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Dún Laoghaire-Rathdown County Council

Civic Offices

Blackrock

Attention: Planning Department - Drainage Division
Re: Proposed Large Residential Development at Temple Hill, Monkstown, Blackrock
Stage III Submission

Our ref: 2511-01-Drainage
Date: 23rd January 2026

Please see attached J.J. Campbell and Associates planning / drainage drawings for the above proposed project, together with engineering service report.

Drawings to be read in conjunction with drainage report:

- C1 Existing Site Plan
- C2 Foul and Surface Water
    - C2-0 – Overall Site Drainage Plan
    - C2-1 – Site Drainage Plan Sheet 1 of 6
    - C2-2 – Site Drainage Plan Sheet 2 of 6
    - C2-3 – Site Drainage Plan Sheet 3 of 6
    - C2-4 – Site Drainage Plan Sheet 4 of 6
    - C2-5 – Site Drainage Plan Sheet 5 of 6
    - C2-6 – Site Drainage Plan Sheet 6 of 6
    - C2-7 – Cross Section Details on Carriageway
    - C2-9 – Longitudinal Section – S.W. Sewer
    - C2-10 – Longitudinal Section – S.W. Sewer
    - C2-11 – Longitudinal Section – S.W. Sewer
- C3 Q_{bar}
- C4-1 Basement under blocks A1 B1 B2 B3 & B4
- C4-2 Basement under blocks D1
- C5 Tree Root Protection
- C6-1 Drainage SuDS Zones
- C6-2 Zone 1 Attenuation

C6-3	Zone 2 Attenuation
C7	Interception Areas at Ground Level
C8	SUDs Typical Sections and Details
C11	Roof Areas
C12	Construction Phasing
C13	Foul Discharge
C14	Diversion Manhole C3
C15	Diversion Manhole C1
D1	Demolition Plan
F1-1	Flood Direction
F1-2	Flood Extents
G01	Watermain Layout
Si	Soakaway Tests

Yours faithfully

Airton Brandini

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ENGINEERING SERVICES REPORT

St. Teresa's LRD Amendment Application

Lands at St. Teresa's
Temple Hill, Temple Road
Monkstown, Blackrock
Co. Dublin

Job No.	2511-01
Date:	January 2026
Prepared by:	Airton Brandini

Contents

Document Information	
Project No.	2511-01
Document Title	Engineering Service Report
Prepared by	Airton Brandini, BEng MIEI
Checked by	Marcus Wallace, BA MIEI Eng Dip
Date	23rd January 2026
File Reference	P:\Current Projects\Projects 2025\ 2511-01

1. Site Description and Proposal

Oval Target Limited intends to apply for permission for development of a Large-Scale Residential Development comprising amendments to the previously permitted application (ABP-303804-19) on lands at 'St. Teresa's House' (A Protected Structure), and 'St. Teresa's Lodge' (A Protected Structure) and associated entrance gates (A Protected Structure) all on a site of approx. 4.56 ha at Temple Hill and Temple Road, Monkstown, Blackrock, Co. Dublin.

The proposed development will consist of revisions to a development previously permitted under SHD ABP-303804-19 (291 no. residential units, a crèche facility and heights of 1-8 storeys) to provide for a new residential and mixed use development (1 – 8 storeys overall) of 414 no. residential units in total (a proposed uplift of 123 no. residential units) with associated crèche facility, a new café and residential amenity space.

The proposed development will consist of:

1. Amendments to previously permitted Blocks C1, C2, C3, D1, E1, E2, E3, E4 and E5 as follows:

    - A revised building design for Block C1 from previously permitted building (3 storeys overall) consisting of 7 no. apartment units (6 no. 2 bed units and 1 no. 3 bed unit) to now comprise **10 no. apartment units** (4 no. 1 bed units and 6 no. 2 bed units) including minor revisions to height (remains 3 storeys overall) and revisions to elevations and building footprint – an uplift of 3 no. residential units in total.

    - A revised building design for Block C2 from previously permitted building (3 storeys overall) consisting of a crèche facility (approx. 286 sq m) at level 00 and 4 no. apartment units at level 01 and 02 (3 no. 2 bed units and 1 no. 3 bed unit) to now comprise a crèche facility of approx. 401 sq m at level 00 and associated outdoor play area space of 302 sq m and **6 no. apartment units** (2 no. 1 bed units and 4 no. 2 bed units) at levels 01 and 02 including minor revisions to height (remains 3 storeys overall), and revisions to elevations and building footprint – an uplift of 2 no. residential units and increased crèche floor area size by approx. 115 sq m.

    - A New Block C3 (1 storey over basement level) comprising residential amenity space of approx. 451 sq m.

- The omission of previously permitted Block D1 (5 storeys overall) and basement level comprising 50 no. apartment units (15 no.1 bed units, 23 no. 2 bed units and 12 no. 3 bed units) to now deliver new Block D1 (4 - 7 storeys over new basement level) comprising **125 no. apartment units** (19 no. 1 bed units, 68 no. 2 bed units and 38 no. 3 bed units) – an uplift of 75 no. residential units.

- The omission of previously permitted Block E1 (5 storeys overall) comprising 14 no. apartment units (9 no. 2 bed units, 4 no. 3 bed units and 1 no. 3 bed duplex unit) to now deliver new Block E1 (4 - 7 storeys) comprising **61 no. apartment units** (7 no. studio units, 6 no. 1 bed units, 26 no. 2 bed units and 22 no. 3 bed units) – an uplift of 47 no. residential units.

- The omission of previously permitted Block E2 (5 storeys overall) comprising 15 no. apartments units (9 no. 2 bed units, 4 no. 3 bed units and 2 no. 3 bed duplex units) to now deliver new Block E2 (6 storeys) comprising **50 no. apartment units** (1 no. studio unit, 25 no. 1 bed units, 20 no. 2 bed units and 4 no. 3 bed units) – an uplift of 35 no. apartment units.

- The omission of permitted Blocks E3 (5 storeys), E4 (4 storeys) and E5 (5 storeys) previously providing for 38 no. units in total (27 no. 2 beds, 8 no. 3 beds and 3 no. 3 bed duplex units).

- Each residential unit has associated private open space in the form of a terrace / balcony.

The above new proposals extend to a total of **252 residential units**.

Blocks A1, B1, B2, B3, B4, Block H (St. Teresa's House) remain as originally permitted with no further amendments as part of this proposal (162 no. units in total and permitted heights of 3-8 storeys).

2. The structures for demolition across the site remain as permitted with no further amendments proposed. This includes any structures previously permitted for demolition that still remain on site and the removal of associated remnants of low / retaining walls and in-ground concrete steps.

3. An amended proposal for Block G (St. Teresa's Lodge) (1 storey) including a change of use from previously permitted 1 no. 1 bed unit to a new café of approx. 67.4 sq m. This proposal will again seek permission for the dismantling/deconstruction of the existing St. Teresa's Lodge (approx. 38.56 sq m) and demolition of a lean to extension (approx. 28.5 sq m) as previously permitted under SHD ABP-303804-19.

The current amendment proposal seeks permission to relocate and reconstruct St. Teresa's Lodge in a new location (180 m southwest of its original position and located adjacent to Rockfield Park) using original roof timbers, decorative elements and rubble stonework, with original brickwork cleaned and re-used where appropriate. The non - original extension (approx. 28.5 sq m) will be again removed as previously permitted. The current proposal seeks further extension of this building (approx. 28.88 sq m) and a change of use from residential (1 no. unit) to café use to deliver a Part M compliant single storey building of approx. 67.4 sqm.

4. A revised landscape plan now provides for:

   - Public open space in the form of a central parkland, garden link, woodland park (incorporating an existing folly) and a tree belt (approx. 11,238 sqm overall).

   - Communal open space is now proposed in the form of entrance gardens, plazas, terraced gardens and roof terraces (approx. 3,620 sqm overall).

   - Provision is also now made for 2 no. new pedestrian connections to Rockfield Park on the southern site boundary (1 no. adjacent to the proposed relocated Gate Lodge and 1 no. at the hammerhead adjacent to Block E2) and all other pedestrian connections remain as permitted under SHD ABP-303804-19.

5. A revised total of 244 no. car parking spaces (a decrease of 28 no. spaces); 962 no. bicycle spaces (an uplift of 296 no. spaces) are proposed. The no. of motorcycle spaces remains as permitted at 20 no. spaces.

6. The development also provides for revised proposals for Bin Storage areas, Bike Storage areas, life safety generator room, ESB substations and switch rooms with a combined floor area of approx. 609 sq m all at surface level.

7. Access to the development generally remains as permitted under SHD ABP-303804-19, which provides for works to the existing entrance to the overall site via Temple Hill and Temple Road to deliver the realignment and upgrade of the existing signalised junction and associated footpaths, with minor modifications to the junction layout to provide for improved and safer vehicular access/egress to the site and to/from St. Vincent's Park. Emergency vehicular access and pedestrian/cycle access also remains as permitted via a secondary and long-established existing access point along Temple Hill. There are no works proposed to the existing gates (Protected Structure) at this location. There are minor modifications proposed to the northeastern boundary walls and access gateway

to 'Carmond' to facilitate alignment improvements for safe access/egress serving St. Vincent's Park.

8. The associated site and infrastructural works include provision for water services; foul and surface water drainage and connections; attenuation proposals; permeable paving; all landscaping works; green roofs; PV panels; boundary treatment; internal roads and footpaths.

