functional integrity of the assets during and after the works. For design submissions and queries related to diversion/build near or over, please contact UÉ Diversion Team via email address diversions@water.ie

This letter does not constitute an offer, in whole or in part, to provide a connection to any Uisce Éireann infrastructure. Before the Development can be connected to our network(s) you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.

As the network capacity changes constantly, this review is only valid at the time of its completion. As soon as planning permission has been granted for the Development, a completed connection application should be submitted. The connection application is available at www.water.ie/connections/get-connected/

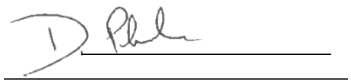
Where can you find more information?

- **Section A -** What is important to know?
- **Section B -** Details of Uisce Éireann's Network(s)

This letter is issued to provide information about the current feasibility of the proposed connection(s) to Uisce Éireann's network(s). This is not a connection offer and capacity in Uisce Éireann's network(s) may only be secured by entering into a connection agreement with Uisce Éireann.

For any further information, visit **www.water.ie/connections**, **email newconnections@water.ie** or contact 1800 278 278**.**

Yours sincerely,



Dermot Phelan
Connections Delivery Manager

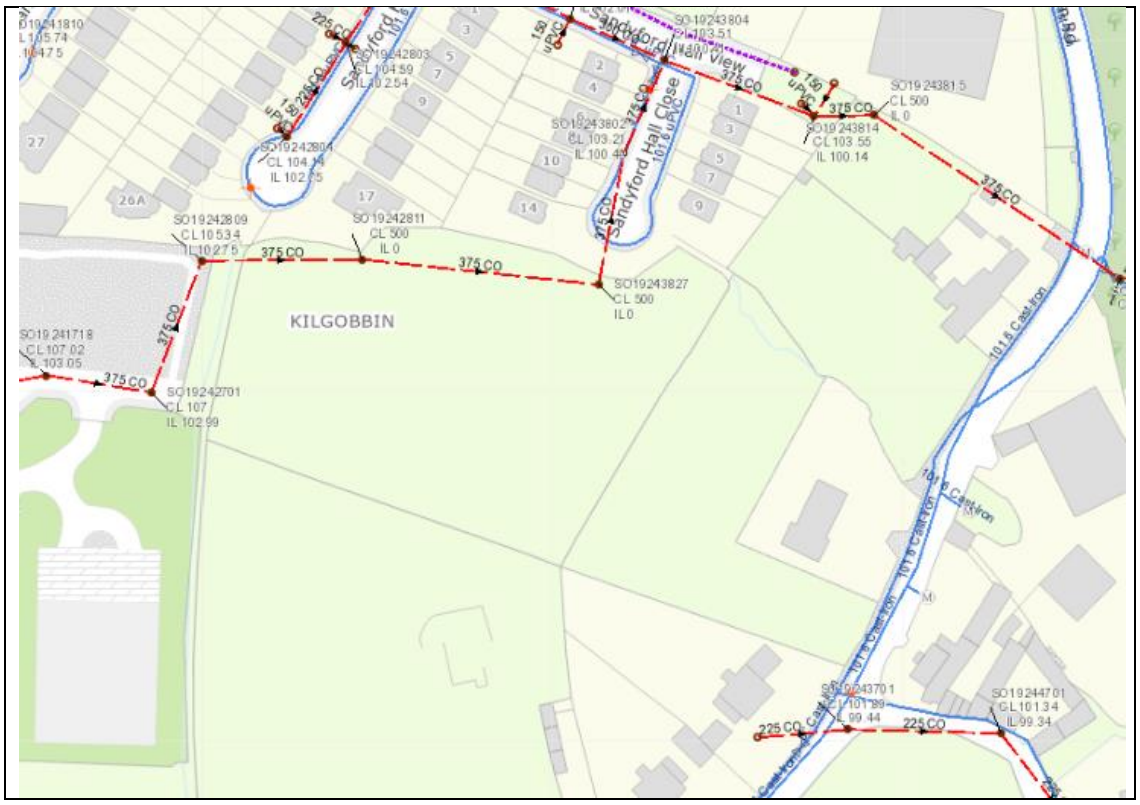
Section A - What is important to know?

What is important to know?	Why is this important?
Do you need a contract to connect?	• Yes, a contract is required to connect. This letter does not constitute a contract or an offer in whole or in part to provide a connection to Uisce Éireann's network(s). • Before the Development can connect to Uisce Éireann's network(s), you must submit a connection application and be granted and sign a connection agreement with Uisce Éireann.
When should I submit a Connection Application?	• A connection application should only be submitted after planning permission has been granted.
Where can I find information on connection charges?	• Uisce Éireann connection charges can be found at: https://www.water.ie/connections/information/charges/
Who will carry out the connection work?	• All works to Uisce Éireann's network(s), including works in the public space, must be carried out by Uisce Éireann*. *Where a Developer has been granted specific permission and has been issued a connection offer for Self-Lay in the Public Road/Area, they may complete the relevant connection works
Fire flow Requirements	• The Confirmation of Feasibility does not extend to fire flow requirements for the Development. Fire flow requirements are a matter for the Developer to determine. • **What to do?** - Contact the relevant Local Fire Authority
Plan for disposal of storm water	• The Confirmation of Feasibility does not extend to the management or disposal of storm water or ground waters. • **What to do?** - Contact the relevant Local Authority to discuss the management or disposal of proposed storm water or ground water discharges.
Where do I find details of Uisce Éireann's network(s)?	• Requests for maps showing Uisce Éireann's network(s) can be submitted to: datarequests@water.ie

What are the design requirements for the connection(s)?	• The design and construction of the Water & Wastewater pipes and related infrastructure to be installed in this Development shall comply with ***the Uisce Éireann Connections and Developer Services Standard Details and Codes of Practice,*** available at www.water.ie/connections
Trade Effluent Licensing	• Any person discharging trade effluent** to a sewer, must have a Trade Effluent Licence issued pursuant to section 16 of the Local Government (Water Pollution) Act, 1977 (as amended). • More information and an application form for a Trade Effluent License can be found at the following link: https://www.water.ie/business/trade-effluent/about/ **trade effluent is defined in the Local Government (Water Pollution) Act, 1977 (as amended)

Section B – Details of Uisce Éireann's Network(s)

The map included below outlines the current Uisce Éireann infrastructure adjacent the Development: To access Uisce Éireann Maps email datarequests@water.ie



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

Note: The information provided on the included maps as to the position of Uisce Éireann's underground network(s) is provided as a general guide only. The information is based on the best available information provided by each Local Authority in Ireland to Uisce Éireann.

Whilst every care has been taken in respect of the information on Uisce Éireann's network(s), Uisce Éireann assumes no responsibility for and gives no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided, nor does it accept any liability whatsoever arising from or out of any errors or omissions. This information should not be solely relied upon in the event of excavations or any other works being carried out in the vicinity of Uisce Éireann's underground network(s). The onus is on the parties carrying out excavations or any other works to ensure the exact location of Uisce Éireann's underground network(s) 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.

MOLONY MILLAR

Ciaran Goggin <cgoggin@molonymillar.ie>

Build Over Application Form

2 messages

Ciaran Goggin <cgoggin@molonymillar.ie> Thu, Aug 14, 2025 at 5:16 PM
To: Diversions <diversions@water.ie>
Cc: Keith Atkinson <katkinson@molonymillar.ie>, Ray Goggin <rgoggin@molonymillar.ie>

To Whom It May Concern,

Please find attached proposed build over application form & associated drawing for a proposed bike shed on our site at Kilgobbin, Stepaside, Dublin 18.

If you have any queries please do not hesitate to me,

Regards,

Ciarán

2 attachments

1285-8-C55 Bike Storage Build Over.pdf
3021K

Build Over Application.pdf
2580K

Diversions <Diversions@water.ie> Wed, Aug 20, 2025 at 2:43 PM
To: Ciaran Goggin <cgoggin@molonymillar.ie>

Hi Ciaran,

Thank you for contacting Uisce Eireann.

Your query has been registered with the diversions team within the Connections and Developer Services department and assigned reference DIV25257. Please quote this in all future correspondence.

A design engineer will be in contact with you in order to progress your query.

Kind regards,

Connections & Developer Services

Uisce Éireann

Teach Colvill, 24-26 Sráid Thalbóid, Baile Átha Cliath 1, Éire

Irish Water

Colvill House, 24-26 Talbot Street, Dublin 1, Ireland

From: Ciaran Goggin <cgoggin@molonymillar.ie>
Sent: Thursday 14 August 2025 17:17
To: Diversions <Diversions@water.ie>
Cc: Keith Atkinson <katkinson@molonymillar.ie>; Ray Goggin <rgoggin@molonymillar.ie>
Subject: Build Over Application Form

[Quoted text hidden]

ionad gnó ag Teach Colvill, 24-26 Sráid na Talbóide, BÁC 1.

Go raibh maith agat as d'aird a thabhairt.

Thank you for your attention.

Building-over or Near an Uisce Éireann Asset Application Form

Water and/or Wastewater Assets

This form should be completed by a person or organisation who wishes to apply to Uisce Éireann to build-over/near a water and/or a wastewater asset. If completing this form by hand, please use BLOCK CAPITALS and black ink.

* Denotes mandatory/required fields. Please note, if mandatory fields are not completed the application will be returned.

In accordance with Uisce Éireann's Connections Charging Policy and as approved by the Commission for Regulation of Utilities, the Applicant will be liable for all costs associated with building-over/near Uisce Éireann's water/wastewater assets.

Uisce Éireann will only permit building-over of its assets in **very limited circumstances**.

Building-over an Uisce Éireann Sewer will **only** be considered if the proposed development is an extension to an existing house **and** if the Sewer has either (i) a maximum diameter of 150mm; or (ii) has a diameter of 225mm while serving less than thirteen (13) houses upstream of the proposed build-over works.

If you plan to build a structure near an Uisce Éireann asset, and the proposed structure will be within the separation distances specified https://water.ie/connections/developer-services/diversions/, Applicants are required to complete this application form.

SectionA|Applicant Details

1 ***Applicant details:**

Registered company name (if applicable): KILGOBBIN APT Ltd

Trading name (if applicable):

Company registration number (if applicable): 770243

If you are not a registered company/business, please provide the Applicant's name:

*Contact name: CIARÁN KAVANAGH

*Postal address: UNIT C5, BLOCK C, SANTRY, DUBLIN 9

Eircode: D09VW27

*Telephone: 0189032744

*Email: Ciaran@Kavco.ie

2 **Agent details (if applicable):**

Contact name: CIARAN GOGGIN

Company name (if applicable): MOLONY MILLAR

Postal address: RIVERBANK HOUSE,
BALLYBODEN ROAD, RATHFARNHAM,
DUBLIN 16

Eircode: D16W2U1

Telephone: 01-4930211

Email: cgoggin@molonymillar.ie

3 **Please indicate whether it is the Applicant or the agent who should receive future correspondence in relation to the build-over or near application:**

Applicant ☐ Agent ☑

Section B | Site Details of the proposed build-over or build near

4 ***Type of application:** Build-Over [✓] Build Near [ ]

5 ***Site address:** KILGOBBIN, RIVERSIDE, KILGOBBIN, STEPASIDE, DUBLIN 18

Site Eircode:

6 ***Irish Grid co-ordinates of site:** E(X) 319345 N(Y) 224748

E.g. co-ordinates of GPO, O'Connell St., Dublin: E(X) 315,878 N(Y)234,619

7 **Brief description of development and reason why it will involve building-over or building near Uisce Éireann assets:**

Proposed bike shed to be built over an existing 375mmØ foul pipe

8 **Local Authority:**

Local Authority that granted planning permission (if applicable):

DUN LAOGHAIRE-RATHDOWN

9 **Planning reference** (current reference and any previous planning reference that may be applicable):

N/A **Date of grant of planning permission:**

Note: Enter "EXEMPT" for exempted developments.

10 **Associated Uisce Éireann New Connection Application Reference Number: (if applicable)**

11 ***Confirmation of Land Ownership:**

Please confirm the name and address of the landowner and provide the folio details of the land where the build-over or build near works are proposed:

KILGOBBIN APT Ltd

Note:
1. Enter "My Land" if this is the case.
2. If land is in ownership of a third-party, a letter of consent to the proposed diversion works is required to be provided by the third-party landowner as part of this application. A formal easement will be required from the third-party landowner should the diversion progress.

12 ***Are there potential contaminated land issues?** Yes [ ] No [✓]

Section C | Build-over or Build near details

13 ***Type of Asset to be built over/near?** Waterman ☐ Wastewater Sewer ☑ Other ☐

14 **Material of Asset to be built over/near? (If known)**

Ductile Iron ☐ uPVC ☐ PE ☐ Cast Iron ☐ AC ☐ Concrete ☑ Clay ☐ Brick ☐ Other ☐

15 **Diameter of existing asset?** 375 **mm**

16 **Depth to invert of existing asset?** 2172 **mm**

17 **If build near, what is the proposed horizontal separation distance to IW asset?** 1423 **m**

18 **Approximate date works are due to commence:** 01/12/2025

Section D | Supporting documentation

The following documentation to be submitted with the application form:

- * Site location map: A site location map to a scale of 1:1000, which clearly identifies the land or structure to which the application relates. The map shall also include the following details: ☐

  a) The scale shall be clearly indicated on the map. ☐

  b) The site boundaries shall be delineated in red. ☐

  c) Irish Grid site co-ordinates shall be marked on the site location map. ☐

  d) Details of Planning Permission or Planning Exemption for the development (if applicable). ☐

  e) Details of wayleaves, easements, covenants, etc. for pipework on the site. ☐

- * Site layout map: A site layout map to a scale of 1:500, which clearly identifies the land or structure to which the application relates. The map shall also include the following details: ☐

  f) The Uisce Éireann Asset you propose to build-over or near. ☐

  g) The line and invert level of the existing IW asset. ☐

  h) Separation distances between the proposed build near and existing/proposed infrastructure and structures on the site. Please note separation distances are to be measured from the face of the asset. ☐

  i) Details of any easements or covenants which may affect the site. (if applicable) ☐

  j) Topographical levels shown of the site. ☐

- * Cross Sections drawings of the build-over or build near proposal identifying existing and proposed infrastructure and structures. The Cross Sections shall include the following details: ☐

  k) The location and invert level of the existing infrastructure on the site that is to be built over or near. ☐

  l) The location and level of any existing/proposed infrastructure that is within the proposed zone of influence and notifications in accordance with Uisce Éireann's Codes of Practice and to demonstrate compliance with separation distance requirements in Uisce Éireann's Codes of ☐

  m) Existing and Proposed Foundation details. ☐

  n) Existing and Proposed Ground Level. ☐

  o) Details of measures to protect the Uisce Éireann asset subject to the build-over or build near. ☐

  p) Details of measures to provide access to the Uisce Éireann asset subject to the build-over or build near. ☐

  q) Any other information that might assist Uisce Éireann to assess this application. ☐

- * Details of site investigation e.g. CCTV, slit trenches etc.

NOTE: Uisce Éireann reserves that right to request additional information from the Applicant to assist the assessment of the build-over/near application.

IMPORTANT TO NOTE:

- In accordance with Uisce Éireann's Connections Charging Policy and as approved by the Commission for Regulation of Utilities, the Applicant will be liable for the full cost of all build-over works.
- If the site also requires a connection to the public water or wastewater infrastructure please ensure that the appropriate application is made in tandem with this build-over or Build near application on https://www.water.ie/connections/get-connected/. No connection(s) to the public water or wastewater infrastructure will be possible without a valid connection agreement between the parties.
- If the build-over or build near proposal relates to a wastewater sewer, a CCTV survey of the existing wastewater sewer to be built over or built near is required to assess the application.
- Please submit all information set out in Section D – Supporting Documentation with the application including details of surveys carried out. The application cannot be assessed without the supporting documentation.

Building-over an Uisce Éireann asset is not permitted to commence until a Build-over Agreement is fully agreed with and executed by Uisce Éireann.

Any interference with an Uisce Éireann asset prior to a Build-Over Agreement being signed by the parties may result in an offence being committed

Section E | Declaration

I/We hereby make this application to Uisce Éireann to build-over/near Uisce Éireann water and/or wastewater asset as detailed on this form. I/We understand that any alterations made to this application must be declared to Uisce Éireann immediately and, in any event, prior to any works being carried out.

The details that I/we have given with this application are accurate.

I/We have enclosed all the necessary supporting documentation.

Any personal data you provide will be processed by Uisce Éireann in accordance with its Privacy Notice, please see https://www.water.ie/privacy-notice/. Our legal basis for collecting and using this information is set out in our Privacy Policy and includes (i) processing is necessary for the performance of a contract to which you are party or in order to take steps at your request prior to entering into a contract; and (ii) it is necessary for the performance of tasks that we carry out in the public interest or in the exercise of official authority vested in us by law (including the Water Services Acts 2007 to 2018). If you have any questions regarding the use of your personal data, please contact dataprotection@ervia.ie.

Signature: Ciaran Goggin Date: 14/08/2025

Your full name (in BLOCK CAPITALS):

CIARAN GOGGIN

Uisce Éireann will carry out a formal assessment based on the information provided on this form.
Any determination made by Uisce Éireann will be based on the information that has been provided here.
Please submit the completed form to **diversions@water.ie**

For office use only:

Customer Number

Guide to completing the application form

This form should be completed by a person or organisation who wishes to apply to Uisce Eireann to build-over/near a water and/or wastewater asset. The Uisce Éireann Codes of Practice are available at **www.water.ie** for reference.

Section A | Applicant details

Question 1: This question requires the Applicant or company applying for a connection to identify themselves, their postal address, and to provide their contact details.

Question 2: If the Applicant has employed a consulting engineer or an agent to manage the application on their behalf, the agent's address and contact details should be recorded here.

Question 3: Please indicate whether it is the Applicant or the agent who should receive future correspondence in relation to the build-over/near application.

Section B | Site details for the proposed build-over/near

Question 4: This question relates to the type of application is being applied for, a Build-over or Build Near

Question 5: This is the address of the site requiring the build-over/near and for which this application is being made.

Question 6: Please provide the Irish Grid co-ordinates of the proposed site. Irish grid positions on maps are expressed in two dimensions as Eastings (E or X) and Northings (N or Y) relative to an origin. You will find these coordinates on your Ordnance Survey map which is required to be submitted with the application.

Question 7: Please provide a brief description of the development, description of the proposed build-over/near and description of why the build-over/near is required.

Question 8: Please identify the Local Authority that is dealing with your planning application if applicable, for example Cork City Council.

Question 9: Please provide the planning reference number granting your proposed development and date of grant of planning permission if applicable.

Question 10: Please provide the new connection application reference number associated with the development if applicable.

Question 11: Please identify the name and address of the landowner where the build-over/build near is to be completed.

Question 12: Please verify if there are any land contamination issues in the vicinity of your proposed build-over/near works.

Section C| Build-over or near details

Question 13: Please identify the type of asset to be built over/near.

Question 14: Please specify the material of the asset to be built over/near.

Question 15: Please specify the diameter of the asset to be built over/near.

Question 16: Please specify the depth to invert of the asset to be built over/near

Question 17: Please specify the proposed horizontal separation distance from the existing asset to the proposed structure.

Question 18: Please provide an approximate date for when the build-over/near is to commence.

Section D| Supporting documentation

Please provide additional information as listed.

Section E| Declaration

Please review the declaration, sign, and return the completed application form to Uisce Éireann by email or by post using the contact details provided in Section E.

APPENDIX III

SURFACE WATER SEWER DESIGN CALCULATIONS

Rainfall Intensity (i) roof =	**75**	**mm/hr**		***RSDW, DOE, 1998, 3.4***
Rainfall Intensity (i) paved =	**50**	**mm/hr**		***RSDW, DOE, 1998, 3.4***
Storm Return Period =	**5**	**years**		***RSDW, DOE, 1998, Table 3.1***
Self cleansing Velocity =	**0.8-3**	**m/s**		***RSDW, DOE, 1998, 3.4***
Roof Vol. run-off coeffiecient (Cv) =			**1**	
Road Vol. run-off coeffiecient (Cv) =			**1**	
Pipe Roughness K_s =	**0.6**	**mm**		***BS8301:1985, 7.4.4.1 Hydraulic Roughness***
Urban creep factor =	**10**	**%**		

Design calculations: **Q =** **1.1 x A_P x i x Cr x Cv x 2.78**

Routing coefficient (Cr) = **1.0**

Qmax = **21.7 l/s**

Total Roof Area = **0.0** **m^2**

Total Road & Footpath Area = **1492.0** **m^2**

Roof discharges limited to max. 0.4 & 0.6 l/s (total 1 l/s)

Pipe No.	Impermeable Area (A_p)		Gradient	Diameter	Actual Rate of Flow	Accumulative Rate of Flow	Discharge Velocity	Capacity Full bore flow	Full Bore Velocity	Proportional flow	Discharge Velocity	Proportional Depth
	Roof (A_{p1})	Road & Footpath			Q	Q_t	v	Q_p	v_p	Q/Q_p		
P	m^2	m^2	1 in	mm	l/s	l/s	m/s	l/s	m/s	OK?	OK?	OK?
S1-S2	0	242	25	225	3.7	3.7	1.24	104.348	2.624	YES	YES	YES
S2-S3	0	34	200	225	0.5	12.0	0.82	36.526	0.919	YES	YES	YES
S3-HW1**	0	0	200	225	0.6	12.6	0.84	36.526	0.919	YES	YES	YES
HW2-S4*	0	0	200	225	0.0	12.6	0.84	36.526	0.919	YES	YES	YES
S4-HW3*	0	0	200	225	0.0	8.3	0.75	36.526	0.919	YES	YES*	YES
S6-S2**	0	506	155	225	7.7	7.7	0.80	41.565	1.045	YES	YES	YES
HW7-S7*	0	710	200	225	10.9	10.9	0.80	36.526	0.919	YES	YES	YES
S7-HW8*	0	0	200	225	0.0	1.2	0.43	36.526	0.919	YES	YES*	YES

*** Flow rate after SUDS and flow restrictor**

**** 0.4 & 0.6 l/s limited discharge from Block A & B respectively**

Urban creep factor of 10% included

APPENDIX IV

SURFACE WATER ATTENUATION CALCULATIONS

Schedule of Catchment Areas

The areas listed below relate to the various catchment areas used for calculating attenuation, drawing 1285-8-C20 depicts these areas.

Entire Site Area =	12194	m^2
Northern Positively Drained Area =	1451	m^2
Southern Positively Drained Area =	9387.2	m^2
Total Positively Drained Site Area =	10838.2	m^2
Block A Roof Area =	703.5	m^2
Block B Roof Area =	1101.7	m^2
Northern Road carraigeway & Footpaths area =	574	m^2
Southern Road carraigeway & Footpaths area =	955	m^2
Northern Landscaped Areas =	385	m^2
Southern Landscaped Areas =	6420	m^2
Northern Permeable Paving Area =	492	
Southern Permeable Paving area =	207	m^2
Sum:	10838.2	m^2

Storm Water Attenuation Calculations

Total Site Area = 12194 m^2
Positively drained Site Area = 10838.2 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof	Green/Blue Ext.	392.1	91.7	359.6
	Green/Blue Int.	120.5	83.4	100.5
	Blue	180.3	91.7	165.3
	Other	10.6	100	10.6
Equivalent impermeable area:		703.5		**636.0**

Site Greenfield runoff = 9.1 l/s (Q_{bar}) HR Wallingford

Permisible outflow from Block A green/blue roof = 0.4 l/s
Outflow from Block B green/blue roof = 0.6 l/s
Outflow (from grnd flr external attenuation) = 8.1 l/s
Total outflow from site (sum) = 9.1 l/s

100 year storm

Permissible Volume (l)= Permisible Outflow (l/s) x time (s)

Actual Volume (l)= Equivalent Impermeable Area x depth of rainfall

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Adjusted Rainfall	Permissible	Actual	Store
min	mm	+ 20% for climate change	l	l	l
15	29.4	35.3	360.00	22437.65	22077.65
30	36.5	43.8	720.00	27856.27	27136.27
60	45.4	54.5	1440.00	34648.62	33208.62
120	56.5	67.8	2880.00	43119.97	40239.97
240	70.2	84.2	5760.00	53575.61	47815.61
360	79.8	95.8	8640.00	60902.19	52262.19
720	99.2	119.0	17280.00	75707.99	58427.99
1440	123.3	148.0	34560.00	94100.75	59540.75
2880	137.8	165.4	69120.00	105166.94	36046.94

Rainfall figures are Site specific, Met Eireann

From table above, required storage volume is 59.54 m^3

Storage in 100mm deep Baudem RWR100 Blue Roof Attenuation cell @ 95% void = 95 l/m^2 (area = 698.1m^2)
therefore **Storage Provided** = 698.1 x 0.095 = 66.32 m^3
Max. Total green blue roof controlled discharge from Block A = 0.4 l/s

Storm Water Attenuation Calculations

Total Site Area = 12194 m^2
Positively drained Site Area = 10838.2 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roof	Green/Blue Ext.	561.6	91.7	515.0
Roof	Green/Blue Int.	244.8	83.4	204.2
Roof	Blue	278.9	91.7	255.8
Roof	Other	16.4	100	16.4
Equivalent impermeable area:		1101.7		**991.3**

Site Greenfield runoff = 9.1 l/s (Q_{bar}) HR Wallingford

Outflow from Block A green/blue roof = 0.4 l/s
Permisible outflow from Block B green/blue roof = 0.6 l/s
Outflow (from grnd flr external attenuation) = 8.1 l/s
Total outflow from site (sum) = 9.1 l/s

100 year storm:

Permissible Volume (l)= Permisible Outflow (l/s) x time (s)

Actual Volume (l)= Equivalent Impermeable Area x depth of rainfall

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Adjusted Rainfall	Permissible	Actual	Store
min	mm	+ 20% for climate change	l	l	l
15	29.4	35.3	540.00	34973.12	34433.12
30	36.5	43.8	1080.00	43419.01	42339.01
60	45.4	54.5	2160.00	54006.12	51846.12
120	56.5	67.8	4320.00	67210.26	62890.26
240	70.2	84.2	8640.00	83507.26	74867.26
360	79.8	95.8	12960.00	94927.05	81967.05
720	99.2	119.0	25920.00	118004.55	92084.55
1440	123.3	148.0	51840.00	146673.00	94833.00
2880	137.8	165.4	103680.00	163921.65	60241.65