This planning application is accompanied by a Natura Impact Statement (NIS) and Environmental Impact Assessment Report (EIAR).

Figure 1 – Proposed Site Plan

2. Existing Drainage Network

2.1 Site Survey and CCTV

Surface water from St Teresa's is currently conveyed through the combined sewer network within the site boundary. The public surface water drainage network on Temple Hill Road conveys storm water West to discharge onto the culverted Carysfort-Maretimo stream. The site generally drains South-East to North-West.

Foul water from St Teresa's is currently conveyed through the combined sewer network within the site boundary. Temple Hill Road is served by a 1200mmØ combined sewer. The combined sewers within St Teresa's Lands discharges to the 1200mmØ combined sewer in Temple Hill Road. This trunk main is routed to the Dun Laoghaire West Pier pumping station where it is pumped to Ringsend Waste Water Treatment Works.

There is an existing 900Ø combined sewer running along the west boundary of the site, it will be diverted locally on the North-West corner of the site to avoid the new basement at Block A1.

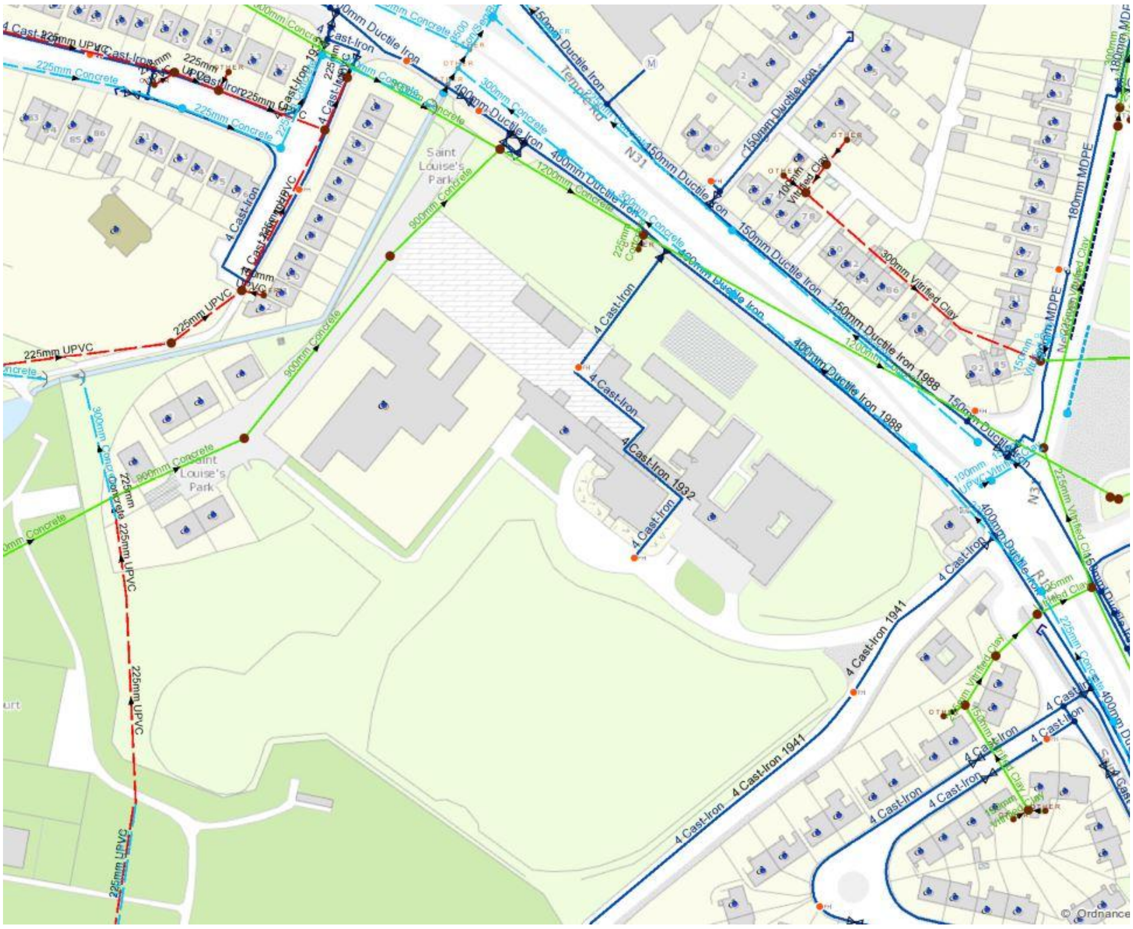


Figure 2 – Existing Drainage Network (Uisce Eireann)

3. Foul Effluent

3.1 Existing Foul Network

Three existing drainage pipe runs were identified as originating outside the site and possibly serving areas or buildings outside the site.

The first is a 225mm diameter uPVC pipe which runs south to north along the western boundary of the site. This pipe is indicated on Uisce Eireann records as Foul or Surface water along different lengths of the pipe and probably discharges to the Maretimo stream. It is not proposed to interfere with this pipe as part of this proposed development.

The second pipe is a 150mm diameter foul drain that runs south west to north east from the south eastern boundary of the site. This pipe probably serves the adjoining St. Catherines House, and it appears to connect to the drainage systems serving the existing buildings on the St Teresa's site. This pipe is not on Uisce Eireann record drawings, and it is not known if it serves buildings outside the subject site. Provision has been made in the foul water drainage design to route any flows from this pipe through the proposed development to the local authority sewer in Temple Road. There is also a 900mm diameter combined sewer which flows south to north along the entrance to St. Louise's and The Alzheimer's Society and then joins a 900mm diameter pipe flowing southeast parallel to Temple Road at the north entrance to the site. This pipe flows through the proposed footprint of building A1. It is proposed to divert this pipe away from building A1. These existing pipes are indicated on J.J. Campbell & Assoc. drawing numbers C2-0 – overall site plan. A sewer diversion agreement, DIV21142 is in place with Uisce Eireann to divert he sewer from the previous planning, ABP-312325-21, it has now expired, and a new sewer diversion application will be made at a future date.

Any other drains encountered during construction will be traced to source to discover if they are live; if they are live, they will be connected into the proposed drainage system in order to conduct the existing flows to the public sewer in Temple Road. If the pipes prove to be redundant, they will be grubbed up and removed from under buildings and structures and any remaining pipes left in the ground will be stopped and allowed remain in place.

3.2 Proposed Foul Effluent

The amended planning application comprises of 414 residential units in total and conversion of the relocated gate lodge into a small Café. Adopting the loading provided in the Uisce Eireann guidance document Code of Practise for Wastewater

Infrastructure (Ref: IW-CDS-5030-03 Dec 2016) section 3.6 the foul effluent discharging from the site is estimated at:

Block A1 – 4 Story - 29 Units:
(447L/D/day x 29 Units x 6DWF) / (24x60x60): 0.90 l/s

Block B1 – 7 Story + PH - 41 Units
(447L/D/day x 41 Units x 6DWF) / (24x60x60): 1.27 l/s

Block B2 – 5 Story + PH - 30 Units
(447L/D/day x 30 Units x 6DWF) / (24x60x60): 0.93 l/s

Block B3 – 5 Story + PH - 30 Units
(447L/D/day x 30 Units x 6DWF) / (24x60x60): 0.93 l/s

Block B4 – 4 Story + PH - 26 Units
(447L/D/day x 26 Units x 6DWF) / (24x60x60): 0.81 l/s

Block C1 – 3 Story - 10 Units
(447L/D/day x 10 Units x 6DWF) / (24x60x60): 0.31 l/s

Block C2 – 3 Story - 6 Units
(447L/D/day x 6 Units x 6DWF) / (24x60x60): 0.19 l/s

Block C2 – Creche
(90L/activity/day x 30 x 6DWF) / (24x60x60): 0.19 l/s

Block C3 – 1 Story + Basement - Amenity
(447L/D/day x 6 x 6DWF) / (24x60x60): 0.19 l/s

Block D1 – 7 Story - 125 Units
(447L/D/day x 125 Units x 6DWF) / (24x60x60): 3.87 l/s

Block E1 – 7 Story - 61 Units
(447L/D/day x 61 Units x 6DWF) / (24x60x60): 1.89 l/s

Block E2 – 6 Story - 50 Units
(447L/D/day x 50 Units x 6DWF) / (24x60x60): 1.55 l/s

Block H - St Teresa House (3 Story) 6 Units
(447L/D/day x 6 Units x 6DWF) / (24x60x60): 0.19 l/s

Block G - Gate Lodge / Café
2 staff @ 15L/person/day: 30 l/day
150 patrons @ 60L/person/day: 9000 l/day
Total: (30 + 9000) x 6DWF / (24x60x60): 0.63 l/s

Total discharge to public sewer: 13.85 l/s
Add 10% consumption allowance: 15.24 l/s

Sewers within the development will typically be laid at:

Main collector Sewer:	DN225 not flatter than 1:80
Secondary Sewers:	DN225 not flatter than 1:60

Design falls are called up on drawing C2.

Self-Cleansing Velocity

See ISEN 7524 (1998) Part 4. - Drain and sewer systems outside buildings

Hydraulic Design Clause 8 Self Cleansing Velocity.

For small diameter drains and sewers less than DN 300, self-cleansing can generally be achieved by ensuring that a velocity of at least 0.7 m/s occurs daily or that a gradient of 1:DN is specified

Outfall Connection

The foul drain will connect to the existing 300Ø combined sewer located within the site boundary on Temple Road, it then discharges to an existing manhole on the public 1200Ø public combined public sewer.

4. Proposed Surface Water

It is proposed to separate the storm runoff from the existing and proposed buildings and to use SuDS techniques, as per the Greater Dublin Strategic Drainage Study (GDSDS) and DLR 2022 – 2028 county Development Plan, to control stormwater discharge from the site. The proposals are set out in detail below. A storm water carrier pipe will be provided around the site to intercept runoff and, where located within filter drains, will be perforated pipe.

Because of the sloping topography of the site, it is proposed to make two surface water connections serving two zones each comprising approximately 50% of the site area.

Surface Water Connection No 1 is for Zone 1 and connects to the existing public sewer 9002 on the North East side of the site.

Surface Water Connection No 2 is for Zone 2, 50% of the proposed development and connects to the existing public sewer manhole on the North corner of the site.

The stormwater network was modelled using Causeway (see Appendices E and F). Road layouts, paving, landscaping, and other hard surfaces remain unchanged from the 2019 approved scheme. Our assessment confirms that no remodelling of the existing stormwater network is required, as the current system provides hydraulic capacity in excess of the design requirements.

The collection system has been assessed with a view to minimizing excavation depths, in circumstances where, due to the nature of the site, some deep pipe runs are necessary. Invert levels have been set to minimize trench depths while maintaining pipe velocities.

Figure 3 - Surface water drainage zones

4.1 Soil Type

The UKSuds web site tool for estimating the Greenfield run rate will be used to check for the soil type, which it gave as Soil Type 4. However, the Site Investigation Report, included as Appendix M, showed that 50% of the soakaway tests passed and 50% had poor / failed, and on a conservative basis, a worse case soil Type 3 has been assumed for this project and an SPR (Standard Percentage Runoff) of 0.37.

4.2 Qbar and Flow Control

At the request of DLRCC Drainage Department for the previous, ABP-312325-21 493 unit scheme, Qbar (net) and not Qbar (whole site) was used to calculate the allowable discharge from the positivity drained areas such as roads, roof's, etc.

As previously recommended by DLRCC, Qbar will be assessed using the UK Suds online tool. Soil type 3, SAAR (Standard Average Annual Rainfall) 765mm and an area of 2.1189 Ha giving an allowable discharge for the positively drained areas of 6.8 l/s, see Appendix A.

Storage volume will be calculated using rainfall data provided by MET Eireann for the site. This data is reproduced as Appendix C in this report.

Attenuation storage at ground level is divided between a "stormtech" below-ground attenuation, situated to the north of Block D and a reinforced concrete tank beside B2 under the road. As these storage systems are connected independently to the local authority collection system, each connection is provided with a flow limiting device (Hydro-brake) set at 3.4 l/s so that the total flow from the site is 6.8 l/s.

The on-line Hydro International design tool for assessing hydro-brakes shall be used for designing the hydro-brake for the Stormtech and concrete tank, the appropriate hydro-brake will be designed and will be set out in Appendix G. Hydro International drawings show a bypass valve, but the hydro-brake shall be ordered without a bypass which will be specified on attenuation drawings.

4.3 SuDS Strategy

Sustainable urban drainage is a concept that incorporates long term environmental and social factors into drainage design. It takes account of both the quantity and quality of runoff as well as the amenity value of surface water in the urban environment. The overcharging principles of SuDS design is that surface water runoff should be managed for maximum benefit. The four categories that benefits can be achieved are:

- Water Quantity
- Water Quality

- Amenity
- Biodiversity

All storm drainage work within the proposed development lands shall be designed as constructed in accordance with the following:

1. GDSDS
2. CIRIA SuDS Manual (C753)

The criteria set out in the above will help confirm the surface water strategy and SuDS management train of the development.

- **Extensive Green Roof** at top most apartment roofs is proposed on Blocks A1 to B4, on basement podium roof and on ancillary single storey buildings, at a minimum of 70% of the collective flat roof surface area. **Intensive Green Roof** at top most apartment roofs is proposed on Blocks C1 to E2, at a minimum of 50% of the collective flat roof surface area. Green Roofs will be installed as per Dun Laoghaire Rathdown Development Plan 2022 – 2028. See drawing C11 for calculation of areas. The Green Roofs details are included in Appendix B to this report. The Green will provide interception storage which will then be connected to the new surface water system.

Access to the roofs for maintenance will be via the automatic opening vents at the top of the stairwells in each building. Secondary access to the roofs will be by a cherry picker from the adjoining roads for maintenance.

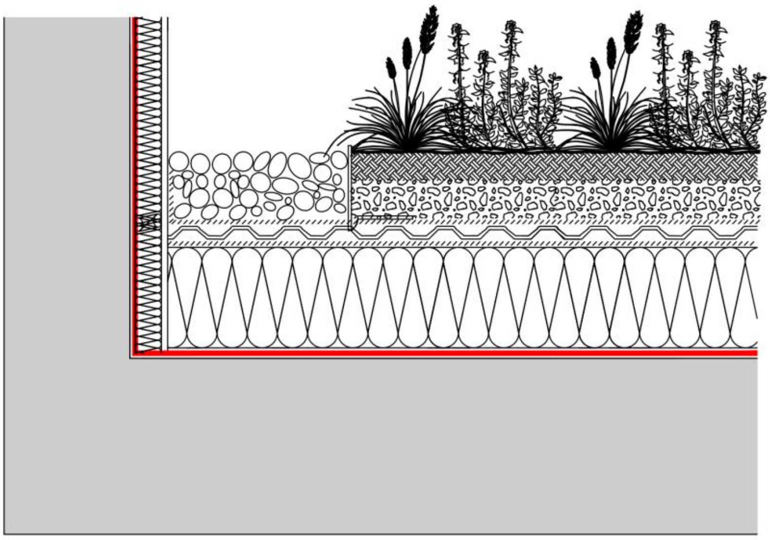


Figure 4 – Typical Green Roof Build-Up at Parapet

- **Dry swales / infiltration trenches** are a useful and natural means of surface water collection and treatment of the first 5mm of runoff. The application of swales / infiltration trenches was examined as part of the design process. Because of the mature trees, to be retained as part of the development, the widespread use of swales cannot be implemented as the necessary trenches would damage the tree root systems, but swales / infiltration trenches shall be installed where they do not damage existing mature trees, see C2 for locations.

Similar issues could potentially arise regarding traditional pipe drainage in trenches, however, the piped drainage system for the development site has been designed to avoid heavily rooted areas, particularly along the main access avenue. It is anticipated that the road surface along the access avenue will be replaced as part of the development. As part of the surface replacement works, a cross-fall will be incorporated into the road surface so that rainwater will be directed onto landscaped areas and thereby flow overland to the drainage system. This ensures that low intensity rainfall on the avenue will not reach the drainage system as it will be infiltrated directly into the soil and that any water reaching the drainage system will have a degree of pre-treatment before entering the drainage system. Provision has been made at two key points along the avenue to collect water from the road surface in order to prevent flooding on the avenue from significant rainfall events.

- **Permeable paving** will intercept the first 5mm of runoff from all impermeable areas of the site. 50% of the onsite soakaways tests passed and 50% had poor / failed infiltration, a high level perforated overflow pipe will be provided from the permeable pavements and will connect to the new gravity storm network, some infiltration will take place in the stone below the areas with poor / failed infiltration and the overflow pipe will retain flow which will slowly infiltrate or evaporate.

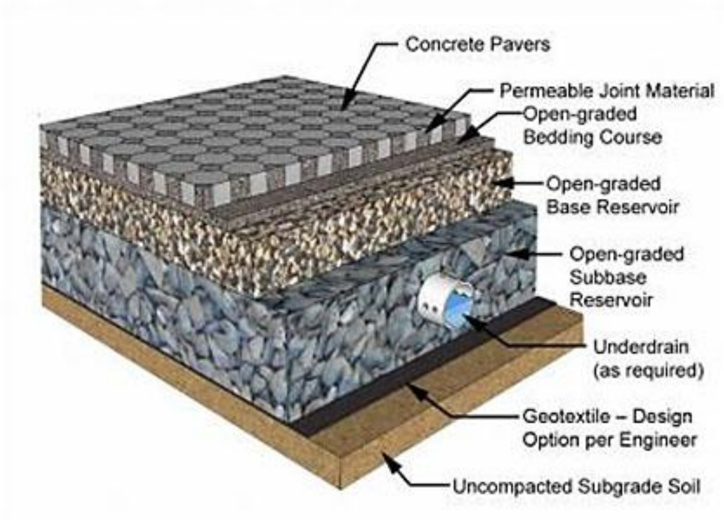


Figure 5 – Typical permeable paving

- **Permeable asphalt** is proposed for interception Area 12 in Zone 2. A high level perforated overflow pipe will be provided from the permeable pavements and will connect to the new gravity storm network, some infiltration will take place in the stone below the areas with poor / failed infiltration and the overflow pipe will retain flow which will slowly infiltrate or evaporate.

Figure 6 – Typical permeable asphalt

- **21 No. Tree Pits** are proposed throughout the site to intercept the first 5mm of rainfall. See drawing C2 series for tree pit locations.