Rainfall figures are Site specific, Met Eireann

From table above, required storage volume is 94.83 m^3

Storage in 100mm deep Baudem RWR100 Blue Roof Attenuation cell @ 95% void = 95 l/m^2 (area = 1121.9m^2)
therefore **Storage Provided** = 1121.9 x 0.095 = 106.58 m^3
Max. Total green blue roof controlled discharge from Block B = 0.6 l/s

Storm Water Attenuation Calculations

Total Site Area = 12194 m^2
Northern Positively drained Site Area = 1451 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roads & footpaths	macadam/conc.	574	80	459.2
landscaping	landscaping	385	40	154.0
Equivalent impermeable area:		959		**613.2**

Site Greenfield runoff = 9.1 l/s (Q_{bar}) HR Wallingford

Outflow from Block A green/blue roof = 0.4 l/s
Outflow from Block B green/blue roof = 0.6 l/s
Northern Catchment Permissible outflow = 1.2 l/s
Southern Catchment Permissible outflow = 6.9 l/s
Total outflow from site (sum) = 9.1 l/s

100 year storm:

Permissible Volume (l)= Permissible Outflow (l/s) x time (s)

Actual Volume (l)= Equivalent Impermeable Area x depth of rainfall

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Adjusted Rainfall	Permissible	Actual	Store
min	mm	+ 20% for climate change	l	l	l
15	29.4	35.3	1080.00	21633.70	20553.70
30	36.5	43.8	2160.00	26858.16	24698.16
60	45.4	54.5	4320.00	33407.14	29087.14
120	56.5	67.8	8640.00	41574.96	32934.96
240	70.2	84.2	17280.00	51655.97	34375.97
360	79.8	95.8	25920.00	58720.03	32800.03
720	99.2	119.0	51840.00	72995.33	21155.33
1440	123.3	148.0	103680.00	90729.07	-12950.93
2880	137.8	165.4	207360.00	101398.75	-105961.25

Rainfall figures are Site specific, Met Eireann

From table above, required storage volume is 34.38 m^3

Storage in combination of swale, tree pits and excees permeable paving
Swales = (L x W x D) = (0.9x0.2x58.6)+(2.4x0.2x16.2) = 18.32 m^3
Tree pits = No. x (L x W x D) x 30% voids = 10x(1.2x1.2x1.5)x0.3 = 6.48 m^3
Excess perm. paving = (excess depth) x area x 30% voids = (0.35-0.24)x492x0.3 16.24 m^3
Total attenuation provision = 41.04 m^3
Northern Catchment hydrobrake discharge = 1.2 l/s
Total Site discharge = 9.1 l/s

Storm Water Attenuation Calculations

Total Site Area = 12194 m^2
Southern Positively drained Site Area = 9387.2 m^2

Areas contributing to SW Run-off:

Description	Finish	Area (m^2)	Percentage run-off (%)	Equivalent run-off area (m^2)
Roads & footpaths	macadam/conc.	955	80	764.0
landscaping	landscaping	6420	40	2568.0
Equivalent impermeable area:		7375		**3332.0**

Site Greenfield runoff = 9.1 l/s (Q_{bar}) HR Wallingford

Outflow from Block A green/blue roof = 0.4 l/s
Outflow from Block B green/blue roof = 0.6 l/s
Northern Catchment Permissible outflow = 1.2 l/s
Southern Catchment Permissible outflow = 6.9 l/s
Total outflow from site (sum) = 9.1 l/s

100 year storm:

Permissible Volume (l)= Permissible Outflow (l/s) x time (s)

Actual Volume (l)= Equivalent Impermeable Area x depth of rainfall

Storage capacity (l)= Actual - Permissible Volumes

Duration	Rainfall	Adjusted Rainfall	Permissible	Actual	Store
min	mm	+ 20% for climate change	l	l	l
15	29.4	35.3	6210.00	117552.96	111342.96
30	36.5	43.8	12420.00	145941.60	133521.60
60	45.4	54.5	24840.00	181527.36	156687.36
120	56.5	67.8	49680.00	225909.60	176229.60
240	70.2	84.2	99360.00	280687.68	181327.68
360	79.8	95.8	149040.00	319072.32	170032.32
720	99.2	119.0	298080.00	396641.28	98561.28
1440	123.3	148.0	596160.00	493002.72	-103157.28
2880	137.8	165.4	1192320.00	550979.52	-641340.48

Rainfall figures are Site specific, Met Eireann

From table above, required storage volume is 181.33 m^3

Storage in Detention Basin: Effective Area x depth = (369x0.5) = 184.50 m^3

Southern Catchment hydrobrake discharge = 7.9 l/s
Total Site discharge = 9.1 l/s

SYSTEM C - NO INFILTRATION

Permeable Paved Parking Area =	**699 m^2**
Additional impermeable area contributing =	**0 m^2**

SUB-BASE THICKNESS REQUIRED FOR VEHICLE LOADINGS

Subgrade - CBR assumed min. 5%
Sub-base - Coarse graded aggregate Type 4/20 (4mm min. and 20mm max. particle size)

Loading category (Table 7):		**Car parking bays**
Required thickness of Subbase (Table 7) =		**350 mm**

SUB-BASE THICKNESS REQUIRED FOR WATER STORAGE

r =	**Ratio of 60min to 2-day rainfalls of 5-years return period**	**0.27**
M_5-60 =	**1 in 5 years , 60 min duration rainfall**	**18.1 mm**
CT (A) =	**1 in 100 year event + 20% climate change**	**240 mm**
	Table 5: Permeable sub-base thickness for attenuation system	
CT (2) =	**CT (A) * (Roof Area+Paved Area / Paved Area)**	**240 mm**

SUB-BASE THICKNESS REQUIRED = MAX CT (1) AND CT (2)	**350 mm**
Therefore Sub-base thickness =	**350 mm**

The design section is:

80 mm BLOCK PAVIOR, ON
50 mm AGGREGATE TYPE 2/6.3 LAYING COURSE, ON
350 mm PERMEABLE COARSE GRADED AGGREGATE TYPE 4/20 ACCORDING TO BS EN 13242:2002, ON

REFERENCES: **PERMEABLE PAVEMENTS. GUIDE TO THE DESIGN, CONSTRUCTION AND MAINTENANCE OF CONCRETE BLOCK PERMEABLE PAVEMENTS EDITION 6.**

BS 7533 13:2009

Met Eireann
Return Period Rainfall Depths for sliding Durations
Irish Grid: Easting: 319286, Northing: 224797,

	Interval		Years												
DURATION	6months,	1year,	2,	3,	4,	5,	10,	20,	30,	50,	75,	100,	150,	200,	250,	500,
5 mins	2.5,	3.7,	4.4,	5.5,	6.2,	6.7,	8.6,	10.8,	12.3,	14.5,	16.4,	17.9,	20.3,	22.2,	23.7,	N/A ,
10 mins	3.5,	5.2,	6.2,	7.6,	8.6,	9.4,	12.0,	15.1,	17.2,	20.2,	22.9,	25.0,	28.3,	30.9,	33.1,	N/A ,
15 mins	4.2,	6.1,	7.3,	9.0,	10.1,	11.1,	14.2,	17.8,	20.2,	23.7,	26.9,	29.4,	33.3,	36.3,	38.9,	N/A ,
30 mins	5.5,	8.0,	9.4,	11.5,	13.0,	14.2,	18.0,	22.4,	25.4,	29.7,	33.5,	36.5,	41.2,	44.9,	48.0,	N/A ,
1 hours	7.2,	10.4,	12.2,	14.9,	16.7,	18.1,	22.9,	28.3,	32.0,	37.1,	41.8,	45.4,	51.1,	55.5,	59.1,	N/A ,
2 hours	9.5,	13.6,	15.8,	19.2,	21.4,	23.2,	29.1,	35.8,	40.2,	46.5,	52.1,	56.5,	63.2,	68.5,	72.9,	N/A ,
3 hours	11.2,	15.9,	18.4,	22.2,	24.8,	26.8,	33.4,	41.0,	46.0,	53.0,	59.3,	64.2,	71.7,	77.5,	82.4,	N/A ,
4 hours	12.6,	17.7,	20.5,	24.7,	27.5,	29.7,	36.9,	45.1,	50.5,	58.2,	65.0,	70.2,	78.3,	84.7,	89.9,	N/A ,
6 hours	14.8,	20.7,	23.9,	28.6,	31.9,	34.4,	42.5,	51.7,	57.8,	66.3,	73.9,	79.8,	88.8,	95.8,	101.6,	N/A ,
9 hours	17.4,	24.2,	27.8,	33.2,	36.9,	39.7,	48.9,	59.3,	66.1,	75.6,	84.1,	90.6,	100.6,	108.4,	114.8,	N/A ,
12 hours	19.5,	27.0,	31.0,	36.9,	40.9,	44.0,	54.0,	65.3,	72.7,	83.0,	92.1,	99.2,	110.0,	118.4,	125.3,	N/A ,
18 hours	22.9,	31.5,	36.1,	42.8,	47.3,	50.8,	62.2,	74.8,	83.1,	94.6,	104.8,	112.6,	124.7,	133.9,	141.6,	N/A ,
24 hours	25.7,	35.2,	40.2,	47.6,	52.5,	56.3,	68.7,	82.4,	91.4,	103.8,	114.8,	123.3,	136.2,	146.2,	154.4,	183.0,
2 days	32.2,	43.1,	48.7,	57.0,	62.5,	66.7,	80.1,	94.9,	104.4,	117.5,	129.0,	137.8,	151.1,	161.3,	169.7,	198.6,
3 days	37.5,	49.5,	55.7,	64.7,	70.6,	75.1,	89.5,	105.1,	115.1,	128.9,	140.9,	150.0,	163.9,	174.4,	183.1,	212.7,
4 days	42.2,	55.2,	61.8,	71.4,	77.7,	82.5,	97.7,	114.1,	124.6,	139.0,	151.4,	160.9,	175.2,	186.0,	194.9,	225.3,
6 days	50.5,	65.1,	72.5,	83.1,	90.1,	95.3,	111.9,	129.7,	141.0,	156.4,	169.7,	179.7,	194.9,	206.3,	215.7,	247.4,
8 days	57.8,	73.8,	81.9,	93.4,	100.9,	106.6,	124.4,	143.4,	155.4,	171.7,	185.7,	196.2,	212.1,	224.1,	233.9,	266.9,
10 days	64.6,	81.9,	90.5,	102.8,	110.8,	116.9,	135.7,	155.8,	168.4,	185.5,	200.1,	211.2,	227.7,	240.2,	250.3,	284.5,
12 days	70.9,	89.3,	98.5,	111.6,	120.0,	126.4,	146.2,	167.2,	180.4,	198.3,	213.5,	225.0,	242.1,	255.0,	265.5,	300.8,
16 days	82.7,	103.2,	113.4,	127.7,	137.0,	143.9,	165.5,	188.2,	202.5,	221.6,	237.9,	250.1,	268.4,	282.1,	293.2,	330.4,
20 days	93.7,	116.1,	127.1,	142.6,	152.6,	160.0,	183.2,	207.4,	222.5,	242.8,	260.1,	273.0,	292.2,	306.6,	318.3,	357.3,
25 days	106.6,	131.1,	143.1,	159.9,	170.7,	178.7,	203.6,	229.6,	245.7,	267.3,	285.6,	299.3,	319.6,	334.8,	347.1,	388.1,

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

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

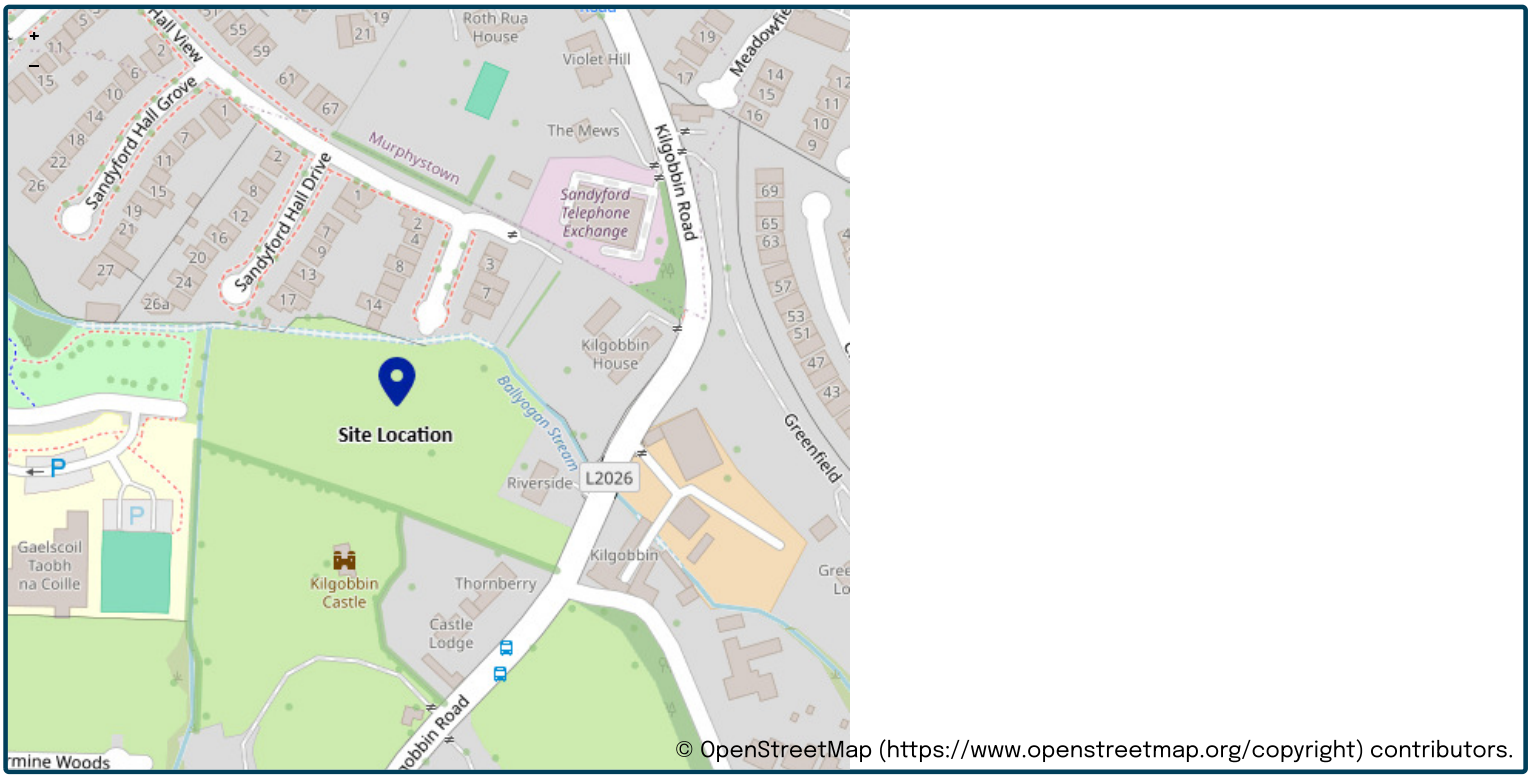
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	21/07/2025
Calculated by	
Reference	
Model version	2.0.1

Location

Site name	Waterside
Site location	Kilgobbin Road



Site easting	119145
Site northing	381974

Site details

Total site area (ha)	1.088 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1116 mm		1001
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		2
SPR	0.47		
QBar (IH124) (l/s)	9.1 l/s		

Growth curve factors

	My value		Map value
Hydrological region	12		12
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.72		
30 year growth factor	2.13		
100 year growth factor	2.61		
200 year growth factor	2.86		

Results

Method	IH124
Flow rate 1 year (l/s)	7.7 l/s
Flow rate 2 year (l/s)	8.6 l/s
Flow rate 10 years (l/s)	15.6 l/s
Flow rate 30 years (l/s)	19.3 l/s
Flow rate 100 years (l/s)	23.7 l/s
Flow rate 200 years (l/s)	25.9 l/s

Disclaimer

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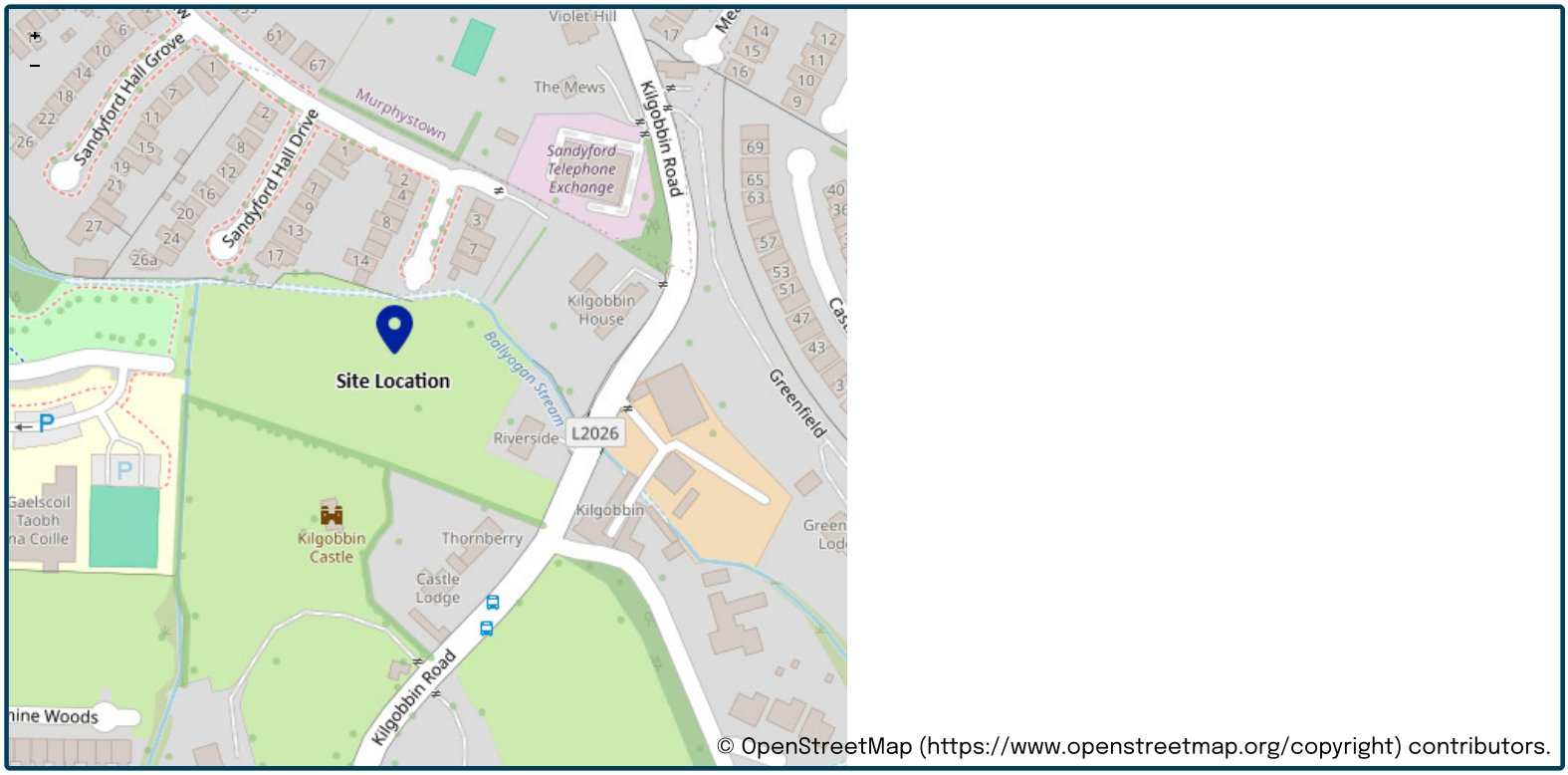
Project details

Date	25/08/2025
Calculated by	Alan Manthe
Reference	1285-8 N
Model version	2.1.2

Location

Site name	Waterside North
Site location	Kilgobbin Road



Site easting (Irish Grid)	319321
Site northing (Irish Grid)	224784
Site easting (Irish Transverse Mercator)	719246
Site northing (Irish Transverse Mercator)	724812

Site details

Total site area (ha)	0.1451 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1116 mm		1001
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		2
SPR	0.47		
QBar (IH124) (l/s)	1.21 l/s		

Growth curve factors

	My value		Map value
Hydrological region	12		12
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.72		
30 year growth factor	2.13		
100 year growth factor	2.61		
200 year growth factor	2.86		

Results

Method	IH124	
Flow rate 1 year (l/s)	1.0	l/s
Flow rate 2 year (l/s)	1.1	l/s
Flow rate 10 years (l/s)	2.1	l/s
Flow rate 30 years (l/s)	2.6	l/s
Flow rate 100 years (l/s)	3.2	l/s
Flow rate 200 years (l/s)	3.5	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

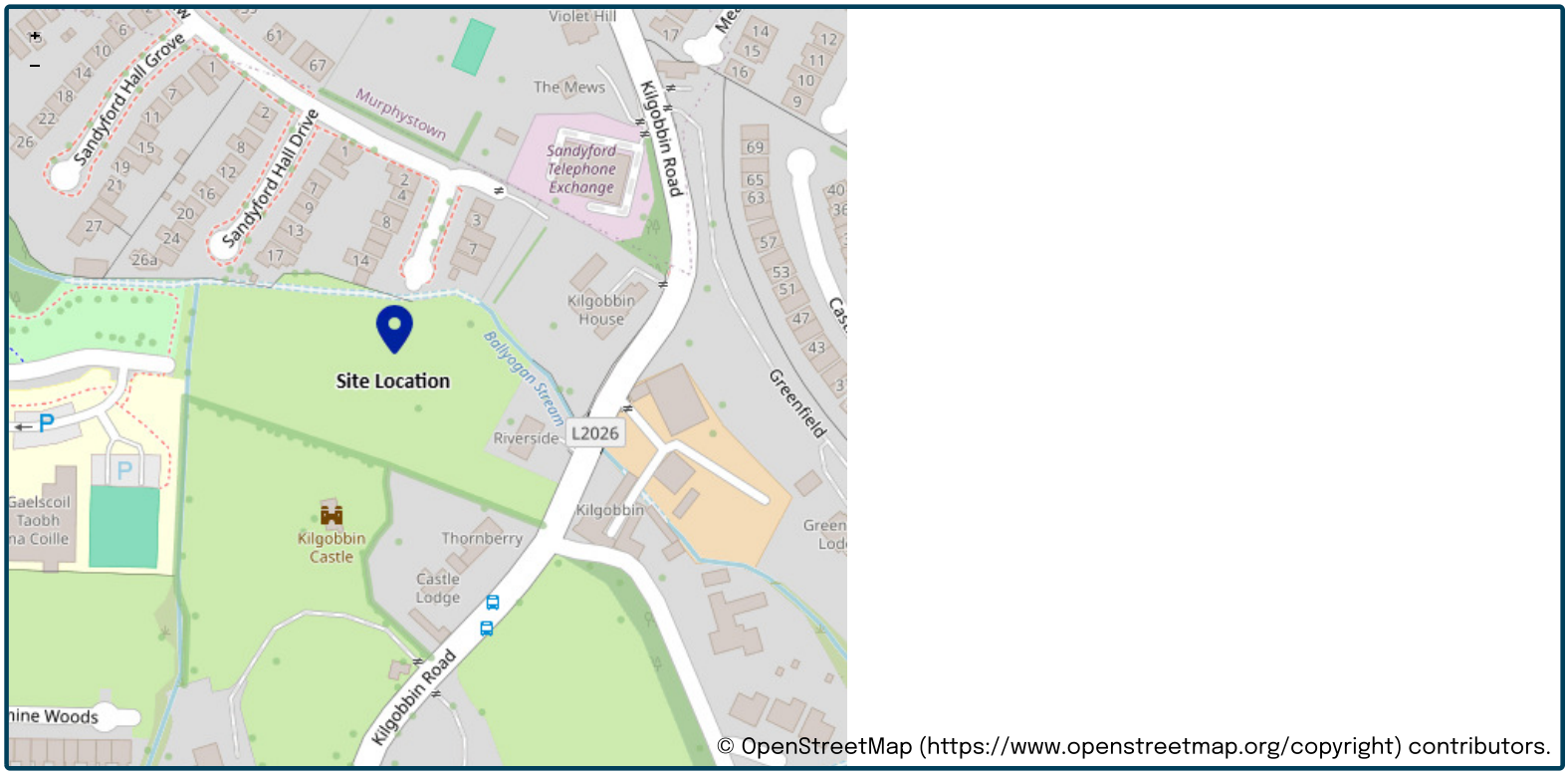
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	25/08/2025
Calculated by	Alan Manthe
Reference	1285-8 N
Model version	2.1.2

Location

Site name	Waterside South
Site location	Kilgobbin Road



Site easting (Irish Grid)	319321
Site northing (Irish Grid)	224784
Site easting (Irish Transverse Mercator)	719246
Site northing (Irish Transverse Mercator)	724812

Site details

Total site area (ha)	0.93672 ha

Greenfield runoff

Method

Method	IH124

IH124

	My value		Map value
SAAR (mm)	1116 mm		1001
How should SPR be derived?	WRAP soil type		
WRAP soil type	4		2
SPR	0.47		
QBar (IH124) (l/s)	7.8 l/s		

Growth curve factors

	My value		Map value
Hydrological region	12		12
1 year growth factor	0.85		
2 year growth factor	0.95		
10 year growth factor	1.72		
30 year growth factor	2.13		
100 year growth factor	2.61		
200 year growth factor	2.86		

Results

Method	IH124	
Flow rate 1 year (l/s)	6.6	l/s
Flow rate 2 year (l/s)	7.4	l/s
Flow rate 10 years (l/s)	13.4	l/s
Flow rate 30 years (l/s)	16.6	l/s
Flow rate 100 years (l/s)	20.4	l/s
Flow rate 200 years (l/s)	22.3	l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

BLOCK A:

Green Blue Extensive coverage	392.1	m^2
Green Blue Intensive coverage	120.5	m^2
Blue Paved covergae	180.3	m^2
Other	10.58	m^2
Total	**703.48**	**m^2**

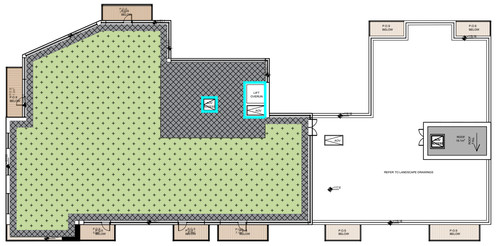
Green Blue as a percentage	73%	OK

BLOCK B:

Green Blue Extensive coverage	561.6	m^2
Green Blue Intensive coverage	244.8	m^2
Blue Paved covergae	278.9	m^2
Other	16.4	m^2
Total	**1101.7**	**m^2**

Green Blue as a percentage	73%	OK

BLOCK A - ROOF TOP



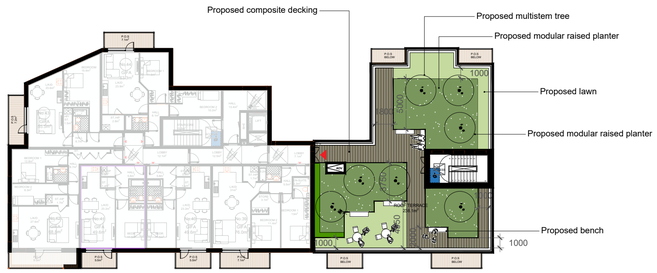
SCHEDULE OF GREEN ROOF TYPOLOGIES
Total roof area: 464.3 m²

Green Blue Extensive (Sedum)
Area: 341.6m² (73.5%)

Blue (Paved)
Area:115.5m² (24.7%)

Other: AOV + lift overun
Area:8.8m² (1.8%)

BLOCK A - FOURTH FLOOR ROOF TERRACE



SCHEDULE OF GREEN ROOF TYPOLOGIES
Total roof area: 238.1 m²

Green Blue Extensive (Lawn)
Area: 50.5m² (21.2%)

Green Blue Intensive (Herbaceous planting)
Area: 120.5m² (50.6%)

Blue (Paved)
Area:64.8m² (27.2%)

Other: AOV
Area:1.78m² (1%)

PROPOSED SCHEDULE OF MATERIALS

Proposed timber bench

Proposed Golden Oak composite decking by Millboard or similar.