Figure 7 – Typical tree pit

Because of the sloping topography of the site, Suds / attenuation has been divided into 2 separate Zones:

Zone 1, south end of the site has 50% coverage, Stormtech or similar below-ground attenuation structures will be used to attenuate the 100yr storm event.

Zone 2, northern end of the site has 50% coverage, attenuation tank located beside building B2 will be used to attenuate the 100yr storm event.

20% increase in rainfall rates, as provided by Met Eireann, will be incorporated into the design to allow for climate change. 10% increase in runoff areas will be incorporated into the design to allow for Urban Creep. See Appendix C for rainfall data.

In accordance with the GDSDS the criterion requirements as set out in Table 6.3 are to be complied with in the following manner:

- **Criterion 1** – River Water Quality Protection:

Criterion 1 is achieved by the interception storage of at least 5mm of rainfall where runoff to the receiving water can be prevented.

CIRIA Report C753 defines Interception as the capture and retention on site of the first 5mm of the majority of all rainfall events.

Interception areas are broken down into Zone 1 and Zone 2 and are further broken down into 13 separate areas as indicated on drawing C7.

As the interception volume is provided at ground level and on extensive and intensive green roofs, no further treatment volume, Vt is necessary for this development (ref. GDSDS volume 2, chapter 6, table 6.3).

4.3.1 Green Roofs

The CIRIA Report C753, Table 24.6 states that all surfaces that have green roofs meet Criterion 1.

Blocks A1, B1, B2, B3 and B4, bike and bin store sheds, ancillary building e podium roof will have Extensive Green roofs. Blocks C1, C2, C3, D1, E1 and E2 will have Intensive Green roofs, localised planting in raised planters shall also be provided at the lower terraces which are mostly non-green, see drawing C11.

The Green roofs have a natural storage, excluding drainage layer for attenuation of:

Green Roofs (See Appendix D for calculation):	5,685 m^2

Soil:	0.029 m^3/m^2
Fleece:	0.003 m^3/m^2
Total Storage: 0.032 m^3/m^2 x 5,685 m^2 =	**182 m^3**

4.3.2 Permeable Paving:

CIRIA Report C753, Table 24.6 states that all permeable paving, whether lined or not can be assumed to comply, provided there is no extra area drained to the permeable pavement.

Where the pavement also drains an adjacent impermeable area, compliance can be assumed for all soil types where the pavement is unlined, as long as the extra paved area is no greater than the permeable pavement area.

Where the infiltration capacity of the ground below the pavement is greater than 1x10-6 m/s, up to 5 times the permeable pavement area can be added as extra contributing area.

Drawing C7, Interception Areas, shows the interception areas broken down into 13 areas. The maximum ratio of impermeable pavement to permeable paving is 1:5 where the infiltration capacity of the ground below the permeable paving is greater than 1x10-6 m/s.

50% of the soakaway tests passed and 50% of the soakaways had poor / failed infiltration. The locations where infiltration is poor, some infiltration will take place along with evotranspiration. The ratio of impermeable paving to permeable paving ranges from 1:0.25 to 1:3.5, see drawing C7 which also gives storage in the permeable paving.

Permeable paving also has storage of:

Area, See drawing C2:	1465 m^2
350mm stone sub-base:	30% voids
Total Storage: 1465 m^2 x 0.35 m x 30% voids =	**154 m^3**

4.3.3 Dry Swale / Infiltration Trench

CIRIA Report C753, Table 24.6 states that areas up to 25 times the base plan of the basin can be assumed to meet interception requirements where infiltration rates are greater than 1x10-6 m/s.

Where the infiltration is poor, some infiltration along with evotranspiration will take place in the infiltration trench which is filled with stone with 30% voids. The ratio of impermeable paving to base plan of swale ranges from 1:6.2 to 1:23.4, see drawings C2 and C7.

200 m of Dry swales / infiltration trenches also have storage of:

Total Storage: 200m x 1m x 0.6m x 30% voids =	**36 m^3**

4.3.4 Interception volume required

Interception storage provision will be for 5mm rainfall over 80% of hard standing areas on the site. Landscaped areas, Green roofs and permeable paving satisfy this requirement for those paved or green areas.

Interception storage will be provided equivalent to the first 5mm of rainfall falling on remaining impervious areas.

Interception volume is required to cater for 5mm rainfall on 80% of paved (impervious) surfaces.

New Buildings (Blocks A1 to E2 + Ancillary buildings)	10,278 m^2
Roads:	4,838 m^2
Parking:	1,465 m^2
Paths:	1,556 m^2
Total contributing area =	18,137 m^2

Interception volume required = 18,137 * 0.8 *0.005 = 72.6 m^3 < 372 m^3 provided.

See Drawing C2 for area calculations.

Interception storage is provided equally throughout the site at ground level and on the Green Roofs, see drawing C11 and at roof level by the use of Green Roofs.

- **Criterion 2** – Storage/attenuation volumes will be assessed using Criterion 4.3
- **Criterion 3** - There will be no flooding on site for the 30 year storm and no property flooding for the 1 in 100 year storm. FFL levels will be a minimum of 500mm above TWL;
- **Criterion 4** – Criterion 4.3 is used assessing attenuation for all storage using the pass forward control of Qbar of 6.8 l/s for the whole site.

4.4 Attenuation Storage

It is proposed to separate the storm runoff from the existing and proposed buildings and to use SuDS techniques, as per the Greater Dublin Strategic Drainage Study (GDSDS) and DLR 2022 – 2028 County Development Plan, to control stormwater discharge from the site. The proposals are set out in detail below. A storm water carrier pipe will be provided around the site to intercept runoff and, where located within filter drains, will be perforated pipe.

It should be noted that the possibility of attenuating the storm water greater than the 30 year volume in attenuation ponds has been examined. However, having considered the possibility, attenuation ponds are not proposed because the site geometry is not conductive to the hydraulic design of such ponds. If attenuation ponds were to be used, it would be necessary to pump stormwater into any attenuation pond on the site and consequently control the release of waters when the drainage system has capacity to receive them, if the pumps fail or there is a power cut during a storm event it would cause extensive flooding.

Thus, the chosen option is that the stormwater volume from a 100 year event will be stored in underground structures on the site. The underground attenuation structures have been checked for flotation and for structural integrity under the loads that are predicted in service and during construction.

Because of the topography of the site, it has been divided into 2 separate Zones, see Section 4.

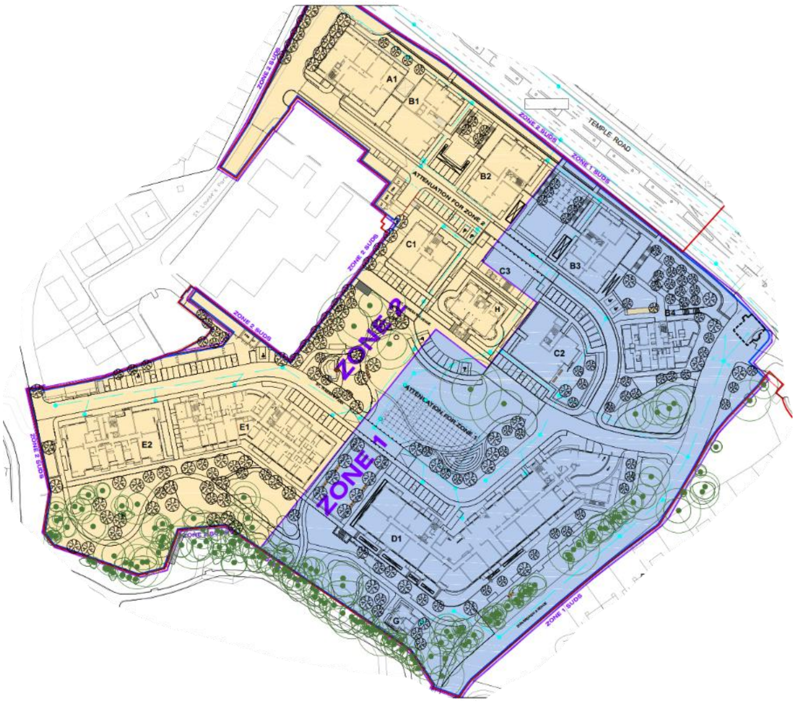


Figure 8 - Surface water drainage zones

The attenuation volumes for each zone are calculated using two methods (1) Spreadsheet calculation in Appendix D and (2) Causeway flow model in Appendix E.

The attenuation volumes to be provided are conservatively based on the Causeway flow model calculation as it resulted in larger volumes, as shown in Table 1.

Table 1 – Attenuation Volumes

Zone	Volume calculated using spreadsheet in Appendix D	Volume calculated using Causeway flow model	Volume to be provided
Zone 1	900	1275	**1300**
Zone 2	900	1034	**1050**
Total	**1800**	**2309**	**2350**

Zone 1:

Below ground attenuation (Stormtech Chambers). The attenuation volume provided is based on the Causeway flow model results in Appendix E.

Volume provided (Flow model calculation): 1300 m^3 (see Appendix E)

Zone 2:

Attenuation tank below building B1. The attenuation volume provided is based on the Causeway flow model results in Appendix E.

Volume provided (Flow model calculation): 1050 m^3 (see Appendix E)

Pass forward Q = 6.8 l/s for whole site = 3.4 l/s for Z1 and 3.4 l/s for Z2

The storage calculation is attached in Appendix D and allows for 20% climate change and for 10% urban creep for the 100 year storm return, as specified in Section 7.1.1 – General Requirements of Appendix 7 from the Dun Laoghaire Rathdown Development Plan 2022 – 2028.