Proposed grass

OMOS Modular Raised Tree Planter s21 or similar product.

Proposed moveable furniture

PROPOSED PLANTING PALETTE

Proposed multistem Trees
Amelanchier lamarckii
Fatsia japonica

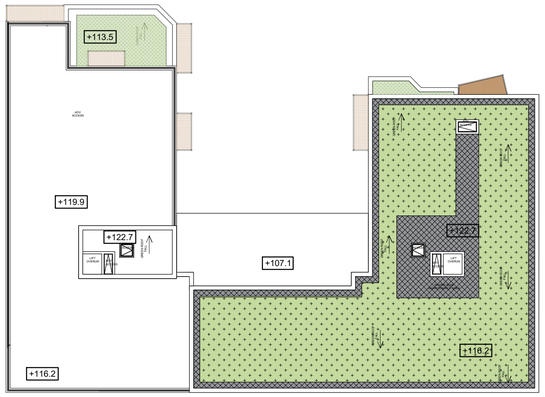
Proposed hedge
Prunus lusitanica

Topiary shrub
Pinus mugo pumilio

Herbaceous & Grasses

Helichrysum italicum
Echinops Sphaerocephalus 'Arctic Glow'
Nepeta 'Six Hills Giant'
Stipa tenuissima
Miscanthus Karl Foerster
Verbena bonariensis
Alchemilla mollis

BLOCK B - ROOF TOP



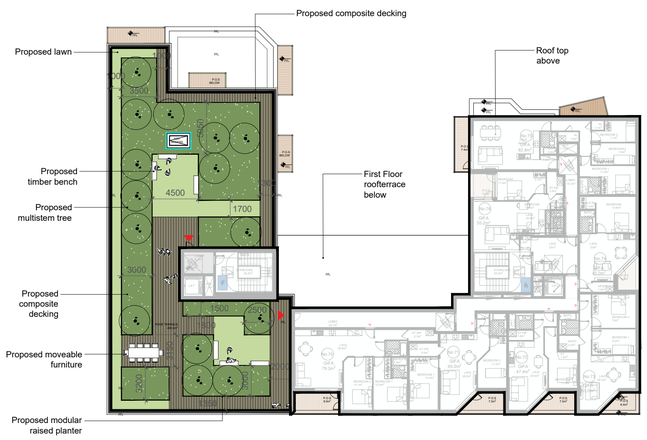
SCHEDULE OF GREEN ROOF TYPOLOGIES
Total roof area: 616.2m²

Green Blue Extensive (Sedum)
Area: 458.7m² (74.5%)

Blue (Paved)
Area:144.3m² (23.4%)

Other: AOV + lift overun
Area:13.2m² (2.1%)

BLOCK B - FIFTH FLOOR ROOF TERRACE



SCHEDULE OF GREEN ROOF TYPOLOGIES
Total roof area: 485.5 m²

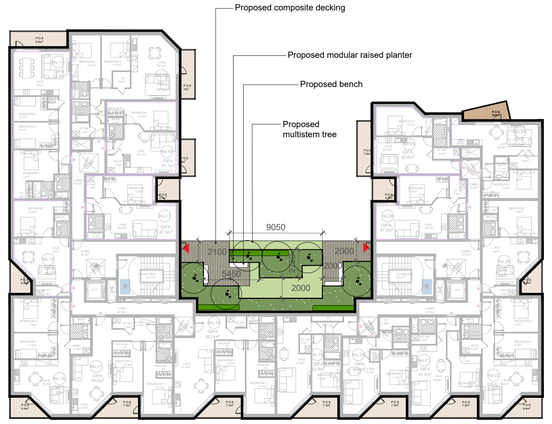
Green Blue Extensive (Lawn)
Area: 102.9m² (21.2%)

Green Blue Intensive (Herbaceous planting)
Area: 244.8m² (50.4%)

Blue (Paved)
Area:134.6m² (27.7%)

Other: AOV
Area:3.2m² (0.7%)

BLOCK B - FIRST FLOOR ROOF TERRACE



SCHEDULE OF GREEN ROOF TYPOLOGIES
Total roof area: 127.9 m²

Green Blue Extensive (Sedum/Lawn)
Area: 27m² (20%)

Green Blue Intensive (Herbaceous planting)
Area: 65m² (50%)

Blue (Paved)
Area: 35.9m² (30%)

Studio Glasú

Studio Glasú
17 Rathfarnham Rd, Terenure,
Dublin, D6W X921

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www.studioglasu.com

notes

All levels and dimensions to be checked on site and any discrepancies should be referred to Studio Glasú for their direction. Work to figured dimensions ONLY. Do not scale off these drawings. Unless otherwise stated all dimensions are in millimeters. Where dimensions are not given, drawings must not be scaled and the matter must be referred to the Landscape Architect.

It is the responsibility of the appointed contractor to ensure that both they and their nominated sub contractors, their nominated suppliers, and the client direct nominated sub contractors and suppliers ensure that all materials and workmanship comply with the relevant Building Regulations and that all Health and Safety regulations are implemented . All to be in full compliance with The Building Regulations Technical Documents 1997-2015. Refer to engineers drawing for all structural and M&E elements details. This drawing is the copyright of the Griffin L.A. Ltd. Studio Glasú is a trading name of Griffin L.A. Ltd.

revisions

REV	DATE	ISSUED BY	NOTES
-	-	-	-

client:

KILGOBBIN APARTMENTS LIMITED

project:

KILGOBBIN ROAD

stage:	PLANNING
revision:	-

title:

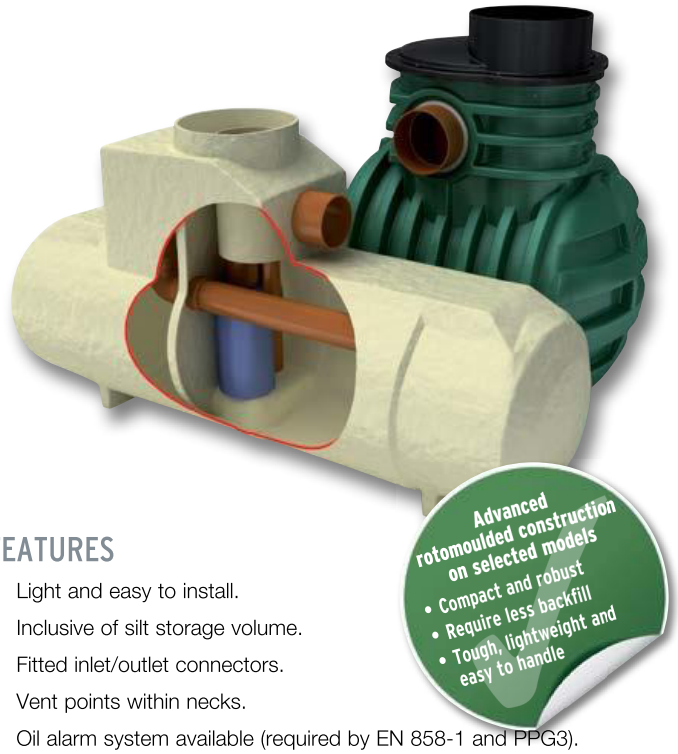
ROOF TERRACES LANDSCAPE MASTERPLAN

drawn by:	NT
approved by:	SO'M
date:	25.08.2025
job no:	135-24
scale:	1:300@A1

drawing no:

DWG.03

Bypass NSB RANGE



APPLICATION

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

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

PERFORMANCE

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

Each bypass separator design includes the necessary volume requirements for:

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

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

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

FEATURES

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

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

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

SIZES AND SPECIFICATIONS

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

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

APPENDIX V

HYDROLOGICAL MODEL

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
SWALE 1	0.034	1.350	Type C	105.555	105.355	0.000	719208.354	724857.821
Northern Road	0.000	1.350	Type C	103.111	102.034	0.927	719224.179	724842.958
SWALE 2	0.054	1.350	Type C	102.435	102.235	0.050	719264.316	724842.900
SWALE 3	0.000	1.350	Type C	102.627	102.186	0.241	719267.980	724849.195
S7	0.000	1.350	Type C	102.806	101.428	1.228	719278.971	724846.564
HW8	0.000	0.000	Type C	103.237	101.400	1.687	719288.620	724843.055

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	SWALE 1	105.355	SWALE 2	102.235	Swale	0.3mx0.2m	57.917	18.6	0.600	0.000	-0.000
2.000	Northern	102.034	SWALE 2	102.235	Circ	0.15mØ	40.137	200.0	0.600	0.927	0.050
1.001	SWALE 2	102.235	SWALE 3	102.186	Swale	0.3mx0.2m	7.283	149.9	0.600	-0.000	0.241
1.002	SWALE 3	102.186	S7	102.111	Swale	0.3mx0.2m	11.301	150.0	0.600	0.241	0.495
1.003	S7	101.428	HW8	101.400	Circ	0.15mØ	10.267	366.7	0.600	1.228	1.687

Permeable Paving Schedule

Permeable Paving	Assigned Manhole	Effective Storage Volume (m3)	CL (m)	IL (m)	Storage Infil Rate (m/hr)	Safety Factor	Easting (m)	Northing (m)
Permeable Paving1	SWALE 1	8.729	105.555	105.075	0.00000000	2.00	719215.050	724852.243
Permeable Paving4	SWALE 1	8.686	105.555	105.075	0.00000000	2.00	719226.760	724848.432
Permeable Paving5	SWALE 1	8.678	105.555	105.075	0.00000000	2.00	719237.623	724845.475
Permeable Paving7	SWALE 1	8.871	105.555	105.075	0.00000000	2.00	719254.411	724841.565
Permeable Paving3	SWALE 1	10.983	105.555	105.075	0.00000000	2.00	719198.193	724844.686
Permeable Paving2	SWALE 1	1.512	105.555	105.175	0.00000000	2.00	719201.314	724855.465
Permeable Paving8	SWALE 2	8.758	102.435	101.955	0.00000000	2.00	719261.675	724827.822
Permeable Paving9	SWALE 2	8.772	102.435	101.955	0.00000000	2.00	719278.004	724824.167
Permeable Paving6	SWALE 2	4.233	102.435	101.955	0.00000000	2.00	719237.735	724834.571

Outfall Details

Outfall Manhole HW8 : Free Discharge

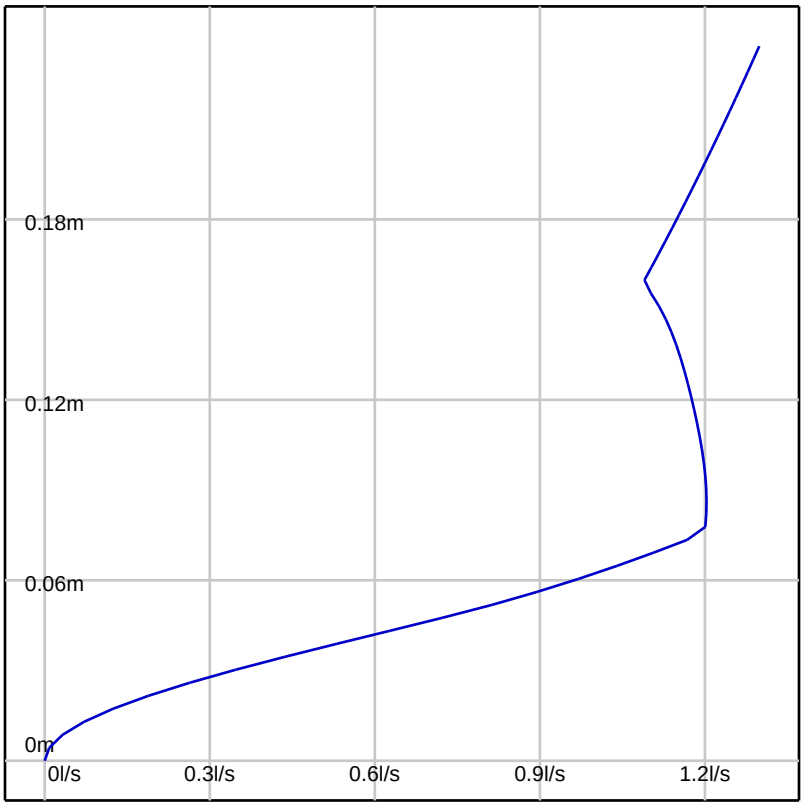
Flow Control Details

Controls within Manhole S7

Hydro-Brake® Optimum Control at Manhole S7

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0062-1200-0200-1200	0.200	1.200	0.000	0.086	1.203	0.159	1.087

Hydro-Brake® Optimum Control at S7



Simulation Settings

FSR: M5-60=18.10, R=0.27, Locale=Scotland and Northern Ireland

Summer (Cv: 0.40), Winter (Cv: 0.40)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +20%), (2, +20%), (5, +20%), (10, +20%), (30, +20%), (100, +20%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
1Yr+20% 15Min Winter	31.791	0.00	0.00	10Yr+20% 960Min Summer	4.175	0.00	0.15
1Yr+20% 15Min Summer	31.791	0.00	0.00	10Yr+20% 960Min Winter	4.175	0.00	0.15
1Yr+20% 30Min Winter	23.654	0.00	0.00	10Yr+20% 1440Min Summer	3.193	0.00	0.13
1Yr+20% 30Min Summer	23.654	0.00	0.00	10Yr+20% 1440Min Winter	3.193	0.00	0.13
1Yr+20% 60Min Winter	15.726	0.00	0.00	10Yr+20% 2160Min Summer	2.432	0.00	0.12
1Yr+20% 60Min Summer	15.726	0.00	0.00	10Yr+20% 2160Min Winter	2.432	0.00	0.12
1Yr+20% 120Min Summer	10.290	0.00	0.00	10Yr+20% 2880Min Summer	2.004	0.00	0.10
1Yr+20% 120Min Winter	10.290	0.00	0.00	10Yr+20% 2880Min Winter	2.004	0.00	0.10
1Yr+20% 180Min Summer	8.024	0.00	0.00	10Yr+20% 4320Min Summer	1.525	0.00	0.09
1Yr+20% 180Min Winter	8.024	0.00	0.00	10Yr+20% 4320Min Winter	1.525	0.00	0.09
1Yr+20% 240Min Winter	6.706	0.00	0.00	10Yr+20% 5760Min Summer	1.257	0.00	0.07
1Yr+20% 240Min Summer	6.706	0.00	0.00	10Yr+20% 5760Min Winter	1.257	0.00	0.07
1Yr+20% 360Min Summer	5.202	0.00	0.00	10Yr+20% 7200Min Summer	1.081	0.00	0.06
1Yr+20% 360Min Winter	5.202	0.00	0.00	10Yr+20% 7200Min Winter	1.081	0.00	0.00
1Yr+20% 480Min Summer	4.342	0.00	0.00	10Yr+20% 8640Min Summer	0.956	0.00	0.06
1Yr+20% 480Min Winter	4.342	0.00	0.00	10Yr+20% 8640Min Winter	0.956	0.00	0.05
1Yr+20% 600Min Summer	3.773	0.00	0.00	10Yr+20% 10080Min Summer	0.862	0.00	0.05
1Yr+20% 600Min Winter	3.773	0.00	0.00	10Yr+20% 10080Min Winter	0.862	0.00	0.05
1Yr+20% 720Min Summer	3.364	0.00	0.00	30Yr+20% 15Min Winter	82.298	0.00	0.00
1Yr+20% 720Min Winter	3.364	0.00	0.00	30Yr+20% 15Min Summer	82.298	0.00	0.00
1Yr+20% 960Min Summer	2.806	0.00	0.00	30Yr+20% 30Min Winter	50.170	0.00	0.15
1Yr+20% 960Min Winter	2.806	0.00	0.00	30Yr+20% 30Min Summer	50.170	0.00	0.16
1Yr+20% 1440Min Summer	2.158	0.00	0.00	30Yr+20% 60Min Winter	32.706	0.00	0.31
1Yr+20% 1440Min Winter	2.158	0.00	0.00	30Yr+20% 60Min Summer	32.706	0.00	0.31
1Yr+20% 2160Min Summer	1.670	0.00	0.07	30Yr+20% 120Min Summer	20.835	0.00	0.24
1Yr+20% 2160Min Winter	1.670	0.00	0.04	30Yr+20% 120Min Winter	20.835	0.00	0.24
1Yr+20% 2880Min Winter	1.393	0.00	0.09	30Yr+20% 180Min Winter	15.832	0.00	0.21
1Yr+20% 2880Min Summer	1.393	0.00	0.11	30Yr+20% 180Min Summer	15.832	0.00	0.21
1Yr+20% 4320Min Summer	1.078	0.00	0.13	30Yr+20% 240Min Summer	13.037	0.00	0.19
1Yr+20% 4320Min Winter	1.078	0.00	0.13	30Yr+20% 240Min Winter	13.037	0.00	0.19
1Yr+20% 5760Min Summer	0.900	0.00	0.11	30Yr+20% 360Min Summer	9.894	0.00	0.17
1Yr+20% 5760Min Winter	0.900	0.00	0.11	30Yr+20% 360Min Winter	9.894	0.00	0.17
1Yr+20% 7200Min Summer	0.782	0.00	0.10	30Yr+20% 480Min Summer	8.126	0.00	0.15
1Yr+20% 7200Min Winter	0.782	0.00	0.10	30Yr+20% 480Min Winter	8.126	0.00	0.15
1Yr+20% 8640Min Summer	0.697	0.00	0.09	30Yr+20% 600Min Summer	6.973	0.00	0.14
1Yr+20% 8640Min Winter	0.697	0.00	0.09	30Yr+20% 600Min Winter	6.973	0.00	0.14
1Yr+20% 10080Min Summer	0.632	0.00	0.08	30Yr+20% 720Min Winter	6.151	0.00	0.14
1Yr+20% 10080Min Winter	0.632	0.00	0.08	30Yr+20% 720Min Summer	6.151	0.00	0.13
2Yr+20% 15Min Summer	38.591	0.00	0.00	30Yr+20% 960Min Summer	5.046	0.00	0.13
2Yr+20% 15Min Winter	38.591	0.00	0.00	30Yr+20% 960Min Winter	5.046	0.00	0.13
2Yr+20% 30Min Summer	27.571	0.00	0.00	30Yr+20% 1440Min Summer	3.849	0.00	0.11
2Yr+20% 30Min Winter	27.571	0.00	0.00	30Yr+20% 1440Min Winter	3.849	0.00	0.11
2Yr+20% 60Min Summer	18.257	0.00	0.00	30Yr+20% 2160Min Summer	2.910	0.00	0.10
2Yr+20% 60Min Winter	18.257	0.00	0.00	30Yr+20% 2160Min Winter	2.910	0.00	0.10
2Yr+20% 120Min Summer	11.881	0.00	0.00	30Yr+20% 2880Min Winter	2.385	0.00	0.09
2Yr+20% 120Min Winter	11.881	0.00	0.00	30Yr+20% 2880Min Summer	2.385	0.00	0.09
2Yr+20% 180Min Winter	9.216	0.00	0.00	30Yr+20% 4320Min Winter	1.800	0.00	0.07
2Yr+20% 180Min Summer	9.216	0.00	0.00	30Yr+20% 4320Min Summer	1.800	0.00	0.07
2Yr+20% 240Min Summer	7.679	0.00	0.00	30Yr+20% 5760Min Winter	1.474	0.00	0.06
2Yr+20% 240Min Winter	7.679	0.00	0.00	30Yr+20% 5760Min Summer	1.474	0.00	0.06
2Yr+20% 360Min Summer	5.930	0.00	0.00	30Yr+20% 7200Min Winter	1.262	0.00	0.05
2Yr+20% 360Min Winter	5.930	0.00	0.00	30Yr+20% 7200Min Summer	1.262	0.00	0.05
2Yr+20% 480Min Summer	4.934	0.00	0.00	30Yr+20% 8640Min Winter	1.112	0.00	0.05
2Yr+20% 480Min Winter	4.934	0.00	0.00	30Yr+20% 8640Min Summer	1.112	0.00	0.05
2Yr+20% 600Min Summer	4.276	0.00	0.00	30Yr+20% 10080Min Winter	0.999	0.00	0.04

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr+20% 600Min Winter	4.276	0.00	0.00	30Yr+20% 10080Min Summer	0.999	0.00	0.04
2Yr+20% 720Min Summer	3.804	0.00	0.00	100Yr+20% 15Min Winter	115.243	0.00	0.34
2Yr+20% 720Min Winter	3.804	0.00	0.00	100Yr+20% 15Min Summer	115.243	0.00	0.35
2Yr+20% 960Min Summer	3.163	0.00	0.08	100Yr+20% 15Min Summer	115.243	0.00	0.35
2Yr+20% 960Min Winter	3.163	0.00	0.05	100Yr+20% 15Min Winter	115.243	0.00	0.34
2Yr+20% 1440Min Summer	2.428	0.00	0.11	100Yr+20% 30Min Winter	65.468	0.00	0.31
2Yr+20% 1440Min Winter	2.428	0.00	0.08	100Yr+20% 30Min Winter	65.468	0.00	0.31
2Yr+20% 2160Min Summer	1.870	0.00	0.15	100Yr+20% 30Min Summer	65.468	0.00	0.31
2Yr+20% 2160Min Winter	1.870	0.00	0.14	100Yr+20% 30Min Summer	65.468	0.00	0.31
2Yr+20% 2880Min Summer	1.554	0.00	0.13	100Yr+20% 60Min Winter	42.383	0.00	0.24
2Yr+20% 2880Min Winter	1.554	0.00	0.13	100Yr+20% 60Min Summer	42.383	0.00	0.24
2Yr+20% 4320Min Summer	1.197	0.00	0.11	100Yr+20% 60Min Summer	42.383	0.00	0.24
2Yr+20% 4320Min Winter	1.197	0.00	0.12	100Yr+20% 60Min Winter	42.383	0.00	0.24
2Yr+20% 5760Min Summer	0.995	0.00	0.10	100Yr+20% 120Min Summer	26.744	0.00	0.18
2Yr+20% 5760Min Winter	0.995	0.00	0.10	100Yr+20% 120Min Summer	26.744	0.00	0.18
2Yr+20% 7200Min Summer	0.862	0.00	0.09	100Yr+20% 120Min Winter	26.744	0.00	0.18
2Yr+20% 7200Min Winter	0.862	0.00	0.09	100Yr+20% 120Min Winter	26.744	0.00	0.18
2Yr+20% 8640Min Summer	0.767	0.00	0.08	100Yr+20% 180Min Winter	20.138	0.00	0.16
2Yr+20% 8640Min Winter	0.767	0.00	0.08	100Yr+20% 180Min Summer	20.138	0.00	0.16
2Yr+20% 10080Min Summer	0.694	0.00	-0.00	100Yr+20% 180Min Winter	20.138	0.00	0.16
2Yr+20% 10080Min Winter	0.694	0.00	0.06	100Yr+20% 180Min Summer	20.138	0.00	0.16
5Yr+20% 15Min Summer	49.863	0.00	0.00	100Yr+20% 240Min Summer	16.496	0.00	0.15
5Yr+20% 15Min Winter	49.863	0.00	0.00	100Yr+20% 240Min Winter	16.496	0.00	0.15
5Yr+20% 30Min Summer	33.761	0.00	0.00	100Yr+20% 240Min Summer	16.496	0.00	0.15
5Yr+20% 30Min Winter	33.761	0.00	0.00	100Yr+20% 240Min Winter	16.496	0.00	0.15
5Yr+20% 60Min Summer	22.238	0.00	0.00	100Yr+20% 360Min Summer	12.423	0.00	0.13
5Yr+20% 60Min Winter	22.238	0.00	0.00	100Yr+20% 360Min Winter	12.423	0.00	0.14
5Yr+20% 120Min Summer	14.368	0.00	0.00	100Yr+20% 360Min Summer	12.423	0.00	0.13
5Yr+20% 120Min Winter	14.368	0.00	0.00	100Yr+20% 360Min Winter	12.423	0.00	0.14
5Yr+20% 180Min Summer	11.068	0.00	0.00	100Yr+20% 480Min Summer	10.145	0.00	0.13
5Yr+20% 180Min Winter	11.068	0.00	0.00	100Yr+20% 480Min Winter	10.145	0.00	0.13
5Yr+20% 240Min Summer	9.185	0.00	0.10	100Yr+20% 480Min Winter	10.145	0.00	0.13
5Yr+20% 240Min Winter	9.185	0.00	0.00	100Yr+20% 480Min Summer	10.145	0.00	0.13
5Yr+20% 360Min Winter	7.051	0.00	0.12	100Yr+20% 600Min Summer	8.666	0.00	0.12
5Yr+20% 360Min Summer	7.051	0.00	0.14	100Yr+20% 600Min Winter	8.666	0.00	0.12
5Yr+20% 480Min Summer	5.841	0.00	0.16	100Yr+20% 600Min Winter	8.666	0.00	0.12
5Yr+20% 480Min Winter	5.841	0.00	0.14	100Yr+20% 600Min Summer	8.666	0.00	0.12
5Yr+20% 600Min Summer	5.046	0.00	0.18	100Yr+20% 720Min Winter	7.616	0.00	0.11
5Yr+20% 600Min Winter	5.046	0.00	0.15	100Yr+20% 720Min Summer	7.616	0.00	0.11
5Yr+20% 720Min Summer	4.476	0.00	0.18	100Yr+20% 720Min Winter	7.616	0.00	0.11
5Yr+20% 720Min Winter	4.476	0.00	0.16	100Yr+20% 720Min Summer	7.616	0.00	0.11
5Yr+20% 960Min Summer	3.704	0.00	0.17	100Yr+20% 960Min Winter	6.212	0.00	0.10
5Yr+20% 960Min Winter	3.704	0.00	0.17	100Yr+20% 960Min Winter	6.212	0.00	0.10
5Yr+20% 1440Min Summer	2.837	0.00	0.14	100Yr+20% 960Min Summer	6.212	0.00	0.10
5Yr+20% 1440Min Winter	2.837	0.00	0.14	100Yr+20% 960Min Summer	6.212	0.00	0.10
5Yr+20% 2160Min Summer	2.172	0.00	0.13	100Yr+20% 1440Min Summer	4.723	0.00	0.09
5Yr+20% 2880Min Summer	1.796	0.00	0.12	100Yr+20% 1440Min Summer	4.723	0.00	0.09
5Yr+20% 2880Min Winter	1.796	0.00	0.12	100Yr+20% 1440Min Winter	4.723	0.00	0.09
5Yr+20% 4320Min Summer	1.374	0.00	0.10	100Yr+20% 1440Min Winter	4.723	0.00	0.09
5Yr+20% 4320Min Winter	1.374	0.00	0.10	100Yr+20% 2160Min Winter	3.542	0.00	0.08
5Yr+20% 5760Min Summer	1.136	0.00	0.09	100Yr+20% 2160Min Summer	3.542	0.00	0.08
5Yr+20% 5760Min Winter	1.136	0.00	0.09	100Yr+20% 2160Min Summer	3.542	0.00	0.08
5Yr+20% 7200Min Summer	0.981	0.00	0.07	100Yr+20% 2160Min Winter	3.542	0.00	0.08
5Yr+20% 7200Min Winter	0.981	0.00	0.07	100Yr+20% 2880Min Summer	2.885	0.00	0.07
5Yr+20% 8640Min Summer	0.869	0.00	0.06	100Yr+20% 2880Min Winter	2.885	0.00	0.07
5Yr+20% 8640Min Winter	0.869	0.00	0.06	100Yr+20% 2880Min Summer	2.885	0.00	0.07
5Yr+20% 10080Min Summer	0.785	0.00	0.05	100Yr+20% 2880Min Winter	2.885	0.00	0.07
5Yr+20% 10080Min Winter	0.785	0.00	0.05	100Yr+20% 4320Min Winter	2.158	0.00	0.06
10Yr+20% 15Min Summer	60.529	0.00	0.00	100Yr+20% 4320Min Summer	2.158	0.00	0.06
10Yr+20% 15Min Winter	60.529	0.00	0.00	100Yr+20% 4320Min Summer	2.158	0.00	0.06
10Yr+20% 30Min Summer	39.352	0.00	0.00	100Yr+20% 4320Min Winter	2.158	0.00	0.06
10Yr+20% 30Min Winter	39.352	0.00	0.00	100Yr+20% 5760Min Summer	1.755	0.00	0.05
10Yr+20% 60Min Summer	25.817	0.00	0.00	100Yr+20% 5760Min Summer	1.755	0.00	0.05
10Yr+20% 60Min Winter	25.817	0.00	0.00	100Yr+20% 5760Min Winter	1.755	0.00	0.05
10Yr+20% 120Min Summer	16.589	0.00	0.17	100Yr+20% 5760Min Winter	1.755	0.00	0.05
10Yr+20% 120Min Winter	16.589	0.00	0.14	100Yr+20% 7200Min Winter	1.495	0.00	0.05
10Yr+20% 180Min Summer	12.712	0.00	0.22	100Yr+20% 7200Min Summer	1.495	0.00	0.05
10Yr+20% 180Min Winter	12.712	0.00	0.19	100Yr+20% 7200Min Winter	1.495	0.00	0.05

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
10Yr+20% 240Min Summer	10.518	0.00	0.24	100Yr+20% 7200Min Summer	1.495	0.00	0.05
10Yr+20% 240Min Winter	10.518	0.00	0.21	100Yr+20% 8640Min Summer	1.311	0.00	0.04
10Yr+20% 360Min Summer	8.039	0.00	0.20	100Yr+20% 8640Min Winter	1.311	0.00	0.04
10Yr+20% 360Min Winter	8.039	0.00	0.21	100Yr+20% 8640Min Winter	1.311	0.00	0.04
10Yr+20% 480Min Summer	6.637	0.00	0.19	100Yr+20% 8640Min Summer	1.311	0.00	0.04
10Yr+20% 480Min Winter	6.637	0.00	0.19	100Yr+20% 10080Min Winter	1.174	0.00	0.04
10Yr+20% 600Min Summer	5.718	0.00	0.17	100Yr+20% 10080Min Summer	1.174	0.00	0.04
10Yr+20% 600Min Winter	5.718	0.00	0.18	100Yr+20% 10080Min Summer	1.174	0.00	0.04
10Yr+20% 720Min Summer	5.062	0.00	0.16	100Yr+20% 10080Min Winter	1.174	0.00	0.04
10Yr+20% 720Min Winter	5.062	0.00	0.16				

Simulation Results

Return Period Yrs: 1.0
Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWALE 1	10080 min Winter	6239	105.355	0.000	0.005		OK
Northern Road	10080 min Summer	5909	102.240	0.206	0.000		OK
SWALE 2	30 min Summer	16	102.255	0.020	2.887		OK
SWALE 3	30 min Summer	18	102.205	0.019	1.008		OK
S7	30 min Summer	20	101.517	0.089	0.949		OK
HW8	30 min Summer	21	101.427	0.027	0.914		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	10080 min Winter	6234	SWALE 1	SWALE 2	0.000	0.000	0.014	0.000	OK
2.000	10080 min Summer	13753	Northern	SWALE 2	0.077	0.003	0.028	0.002	OK
1.001	15 min Summer	8	SWALE 2	SWALE 3	0.023	0.166	1.134	0.000	OK
1.002	30 min Summer	18	SWALE 3	S7	0.023	0.163	1.018	0.000	OK
1.003	30 min Summer	21	S7	HW8	0.029	0.375	0.914	0.100	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving1	10080 min Summer	20159	105.332	0.257	0.000		OK
Permeable Paving4	10080 min Summer	20158	105.332	0.257	0.000		OK
Permeable Paving5	10080 min Summer	20157	105.332	0.257	0.000		OK
Permeable Paving7	10080 min Summer	20159	105.332	0.257	0.000		OK
Permeable Paving3	10080 min Summer	20157	105.331	0.256	0.000		OK
Permeable Paving2	10080 min Summer	5983	105.356	0.181	0.005		OK
Permeable Paving8	10080 min Summer	5907	102.240	0.285	0.021		OK
Permeable Paving9	10080 min Summer	5909	102.240	0.285	0.021		OK
Permeable Paving6	10080 min Summer	5909	102.240	0.285	0.010		OK

Return Period Yrs: 2.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWALE 1	10080 min Summer	4369	105.624	0.270	5.602		Flood Risk
Northern Road	8640 min Summer	5000	102.241	0.207	0.004		OK
SWALE 2	15 min Summer	8	102.257	0.023	3.519		OK
SWALE 3	15 min Summer	10	102.207	0.021	1.229		OK
S7	30 min Summer	20	101.529	0.101	1.105		OK
HW8	30 min Summer	21	101.429	0.029	1.064		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	10080 min Summer	4359	SWALE 1	SWALE 2	0.009	0.000	0.000	0.000	OK
2.000	10080 min Summer	4379	Northern	SWALE 2	0.129	0.238	5.603	0.449	OK
1.001	10080 min Summer	4380	SWALE 2	SWALE 3	0.100	0.328	5.591	0.000	OK
1.002	15 min Summer	10	SWALE 3	S7	0.025	0.174	1.218	0.000	OK
1.003	10080 min Summer	4419	S7	HW8	0.037	0.000	1.044	0.114	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving1	10080 min Winter	9872	105.355	0.281	0.002		OK
Permeable Paving4	10080 min Winter	9871	105.355	0.281	0.002		OK
Permeable Paving5	10080 min Winter	9871	105.355	0.281	0.002		OK
Permeable Paving7	10080 min Winter	9876	105.355	0.281	0.002		OK
Permeable Paving3	10080 min Winter	9914	105.355	0.281	0.002		OK
Permeable Paving2	8640 min Summer	4995	105.356	0.181	0.007		OK
Permeable Paving8	8640 min Summer	4970	102.241	0.286	0.028		OK
Permeable Paving9	8640 min Summer	4969	102.241	0.286	0.028		OK
Permeable Paving6	8640 min Summer	4962	102.241	0.286	0.014		OK

Return Period Yrs: 5.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWALE 1	10080 min Winter	7473	105.356	0.002	0.054		OK
Northern Road	7200 min Summer	4016	102.243	0.208	0.008		OK
SWALE 2	15 min Summer	8	102.261	0.026	4.549		OK
SWALE 3	15 min Summer	10	102.211	0.025	1.595		OK
S7	15 min Summer	13	101.560	0.132	1.281		OK
HW8	15 min Summer	12	101.431	0.031	1.204		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	10080 min Winter	7474	SWALE 1	SWALE 2	0.002	0.000	0.054	0.000	OK
2.000	8640 min Summer	10608	Northern	SWALE 2	0.079	0.003	0.028	0.002	OK
1.001	15 min Summer	8	SWALE 2	SWALE 3	0.029	0.195	1.794	0.000	OK
1.002	15 min Summer	10	SWALE 3	S7	0.029	0.192	1.585	0.000	OK
1.003	15 min Summer	12	S7	HW8	0.034	0.406	1.204	0.132	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving1	10080 min Winter	7479	105.357	0.282	0.010		OK
Permeable Paving4	10080 min Winter	7473	105.357	0.282	0.010		OK
Permeable Paving5	10080 min Winter	7472	105.357	0.282	0.010		OK
Permeable Paving7	10080 min Winter	7486	105.357	0.282	0.010		OK
Permeable Paving3	10080 min Winter	7428	105.357	0.282	0.012		OK
Permeable Paving2	10080 min Winter	7474	105.356	0.182	0.002		OK
Permeable Paving8	8640 min Summer	4700	102.243	0.288	0.042		OK
Permeable Paving9	8640 min Summer	4699	102.243	0.288	0.042		OK
Permeable Paving6	8640 min Summer	4712	102.243	0.288	0.020		OK

Return Period Yrs: 10.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWALE 1	10080 min Winter	6726	105.357	0.003	0.103		OK
Northern Road	7200 min Summer	3865	102.244	0.210	0.005		OK
SWALE 2	15 min Summer	8	102.264	0.029	5.523		OK
SWALE 3	15 min Summer	10	102.214	0.028	1.951		OK
S7	15 min Summer	14	101.628	0.200	1.209		Surcharged
HW8	15 min Summer	11	101.431	0.031	1.204		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	10080 min Winter	6726	SWALE 1	SWALE 2	0.003	0.000	0.103	0.000	OK
2.000	240 min Summer	247	Northern	SWALE 2	0.080	0.003	0.028	0.002	OK
1.001	15 min Summer	8	SWALE 2	SWALE 3	0.032	0.208	2.189	0.000	OK
1.002	15 min Summer	10	SWALE 3	S7	0.033	0.207	1.944	0.000	OK
1.003	15 min Winter	11	S7	HW8	0.034	0.406	1.204	0.132	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving1	10080 min Winter	6733	105.358	0.283	0.019		OK
Permeable Paving4	10080 min Winter	6727	105.358	0.283	0.019		OK
Permeable Paving5	10080 min Winter	6725	105.358	0.283	0.019		OK
Permeable Paving7	10080 min Winter	6735	105.358	0.283	0.019		OK
Permeable Paving3	10080 min Winter	6720	105.358	0.284	0.024		OK
Permeable Paving2	10080 min Winter	6728	105.357	0.183	0.005		OK
Permeable Paving8	7200 min Summer	3880	102.244	0.290	0.055		OK
Permeable Paving9	7200 min Summer	3881	102.244	0.290	0.055		OK
Permeable Paving6	7200 min Summer	3867	102.244	0.289	0.027		OK

Return Period Yrs: 30.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWALE 1	10080 min Summer	5806	105.359	0.004	0.198		OK
Northern Road	240 min Summer	143	102.247	0.213	0.026		OK
SWALE 2	15 min Summer	8	102.270	0.035	7.511		OK
SWALE 3	15 min Summer	10	102.219	0.033	2.696		OK
S7	15 min Summer	15	101.772	0.344	1.214		Surcharged
HW8	15 min Summer	13	101.432	0.032	1.299		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	10080 min Summer	5807	SWALE 1	SWALE 2	0.004	0.184	0.198	0.000	OK
2.000	60 min Summer	61	Northern	SWALE 2	0.085	0.005	0.044	0.004	OK
1.001	15 min Summer	8	SWALE 2	SWALE 3	0.038	0.230	3.020	0.000	OK
1.002	15 min Summer	10	SWALE 3	S7	0.039	0.234	2.697	0.000	OK
1.003	15 min Winter	13	S7	HW8	0.035	0.416	1.299	0.142	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving1	10080 min Summer	5811	105.360	0.285	0.036		OK
Permeable Paving4	10080 min Summer	5807	105.360	0.285	0.036		OK
Permeable Paving5	10080 min Summer	5806	105.360	0.285	0.036		OK
Permeable Paving7	10080 min Summer	5800	105.360	0.285	0.037		OK
Permeable Paving3	10080 min Summer	5815	105.360	0.286	0.045		OK
Permeable Paving2	10080 min Summer	5808	105.359	0.184	0.009		OK
Permeable Paving8	4320 min Summer	2353	102.247	0.293	0.086		OK
Permeable Paving9	4320 min Summer	2354	102.247	0.293	0.086		OK
Permeable Paving6	4320 min Summer	2352	102.247	0.292	0.042		OK

Return Period Yrs: 100.0
Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
SWALE 1	7200 min Summer	4037	105.360	0.005	0.340		OK
Northern Road	60 min Summer	37	102.263	0.228	0.023		OK
SWALE 2	15 min Summer	8	102.277	0.042	10.520		OK
SWALE 3	15 min Summer	10	102.227	0.040	3.872		OK
S7	15 min Summer	16	102.052	0.624	1.265		Surcharged
HW8	15 min Winter	11	101.432	0.032	1.301		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	7200 min Summer	4038	SWALE 1	SWALE 2	0.006	0.224	0.340	0.000	OK
2.000	15 min Summer	15	Northern	SWALE 2	0.095	0.036	0.367	0.029	OK
1.001	15 min Summer	8	SWALE 2	SWALE 3	0.044	0.256	4.272	0.000	OK
1.002	15 min Summer	10	SWALE 3	S7	0.046	0.268	3.874	0.000	OK
1.003	15 min Winter	11	S7	HW8	0.035	0.416	1.301	0.142	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving1	7200 min Summer	4038	105.362	0.287	0.062		OK
Permeable Paving4	7200 min Summer	4035	105.362	0.287	0.062		OK
Permeable Paving5	7200 min Summer	4034	105.362	0.287	0.062		OK
Permeable Paving7	7200 min Summer	4038	105.362	0.287	0.063		OK
Permeable Paving3	7200 min Summer	4039	105.363	0.288	0.077		OK
Permeable Paving2	7200 min Summer	4039	105.360	0.186	0.015		OK
Permeable Paving8	2160 min Summer	1208	102.252	0.298	0.150		OK
Permeable Paving9	2160 min Summer	1208	102.252	0.298	0.150		OK
Permeable Paving6	2160 min Summer	1204	102.251	0.296	0.074		OK

Network Details

Manhole Schedule

Manhole	Catchment Area (ha)	Diameter (m)	Type	CL (m)	IL (m)	Depth To Soffit (m)	Easting (m)	Northing (m)
Roof A Green	0.000	1.350	Type C	104.083	102.733	1.125	719203.352	724827.054
S5	0.004	1.350	Type C	103.397	102.075	1.097	719217.924	724832.847
S6	0.086	1.200	Type B	103.847	101.940	1.682	719214.981	724821.659
S1	0.327	1.350	Type B	105.538	103.451	1.862	719190.563	724796.935
S2	0.057	1.350	Type B	104.764	101.745	2.794	719205.102	724792.110
S3	0.163	1.200	Type B	102.995	101.390	1.380	719272.535	724777.921
HW1	0.000	1.350	Type C	102.600	101.378	0.997	719277.253	724779.028
HW2	0.000	1.350	Type C	102.600	101.350	1.025	719293.140	724794.482
S4	0.000	1.200	Type B	103.137	101.330	1.582	719297.065	724797.269
HW3	0.000	0.000	Type C	101.817	101.203	0.389	719308.193	724819.932

Pipe Schedule

Pipe Number	US Manhole	US IL (m)	DS Manhole	DS IL (m)	Shape	Dimension (m)	Length (m)	Gradient (1:x)	Roughness (mm)	US Depth To Soffit (m)	DS Depth To Soffit (m)
1.000	Roof A Green	102.733	S6	101.940	Circ	0.225mØ	12.820	16.2	0.600	1.125	1.682
2.000	S5	102.075	S6	101.940	Circ	0.225mØ	11.568	85.7	0.600	1.097	1.682
1.001	S6	101.940	S2	101.745	Circ	0.225mØ	31.157	159.8	0.600	1.682	2.794
3.000	S1	103.451	S2	102.823	Circ	0.225mØ	15.319	24.4	0.600	1.862	1.716
1.002	S2	101.745	S3	101.390	Circ	0.225mØ	68.909	194.1	0.600	2.794	1.380
1.003	S3	101.390	HW1	101.378	Circ	0.225mØ	4.846	403.8	0.600	1.380	0.997
1.004	HW1	101.378	HW2	101.350	Circ	0.225mØ	22.163	791.5	0.600	0.997	1.025
1.005	HW2	101.350	S4	101.330	Circ	0.225mØ	4.814	240.7	0.600	1.025	1.582
1.006	S4	101.330	HW3	101.203	Circ	0.225mØ	25.248	198.8	0.600	1.582	0.389

Permeable Paving Schedule

Permeable Paving	Assigned Manhole	Effective Storage Volume (m3)	CL (m)	IL (m)	Storage Infil Rate (m/hr)	Safety Factor	Easting (m)	Northing (m)
Permeable Paving12	S6	5.614	103.847	103.367	0.00000000	2.00	719221.205	724826.325
Permeable Paving11	S6	8.772	103.847	103.367	0.00000000	2.00	719210.323	724828.993
Permeable Paving15	S1	99.346	105.538	105.108	0.00000000	2.00	719171.913	724822.812
Permeable Paving13	S2	8.418	104.764	104.284	0.00000000	2.00	719217.629	724813.794
Permeable Paving14	S2	6.779	104.764	104.284	0.00000000	2.00	719213.780	724802.196
Permeable Paving16	S3	177.546	102.995	102.565	0.00000000	2.00	719261.799	724796.320

Outfall Details

Outfall Manhole HW3 : Free Discharge

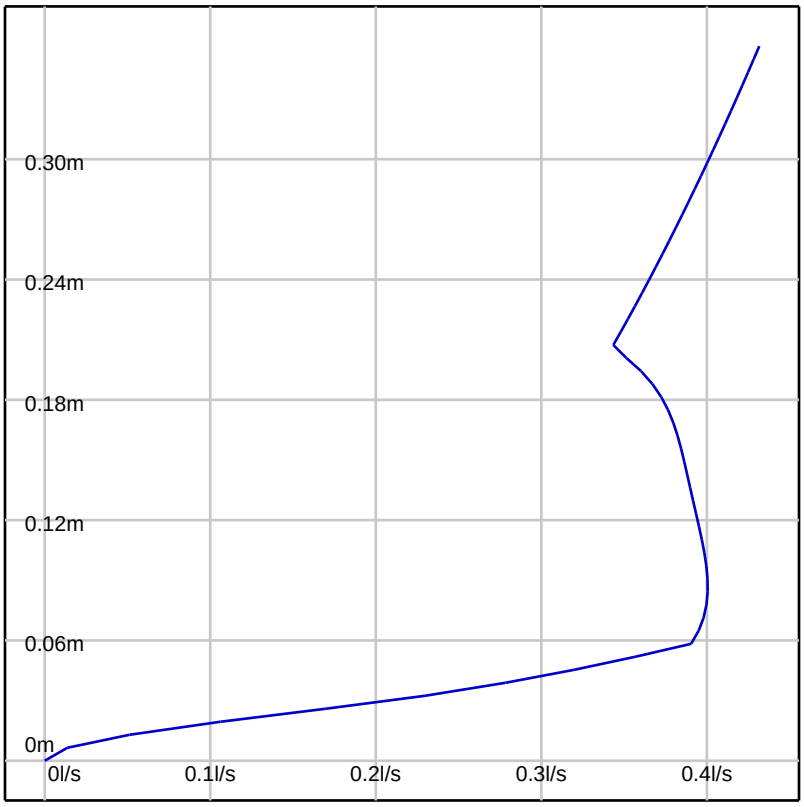
Flow Control Details

Controls within Manhole Roof A Green Roof

Hydro-Brake® Optimum Control at Manhole Roof A Green Roof

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0037-4000-0300-4000	0.300	0.400	0.000	0.087	0.400	0.206	0.342

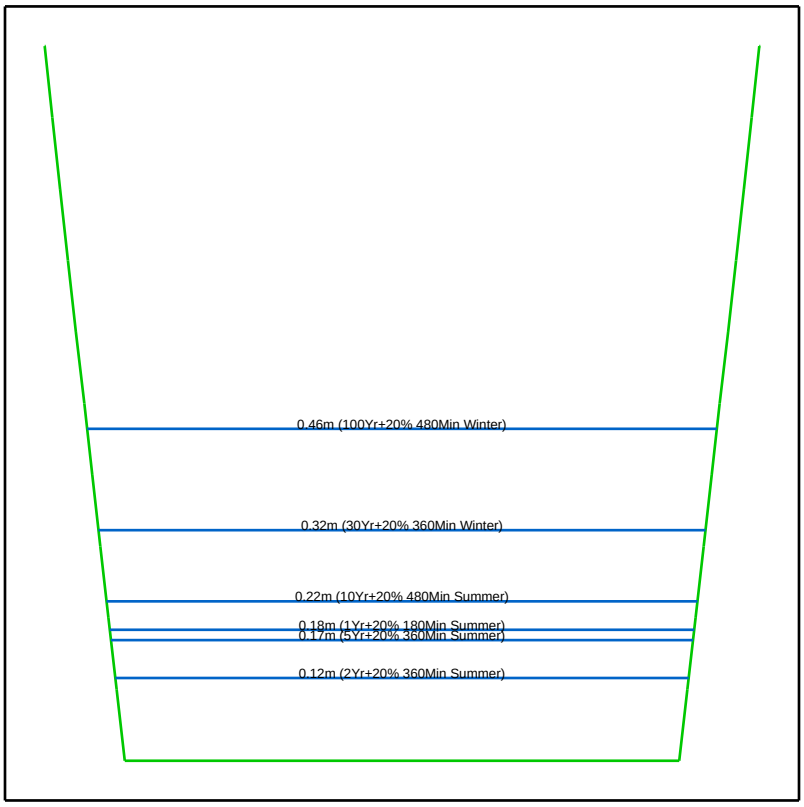
Hydro-Brake® Optimum Control at Roof A



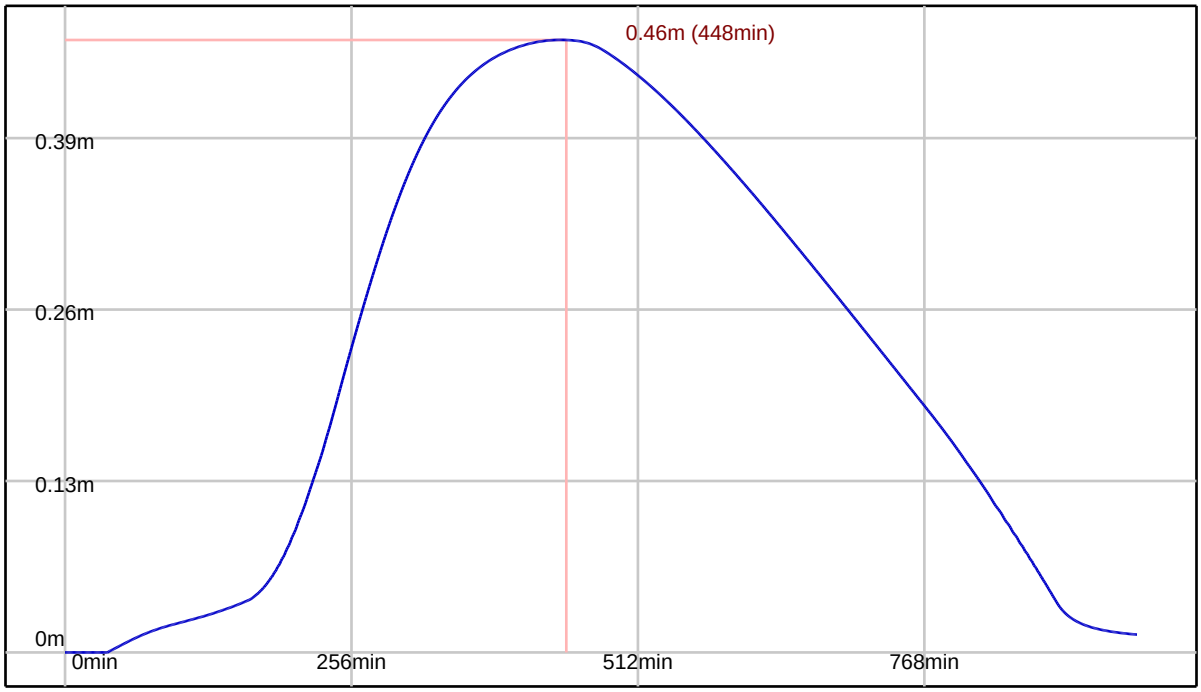
Pond Structure at Manhole HW2

Pond Invert (m)	Max Depth (m)	Volume To Water Level (m3)	Water Level (m)	Freeboard (m)	Infil Base (m/hr)	Infil Side (m/hr)	Safety Factor
101.600	1.000	125.945	102.000	0.600	0.00000000	0.00000000	2.00