Surface Water Connection No 1 is for Zone 1 and connects to the existing public sewer 9002 on the North East side of the site.

Surface Water Connection No 2 is for Zone 2 and connects to the existing public sewer manhole on the North corner of the site.

The collection system has been assessed with a view to minimizing excavation depths, in circumstances where, due to the nature of the site, some deep pipe runs are necessary. Invert levels have been set to minimize trench depths while maintaining pipe velocities.

4.5 Other SUDS features

The alternative of normally dry attenuation ponds was examined for retention of exceptional rainfall. These ponds would be designed to begin to fill when the below ground attenuation storage required for the 30 year rainfall event had reached and would provide attenuation storage at surface level for events up 100 year return period. However, in order for these ponds to function effectively, the drainage system must be able to overflow into them before it overflows anywhere else; the system is allowed to flood into the dry basin before flooding occurs elsewhere. For this to happen, the basin/pond must be situated at the low point of the site. As the available area for such a pond is at the high point of the site, flooding could occur in low lying areas before the attenuation pond would activate. For this reason, dry attenuation basins were not adopted in the design.

Issues arise regarding traditional pipe drainage in trenches similar to the inclusion of swales, however, the piped drainage system is designed to avoid heavily rooted areas, particularly along the main access avenue. It is anticipated that the road surface along the access avenue will be replaced as part of the development. As part of the surface replacement works, a cross-fall will be incorporated into the road surface so that rainwater will be directed onto landscaped areas and thus by overland flow to the drainage system. This ensures that low intensity rainfall on the avenue will not reach the drainage system as it will be infiltrated directly into the soil and that any water reaching the drainage system will have a degree of pre-treatment before entering the drainage system. Provision has been made at two key points along the avenue to collect water from the road surface in order to prevent flooding on the avenue from significant rainfall events.

4.6 Blockages and Flood routing.

The effect of blockages occurring at critical points in the system will be examined to ensure that any flood flows will be away from buildings. The locations chosen and consequential flows are listed below.

Event	**Consequence**
1. The outlet hydro-brake at the attenuation tank for drainage zone 2 blocks.	Outlet manhole cover will rise due to water pressure, causing flooding and overland flows from the manhole towards the Maretimo stream. Ground levels and kerbs direct overland flow away from buildings A1 and B1.
2. The inlet manhole to the attenuation tank for drainage zone 2 blocks.	The inlet manhole cover and the manhole adjacent to building E1 are most vulnerable to rising due to water pressure due to site levels. Overland flow from these manholes will be away from buildings and towards watercourses.

3. The inlet or outlet manholes serving the stormtech attenuation structure for drainage zone 1 blocks.	The most vulnerable manholes, those with lowest cover levels, are those adjacent to building B4 and that at the Main entrance to the development. If water backs up sufficiently for any of these manhole covers to leak, the overland flow will be away from building B4, towards Temple Hill road.
4. A 50% blockage of the hydro-brake serving zone 1 will be modelled using Causeway software.	The analysis for the scheme indicates that the collection system will surcharge for a number of storm criteria, however a minimum of 300mm freeboard will be maintained at all manholes and there is no risk of flooding indicated by the analysis.
5. A 50% blockage of the hydro-brake serving zone 2 will be modelled using Causeway software.	The analysis for the scheme indicates that the collection system will surcharge for a number of storm criteria, however a minimum of 300mm freeboard will be maintained at all manholes and there is no risk of flooding indicated by the analysis.

Table 2 – Consequential Flows

Drainage analysis results for zones 1 and 2 will be presented in Appendix E and F.

4.7 Surface Water Audit (SWA)

An independent audit of the surface water design was carried out by JBA Consulting Engineers for the permitted SHD ABP-303804-19 (291 no. units permitted) and ABP-312325-21 493 unit scheme, SWA has been updated and is included in Appendix I and will take into account the provision of Green roofs.

5. Water Supply

The site is served by 2 No. 100Ø water main spurs which are connected to an existing 400Ø watermain in the path that runs along Temple Road – see Figure 7 below.

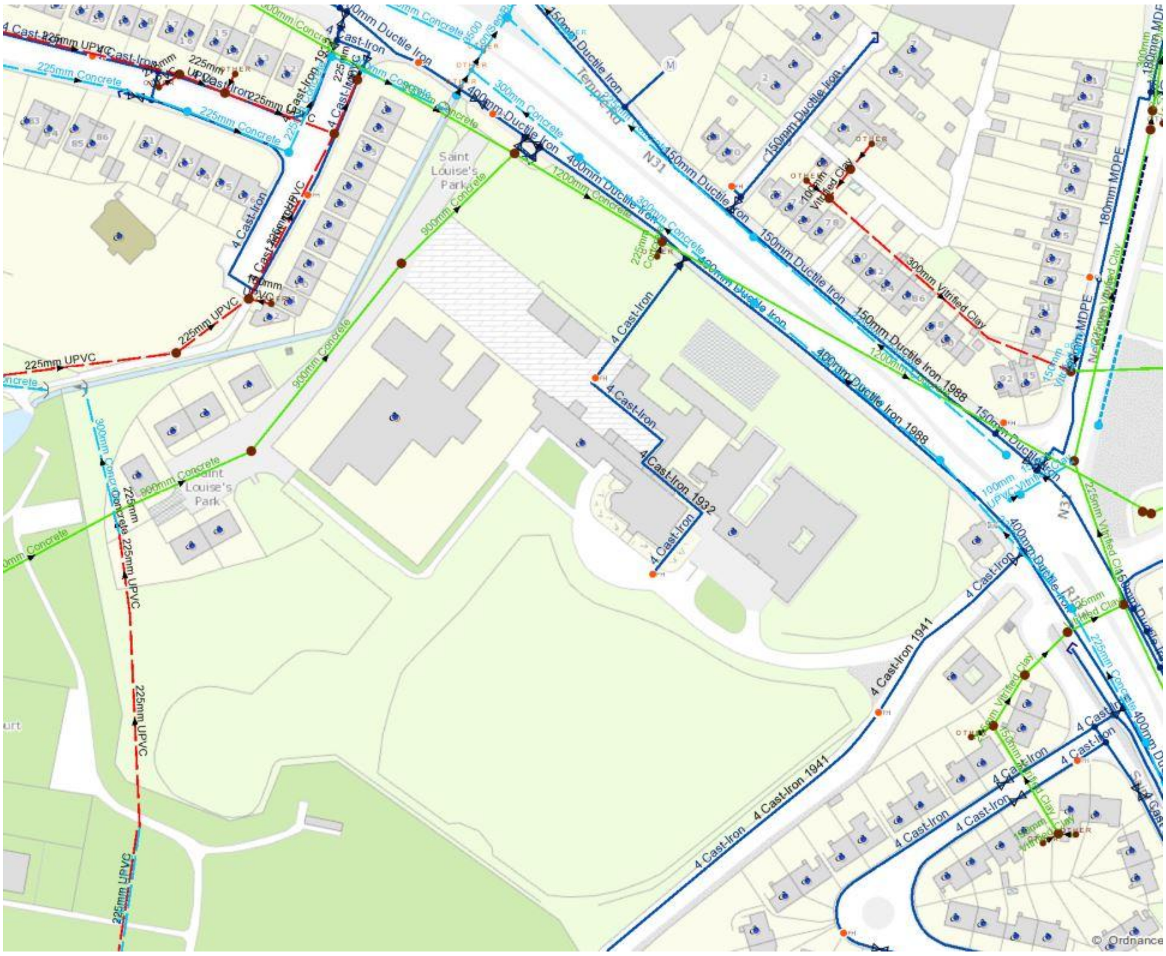


Figure 9 - Existing water main

A 200mm I.D. MDPE pipe (type PE 80 and SDR 11) will be provided, looped around the development to serve each unit. Fire hydrants will be provided to ensure that no unit is more than 46m away from an accessible hydrant.

The average domestic daily demand is 150 l/person/day and 2.7 persons/dwelling gives a demand of 167,670 l/day. The average day / peak week demand is 1.25 x average = 209,587 l/day

In accordance with Uisce Eireann Code of Practise for Water Infrastructure s2.6.7, where flow is more than 20m^3 per day there is a requirement to fit a bulk meter to measure the water demand of the development

6. Pre-application interactions

6.1 Uisce Eireann

ABP-312325-21 Scheme:

A pre-connection enquiry for 521 Units was issued to Uisce Eireann on 17th April 2020 and acknowledgement email received on 20th April 2020, reference number 0883622. A confirmation of feasibility, letter reference CDS20002536, dated 10th June 2020 was issued by Uisce Eireann.

An application for a "Statement of Design Acceptance" was made to IW on the 25th February 2021 and confirmation of acceptance was received on the 8th August 2021, reference number CDS20002536.

Current Amended Scheme:

Confirmation of feasibility (Ref. CDS25004579) was received for the current amended scheme and is included in Appendix I.

A Statement of Design Acceptance was received for the current amended scheme and is included in Appendix J.

6.2 Dun Laoghaire Rathdown County Council (DLRCC)

No correspondence or separate meeting has been held with DLRCC in relation to the Stage III planning submission of 2025 amended application.

Meetings were held with DLRCC in relation to Stage I and Stage II submissions.

7. Flood Risk Assessment

JBA Consulting were commissioned by Oval Target Ltd to update the Flood Risk Assessment (FRA) for this amended 2019 granted scheme.

8. Slope stabilisation and root protection.

8.1 Slope stabilisation.

The stepped landscaped area at block B4 and Temple Hill Road will be set out as grassed terraces.

The average slope of the area is about 1m fall in 10m, however, as the area will be terraced, there will be local slopes in the region of 1m fall in four. To stabilise the soil in this area and to prevent erosion, a geogrid product, Terram Geocell, or similar, will be used to stabilise the surface.

8.2 Root protection - General

The main access avenue and the access route through the site to lands to the south of the site are to be constructed adjacent to the root systems of mature trees. The roots under these roadways will be protected from traffic loads by constructing a relatively thin concrete slab, (in the region of 225mm), supported on insitu mass concrete columns or piles at close centres, see drawing C5 for details. The loads will be transferred through the slab to the piles and thus to the soils below the root zone.

A number of footpaths and jogging routes are proposed through existing wooded areas. These paths will also accommodate light maintenance traffic. The existing root zones will be protected by using proprietary products such as Terram Geocell to bind the base materials, thereby providing an all-weather surface that is not prone to rutting or heave under light wheel loads. The relevant areas are indicated in figure 9.

8.3 Root protection - Gate Lodge Foundations

Due to the sensitive location of the repositioned Gate Lodge and its proximity to existing trees, it is proposed to reconstruct the building on a piled foundation to prevent pressure on the tree roots.

The piles will be small-diameter, hand-installed piles, positioned to avoid root damage. A lightweight, suspended ground beam will span between the piles and will be cast on insulation, ensuring no direct load is transferred onto the ground above the roots. This method will allow the Gate Lodge to be reconstructed while safeguarding the health and stability of the surrounding trees and tree roots.

Figure 10 – Root Protection

Protection in roads shown green, protection in paths shown blue, embankment stabilisation shown purple

Appendix A – Greenfield Runoff Q_{bar} – UKSuds

hr wallingford

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	08/12/2025
Calculated by	Airton Brandini
Reference	2511-01
Model version	2.2.2

Location

Site name	St Teresa`s
Site location	Temple Road

© OpenStreetMap (https://www.openstreetmap.org/copyright) contributors.

Site easting (Irish Grid)	321877
Site northing (Irish Grid)	228985
Site easting (Irish Transverse Mercator)	721802
Site northing (Irish Transverse Mercator)	729012

Site details

Total site area (ha)	2.1189	ha

Greenfield runoff

Method

Method	IH124

IH124

	My value			Map value
SAAR (mm)	765	mm	○	900
How should SPR be derived?	WRAP soil type			
WRAP soil type	3		○	4
SPR	0.37			
QBar (IH124) (l/s)	6.8	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)	5.7	l/s
Flow rate 2 year (l/s)	6.4	l/s
Flow rate 10 years (l/s)	11.6	l/s
Flow rate 30 years (l/s)	14.4	l/s
Flow rate 100 years (l/s)	17.6	l/s
Flow rate 200 years (l/s)	19.3	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

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) developed by HR Wallingford and available at uksuds.com (https://www.uksuds.com/). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (https://www.uksuds.com/terms-conditions). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

Appendix B – Green Roof

GREEN ROOFS

BIODIVERSE, EXTENSIVE AND INTENSIVE SYSTEMS

GREEN ROOF SYSTEMS

Committed to utilising the very latest manufacturing technology, Bauder invests in a programme of continuous research and development to ensure every product and installation is ahead of industry standards, and that the needs of the environment are always kept in focus.

GREEN ROOF SYSTEMS

Each green roof brings back a piece of nature and on some buildings a recreational space can be created for people to access and enjoy.

A Bauder green roof combines the finished planting scheme and all its supportive components with a high quality and secure waterproofing system to give you the best results every time.

Designing a green roof can be complex and your local technical manager is best placed to advise you on the implications your green roof will have on the building and its construction as well as the ongoing maintenance of the vegetation and roof.

We have produced a design considerations guidw for green roofs which can be downloaded from our website.

bauder.co.uk/technical-centre/design-guides

Recreational Gardens, Terraces and Spaces Accessed Intensive Green Roofs

Rooftops where the design may include flowerbeds, lawns, shrubs and trees intermixed with paths, driveways and patios. The combinations of finishes will impact on the design, construction, drainage and components used to deliver to each element's requirements.

Sedum System Non-Accessed Extensive Green Roof

Lightweight, all in one vegetation system comprising mature sedums pre-grown on an integrated multifunctional water retention and filter layer with 20mm of extensive substrate. The system has been developed for use directly over the waterproofing without the need for a secondary layer of substrate.

Substrate Roofs
Non-Accessed Extensive Green Roofs

Substrate green roofs are designed to be comparatively lightweight, work towards providing some storm water mitigation and support a wide variety of low maintenance plant species which are generally self-sustaining, and wind, frost and drought tolerant. They are primarily used for their ecological benefits and not intended for general access or for leisure purposes.

Biodiverse Habitats

A natural living habitat to encourage a wider spread of birds, insects and plant species into the area and generally replicates the ecological environment of the site upon which construction development is taking place, particularly if a Biodiversity Action Plan (BAP) is to be met with priority species.

Precultivated Vegetation Blankets

Lightweight option with precultivated vegetation for instant planting of the roof. Two options are available; XF118 wildflower blanket contains a mixture of 24 species of annual and perennial native wildflowers and XF300 incorporates perennial sedums with some grasses and mosses.

Plug Planted Systems

Individually planted roof usually incorporating sedums, grasses, herbs, succulents and wildflowers. These can be planted to accommodate location and expected weather conditions, colour or layout designs to the client's preference.

Seeded Roofs

The vegetation is grown and colonised entirely on the roof from seed with full plant establishment taking between 18-24 months. The plant selection can incorporate native and priority species to gain BREEAM points and meet a BAP.

BioSOLAR Roofs

Combining a substrate green roof with a solar PV array where the substrate and vegetation provide the ballast for the installation. The mounting system raises the modules above the substrate to allow liberal growing room for the plants, which are specified explicitly so that their maximum height does not block light to the array that would otherwise reduce the efficiency of the panels.

TECHNICAL CREDENTIALS

Adopting Standards

Throughout Europe, the standards most widely recognised as comprehensively covering green roofs are those of the Forschungsgesllschaft Landschaftsentwicklung Landschafttsbau (FLL), which is a research society for the development of the landscape.

We have adopted these well respected standards, which cover all aspects of waterproofing, root protection, landscaping, installation and maintenance and we will continue to do so whilst also working in conjunction with the GRO Code of Best Practice for the UK.

Protection of the Waterproofing

A green roof protects the waterproofing from UV damage and thermal movement. Research has shown that the life expectancy of the waterproofing is significantly extended and in many cases may last the estimated design life of the building, which can eliminate future replacement costs.

Fire Testing

Bauder XF301 was the first sedum blanket in the UK to be awarded an EXT. F.AA fire rating by the Building Research Establishment.

The full XF 301 sedum system, including the vegetation waterproofing, and insulation was tested, and awarded an EXT. F.AA.

The same system was tested in a sloped orientation to ensure that the fire behaviour is not affected by roof slope and is also classified EXT.S.AA.

Increased Efficiency and Output of a BioSOLAR PV Array

A green roof helps to maximise solar energy generation as the vegetation preserves ambient rooftop temperatures, keeping the modules at optimal output. The cooling effect increases panel output by up to 5-7%.

Productivity in the Workplace

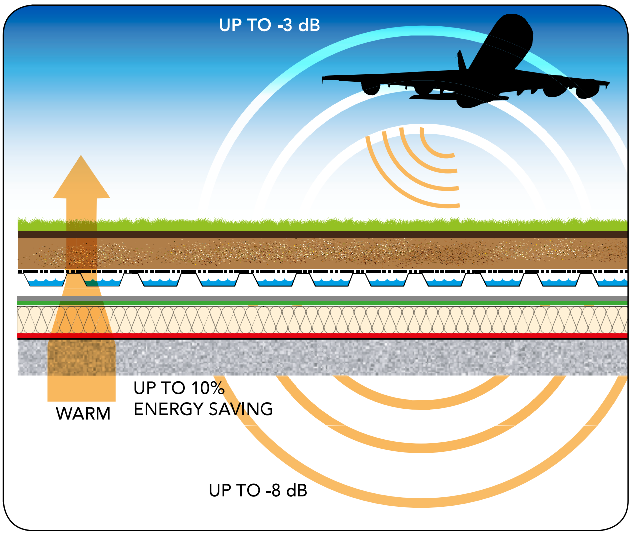
Research has shown that people working in offices that overlook green spaces have a higher productivity and a reduction in stress levels than those with a poorer outlook on a hard, impervious buildings.

Health

Hospitals are greening overlooked roofs or incorporating rooftop garden areas for the benefit of patients as they find that this speeds recovery.

Reduction of external noise within the building

Green roofs have excellent acoustic qualities for both external sound (up to 3dB) and internal noise (up to 8dB). This can prove to be both economically and environmentally effective when used on structures close to airports or industrial developments.



Reduced Building Running Costs

The enhanced thermal performance provided by a green roof provides a more balanced temperature within the building. This reduces heating costs in the winter and air conditioning expenses during the summer.