Pond Depth/Area Diagram at HW2



Pond at HW2 (100Yr+20% 480Min Winter)

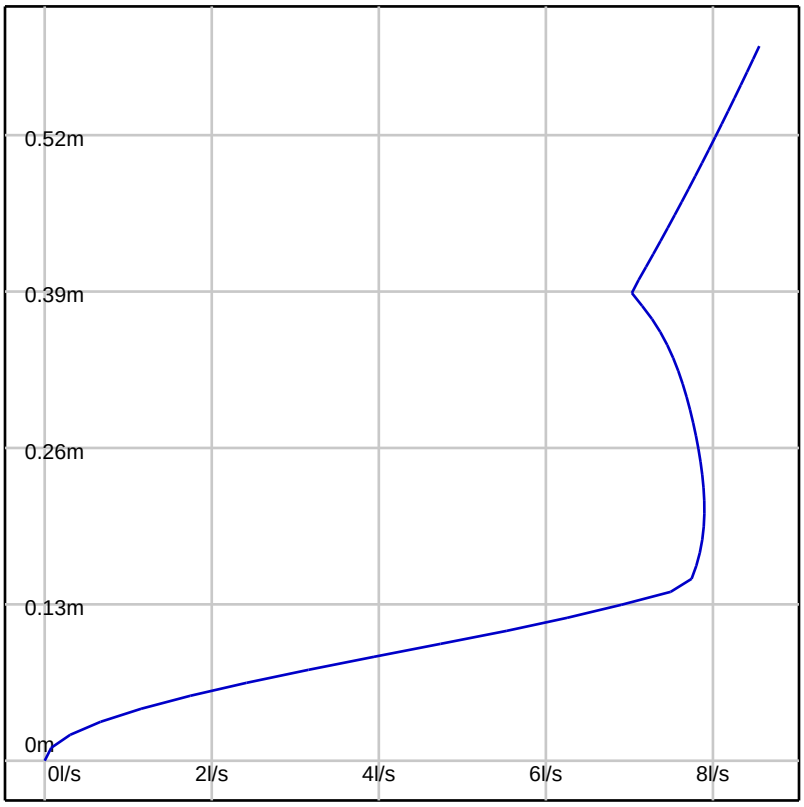


Controls within Manhole S4

Hydro-Brake® Optimum Control at Manhole S4

Model Ref	Design Depth (m)	Design Flow (l/s)	Depth Above Invert (m)	FF Head (m)	FF Flow (l/s)	KF Head (m)	KF Flow (l/s)
SHE-0137-7900-0500-7900	0.500	7.900	0.000	0.209	7.898	0.388	7.015

Hydro-Brake® Optimum Control at S4



Simulation Settings

FSR: M5-60=18.10, R=0.27, Locale=Scotland and Northern Ireland

Summer (Cv min: 0.15, max: 0.80), Winter (Cv min: 0.15, max: 0.84)

Global Time of Entry: 5.0 mins

Durations (mins): 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Periods (yrs) + Climate Change: (1, +20%), (2, +20%), (5, +20%), (10, +20%), (30, +20%), (100, +20%)

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
1Yr+20% 15Min Winter	31.791	-0.29	-0.15	10Yr+20% 720Min Summer	5.062	0.00	0.00
1Yr+20% 15Min Summer	31.791	-0.40	-0.19	10Yr+20% 720Min Winter	5.062	0.00	0.00
1Yr+20% 30Min Winter	23.654	-0.10	0.00	10Yr+20% 960Min Summer	4.175	0.00	0.00
1Yr+20% 30Min Summer	23.654	-0.39	0.00	10Yr+20% 960Min Winter	4.175	0.00	0.00
1Yr+20% 60Min Winter	15.726	0.00	0.07	10Yr+20% 1440Min Summer	3.193	0.00	0.00
1Yr+20% 60Min Summer	15.726	-0.07	0.05	10Yr+20% 1440Min Winter	3.193	0.00	0.00
1Yr+20% 120Min Summer	10.290	0.00	0.04	10Yr+20% 2160Min Summer	2.432	0.00	0.00
1Yr+20% 120Min Winter	10.290	0.00	0.05	10Yr+20% 2160Min Winter	2.432	0.00	0.00
1Yr+20% 180Min Winter	8.024	0.00	0.03	10Yr+20% 2880Min Summer	2.004	0.00	0.00
1Yr+20% 180Min Summer	8.024	0.00	0.13	10Yr+20% 2880Min Winter	2.004	0.00	-0.01
1Yr+20% 240Min Summer	6.706	0.00	0.02	10Yr+20% 4320Min Summer	1.525	0.00	-0.01
1Yr+20% 240Min Winter	6.706	0.00	0.02	10Yr+20% 4320Min Winter	1.525	0.00	-0.01
1Yr+20% 360Min Winter	5.202	0.00	0.00	10Yr+20% 5760Min Summer	1.257	0.00	-0.00
1Yr+20% 360Min Summer	5.202	0.00	0.00	10Yr+20% 5760Min Winter	1.257	0.00	-0.00
1Yr+20% 480Min Summer	4.342	0.00	0.00	10Yr+20% 7200Min Summer	1.081	0.00	-0.00
1Yr+20% 480Min Winter	4.342	0.00	0.00	10Yr+20% 7200Min Winter	1.081	0.00	-0.00
1Yr+20% 600Min Summer	3.773	0.00	0.00	10Yr+20% 8640Min Summer	0.956	0.00	-0.00
1Yr+20% 600Min Winter	3.773	0.00	0.00	10Yr+20% 8640Min Winter	0.956	0.00	-0.00
1Yr+20% 720Min Summer	3.364	0.00	0.00	10Yr+20% 10080Min Summer	0.862	0.00	-0.00
1Yr+20% 720Min Winter	3.364	0.00	0.00	10Yr+20% 10080Min Winter	0.862	0.00	-0.00
1Yr+20% 960Min Summer	2.806	0.00	0.00	30Yr+20% 15Min Summer	82.298	-0.35	0.34
1Yr+20% 960Min Winter	2.806	0.00	0.00	30Yr+20% 15Min Winter	82.298	-0.27	0.28
1Yr+20% 1440Min Summer	2.158	0.00	0.00	30Yr+20% 30Min Summer	50.170	-0.16	0.43
1Yr+20% 1440Min Winter	2.158	0.00	0.00	30Yr+20% 30Min Winter	50.170	-0.10	0.44
1Yr+20% 2160Min Summer	1.670	0.00	-0.01	30Yr+20% 60Min Summer	32.706	-0.07	0.52
1Yr+20% 2160Min Winter	1.670	0.00	-0.01	30Yr+20% 60Min Winter	32.706	-0.03	0.52
1Yr+20% 2880Min Summer	1.393	0.00	-0.01	30Yr+20% 120Min Summer	20.835	-0.03	0.43
1Yr+20% 2880Min Winter	1.393	0.00	-0.01	30Yr+20% 120Min Winter	20.835	0.00	0.43
1Yr+20% 4320Min Summer	1.078	0.00	-0.01	30Yr+20% 180Min Summer	15.832	0.00	0.31
1Yr+20% 4320Min Winter	1.078	0.00	-0.01	30Yr+20% 180Min Winter	15.832	0.00	0.31
1Yr+20% 5760Min Summer	0.900	0.00	-0.01	30Yr+20% 240Min Summer	13.037	0.00	0.17
1Yr+20% 5760Min Winter	0.900	0.00	-0.01	30Yr+20% 240Min Winter	13.037	0.00	0.18
1Yr+20% 7200Min Winter	0.782	0.00	-0.01	30Yr+20% 360Min Summer	9.894	0.00	-0.02
1Yr+20% 7200Min Summer	0.782	0.00	-0.01	30Yr+20% 360Min Winter	9.894	0.00	-0.01
1Yr+20% 8640Min Summer	0.697	0.00	-0.01	30Yr+20% 480Min Summer	8.126	0.00	-0.01
1Yr+20% 8640Min Winter	0.697	0.00	-0.01	30Yr+20% 480Min Winter	8.126	0.00	-0.01
1Yr+20% 10080Min Summer	0.632	0.00	-0.01	30Yr+20% 600Min Summer	6.973	0.00	-0.01
1Yr+20% 10080Min Winter	0.632	0.00	0.06	30Yr+20% 600Min Winter	6.973	0.00	-0.01
2Yr+20% 15Min Summer	38.591	-0.40	-0.16	30Yr+20% 720Min Summer	6.151	0.00	-0.01
2Yr+20% 15Min Winter	38.591	-0.29	-0.14	30Yr+20% 720Min Winter	6.151	0.00	0.00
2Yr+20% 30Min Summer	27.571	-0.16	0.03	30Yr+20% 960Min Summer	5.046	0.00	-0.01
2Yr+20% 30Min Winter	27.571	-0.10	0.03	30Yr+20% 960Min Winter	5.046	0.00	0.00
2Yr+20% 60Min Summer	18.257	-0.07	0.06	30Yr+20% 1440Min Summer	3.849	0.00	0.00
2Yr+20% 60Min Winter	18.257	0.00	0.07	30Yr+20% 1440Min Winter	3.849	0.00	0.00
2Yr+20% 120Min Summer	11.881	0.00	0.04	30Yr+20% 2160Min Summer	2.910	0.00	0.00
2Yr+20% 120Min Winter	11.881	0.00	0.05	30Yr+20% 2160Min Winter	2.910	0.00	0.00
2Yr+20% 180Min Summer	9.216	0.00	0.03	30Yr+20% 2880Min Summer	2.385	0.00	0.00
2Yr+20% 180Min Winter	9.216	0.00	0.03	30Yr+20% 2880Min Winter	2.385	0.00	-0.00
2Yr+20% 240Min Summer	7.679	0.00	0.02	30Yr+20% 4320Min Winter	1.800	0.00	-0.00
2Yr+20% 240Min Winter	7.679	0.00	0.02	30Yr+20% 4320Min Summer	1.800	0.00	-0.00
2Yr+20% 360Min Summer	5.930	0.00	0.01	30Yr+20% 5760Min Winter	1.474	0.00	-0.00
2Yr+20% 360Min Winter	5.930	0.00	0.01	30Yr+20% 5760Min Summer	1.474	0.00	-0.00
2Yr+20% 480Min Summer	4.934	0.00	0.00	30Yr+20% 7200Min Winter	1.262	0.00	-0.00
2Yr+20% 480Min Winter	4.934	0.00	0.00	30Yr+20% 7200Min Summer	1.262	0.00	-0.00
2Yr+20% 600Min Summer	4.276	0.00	0.00	30Yr+20% 8640Min Winter	1.112	0.00	-0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
2Yr+20% 600Min Winter	4.276	0.00	0.00	30Yr+20% 10080Min Winter	0.999	0.00	-0.00
2Yr+20% 720Min Summer	3.804	0.00	0.00	30Yr+20% 10080Min Summer	0.999	0.00	-0.00
2Yr+20% 720Min Winter	3.804	0.00	0.00	100Yr+20% 15Min Winter	115.243	-0.25	0.37
2Yr+20% 960Min Summer	3.163	0.00	0.00	100Yr+20% 15Min Summer	115.243	-0.31	0.41
2Yr+20% 960Min Winter	3.163	0.00	0.00	100Yr+20% 15Min Winter	115.243	-0.25	0.37
2Yr+20% 1440Min Winter	2.428	0.00	0.00	100Yr+20% 15Min Summer	115.243	-0.31	0.41
2Yr+20% 1440Min Summer	2.428	0.00	0.00	100Yr+20% 30Min Summer	65.468	-0.15	0.56
2Yr+20% 2160Min Summer	1.870	0.00	-0.01	100Yr+20% 30Min Winter	65.468	-0.10	0.58
2Yr+20% 2160Min Winter	1.870	0.00	-0.01	100Yr+20% 30Min Summer	65.468	-0.15	0.56
2Yr+20% 2880Min Summer	1.554	0.00	-0.01	100Yr+20% 30Min Winter	65.468	-0.10	0.58
2Yr+20% 2880Min Winter	1.554	0.00	-0.01	100Yr+20% 60Min Summer	42.383	-0.07	0.59
2Yr+20% 4320Min Summer	1.197	0.00	-0.00	100Yr+20% 60Min Winter	42.383	-0.03	0.59
2Yr+20% 4320Min Winter	1.197	0.00	-0.01	100Yr+20% 60Min Summer	42.383	-0.07	0.59
2Yr+20% 5760Min Summer	0.995	0.00	-0.01	100Yr+20% 60Min Winter	42.383	-0.03	0.59
2Yr+20% 5760Min Winter	0.995	0.00	-0.01	100Yr+20% 120Min Summer	26.744	-0.03	0.51
2Yr+20% 7200Min Summer	0.862	0.00	-0.01	100Yr+20% 120Min Winter	26.744	0.00	0.51
2Yr+20% 7200Min Winter	0.862	0.00	-0.01	100Yr+20% 120Min Winter	26.744	0.00	0.51
2Yr+20% 8640Min Summer	0.767	0.00	-0.01	100Yr+20% 120Min Summer	26.744	-0.03	0.51
2Yr+20% 8640Min Winter	0.767	0.00	-0.01	100Yr+20% 180Min Winter	20.138	0.00	0.42
2Yr+20% 10080Min Summer	0.694	0.00	-0.01	100Yr+20% 180Min Summer	20.138	0.00	0.42
2Yr+20% 10080Min Winter	0.694	0.00	-0.01	100Yr+20% 180Min Summer	20.138	0.00	0.42
5Yr+20% 15Min Summer	49.863	-0.38	-0.08	100Yr+20% 180Min Winter	20.138	0.00	0.42
5Yr+20% 15Min Winter	49.863	-0.28	-0.09	100Yr+20% 240Min Winter	16.496	0.00	0.33
5Yr+20% 30Min Summer	33.761	-0.16	0.10	100Yr+20% 240Min Summer	16.496	0.00	0.32
5Yr+20% 30Min Winter	33.761	-0.10	0.13	100Yr+20% 240Min Winter	16.496	0.00	0.33
5Yr+20% 60Min Summer	22.238	-0.07	0.27	100Yr+20% 240Min Summer	16.496	0.00	0.32
5Yr+20% 60Min Winter	22.238	0.00	0.27	100Yr+20% 360Min Winter	12.423	0.00	0.12
5Yr+20% 120Min Summer	14.368	0.00	0.10	100Yr+20% 360Min Winter	12.423	0.00	0.12
5Yr+20% 120Min Winter	14.368	0.00	0.12	100Yr+20% 360Min Summer	12.423	0.00	0.11
5Yr+20% 180Min Summer	11.068	0.00	0.02	100Yr+20% 360Min Summer	12.423	0.00	0.11
5Yr+20% 180Min Winter	11.068	0.00	0.03	100Yr+20% 480Min Winter	10.145	0.00	-0.02
5Yr+20% 240Min Winter	9.185	0.00	0.02	100Yr+20% 480Min Summer	10.145	0.00	-0.03
5Yr+20% 240Min Summer	9.185	0.00	0.02	100Yr+20% 480Min Summer	10.145	0.00	-0.03
5Yr+20% 360Min Summer	7.051	0.00	0.00	100Yr+20% 480Min Winter	10.145	0.00	-0.02
5Yr+20% 360Min Winter	7.051	0.00	0.01	100Yr+20% 600Min Summer	8.666	0.00	-0.03
5Yr+20% 480Min Summer	5.841	0.00	0.00	100Yr+20% 600Min Summer	8.666	0.00	-0.03
5Yr+20% 480Min Winter	5.841	0.00	0.00	100Yr+20% 600Min Winter	8.666	0.00	-0.02
5Yr+20% 600Min Summer	5.046	0.00	0.00	100Yr+20% 600Min Winter	8.666	0.00	-0.02
5Yr+20% 600Min Winter	5.046	0.00	0.00	100Yr+20% 720Min Winter	7.616	0.00	-0.01
5Yr+20% 720Min Summer	4.476	0.00	0.00	100Yr+20% 720Min Summer	7.616	0.00	-0.02
5Yr+20% 720Min Winter	4.476	0.00	0.00	100Yr+20% 720Min Winter	7.616	0.00	-0.01
5Yr+20% 960Min Summer	3.704	0.00	0.00	100Yr+20% 720Min Summer	7.616	0.00	-0.02
5Yr+20% 960Min Winter	3.704	0.00	0.00	100Yr+20% 960Min Winter	6.212	0.00	-0.01
5Yr+20% 1440Min Summer	2.837	0.00	0.00	100Yr+20% 960Min Winter	6.212	0.00	-0.01
5Yr+20% 1440Min Winter	2.837	0.00	0.00	100Yr+20% 960Min Summer	6.212	0.00	-0.02
5Yr+20% 2160Min Summer	2.172	0.00	0.00	100Yr+20% 960Min Summer	6.212	0.00	-0.02
5Yr+20% 2160Min Winter	2.172	0.00	-0.01	100Yr+20% 1440Min Winter	4.723	0.00	-0.01
5Yr+20% 2880Min Summer	1.796	0.00	-0.01	100Yr+20% 1440Min Winter	4.723	0.00	-0.01
5Yr+20% 2880Min Winter	1.796	0.00	-0.01	100Yr+20% 1440Min Summer	4.723	0.00	-0.01
5Yr+20% 4320Min Summer	1.374	0.00	-0.01	100Yr+20% 1440Min Summer	4.723	0.00	-0.01
5Yr+20% 4320Min Winter	1.374	0.00	-0.01	100Yr+20% 2160Min Winter	3.542	0.00	0.00
5Yr+20% 5760Min Summer	1.136	0.00	-0.01	100Yr+20% 2160Min Winter	3.542	0.00	0.00
5Yr+20% 5760Min Winter	1.136	0.00	-0.01	100Yr+20% 2160Min Summer	3.542	0.00	-0.01
5Yr+20% 7200Min Summer	0.981	0.00	-0.01	100Yr+20% 2160Min Summer	3.542	0.00	-0.01
5Yr+20% 7200Min Winter	0.981	0.00	-0.01	100Yr+20% 2880Min Summer	2.885	0.00	-0.00
5Yr+20% 8640Min Summer	0.869	0.00	-0.01	100Yr+20% 2880Min Winter	2.885	0.00	0.00
5Yr+20% 8640Min Winter	0.869	0.00	-0.00	100Yr+20% 2880Min Winter	2.885	0.00	0.00
5Yr+20% 10080Min Summer	0.785	0.00	-0.00	100Yr+20% 2880Min Summer	2.885	0.00	-0.00
5Yr+20% 10080Min Winter	0.785	0.00	-0.00	100Yr+20% 4320Min Summer	2.158	0.00	0.00
10Yr+20% 15Min Winter	60.529	-0.27	0.00	100Yr+20% 4320Min Winter	2.158	0.00	-0.00
10Yr+20% 15Min Summer	60.529	-0.36	0.00	100Yr+20% 4320Min Summer	2.158	0.00	0.00
10Yr+20% 30Min Winter	39.352	-0.10	0.26	100Yr+20% 5760Min Summer	1.755	0.00	0.00
10Yr+20% 30Min Summer	39.352	-0.16	0.24	100Yr+20% 5760Min Winter	1.755	0.00	-0.00
10Yr+20% 60Min Summer	25.817	-0.07	0.37	100Yr+20% 5760Min Winter	1.755	0.00	-0.00
10Yr+20% 60Min Winter	25.817	0.00	0.38	100Yr+20% 5760Min Summer	1.755	0.00	0.00
10Yr+20% 120Min Summer	16.589	0.00	0.27	100Yr+20% 7200Min Winter	1.495	0.00	-0.00
10Yr+20% 120Min Winter	16.589	0.00	0.28	100Yr+20% 7200Min Summer	1.495	0.00	-0.00
10Yr+20% 180Min Summer	12.712	0.00	0.12	100Yr+20% 7200Min Summer	1.495	0.00	-0.00

Simulated Rainfall Events

Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %	Storm	Average Intensity (mm/hr)	Runoff Continuity %	Flow Continuity %
10Yr+20% 180Min Winter	12.712	0.00	0.14	100Yr+20% 7200Min Winter	1.495	0.00	-0.00
10Yr+20% 240Min Summer	10.518	0.00	0.01	100Yr+20% 8640Min Summer	1.311	0.00	-0.00
10Yr+20% 240Min Winter	10.518	0.00	0.02	100Yr+20% 8640Min Summer	1.311	0.00	-0.00
10Yr+20% 360Min Summer	8.039	0.00	0.00	100Yr+20% 8640Min Winter	1.311	0.00	-0.00
10Yr+20% 360Min Winter	8.039	0.00	0.00	100Yr+20% 8640Min Winter	1.311	0.00	-0.00
10Yr+20% 480Min Summer	6.637	0.00	0.00	100Yr+20% 10080Min Winter	1.174	0.00	-0.00
10Yr+20% 480Min Winter	6.637	0.00	0.00	100Yr+20% 10080Min Summer	1.174	0.00	-0.00
10Yr+20% 600Min Summer	5.718	0.00	0.00	100Yr+20% 10080Min Summer	1.174	0.00	-0.00
10Yr+20% 600Min Winter	5.718	0.00	0.00	100Yr+20% 10080Min Winter	1.174	0.00	-0.00

Simulation Results

Return Period Yrs: 1.0
Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Roof A Green Roof	180 min Summer	2051	102.733	0.000	0.001		OK
S5	15 min Winter	8	102.091	0.016	0.636		OK
S6	30 min Summer	18	102.089	0.149	4.563		OK
S1	30 min Summer	16	103.529	0.078	27.371		OK
S2	30 min Summer	18	102.086	0.341	27.983		Surcharged
S3	30 min Summer	18	101.849	0.459	32.004		Surcharged
HW1	30 min Summer	18	101.832	0.454	31.348		Surcharged
HW2	180 min Summer	4319	101.783	0.183	0.000		Surcharged
S4	240 min Summer	159	101.775	0.445	7.723		Surcharged
HW3	15 min Summer	17	101.273	0.070	7.898		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	30 min Summer	18	Roof A Green	S6	0.074	0.000	0.000	0.000	OK
2.000	30 min Summer	19	S5	S6	0.082	0.142	0.616	0.011	OK
1.001	30 min Summer	19	S6	S2	0.187	0.255	8.402	0.205	OK
3.000	30 min Summer	16	S1	S2	0.078	2.254	27.359	0.259	OK
1.002	30 min Summer	18	S2	S3	0.225	0.791	31.459	0.848	OK
1.003	30 min Summer	18	S3	HW1	0.225	0.788	31.348	1.226	OK
1.004	240 min Summer	162	HW1	HW2	0.157	0.695	17.972	0.992	OK
1.005	240 min Summer	162	HW2	S4	0.157	0.928	27.282	0.820	OK
1.006	30 min Summer	51	S4	HW3	0.070	0.748	7.897	0.215	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving12	120 min Summer	70	103.381	0.015	0.256		OK
Permeable Paving11	120 min Summer	72	103.384	0.017	0.351		OK
Permeable Paving15	480 min Summer	290	105.159	0.051	1.710		OK
Permeable Paving13	120 min Summer	72	104.301	0.017	0.336		OK
Permeable Paving14	120 min Summer	71	104.300	0.016	0.287		OK
Permeable Paving16	720 min Summer	439	102.626	0.061	2.233		OK

Return Period Yrs: 2.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Roof A Green Roof	-	0	102.733	0.000	0.000		OK
S5	30 min Summer	18	102.188	0.113	1.747		OK
S6	30 min Summer	18	102.184	0.244	4.762		Surcharged
S1	15 min Summer	8	103.537	0.086	33.209		OK
S2	30 min Summer	18	102.176	0.431	37.593		Surcharged
S3	15 min Summer	11	101.895	0.505	33.532		Surcharged
HW1	15 min Summer	11	101.875	0.497	33.440		Surcharged
HW2	360 min Summer	251	101.716	0.116	7.108		Surcharged
S4	240 min Summer	174	101.802	0.472	10.783		Surcharged
HW3	180 min Summer	85	101.273	0.070	7.898		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	10	Roof A Green	S6	0.113	0.000	0.000	0.000	OK
2.000	30 min Summer	20	S5	S6	0.169	0.188	4.249	0.076	OK
1.001	30 min Summer	21	S6	S2	0.225	0.343	9.848	0.240	OK
3.000	15 min Summer	8	S1	S2	0.086	2.372	33.037	0.312	OK
1.002	30 min Summer	17	S2	S3	0.225	0.862	34.290	0.924	OK
1.003	30 min Summer	19	S3	HW1	0.225	0.875	34.790	1.361	OK
1.004	360 min Summer	251	HW1	HW2	0.170	0.644	17.276	0.954	OK
1.005	360 min Summer	251	HW2	S4	0.170	0.940	29.706	0.893	OK
1.006	30 min Summer	20	S4	HW3	0.070	0.748	7.898	0.215	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving12	120 min Summer	69	103.383	0.017	0.319		OK
Permeable Paving11	120 min Summer	71	103.387	0.020	0.429		OK
Permeable Paving15	480 min Summer	288	105.164	0.057	1.972		OK
Permeable Paving13	120 min Summer	71	104.304	0.020	0.412		OK
Permeable Paving14	120 min Summer	70	104.302	0.018	0.369		OK
Permeable Paving16	720 min Summer	436	102.633	0.068	2.570		OK

Return Period Yrs: 5.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Roof A Green Roof	-	0	102.733	0.000	0.000		OK
S5	15 min Summer	11	102.408	0.333	0.465		Surcharged
S6	15 min Summer	11	102.395	0.455	8.028		Surcharged
S1	15 min Summer	8	103.550	0.099	42.968		OK
S2	15 min Summer	11	102.382	0.637	34.941		Surcharged
S3	15 min Summer	11	101.989	0.599	41.233		Surcharged
HW1	15 min Summer	11	101.961	0.583	40.328		Surcharged
HW2	360 min Summer	277	101.769	0.169	7.283		Surcharged
S4	240 min Summer	173	101.822	0.492	6.368		Surcharged
HW3	30 min Summer	19	101.273	0.070	7.910		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Summer	8	Roof A Green	S6	0.113	0.000	0.000	0.000	OK
2.000	15 min Winter	13	S5	S6	0.225	0.159	5.101	0.091	OK
1.001	15 min Winter	15	S6	S2	0.225	0.387	13.814	0.337	OK
3.000	15 min Summer	8	S1	S2	0.099	2.541	42.754	0.404	OK
1.002	30 min Summer	18	S2	S3	0.225	1.019	40.528	1.092	OK
1.003	30 min Summer	19	S3	HW1	0.225	1.021	40.608	1.588	OK
1.004	360 min Summer	277	HW1	HW2	0.197	0.726	20.652	1.140	OK
1.005	360 min Summer	406	HW2	S4	0.197	0.934	29.706	0.893	OK
1.006	15 min Winter	13	S4	HW3	0.070	0.747	7.895	0.215	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving12	60 min Summer	37	103.387	0.021	0.472		OK
Permeable Paving11	120 min Summer	70	103.391	0.024	0.561		OK
Permeable Paving15	360 min Summer	221	105.173	0.066	2.436		OK
Permeable Paving13	120 min Summer	70	104.307	0.024	0.538		OK
Permeable Paving14	60 min Summer	38	104.306	0.022	0.491		OK
Permeable Paving16	600 min Summer	368	102.643	0.078	3.184		OK

Return Period Yrs: 10.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Roof A Green Roof	-	0	102.733	0.000	0.000		OK
S5	15 min Summer	11	102.640	0.565	0.562		Surcharged
S6	15 min Summer	11	102.624	0.684	7.721		Surcharged
S1	15 min Summer	8	103.562	0.111	52.216		OK
S2	15 min Summer	11	102.607	0.862	42.095		Surcharged
S3	15 min Summer	12	102.078	0.688	45.036		Surcharged
HW1	15 min Summer	12	102.041	0.663	46.274		Surcharged
HW2	480 min Summer	372	101.823	0.223	7.324		Surcharged
S4	360 min Winter	211	101.823	0.493	5.149		Surcharged
HW3	480 min Summer	643	101.273	0.070	7.897		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	8	Roof A Green	S6	0.113	0.000	0.000	0.000	OK
2.000	15 min Summer	13	S5	S6	0.225	0.201	5.385	0.096	OK
1.001	15 min Summer	16	S6	S2	0.225	0.428	14.495	0.354	OK
3.000	15 min Summer	8	S1	S2	0.111	2.672	51.967	0.492	OK
1.002	15 min Summer	10	S2	S3	0.225	1.182	47.009	1.267	OK
1.003	15 min Summer	11	S3	HW1	0.225	1.164	46.283	1.810	OK
1.004	480 min Summer	372	HW1	HW2	0.224	0.690	20.761	1.146	OK
1.005	480 min Summer	372	HW2	S4	0.224	0.930	29.574	0.889	OK
1.006	30 min Summer	18	S4	HW3	0.070	0.746	7.887	0.215	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving12	60 min Summer	38	103.391	0.024	0.674		OK
Permeable Paving11	60 min Summer	39	103.395	0.028	0.615		OK
Permeable Paving15	360 min Summer	220	105.181	0.073	2.873		OK
Permeable Paving13	60 min Summer	39	104.312	0.028	0.589		OK
Permeable Paving14	60 min Summer	39	104.310	0.026	0.475		OK
Permeable Paving16	600 min Summer	366	102.652	0.087	3.702		OK

Return Period Yrs: 30.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Roof A Green Roof	15 min Winter	14	102.817	0.084	0.297		OK
S5	15 min Summer	11	103.090	1.015	0.759		Surcharged
S6	15 min Summer	11	103.093	1.153	9.487		Surcharged
S1	15 min Summer	8	103.585	0.134	71.134		OK
S2	15 min Summer	11	103.078	1.333	52.312		Surcharged
S3	15 min Summer	12	102.261	0.871	57.199		Surcharged
HW1	15 min Summer	12	102.203	0.825	57.888		Surcharged
HW2	360 min Winter	333	101.923	0.323	8.060		Surcharged
S4	360 min Winter	333	101.922	0.592	8.045		Surcharged
HW3	360 min Winter	334	101.274	0.071	8.045		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	14	Roof A Green	S6	0.225	0.106	3.485	0.027	OK
2.000	15 min Winter	15	S5	S6	0.225	0.173	6.380	0.114	OK
1.001	15 min Winter	15	S6	S2	0.225	0.507	20.168	0.492	OK
3.000	15 min Winter	11	S1	S2	0.162	2.861	69.340	0.656	OK
1.002	15 min Winter	11	S2	S3	0.225	1.461	58.100	1.566	OK
1.003	15 min Winter	13	S3	HW1	0.225	1.467	58.324	2.281	OK
1.004	180 min Summer	117	HW1	HW2	0.225	1.163	38.507	2.126	OK
1.005	1440 min Summer	809	HW2	S4	0.225	0.934	29.861	0.898	OK
1.006	360 min Winter	334	S4	HW3	0.071	0.752	8.045	0.219	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving12	60 min Summer	40	103.396	0.029	0.795		OK
Permeable Paving11	60 min Summer	41	103.402	0.035	0.818		OK
Permeable Paving15	240 min Summer	152	105.195	0.088	3.760		OK
Permeable Paving13	60 min Summer	41	104.319	0.035	0.785		OK
Permeable Paving14	60 min Summer	40	104.316	0.032	0.960		OK
Permeable Paving16	480 min Summer	297	102.668	0.103	4.852		OK

Return Period Yrs: 100.0

Climate Change %: 20

Manholes

Manhole	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Roof A Green Roof	30 min Winter	25	102.899	0.167	0.000		OK
S5	15 min Winter	10	103.397	1.322	37.861		Surcharged
S6	15 min Summer	10	103.462	1.522	47.232		Surcharged
S1	15 min Summer	10	103.956	0.505	81.328		Surcharged
S2	15 min Summer	10	103.583	1.838	103.576		Surcharged
S3	15 min Summer	11	102.448	1.058	68.832		Surcharged
HW1	15 min Summer	11	102.369	0.991	67.727		Flood Risk
HW2	480 min Winter	443	102.064	0.464	8.560		Flood Risk
S4	480 min Winter	443	102.063	0.733	8.555		Surcharged
HW3	360 min Winter	257	101.276	0.073	8.555		Outfall

Conduits

Pipe No.	Critical Storm	Peak (mins)	US Manhole	DS Manhole	Flow Depth (m)	Max Velocity (m/s)	Max Flow (l/s)	Flow / Capacity	Status
1.000	15 min Winter	17	Roof A Green	S6	0.225	0.210	4.863	0.037	OK
2.000	15 min Summer	13	S5	S6	0.225	0.187	7.443	0.133	OK
1.001	15 min Winter	17	S6	S2	0.225	0.634	25.198	0.615	OK
3.000	15 min Summer	9	S1	S2	0.225	3.015	98.855	0.935	OK
1.002	15 min Summer	10	S2	S3	0.225	1.752	69.680	1.878	OK
1.003	30 min Winter	21	S3	HW1	0.225	1.728	68.721	2.688	OK
1.004	60 min Summer	46	HW1	HW2	0.225	2.025	67.353	3.718	OK
1.005	120 min Winter	74	HW2	S4	0.225	0.901	30.204	0.908	OK
1.006	360 min Winter	257	S4	HW3	0.073	0.765	8.555	0.233	OK

Permeable Paving Storage

Permeable Paving	Critical Storm	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Flood (m3)	Status
Permeable Paving12	15 min Summer	12	103.421	0.055	1.877		OK
Permeable Paving11	15 min Summer	16	103.419	0.052	1.686		OK
Permeable Paving15	240 min Summer	151	105.216	0.108	5.019		OK
Permeable Paving13	60 min Summer	42	104.326	0.042	1.244		OK
Permeable Paving14	60 min Summer	41	104.322	0.038	1.080		OK
Permeable Paving16	360 min Summer	231	102.692	0.127	5.819		OK

APPENDIX VI

SITE INVESTIGATION REPORT

S.I. Ltd Contract No: 6400

Client: Kavco Group

Contractor: Site Investigations Ltd

Kilgobbin,
Stepaside, Co. Dublin
Site Investigation Report

Prepared by:

.....

Stephen Letch

Issue Date:	18/03/2025
Status	Final
Revision	0

Contents:

Appendices:

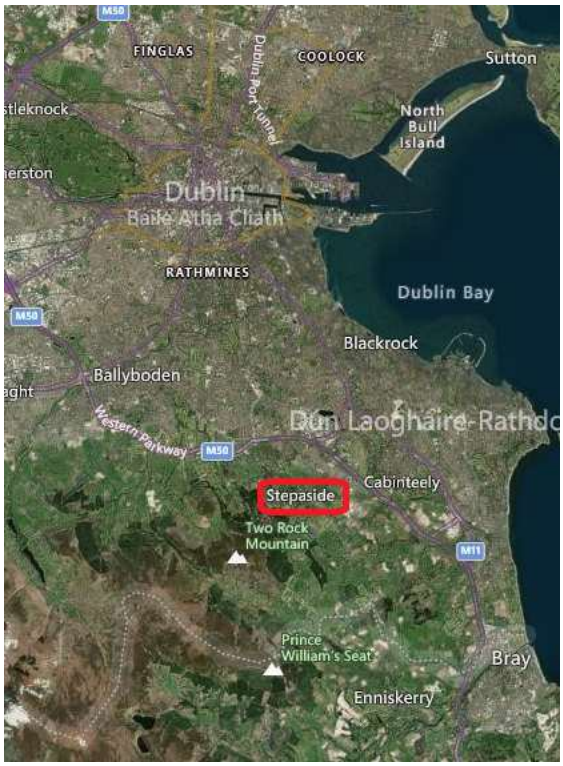
1. Introduction

On the instructions of the Client, Kavco, Site Investigations Ltd (SIL) was appointed to complete a ground investigation at Kilgobbin, Stepaside, Co. Dublin. The investigation was for a residential development and was completed in November 2024.

This report presents the factual geotechnical data obtained from the field and laboratory testing with interpretation of the ground conditions discussed.

2. Site Location

The site location is in Stepaside, south Dublin, close to the Luas Green line and Junction 14 of the M50 motorway. The map on the left below shows the location of Stepaside in south Dublin and the second map shows the location of the site in the local area.



3. Fieldwork

All fieldwork was carried out in accordance with BS 5930:2015, Engineers Ireland GI Specification and Related Document 2nd Edition 2016 and Eurocode 7: Geotechnical Design. The fieldworks comprised of the following:

- 6 No. cable percussive boreholes
- 3 No. soakaway tests

3.1. Cable Percussive Boreholes

Cable percussion boring was undertaken at 6 No. locations using a Dando 2000 rig and constructed 200mm diameter boreholes. BH03 encountered a shallow obstruction at 1.90mbgl so a reattempt was made to advance the borehole, BH03A and this terminated at 3.00mbgl. The other boreholes terminated at similar depths of 4.20mbgl (BH06) to 5.70mbgl (BH02) after an hour and a half chiselling was completed and no further progress was made. Bulk disturbed samples were recovered at regular intervals as the boreholes progressed.

To test the strength of the stratum, Standard Penetration Tests (SPT's) were performed at 1.00m intervals in accordance with BS 1377 (1990). In soils with high gravel and cobble content it is appropriate to use a solid cone (60°) (CPT) instead of the split spoon and this was used throughout the testing. The test is completed over 450mm and the cone is driven 150mm into the stratum to ensure that the test is conducted over an undisturbed zone. The cone is then driven the remaining 300mm and the blows recorded to report the N-Value. The report shows the N-Value with the 75mm incremental blows listed in brackets (e.g., BH01 at 1.00mbgl where N=9-(1,1/2,2,2,3)). Where refusal of 50 blows across the test zone was encountered was achieved during testing, the penetration depth is also reported (e.g., BH01 at 3.00mbgl where N=50-(4,10/50 for 135mm)).

At BH06, a standpipe was installed to allow for long term monitoring of the groundwater table. This consisted of a slotted pipe with a gravel surround to allow for equalisation of water within the pipe and bentonite seals at the surface to prevent downward migration water.

The cable percussive borehole logs are presented in Appendix 1.

3.2. Soakaway Tests

At 3 No. locations, soakaway tests were completed and logged by SIL geotechnical engineer. BRE Special Digest 365 stipulates that the pit should be filled three times and that the final cycle is used to provide the infiltration rate. The time taken for the water level to fall from 75% volume to 25% volume is required to calculate the rate of infiltration. However, if the water level does not fall at a steady rate, then the test is deemed to have failed and the area is unsuitable for storm water drainage.

The soakaway test results and photographs are presented in Appendix 2.

3.3. Surveying

Following completion of all the fieldworks, a survey of the exploratory hole locations was completed using a GeoMax GPS Rover. The data is supplied on each individual log and along with a site plan in Appendix 4.

4. Laboratory Testing

Geotechnical laboratory testing was completed on representative soil samples in accordance with BS 1377 (1990). Testing included:

- 7 No. Moisture contents
- 7 No. Atterberg limits
- 7 No. Particle size gradings
- 7 No. pH, sulphate and chloride content

The geotechnical laboratory test results are presented in Appendix 3.

5. Ground Conditions

5.1. Overburden

The natural ground conditions are consistent across the site with firm brown and brown grey (slightly) sandy (slightly) gravelly silty CLAY with cobbles overlying stiff black slightly sandy slightly gravelly silty CLAY with cobbles. This then overlies a dense light brown slightly silty sandy GRAVEL with cobbles and this may possibly be weathered bedrock but rotary coring would be required to confirm this.

The boreholes recorded slightly different N-values at 1.00mbgl with BH01, BH05 and BH06 recording lower values of 9, 6 and 8 respectively whereas BH02 and BH03 recorded values of 14 and BH04 recorded a higher value again of 26. The values increase at 2.00mbgl to 16 at BH06 to 34 at BH02 with refusals at BH03A and BH05. Finally, BH02 recorded a SPT of 18 at 3.00mbgl and BH06 recorded a value of 28.

The laboratory tests recorded CLAY soils with low to intermediate plasticity indices ranging from 8% to 17%. The particle size distribution curves were poorly sorted straight-line curves with low fines content of 17% to 52% in the cohesive soils.

5.2. Groundwater

Groundwater was recorded in four of the boreholes, BH01, BH02, BH04 and BH05, at 2.90mbgl, 3.20mbgl, 2.70mbgl and 2.20mbgl respectively and this correlates with the boreholes encountering the higher permeability GRAVEL soils.

6. Recommendations and Conclusions

Please note the following caveats:

The recommendations given, and opinions expressed in this report are based on the findings as detailed in the exploratory hole records. Where an opinion is expressed on the material between the exploratory hole locations or below the final level of excavation, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for adjacent unexpected conditions that have not been revealed by the exploratory holes. It is further recommended that all bearing surfaces when excavated should be inspected by a suitably qualified Engineer to verify the information given in this report.

Excavated surfaces in clay strata should be kept dry to avoid softening prior to foundation placement. Foundations should always be taken to a minimum depth of 0.50mBGL to avoid the effects of frost action and possible seasonal shrinkage/swelling.

If it is intended that on-site materials are to be used as fill, then the necessary laboratory testing should be specified by the Client to confirm the suitability. Also, relevant lab testing should be specified where stability of side slopes to excavations is a concern, or where contamination may be an issue.

6.1. Shallow Foundations

Due to the unknown depth of foundation and no longer-term groundwater information, this analysis assumes the groundwater will not influence the construction or performance of these foundations.

For cohesive soils, a correlation proposed by Stroud and Butler between SPT N-values and plasticity indices can be used to calculate the undrained shear strength. Dependent on the plasticity index at each site, the Stroud and Butler correlation is C_u=4 to 6N. With the low plasticity indexes recorded in the laboratory for the soils on this site, the correlation chosen is C_u=6N. The C_u value can then be used to calculate the ultimate bearing capacity, which is the total loading that the soil could withstand but then a factor of safety is used to ensure that failure of the soils does not occur. A factor of safety of 3 has been chosen for this site.

In granular soils, the SPT N-value can be used to calculate the allowable bearing capacity, as per Terzaghi and Peck, using the correlation of SPT N-value x 10 = ABC. The test from 2.00mbgl at 2.00mbgl extends into the granular soils and therefore, this method of calculating the allowable bearing capacity has been chosen for this location and depth.

The table overleaf shows the SPT N-value, C_u, the ultimate bearing capacity and finally, the allowable bearing capacities at 1.00mbgl and 2.00mbgl. For the refusals, no bearing capacity is calculated. The C_u, ultimate bearing capacity and allowable bearing capacities are in kN/m^2.

Depth	BH01				BH02				BH03A			
	N-Value	Cu	UBC	ABC	N-Value	Cu	UBC	ABC	N-Value	Cu	UBC	ABC
1.00	9	54	293	**100**	14	84	446	**150**	14	84	446	**150**
2.00	29	174	923	**308**	34	204	1076	**360**	-[1]	-[1]	-[1]	**-[1]**
Depth	BH04				BH05				BH06			
	N-Value	Cu	UBC	ABC	N-Value	Cu	UBC	ABC	N-Value	Cu	UBC	ABC
1.00	26	156	814	**270**	6	36	202	**67**	8	48	263	**88**
2.00	23	-	-	**230**	-[1]	-[1]	-[1]	**-[1]**	16	96	526	**175**

Key:
-[1]: Refusal

It would be recommended that all founding strata be inspected by a suitably qualified Engineer prior to pouring the foundations and additional insitu testing completed if required to confirm the soils are suitable for the final foundation design.

The following assumptions were made as part of these analyses. If any of these assumptions are not in accordance with detailed design or observations made during construction these recommendations should be re-evaluated.

- Foundations are to be constructed on a level formation of uniform material type.
- All man-made or filled material is to be removed prior to construction.
- The bulk unit weight of the material in this stratum has a minimum density of 19kN/m^3.
- Based on groundwater observations this analysis assumes the groundwater will not influence the construction or performance of these foundations.
- All bearing capacity calculations allow for 25mm settlement.

6.2. Groundwater

The caveats below relating to interpretation of groundwater levels should be noted:
There is always considerable uncertainty as to the likely rates of water ingress into excavations in clayey soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water.

Furthermore, water levels noted on the borehole and trial pit logs do not generally give an accurate indication of the actual groundwater conditions as the borehole or trial pit is rarely left open for sufficient time for the water level to reach equilibrium.

Also, during boring procedures, a permeable stratum may have been sealed off by the borehole casing, or water may have been added to aid drilling. Therefore, an extended period of

groundwater monitoring using any constructed standpipes is required to provide more accurate information regarding groundwater conditions. Finally, groundwater levels vary with time of year, rainfall or any nearby construction sites.

Pumping tests would be required to determine likely seepage rates and persistence into excavations taken below the groundwater level. Deep trial pits also aid estimation of seepage rates.

As discussed previously, groundwater was recorded in the boreholes from 2.20mbgl and below when the higher permeability GRAVEL soils were encountered.

There is always considerable uncertainty as to the likely rates of water ingress into excavations in cohesive soil sites due to the possibility of localised unforeseen sand and gravel lenses acting as permeable conduits for unknown volumes of water. Based on this information at the exploratory hole locations to date, it is considered likely that any shallow ingress into excavations will be slow to medium.

If groundwater is encountered during excavations then mechanical pumps will be required to remove the groundwater from sumps. Sumps should be carefully located and constructed to ensure that groundwater is efficiently removed from excavations and trenches.

6.3. Soakaway Tests

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.

6.4. Aggressive Ground Conditions

The chemical test results in Appendix 3 indicate a general pH value between 8.32 and 8.86, which is close to neutral and below the level of 9, therefore no special precautions are required.

The maximum value obtained for water soluble sulphate was 130mg/l as SO_3. The BRE Special Digest 1:2005 – '*Concrete in Aggressive Ground*' guidelines require SO_4 values and after conversion ($SO_4 = SO_3 \times 1.2$), the maximum value of 156mg/l shows Class 1 conditions and no special precautions are required.

6.5. Radon Gas

The Environmental Protection Agency (EPA) has recently updated the Radon gas exposure map and this is available to view on the EPA website. This shows the possible exposure to

radon gas with the bedrock geology, subsoil geology, soil permeability and aquifer type analysed to produce the map. The map is shows that the site falls within the highest level of 1 in 5 homes have a possibility of high radon exposure. Measures should be taken in the form of radon protection barriers to protect from radon exposure in the new structure.

EPA map identifying possible Radon exposure.
https://gis.epa.ie/EPAMaps/Radon?&lid=EPA:RadonRiskMapofIreland

Appendix 1

Cable Percussive Borehole Logs

Contract No: 6400	**Cable Percussion Borehole Log**				Borehole No: **BH01**
Contract:	Kilgobbin	Easting:	719169.609	Date Started:	28/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724821.789	Date Completed:	28/11/2024
Client:	Kavco	Elevation:	104.83	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			104.63					
		Firm brown grey slightly sandy slightly gravelly silty CLAY with low cobble content.		104.5						
0.5										
1.0				104.0		1.00	B	JOT16		
						1.00	C	N=9 (1,1/2,2,2,3)		
1.5	1.50			103.5						
		Stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.			103.33					
2.0				103.0		2.00	B	JOT17		
						2.00	C	N=29 (2,5/5,7,9,8)		
2.5				102.5						
	2.90			102.0	101.93					
3.0		Dense light brown slightly silty sandy GRAVEL with medium cobble content.				3.00	B	JOT18		
						3.00	C	50 (4,10/50 for 135mm)		
3.5				101.5						
4.0				101.0		4.00	B	JOT19		
						4.00	C	50 (9,15/50 for 105mm)		
4.5				100.5						
5.0				100.0		5.00	B	JOT20		
	5.20				99.63	5.00	C	50 (7,9/50 for 40mm)		
	5.40	Obstruction - possible boulders.		99.5	99.43	5.40	C	50 (25 for 5mm/50 for 5mm)		
5.5		End of Borehole at 5.40m								
6.0				99.0						
6.5				98.5						
7.0				98.0						
7.5				97.5						
				97.0						

Chiselling:

From:	To:	Time:
3.20	3.40	01:00
4.20	4.40	01:00
5.20	5.40	01:30

Water Strikes:

Strike:	Rose:	Depth Sealed
2.90	2.80	NS

Water Details:

Date:	Hole Depth:	Water Depth:
28/11	5.40	5.00

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	5.40	Arisings

Remarks: Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 6400	**Cable Percussion Borehole Log**	Borehole No: **BH02**

Contract:	Kilgobbin	Easting:	719182.008	Date Started:	29/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724801.735	Date Completed:	29/11/2024
Client:	Kavco	Elevation:	104.85	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0.5	0.20	TOPSOIL.		104.5	104.65					
		Firm brown grey sandy gravelly silty CLAY with low cobble content.				1.00	B	JOT21		
1.0				104.0		1.00	C	N=14 (1,1/2,3,4,5)		
1.5				103.5						
	1.80	Stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.		103.0	103.05					
2.0						2.00	B	JOT22		
2.5				102.5		2.00	C	N=34 (2,5/7,7,9,11)		
3.0				102.0		3.00	B	JOT23		
	3.20	Dense light brown slightly silty sandy GRAVEL with medium cobble content.		101.5	101.65	3.00	C	N=18 (3,4/4,5,5,4)		
3.5										
4.0				101.0		4.00	B	JOT24		
						4.00	C	50 (7,9/50 for 135mm)		
4.5				100.5						
5.0				100.0		5.00	B	JOT25		
						5.00	C	50 (10,15/50 for 115mm)		
5.5				99.5						
	5.60				99.25					
	5.70	Obstruction - possible boulders. End of Borehole at 5.70m		99.0	99.15	5.70	C	50 (25 for 5mm/50 for 5mm)		
6.0				98.5						
6.5				98.0						
7.0				97.5						
7.5				97.0						

Chiselling:

From:	To:	Time:
4.30	4.50	01:00
5.60	5.70	01:30

Water Strikes:

Strike:	Rose:	Depth Sealed
3.20	3.00	NS

Water Details:

Date:	Hole Depth:	Water Depth:
29/11	5.70	3.10

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	5.70	Arisings

Remarks: Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 6400	**Cable Percussion Borehole Log**				Borehole No: **BH03**
Contract:	Kilgobbin	Easting:	719219.183	Date Started:	27/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724817.754	Date Completed:	27/11/2024
Client:	Kavco	Elevation:	104.15	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0.5	0.20	TOPSOIL.		104.0	103.95					
		Brown sandy gravelly silty CLAY.		103.5						
1.0	1.00	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.		103.0	103.15	1.00 1.00	B C	JOT13 N=14 (2,2/3,3,4,4)		
1.5				102.5						
2.0	1.80 1.90	Obstruction - possible boulders. End of Borehole at 1.90m		102.0	102.35 102.25	1.90	C	50 (25 for 5mm/50 for 5mm)		
2.5				101.5						
3.0				101.0						
3.5				100.5						
4.0				100.0						
4.5				99.5						
5.0				99.0						
5.5				98.5						
6.0				98.0						
6.5				97.5						
7.0				97.0						
7.5				96.5						

Chiselling:

From:	To:	Time:
1.80	1.90	01:30

Water Strikes:

Strike:	Rose:	Depth Sealed

Water Details:

Date:	Hole Depth:	Water Depth:
27/11	1.90	Dry

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	1.90	Arisings

Remarks:

Borehole terminated due to obstruction - borehole relocated and reattempt made.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 6400	**Cable Percussion Borehole Log**	Borehole No: **BH03A**

Contract:	Kilgobbin	Easting:	719216.868	Date Started:	27/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724817.312	Date Completed:	27/11/2024
Client:	Kavco	Elevation:	104.12	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0.5	0.30	TOPSOIL.		104.0	103.82					
		Brown sandy gravelly silty CLAY.		103.5						
1.0	0.90	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.		103.22		1.00	C	N=14 (3,3/3,4,3,3,4)		
1.5				103.0						
2.0				102.5		2.00	B	JOT14		
				102.0		2.00	C	50 (25 for 65mm/50 for 40mm)		
2.5	2.30	Dense light brown slightly silty sandy GRAVEL with medium cobble content.		101.5	101.82					
3.0	2.90	Obstruction - possible boulders.		101.22						
	3.00	End of Borehole at 3.00m		101.12		3.00	B	JOT15		
				101.0		3.00	C	50 (25 for 5mm/50 for 5mm)		
3.5				100.5						
4.0				100.0						
4.5				99.5						
5.0				99.0						
5.5				98.5						
6.0				98.0						
6.5				97.5						
7.0				97.0						
7.5				96.5						

Chiselling:

From:	To:	Time:
2.10	2.30	01:00
2.90	3.00	01:30

Water Strikes:

Strike:	Rose:	Depth Sealed

Water Details:

Date:	Hole Depth:	Water Depth:
27/11	3.00	Dry

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	3.00	Arisings

Remarks:

Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 6400	**Cable Percussion Borehole Log**				Borehole No: **BH04**
Contract:	Kilgobbin	Easting:	719234.702	Date Started:	26/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724783.955	Date Completed:	26/11/2024
Client:	Kavco	Elevation:	104.29	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.			104.09					
		Brown sandy slightly gravelly silty CLAY.		104.0						
0.5										
	0.80			103.5	103.49					
1.0		Stiff black slightly sandy slightly gravelly silty CLAY with low cobble content.				1.00	B	JOT09		
						1.00	C	N=26 (2,5/5,7,7,7)		
1.5				103.0						
				102.5						
2.0						2.00	B	JOT10		
	2.20				102.09	2.00	C	N=23 (2,5/5,5,6,7)		
		Dense light brown slightly silty sandy GRAVEL with medium cobble content.		102.0						
2.5										
				101.5						
3.0						3.00	B	JOT11		
						3.00	C	50 (5,7/50 for 175mm)		
				101.0						
3.5										
				100.5						
4.0						4.00	B	JOT12		
						4.00	C	50 (4,9/50 for 125mm)		
				100.0						
4.5										
	4.80			99.5	99.49					
		Obstruction - possible boulders.								
5.0	5.00				99.29	5.00	C	50 (25 for 5mm/50 for 5mm)		
		End of Borehole at 5.00m		99.0						
5.5										
				98.5						
6.0										
				98.0						
6.5										
				97.5						
7.0										
				97.0						
7.5										
				96.5						

Chiselling:

From:	To:	Time:
3.40	3.50	01:00
4.80	5.00	01:30

Water Strikes:

Strike:	Rose:	Depth Sealed
2.70	2.50	NS

Water Details:

Date:	Hole Depth:	Water Depth:
26/11	5.00	1.10

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	5.00	Arisings

Remarks:

Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 6400	**Cable Percussion Borehole Log**				Borehole No: **BH05**
Contract:	Kilgobbin	Easting:	719263.300	Date Started:	25/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724823.575	Date Completed:	25/11/2024
Client:	Kavco	Elevation:	102.59	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
0	0.20	TOPSOIL.		102.5	102.39					
		Soft dark brown sandy gravelly silty CLAY.		102.0		1.00	B	JOT05		
0.5						1.00	C	N=6 (1,0/1,1,2,2)		
1.0				101.5						
1.5	1.50			101.0	101.09					
		Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.								
2.0	1.90				100.69					
		Dense light brown slightly silty sandy GRAVEL with medium cobble content.		100.5		2.00	B	JOT06		
2.5						2.00	C	50 (5,11/50 for 200mm)		
3.0				100.0						
				99.5		3.00	B	JOT07		
3.5						3.00	C	50 (25 for 135mm/50 for 30mm)		
4.0				99.0						
				98.5		4.00	B	JOT08		
4.5						4.00	C	50 (7,18/50 for 50mm)		
				98.0						
	4.80	Obstruction - possible boulders.			97.79					
5.0	5.00	End of Borehole at 5.00m		97.5	97.59	5.00	C	50 (25 for 5mm/50 for 5mm)		
5.5				97.0						
6.0				96.5						
6.5				96.0						
7.0				95.5						
7.5				95.0						

Chiselling:

From:	To:	Time:
2.30	2.40	01:00
3.20	3.40	01:00
4.80	5.00	01:30

Water Strikes:

Strike:	Rose:	Depth Sealed
2.20	2.00	NS

Water Details:

Date:	Hole Depth:	Water Depth:
25/11	5.00	3.20

Installation:

From:	To:	Pipe:

Backfill:

From:	To:	Type:
0.00	5.00	Arisings

Remarks:

Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Contract No: 6400	**Cable Percussion Borehole Log**	Borehole No: **BH06**

Contract:	Kilgobbin	Easting:	719282.283	Date Started:	22/11/2024
Location:	Stepaside, Co. Dublin	Northing:	724795.568	Date Completed:	22/11/2024
Client:	Kavco	Elevation:	102.69	Drilled By:	J. O'Toole
Engineer:	-	Borehole Diameter:	200mm	Status:	FINAL

Depth (m) Scale	Depth	Stratum Description	Legend	Level (mOD) Scale	Depth	Samples and Insitu Tests Depth	Type	Result	Water Strike	Backfill
	0.20	TOPSOIL.		102.5	102.49					
0.5		Brown sandy slightly gravelly silty CLAY.								
	0.70	Firm brown slightly sandy slightly gravelly silty CLAY with low cobble content.		102.0	101.99					
1.0						1.00	B	JOT01		
				101.5		1.00	C	N=8 (1,1/1,2,2,3)		
	1.30	Stiff brown grey slightly sandy slightly gravelly silty CLAY with low cobble content.			101.39					
1.5				101.0						
2.0						2.00	B	JOT02		
				100.5		2.00	C	N=16 (2,2/3,4,4,5)		
2.5										
				100.0						
3.0						3.00	B	JOT03		
	3.20			99.5	99.49	3.00	C	N=28 (2,3/5,7,7,9)		
3.5		Stiff brown slightly sandy slightly gravelly silty CLAY with low cobble content.								
				99.0						
	3.80				98.89					
4.0		Dense light brown slightly silty sandy GRAVEL with medium cobble content.				4.00	B	JOT04		
	4.10				98.59	4.00	C	50 (25 for		
	4.20	Obstruction - possible boulders.		98.5	98.49	4.20	C	95mm/50 for 15mm)		
4.5		End of Borehole at 4.20m						50 (25 for 5mm/50 for 5mm)		
				98.0						
5.0										
				97.5						
5.5										
				97.0						
6.0										
				96.5						
6.5										
				96.0						
7.0										
				95.5						
7.5										
				95.0						

Chiselling: From:	To:	Time:	Water Strikes: Strike:	Rose:	Depth Sealed	Water Details: Date:	Hole Depth:	Water Depth:	Installation: From:	To:	Pipe:	Backfill: From:	To:	Type:	Remarks:
4.10	4.20	01:30				22/11	4.20	Dry	0.00 1.50	1.50 4.20	Solid Slotted	0.00 1.00	1.00 4.20	Bentonite Gravel	Borehole terminated due to obstruction.

Legend:
B: Bulk
D: Disturbed
U: Undisturbed
ES: Environmental
W: Water
C: Cone SPT
S: Split spoon SPT

Appendix 2

Soakaway Test Results and Photographs

SOAKAWAY TEST

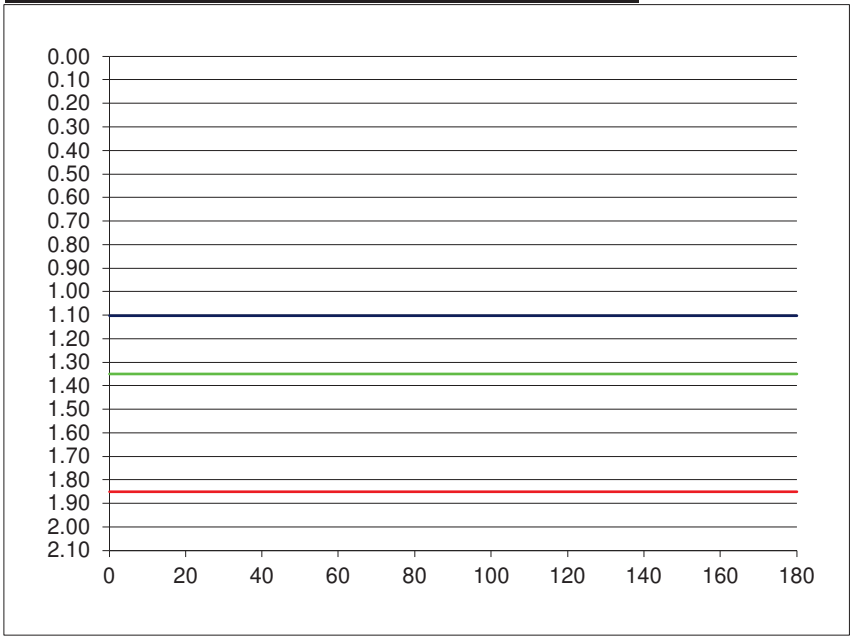
Project Reference:	6400
Contract name:	Kilgobbin
Location:	Stepaside, Co. Dublin
Test No:	SA01
Date:	21/11/2024

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	1.60	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content.
1.60	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.10
0.5	1.10
1	1.10
1.5	1.10
2	1.10
2.5	1.10
3	1.10
3.5	1.10
4	1.10
4.5	1.10
5	1.10
6	1.10
7	1.10
8	1.10
9	1.10
10	1.10
12	1.10
14	1.10
16	1.10
18	1.10
20	1.10
25	1.10
30	1.10
40	1.10
50	1.10
60	1.10
75	1.10
90	1.10
120	1.10
150	1.10
180	1.10

Pit Dimensions (m)		
Length (m)	2.30	m
Width (m)	0.50	m
Depth	2.10	m
Water		
Start Depth of Water	1.10	m
Depth of Water	1.00	m
75% Full	1.35	m
25% Full	1.85	m
75%-25%	0.50	m
Volume of water (75%-25%)	**0.58**	m3
Area of Drainage	**11.76**	m2
Area of Drainage (75%-25%)	**3.95**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** **m/min** or **Fail** **m/s**

SOAKAWAY TEST

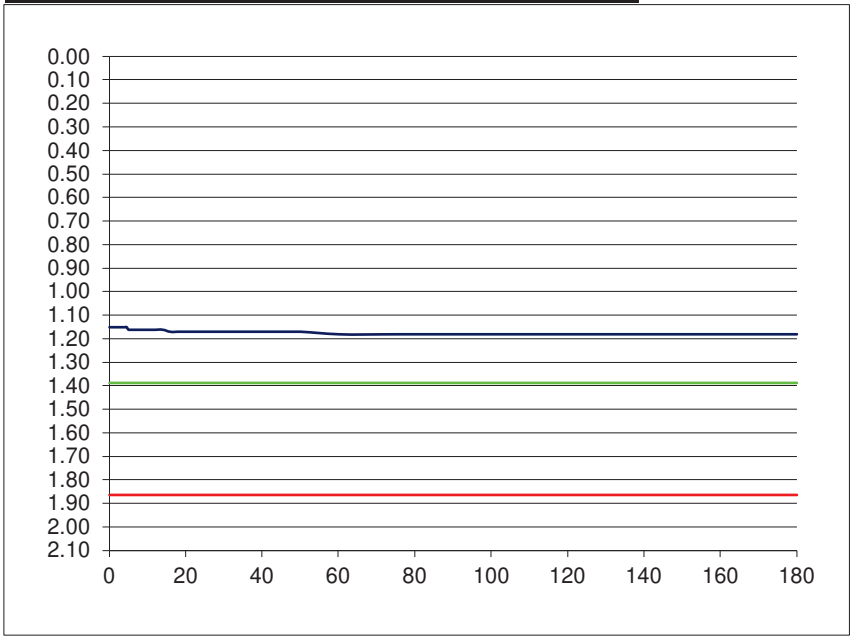
Project Reference:	6400
Contract name:	Kilgobbin
Location:	Stepaside, Co. Dublin
Test No:	SA02
Date:	21/11/2024

Ground Conditions

From	To	
0.00	0.40	TOPSOIL.
0.40	1.60	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content.
1.60	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.15
0.5	1.15
1	1.15
1.5	1.15
2	1.15
2.5	1.15
3	1.15
3.5	1.15
4	1.15
4.5	1.15
5	1.16
6	1.16
7	1.16
8	1.16
9	1.16
10	1.16
12	1.16
14	1.16
16	1.17
18	1.17
20	1.17
25	1.17
30	1.17
40	1.17
50	1.17
60	1.18
75	1.18
90	1.18
120	1.18
150	1.18
180	1.18

Pit Dimensions (m)		
Length (m)	2.20	m
Width (m)	0.50	m
Depth	2.10	m
Water		
Start Depth of Water	1.15	m
Depth of Water	0.95	m
75% Full	1.39	m
25% Full	1.86	m
75%-25%	0.48	m
Volume of water (75%-25%)	**0.52**	m3
Area of Drainage	**11.34**	m2
Area of Drainage (75%-25%)	**3.67**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** **m/min** or **Fail** **m/s**

SOAKAWAY TEST

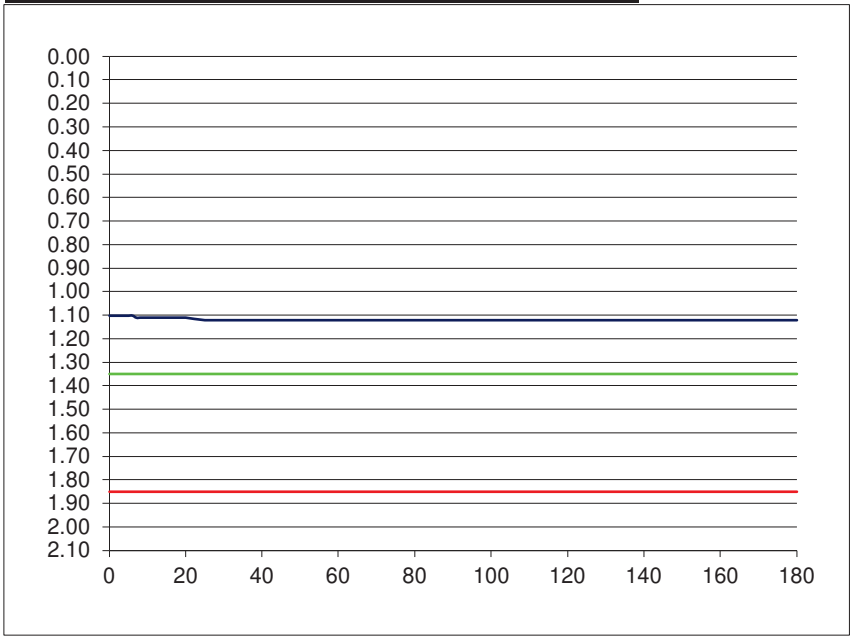
Project Reference:	6400
Contract name:	Kilgobbin
Location:	Stepaside, Co. Dublin
Test No:	SA03
Date:	21/11/2024

Ground Conditions

From	To	
0.00	0.30	TOPSOIL.
0.30	1.90	Firm brown slightly sandy slightly gravelly silty CLAY with medium cobble content.
1.90	2.10	Stiff black slightly sandy slightly gravelly silty CLAY with medium cobble and low boulder content.

Elapsed Time (mins)	Fall of Water (m)
0	1.10
0.5	1.10
1	1.10
1.5	1.10
2	1.10
2.5	1.10
3	1.10
3.5	1.10
4	1.10
4.5	1.10
5	1.10
6	1.10
7	1.11
8	1.11
9	1.11
10	1.11
12	1.11
14	1.11
16	1.11
18	1.11
20	1.11
25	1.12
30	1.12
40	1.12
50	1.12
60	1.12
75	1.12
90	1.12
120	1.12
150	1.12
180	1.12

Pit Dimensions (m)		
Length (m)	2.30	m
Width (m)	0.50	m
Depth	2.10	m
Water		
Start Depth of Water	1.10	m
Depth of Water	1.00	m
75% Full	1.35	m
25% Full	1.85	m
75%-25%	0.50	m
Volume of water (75%-25%)	**0.58**	m3
Area of Drainage	**11.76**	m2
Area of Drainage (75%-25%)	**3.95**	m2
Time		
75% Full	N/A	min
25% Full	N/A	min
Time 75% to 25%	**N/A**	min
Time 75% to 25% (sec)	**N/A**	sec



f = **Fail** **m/min** or **Fail** **m/s**

SA01 Sidewall

SA01 Spoil

SA02 Sidewall

SA02 Spoil

SA03 Sidewall

SA03 Spoil

Appendix 3

Geotechnical Laboratory Test Results

Classification Tests
In accordance with BS 1377: Part 2

Client	Kavco
Site	Kilgobbin, Stepaside
S.I. File No	6400 / 24
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	12th December 2024

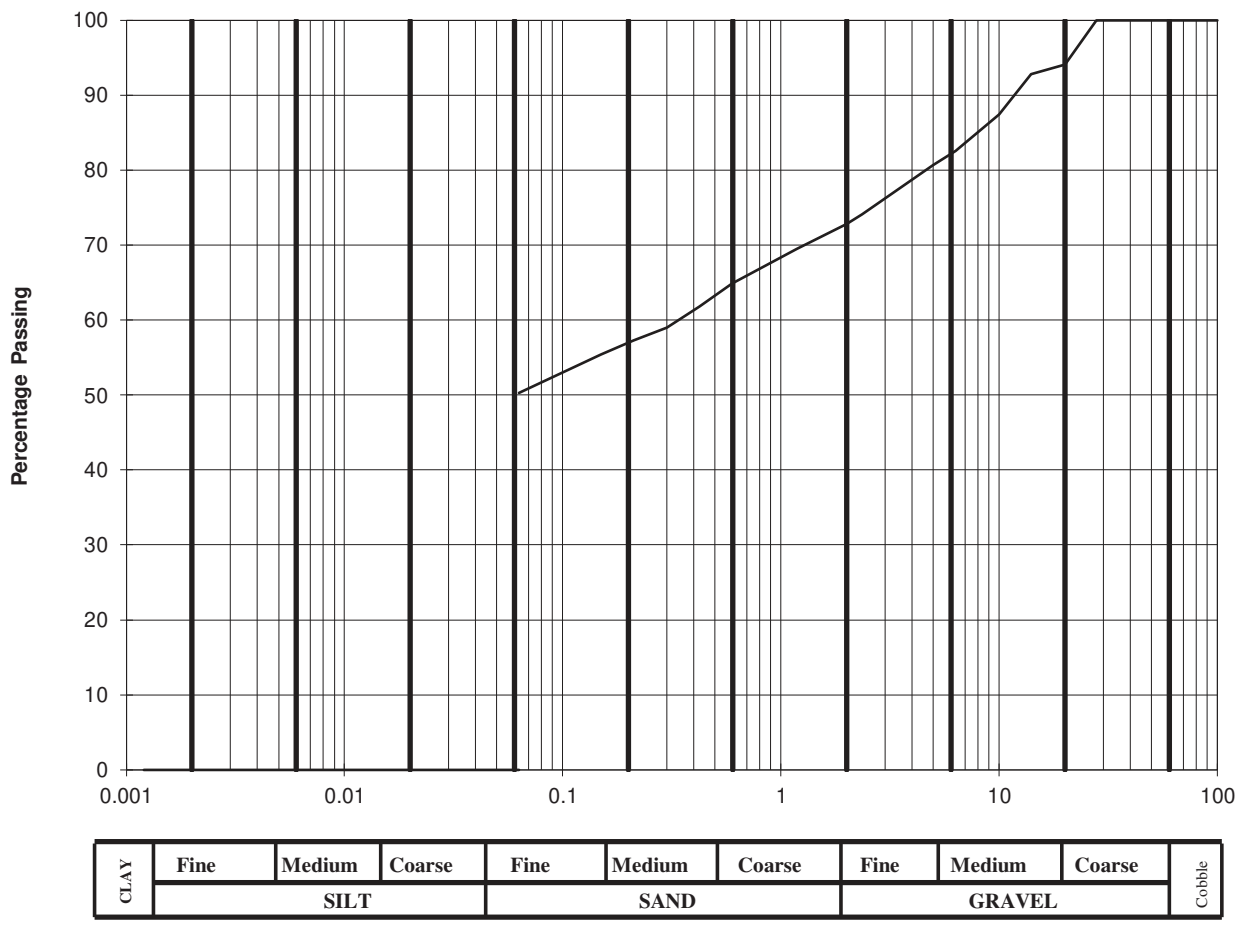
Hole ID	Depth	Sample No	Lab Ref No.	Sample Type	Natural Moisture Content %	Liquid Limit %	Plastic Limit %	Plastic Index %	Bulk Density g/cm^3	Specific gravity	% passing 425um	Comments	**Remarks** **C**=Clay; **M**=Silt **Plasticity**: **L**=Low; **I**=Intermediate; **H**=High; **V**=Very High; **E**=Extremely High
BH01	1.00	JOT16	24/1796	B	15.5	38	21	17			61.8		CI
BH02	1.00	JOT21	24/1797	B	13.0	27	19	8			29.1		CL
BH03	1.00	JOT13	24/1798	B	18.6	36	20	16			56.5		CI
BH04	1.00	JOT09	24/1799	B	13.7	36	19	17			55.1		CI
BH05	1.00	JOT05	24/1800	B	33.2	28	20	8			35.5		CL
BH06	1.00	JOT01	24/1802	B	15.0	39	23	16			66.2		CI

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	94.1		
14	92.8		
10	87.4		
6.3	82.5		
5.0	80.7		
2.36	74.1		
2.00	72.8		
1.18	69.5		
0.600	64.9		
0.425	61.8		
0.300	59		
0.212	57.3		
0.150	55.4		
0.063	50		

Cobbles, %	0
Gravel, %	27
Sand, %	23
Clay / Silt, %	50



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1796
Sample No :	JOT16

Hole ID :	BH 01
Depth, m :	1.00

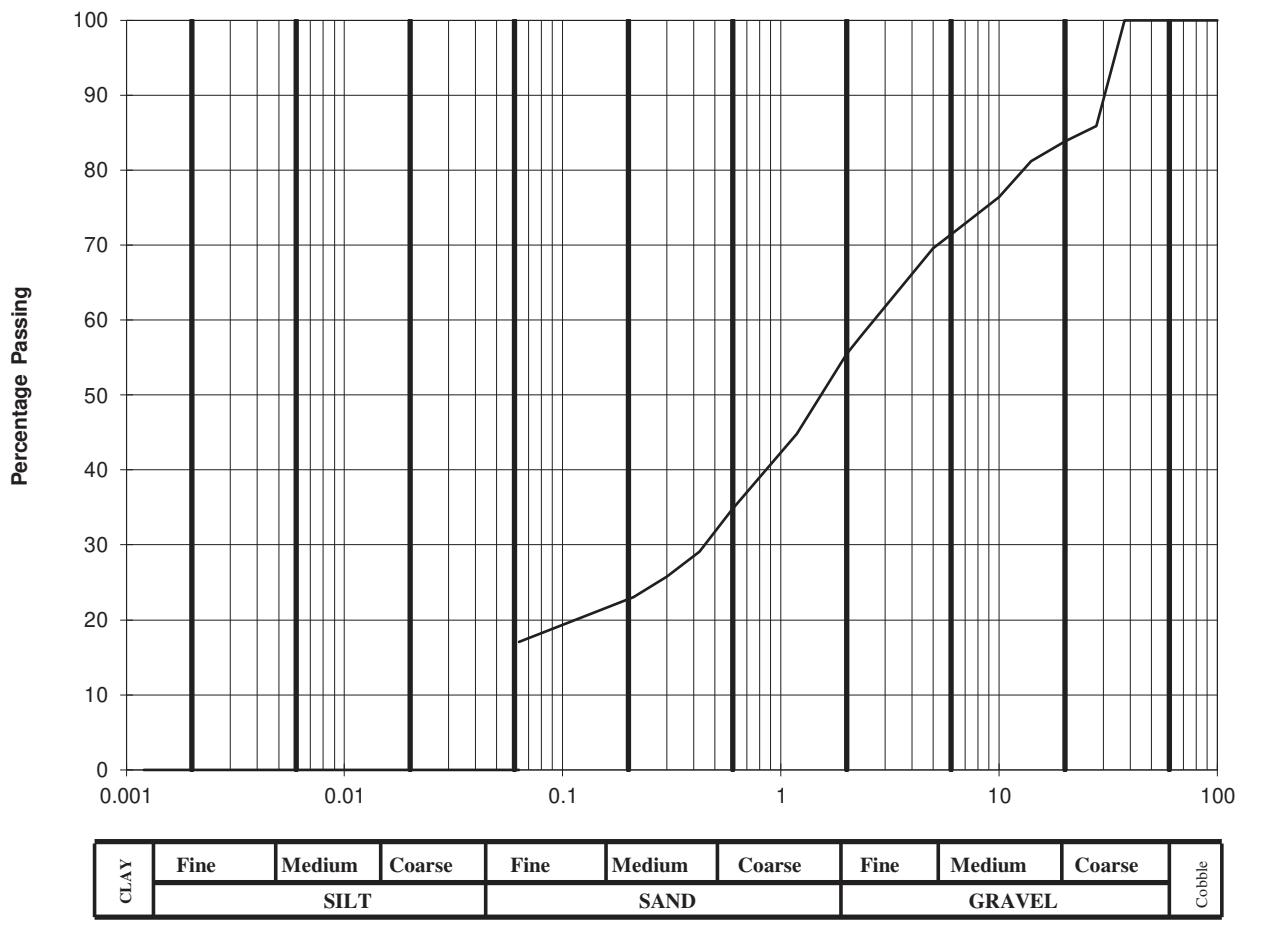
Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	85.9		
20	83.8		
14	81.2		
10	76.4		
6.3	71.9		
5.0	69.6		
2.36	58		
2.00	55.5		
1.18	44.8		
0.600	34.7		
0.425	29.1		
0.300	25.8		
0.212	23		
0.150	21.3		
0.063	17		