Reduced Lifecycle Costs

The main reduction in lifecycle costs comes from the green roof providing protection from the damaging effects of the weather, which effectively 'ages' the waterproofing, thus the time span between replacement is extended significantly, and in many cases replacement will become unnecessary.

Aid to Planning Consent

Many local authorities favour planning proposals that incorporate green roofs within the application, particularly if it meets their policies towards a sustainable environment or supports priority species.

Offset Construction Costs

In large construction projects a green roof can mean that storm water holding tanks are reduced in size or no longer required, as the roof itself will retain a proportion of the rainfall.

Creates an Amenity Space

The roof is often an under utilised asset of a building, as it offers the unique potential to replace the land lost to the construction as reusable space. Large roof areas covering underground car parks can provide parkland or sports facilities.

Increases Property Value

As an additional dimension is created, the property will maximise the potential available for the sites, and so increase the value.

Appendix C – Met Eireann Rainfall Data

```
                                            Met Eireann
                          Return Period Rainfall Depths for sliding Durations
                           Irish Grid:  Easting: 321852, Northing: 228993,

               Interval     |                                     Years
DURATION   6months, 1year,  |      2,     3,     4,     5,    10,    20,    30,    50,    75,   100,   120,
  5 mins       2.4,   3.5,  |    4.1,   4.9,   5.5,   6.0,   7.5,   9.3,  10.4,  12.1,  13.6,  14.7,  15.5,
 10 mins       3.4,   4.8,  |    5.6,   6.9,   7.7,   8.3,  10.5,  12.9,  14.5,  16.8,  18.9,  20.5,  21.6,
 15 mins       4.0,   5.7,  |    6.6,   8.1,   9.0,   9.8,  12.3,  15.2,  17.1,  19.8,  22.2,  24.1,  25.4,
 30 mins       5.3,   7.4,  |    8.6,  10.4,  11.6,  12.5,  15.6,  19.1,  21.4,  24.7,  27.6,  29.8,  31.4,
 1 hours       6.9,   9.7,  |   11.2,  13.4,  14.9,  16.0,  19.8,  24.0,  26.8,  30.7,  34.2,  36.9,  38.7,
 2 hours       9.2,  12.6,  |   14.5,  17.2,  19.1,  20.5,  25.1,  30.2,  33.6,  38.3,  42.4,  45.6,  47.8,
 3 hours      10.8,  14.8,  |   16.9,  20.0,  22.0,  23.6,  28.8,  34.6,  38.3,  43.5,  48.1,  51.6,  54.0,
 4 hours      12.1,  16.5,  |   18.8,  22.2,  24.4,  26.2,  31.8,  38.0,  42.0,  47.7,  52.6,  56.4,  58.9,
 6 hours      14.3,  19.3,  |   21.9,  25.7,  28.3,  30.2,  36.5,  43.5,  48.0,  54.2,  59.7,  63.9,  66.7,
 9 hours      16.8,  22.5,  |   25.5,  29.8,  32.7,  34.9,  41.9,  49.7,  54.7,  61.6,  67.7,  72.3,  75.4,
12 hours      18.9,  25.1,  |   28.4,  33.1,  36.2,  38.6,  46.3,  54.7,  60.1,  67.5,  74.0,  78.9,  82.2,
18 hours      22.2,  29.4,  |   33.0,  38.4,  41.9,  44.6,  53.2,  62.5,  68.5,  76.7,  83.9,  89.4,  93.0,
24 hours      24.9,  32.8,  |   36.8,  42.6,  46.5,  49.4,  58.7,  68.7,  75.2,  84.1,  91.8,  97.6, 101.5,
  2 days      30.8,  39.6,  |   44.0,  50.3,  54.5,  57.6,  67.4,  78.0,  84.7,  93.7, 101.6, 107.5, 111.4,
  3 days      35.8,  45.3,  |   50.1,  56.9,  61.3,  64.7,  75.1,  86.2,  93.1, 102.6, 110.7, 116.7, 120.8,
  4 days      40.2,  50.5,  |   55.6,  62.9,  67.5,  71.1,  82.0,  93.6, 100.8, 110.6, 119.0, 125.3, 129.4,
  6 days      48.3,  59.8,  |   65.5,  73.5,  78.6,  82.5,  94.4, 106.9, 114.7, 125.1, 134.0, 140.6, 145.0,
  8 days      55.6,  68.3,  |   74.4,  83.1,  88.6,  92.8, 105.5, 118.8, 127.1, 138.1, 147.5, 154.5, 159.0,
 10 days      62.5,  76.1,  |   82.8,  92.0,  97.9, 102.3, 115.8, 129.9, 138.6, 150.2, 160.0, 167.2, 172.0,
 12 days      69.0,  83.6,  |   90.6, 100.4, 106.7, 111.3, 125.6, 140.3, 149.4, 161.5, 171.7, 179.2, 184.2,
 16 days      81.4,  97.6,  |  105.4, 116.2, 123.1, 128.2, 143.7, 159.7, 169.5, 182.5, 193.4, 201.6, 206.9,
 20 days      93.1, 110.9,  |  119.3, 131.1, 138.5, 144.0, 160.7, 177.8, 188.2, 202.1, 213.7, 222.2, 227.8,
 25 days     107.2, 126.6,  |  135.9, 148.7, 156.7, 162.6, 180.7, 199.0, 210.2, 225.0, 237.4, 246.5, 252.4,

NOTES:
These values are derived from a Depth Duration Frequency (DDF) Model update 2023
For details refer to:
'Mateus C., and Coonan, B. 2023. Estimation of point rainfall frequencies in Ireland. Technical Note No. 68. Met Eireann',
 Available for download at:
 http://hdl.handle.net/2262/102417
```

Appendix D – Attenuation for Zones 1 and 2

Project : **Temple Hill**
Job No : **2511-01**

Return Period: 100 Yrs

Site Area: 2.037 Ha **20371** **m^3**
(Net positively drained area)
Qbar: 6.80 l/s
(Qbar minimum set to 2 l/s for operational purposes)

Surface Water Attenuation Design:
Contribution Areas

	Green Roof Areas	**Area**		**% imperv**	**Equivalent Area**	
	Block A1	0.050	Ha	91.7	0.045	Ha
	Block B1	0.027	Ha	91.7	0.024	Ha
Extensive Green Roof	Block B2	0.027	Ha	91.7	0.024	Ha
	Block B3	0.027	Ha	91.7	0.024	Ha
	Block B4	0.025	Ha	91.7	0.023	Ha
	Podium Roof	0.109	Ha	91.7	0.100	Ha
	Block C1	0.015	Ha	83.4	0.012	Ha
	Block C2	0.024	Ha	83.4	0.020	Ha
	Block C3	0.015	Ha	83.4	0.012	Ha
Intensive Green Roof	Block D1	0.148	Ha	83.4	0.123	Ha
	Block E1	0.077	Ha	83.4	0.064	Ha
	Block E2	0.047	Ha	83.4	0.039	Ha
	Bins/Bike Sheds	0.065	Ha	83.4	0.054	Ha
	Gate Lodge	0.002	Ha	83.4	0.002	Ha
St Teresa`s House		0.033	Ha	95.0	0.032	Ha
Permeable Parking		0.147	Ha	80.0	0.117	Ha
Roads/Paths		0.639	Ha	90.0	0.575	Ha
Other hard areas		0.562	Ha	95.0	0.534	Ha
Total:		**2.037**	**Ha**		**1.827**	**Ha**

Duration (minutes)	Runoff Area (Ha)	Rainfall (mm)	Rainfall + 20% for climate Change + 10% for Urban Creep	Rainfall (m^3/Ha)	Total surface Water (m^3)	Allowable Outflow (m³)	Storage required (m³)
10	1.83	20.50	26.65	266.50	486.93	4.08	482.85
15	1.83	24.10	31.33	313.30	572.44	6.12	566.32
30	1.83	29.80	38.74	387.40	707.82	12.24	695.58
60	1.83	36.90	47.97	479.70	876.47	24.48	851.99
120	1.83	45.60	59.28	592.80	1083.11	48.96	1034.15
240	1.83	56.40	73.32	733.20	1339.64	97.92	1241.72
360	1.83	63.90	83.07	830.70	1517.78	146.88	1370.90
720	1.83	78.90	102.57	1025.70	1874.07	293.76	1580.31
1440	1.83	97.60	126.88	1268.80	2318.24	587.52	1730.72
2880	1.83	107.50	139.75	1397.50	2553.39	1175.04	1378.35
Max Storage Capacity Required incl 20% climate change + 10% Urban Creep							**1730.72**

Attenuation volumes for each zone: Say 1800.00
50% of attenuation volume to be provided in Zone 1 using Stormtech Cells: 900 m^3
50% of attenuation volume to be provided in Zone 2 using Concrete Attenuation Tank: 900 m^3

Extensive green roof effective runoff area 2412 m^2
Intensive green roof effective runoff area 3273 m^2
Total 5685 m^2