Cobbles, %	0
Gravel, %	45
Sand, %	39
Clay / Silt, %	17



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1797
Sample No :	JOT21

Hole ID :	BH 02
Depth, m :	1.00

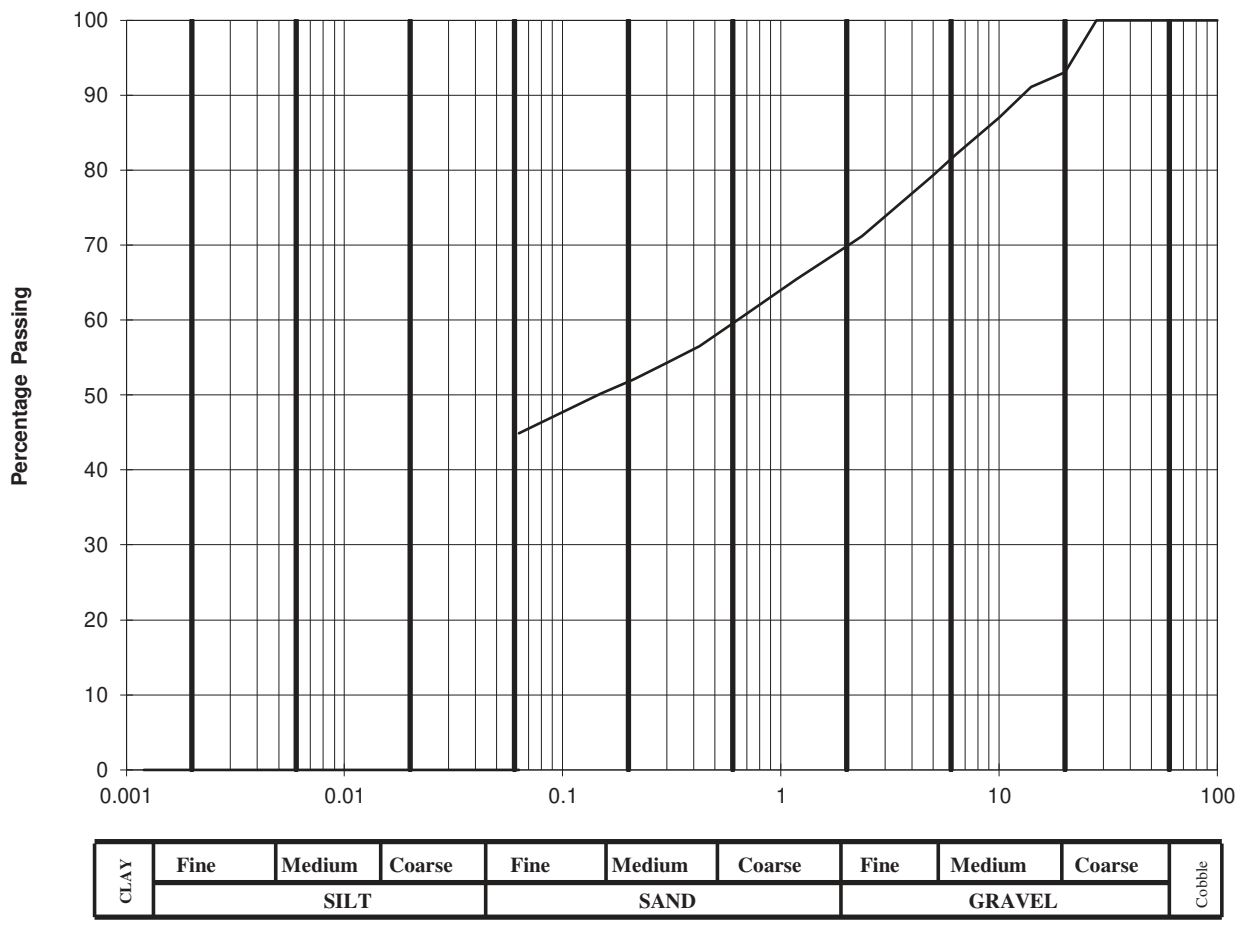
Material description :	sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	93		
14	91.1		
10	87		
6.3	82		
5.0	79.3		
2.36	71.2		
2.00	69.8		
1.18	65.5		
0.600	59.5		
0.425	56.5		
0.300	54.3		
0.212	52.1		
0.150	50.2		
0.063	45		

Cobbles, %	0
Gravel, %	30
Sand, %	25
Clay / Silt, %	45



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1798
Sample No :	JOT13

Hole ID :	BH 03
Depth, m :	1.00

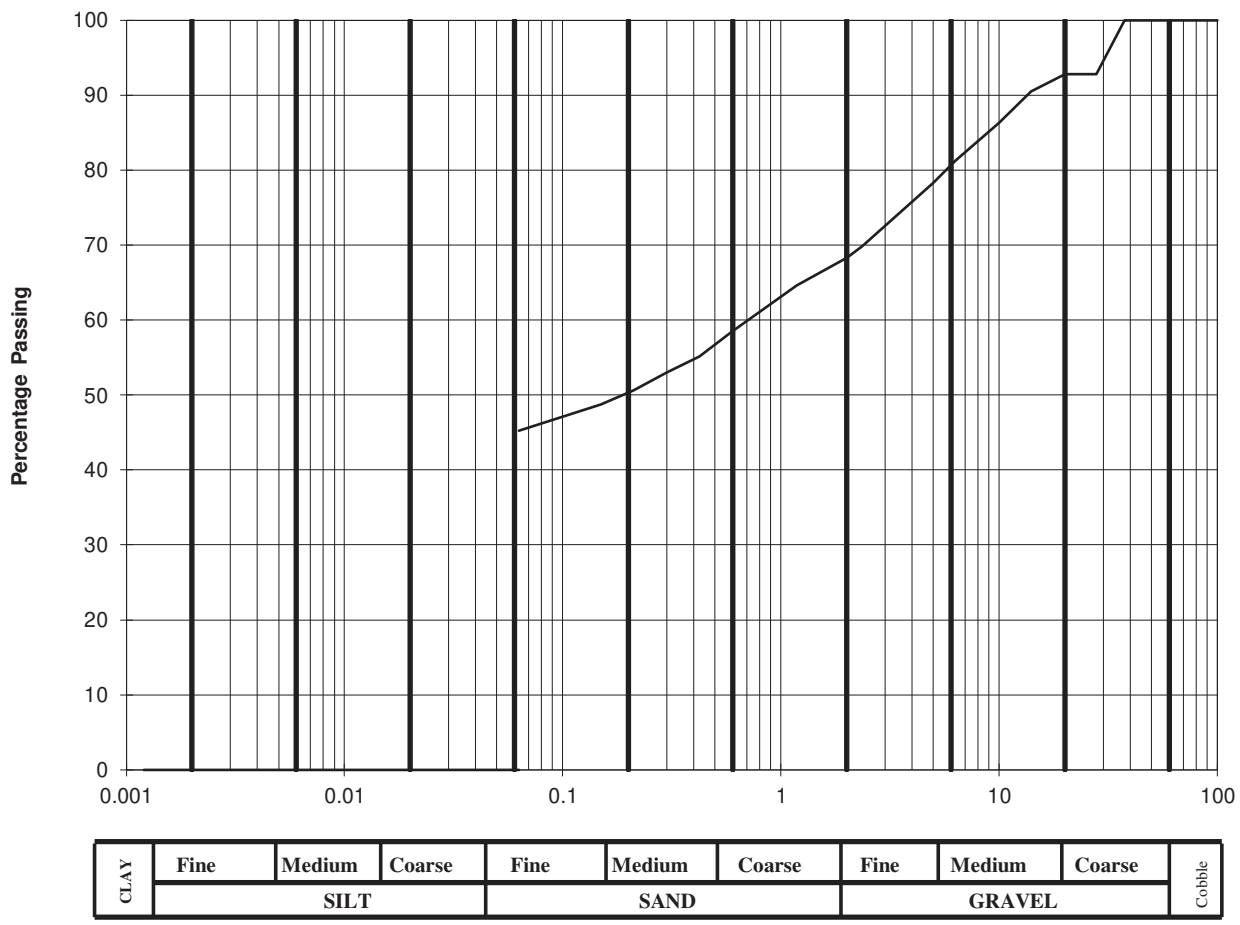
Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	92.8		
20	92.8		
14	90.5		
10	86.3		
6.3	81.3		
5.0	78.3		
2.36	69.8		
2.00	68.3		
1.18	64.6		
0.600	58.5		
0.425	55.1		
0.300	53		
0.212	50.6		
0.150	48.7		
0.063	45		

Cobbles, %	0
Gravel, %	32
Sand, %	23
Clay / Silt, %	45



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1799
Sample No :	JOT09

Hole ID :	BH 04
Depth, m :	1.00

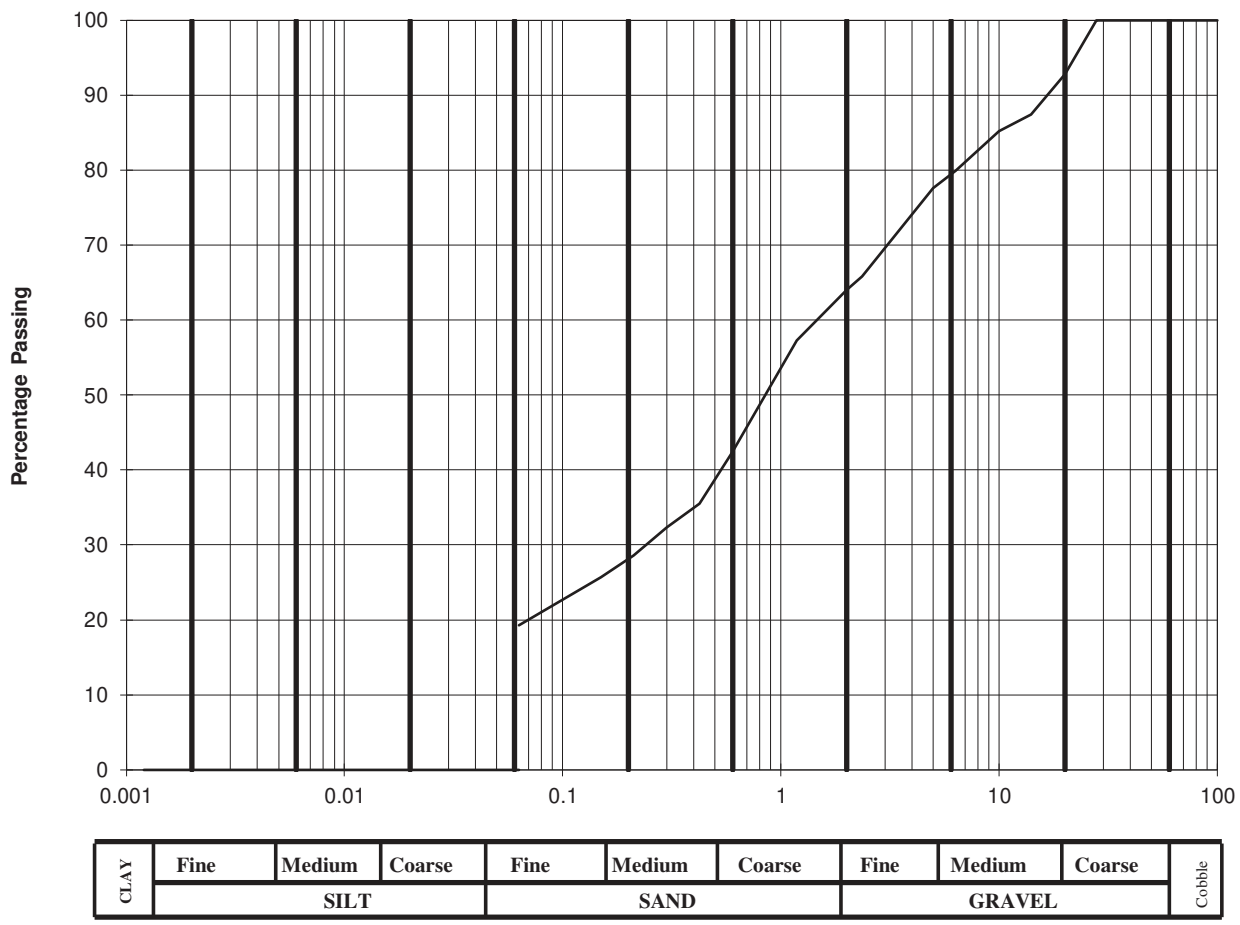
Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	92.8		
14	87.4		
10	85.2		
6.3	79.9		
5.0	77.6		
2.36	65.8		
2.00	64		
1.18	57.3		
0.600	42.3		
0.425	35.5		
0.300	32.3		
0.212	28.6		
0.150	25.7		
0.063	19		

Cobbles, %	0
Gravel, %	36
Sand, %	45
Clay / Silt, %	19



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1800
Sample No :	JOT05

Hole ID :	BH 05
Depth, m :	1.00

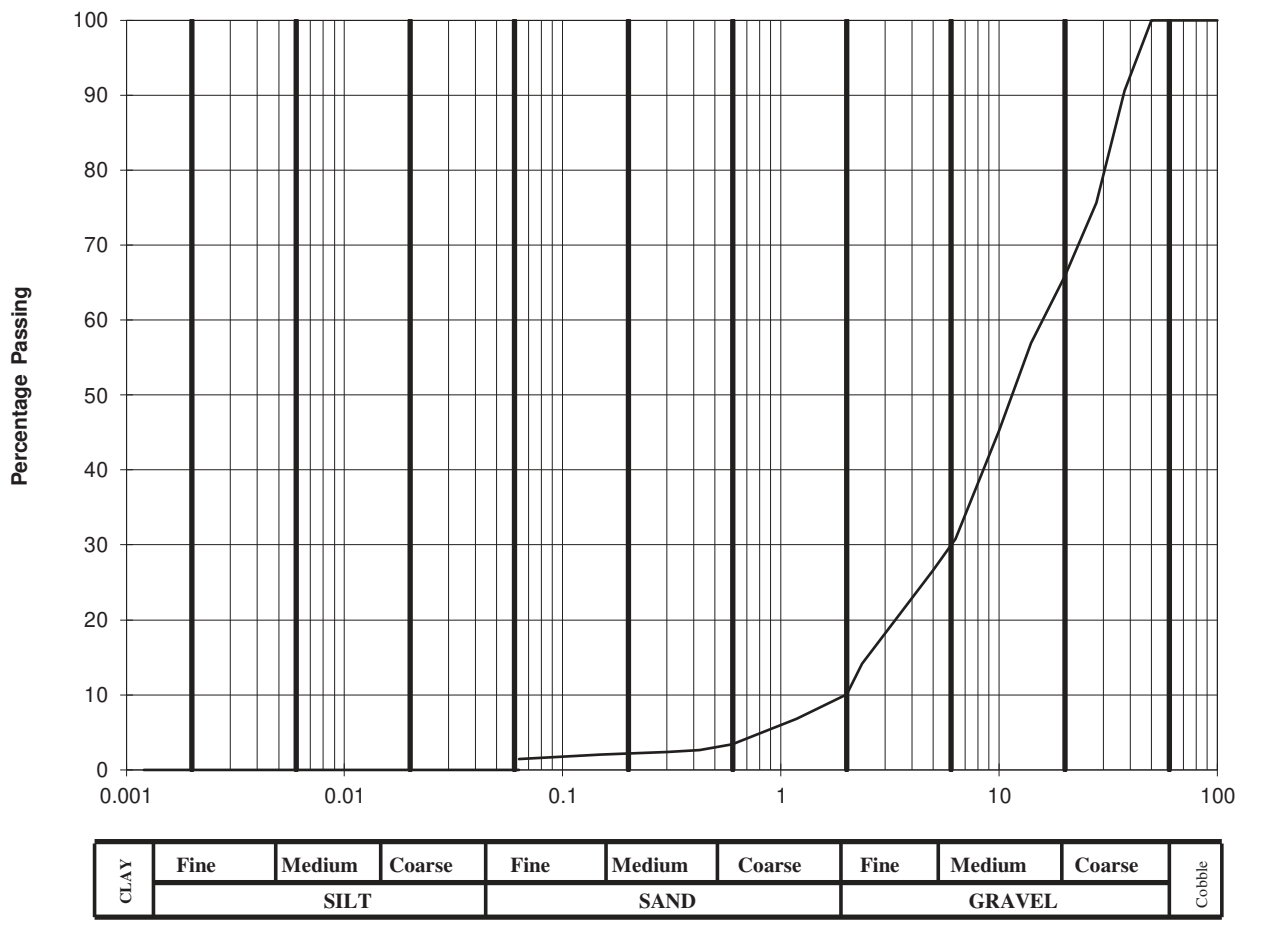
Material description :	sandy gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	90.6		
28	75.6		
20	65.9		
14	56.9		
10	45.2		
6.3	30.8		
5.0	26.6		
2.36	14.2		
2.00	10.1		
1.18	6.8		
0.600	3.4		
0.425	2.6		
0.300	2.4		
0.212	2.2		
0.150	2		
0.063	2		

Cobbles, %	0
Gravel, %	90
Sand, %	8
Clay / Silt, %	2



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1801
Sample No :	JOT06

Hole ID :	BH 05
Depth, m :	2.00

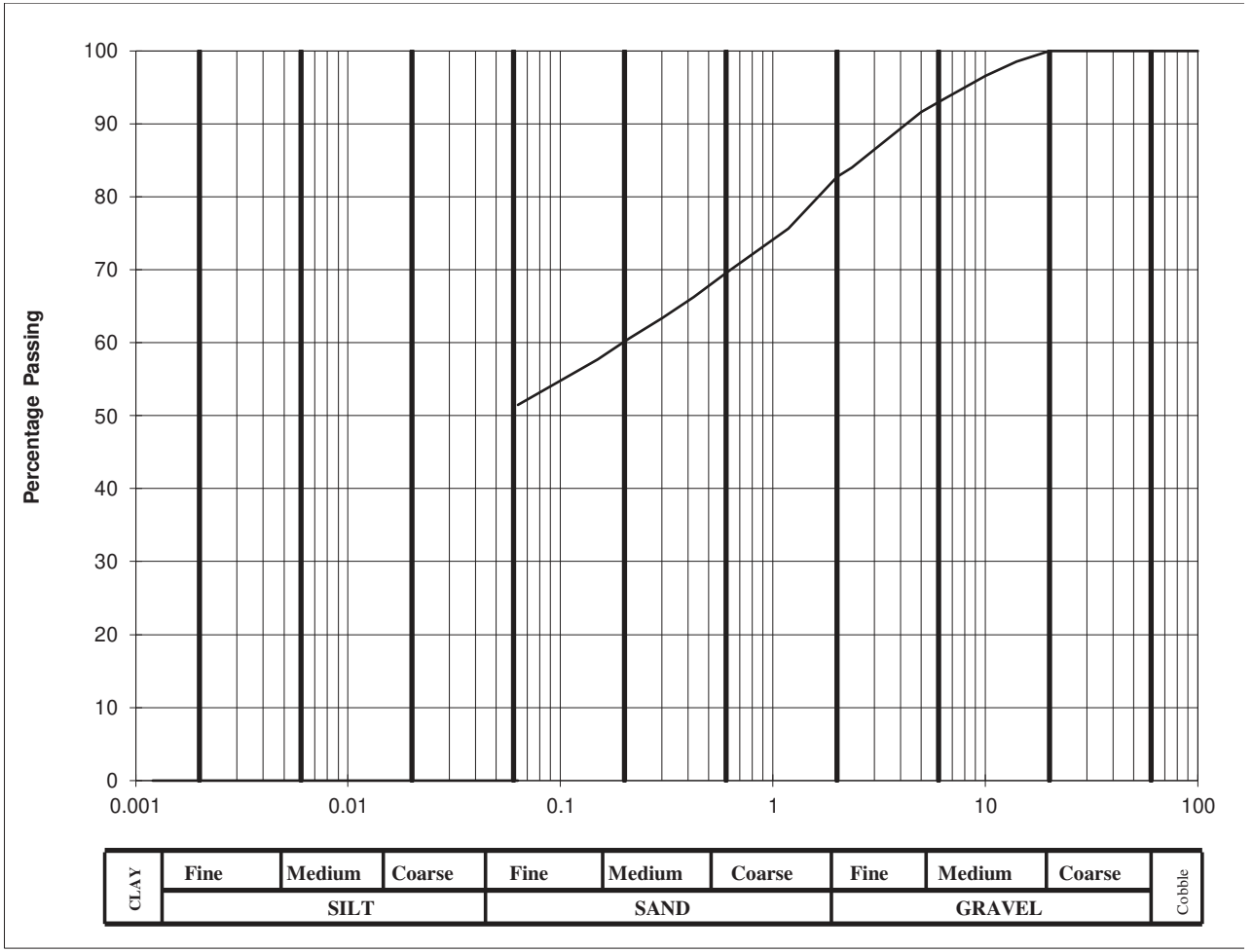
Material description :	slightly silty sandy GRAVEL
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

BS 1377 Particle Size Analysis

Site Investigations Limited

BS Sieve size, mm	Percent passing	Hydrometer analysis	
		Diameter, mm	% passing
100	100	**0.0630**	
90	100	**0.0200**	
75	100	**0.0060**	
63	100	**0.0020**	
50	100		
37.5	100		
28	100		
20	100		
14	98.5		
10	96.5		
6.3	93.3		
5.0	91.6		
2.36	84		
2.00	82.7		
1.18	75.6		
0.600	69.5		
0.425	66.2		
0.300	63.3		
0.212	60.6		
0.150	57.7		
0.063	52		

Cobbles, %	0
Gravel, %	17
Sand, %	31
Clay / Silt, %	52



Client :	Kavco
Project :	Kilgobbin, Stepaside

Lab. No :	24/1802
Sample No :	JOT01

Hole ID :	BH 06
Depth, m :	1.00

Material description :	slightly sandy slightly gravelly silty CLAY
Remarks :	Soils with clay or silt content between 15% - 35% can be classified as clay or silt depending on the field Engineers assessment of in-situ behaviour. Where material is for re-use and therefore disturbed, only soils with clay or silt >35% are classified as clay or silt

Chemical Testing
In accordance with BS 1377: Part 3

Client	Kavco
Site	Kilgobbin, Stepaside
S.I. File No	6400 / 24
Test Lab	Site Investigations Ltd., Carhugar The Grange, 12th Lock Rd., Lucan Co. Dublin. Tel (01) 6108768 Email:info@siteinvestigations.ie
Report Date	12th December 2024

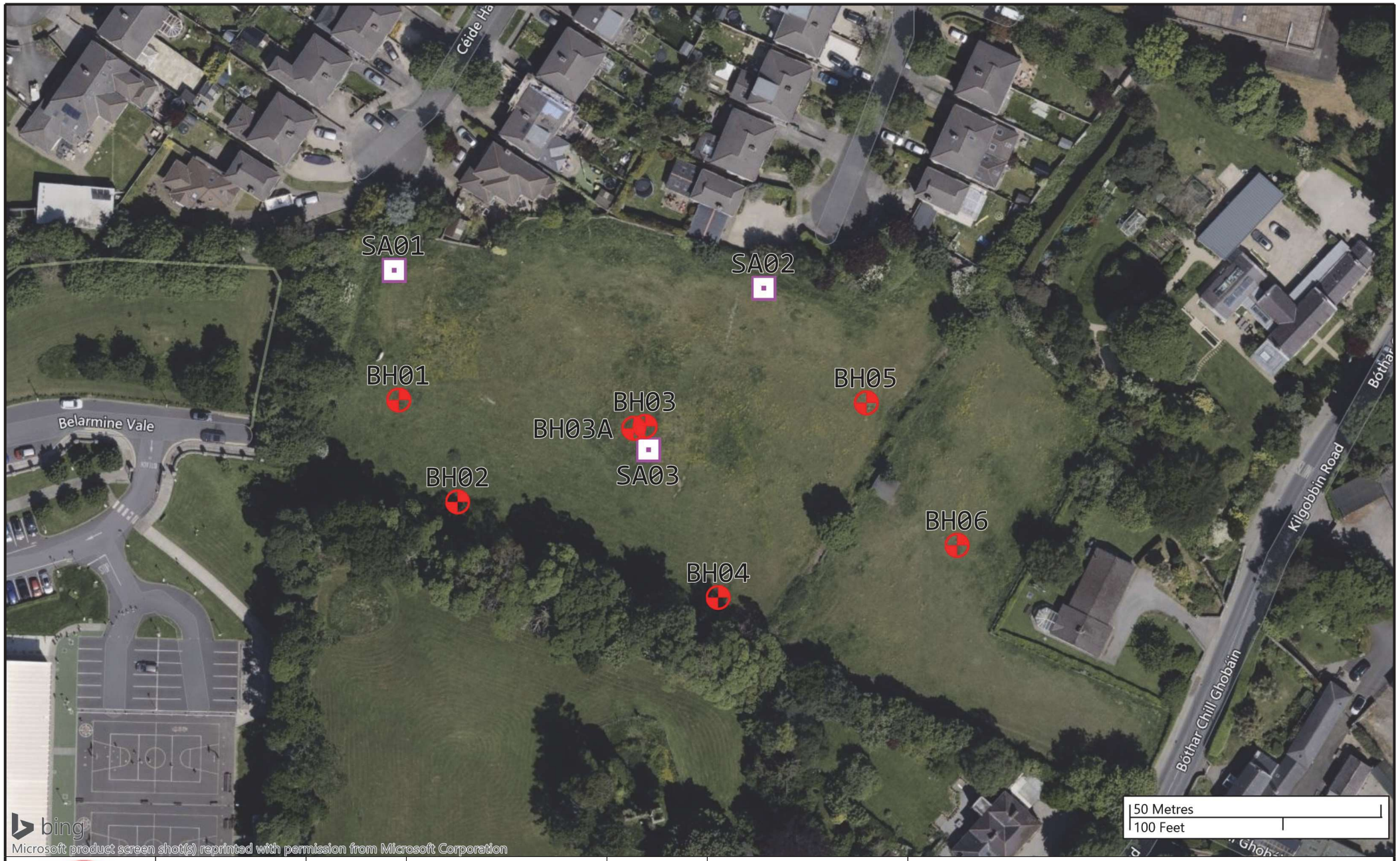
Hole Id	Depth (mBGL)	Sample No	Lab Ref	pH Value	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Water Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Acid Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) g/L	Acid Soluble Sulphate Content (2:1 Water-soil extract) (SO_3) %	Chloride ion Content (water:soil ratio 2:1) %	% passing 2mm
BH01	1.00	JOT16	24/1796	8.86	0.126	0.092			0.15	72.8
BH02	1.00	JOT21	24/1797	8.73	0.117	0.065			0.18	55.5
BH03	1.00	JOT13	24/1798	8.78	0.130	0.091			0.19	69.8
BH04	1.00	JOT09	24/1799	8.74	0.123	0.084			0.16	68.3
BH05	1.00	JOT05	24/1800	8.32	0.117	0.075			0.18	64.0
BH06	1.00	JOT01	24/1802	8.48	0.129	0.106			0.15	82.7

Appendix 4

Survey Data

Survey Data

Location	Irish Transverse Mercator		Elevation	Irish National Grid	
	Easting	Northing		Easting	Northing
Cable Percussive Boreholes					
BH01	719169.609	724821.789	104.83	319244.790	224793.511
BH02	719182.008	724801.735	104.85	319257.192	224773.453
BH03	719219.183	724817.754	104.15	319294.375	224789.476
BH03A	719216.868	724817.312	104.12	319292.059	224789.034
BH04	719234.702	724783.955	104.29	319309.898	224755.669
BH05	719263.300	724823.575	102.59	319338.501	224795.298
BH06	719282.283	724795.568	102.69	319357.489	224767.285
Soakaway Tests					
SA01	719168.006	724847.673	104.43	319243.187	224819.401
SA02	719242.230	724845.959	102.81	319317.427	224817.687
SA03	719219.962	724813.111	104.35	319295.154	224784.832



Site Investigations Ltd
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e: info@siteinvestigations.ie

Contract No:	6400	Client:	Kavco
Contract Name:	Kilgobbin	Engineer:	-
Location:	Stepaside, Co. Dublin	Scale:	1:1000
Title:	Site Plan	Drawn By:	SL

Legend Key

- Locations By Type - CP
- Locations By Type - IP