Appendix E – Causeway Storm Drain Calculations

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.277	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
48	0.076	5.00	18.441	1200	724844.682	728947.551	1.441
47		5.00	19.165	1200	724803.423	728971.213	1.315
46	0.044	5.00	19.172	1200	724798.764	728939.291	1.272
45		5.00	19.688	1200	724728.932	728900.701	1.688
1		5.00	20.337	1200	724780.075	728868.140	1.687
44	0.008	5.00	21.300	1200	724763.809	728825.907	1.000
43	0.052	5.00	20.000	1200	724777.352	728880.072	1.920
42			19.600	1200	724744.645	728904.587	3.530
41			19.591	1200	724746.766	728907.417	3.541
40	0.032	5.00	20.000	1200	724789.555	728883.155	2.100
39			19.500	1200	724811.544	728901.679	3.100
38	0.051	5.00	19.170	1200	724808.396	728974.235	1.418
37	0.003	5.00	18.594	1350	724838.134	728948.472	1.994
36	0.082	5.00	17.600	1500	724886.827	728929.655	1.500
35			21.300	1200	724776.861	728830.566	1.100
34	0.068	5.00	21.300	1200	724795.107	728820.004	1.200
33			20.300	1200	724843.614	728860.738	2.300
32	0.033	5.00	19.740	1200	724860.844	728875.334	2.640
31	0.043	5.00	19.000	1500	724871.049	728892.805	3.060
30	0.037	5.00	18.600	1500	724819.139	728917.532	2.788
29			19.200	1350	724795.786	728935.367	3.453
28			19.500	1500	724775.721	728929.683	3.799
27			19.605	1500	724765.942	728916.211	3.936
ATT/HB Z1			19.516	1500	724757.564	728922.292	3.867
25			19.500	1200	724760.775	728926.488	3.877
24			19.200	1200	724791.402	728935.164	3.736
23			14.700	1200	724835.551	728996.291	1.000
22			14.400	1200	724814.438	729012.367	0.900
21			14.100	1200	724819.816	729020.622	1.330
20		5.00	17.750	1200	724797.327	729007.046	2.225
J7			17.383	1200	724786.653	728993.299	3.633
18	0.380	5.00	16.500	1200	724782.036	729015.504	3.400
J6	0.031	5.00	16.651	1200	724772.619	729003.287	4.901
16		5.00	16.525	1200	724730.955	729043.975	1.525
15			16.278	1350	724765.983	729007.995	4.628
14	0.009	5.00	16.600	1200	724616.402	728913.463	2.025
13	0.038	5.00	18.100	1200	724707.784	728928.851	4.237
12			19.550	1200	724739.042	728908.343	5.874
11	0.015	5.00	18.500	1350	724760.883	728936.195	5.001
10	0.054	5.00	18.500	1350	724764.552	728955.371	5.099

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
9	0.015	5.00	17.400	1350	724783.708	728980.338	4.900
ATT/HB Z2	0.013	5.00	16.181	1350	724763.624	729009.954	4.741
J1			16.190		724625.914	728915.064	1.890
6			13.354	1200	724784.031	729035.492	2.104
5	0.072	5.00	16.800	1200	724626.479	728907.666	2.050
4			12.200	1200	724728.641	729075.850	1.380
3			12.250	1200	724725.938	729081.443	1.575
2			12.250	1200	724722.909	729086.928	1.650
7		5.00	17.307	1200	724656.857	728913.697	1.807
J2	0.113	5.00	16.963		724656.292	728920.180	2.839
J3	0.012	5.00	17.831		724689.196	728925.721	3.874
8	0.122	5.00	18.082		724688.070	728919.915	1.582
26	0.301	5.00	19.658	1200	724812.748	728893.952	2.158
49		5.00	19.904		724757.912	728884.506	1.429
J4			19.796		724760.359	728892.809	1.846
Depth/Area 1		5.00	18.439		724828.177	728962.261	1.239
J5			18.836		724825.751	728959.419	1.742
J8	0.037	5.00	17.808		724776.184	728970.531	4.483
J9			17.445		724782.249	728978.375	4.170
17	0.085	5.00	17.956		724781.465	728966.554	1.476
19		5.00	17.161		724772.732	728985.689	1.475

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
44	44	35	13.859	0.600	20.300	20.200	0.100	138.6	150	5.27	38.7
35	35	34	21.083	0.600	20.200	20.100	0.100	210.8	150	5.78	37.4
34	34	33	63.342	0.600	20.100	18.000	2.100	30.2	225	6.22	36.3
33	33	32	22.581	0.600	18.000	17.100	0.900	25.1	225	6.37	36.0
32	32	31	20.233	0.600	17.100	16.000	1.100	18.4	225	6.48	35.7
36	36	31	40.086	0.600	16.100	15.940	0.160	250.5	300	5.68	37.6
31	31	30	57.498	0.600	15.940	15.812	0.128	449.2	450	7.48	33.7
47	47	38	5.819	0.600	17.850	17.752	0.098	59.4	150	5.07	39.2
38	38	J5	22.819	0.600	17.775	17.094	0.681	33.5	225	5.24	38.8
Depth/Area 1	Depth/Area 1	J5	3.737	0.600	17.200	17.094	0.106	35.3	150	5.04	39.3
J5	J5	37	16.528	0.600	17.094	16.600	0.494	33.5	225	5.36	38.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
44	0.852	15.0	1.1	0.850	0.950	0.008	0.0
35	0.688	12.2	1.1	0.950	1.050	0.008	0.0
34	2.391	95.1	9.9	0.975	2.075	0.076	0.0
33	2.622	104.3	9.8	2.075	2.415	0.076	0.0
32	3.065	121.9	14.1	2.415	2.775	0.109	0.0
36	0.989	69.9	11.1	1.200	2.760	0.082	0.0
31	0.952	151.5	28.5	2.610	2.338	0.234	0.0
47	1.307	23.1	0.0	1.165	1.268	0.000	0.0
38	2.267	90.2	7.1	1.170	1.517	0.051	0.0
Depth/Area 1	1.701	30.1	0.0	1.089	1.592	0.000	0.0
J5	2.269	90.2	7.1	1.517	1.769	0.051	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
48	48	37	6.612	0.600	17.000	16.600	0.400	16.5	150	5.04	39.3
37	37	30	36.306	0.600	16.600	15.812	0.788	46.1	375	5.59	37.8
40	40	39	28.752	0.600	17.900	16.400	1.500	19.2	225	5.16	39.0
26	26	39	7.820	0.600	17.500	17.344	0.156	50.1	225	5.07	39.2
39	39	30	17.578	0.600	16.400	15.812	0.588	29.9	300	5.26	38.7
30	30	29	29.385	0.600	15.812	15.747	0.065	452.1	450	8.00	32.7
46	46	29	4.926	0.600	17.900	17.703	0.197	25.0	150	5.04	39.3
29	29	28	20.855	0.600	15.747	15.701	0.046	453.4	450	8.37	32.1
28	28	27	16.647	0.600	15.701	15.669	0.032	520.2	525	8.65	31.6
27	27	ATT/HB Z1	10.352	0.600	15.669	15.649	0.020	517.6	525	8.83	31.3
1	1	43	12.239	0.600	18.650	18.080	0.570	21.5	225	5.07	39.2
43	43	J4	21.237	0.600	18.080	17.951	0.129	164.6	225	5.42	38.3
49	49	J4	8.656	0.600	18.475	17.950	0.525	16.5	150	5.06	39.3
J4	J4	42	19.638	0.600	17.951	17.830	0.121	162.3	225	5.74	37.5
42	42	41	3.537	0.600	16.070	16.050	0.020	176.8	225	5.80	37.3
41	41	ATT/HB Z1	18.381	0.600	16.050	15.649	0.401	45.8	300	5.93	37.0
ATT/HB Z1	ATT/HB Z1	25	5.284	0.600	15.649	15.623	0.026	203.2	225	8.92	31.2
25	25	24	31.832	0.600	15.623	15.464	0.159	200.2	225	9.50	30.3
24	24	23	75.403	0.600	15.464	13.700	1.764	42.7	225	10.13	29.4
23	23	22	26.537	0.600	13.700	13.500	0.200	132.7	225	10.52	28.9
22	22	21	9.852	0.600	13.500	12.770	0.730	13.5	225	10.56	28.9
14	14	J1	9.646	0.600	14.575	14.300	0.275	35.1	225	5.07	39.2
5	5	J1	7.420	0.600	14.750	14.300	0.450	16.5	150	5.05	39.3
J1	J1	J2	30.806	0.600	14.300	14.124	0.176	175.0	300	5.51	38.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
48	2.489	44.0	10.8	1.291	1.844	0.076	0.0
37	2.675	295.4	17.8	1.619	2.413	0.130	0.0
40	3.002	119.4	4.6	1.875	2.875	0.032	0.0
26	1.851	73.6	42.7	1.933	1.931	0.301	0.0
39	2.886	204.0	46.7	2.800	2.488	0.334	0.0
30	0.949	151.0	86.9	2.338	3.003	0.734	0.0
46	2.022	35.7	6.3	1.122	1.347	0.044	0.0
29	0.948	150.8	90.3	3.003	3.349	0.779	0.0
28	0.975	211.0	89.0	3.274	3.411	0.779	0.0
27	0.977	211.6	88.2	3.411	3.342	0.779	0.0
1	2.836	112.8	0.0	1.462	1.695	0.000	0.0
43	1.016	40.4	7.2	1.695	1.620	0.052	0.0
49	2.493	44.0	0.0	1.279	1.696	0.000	0.0
J4	1.023	40.7	7.1	1.620	1.545	0.052	0.0
42	0.980	39.0	7.0	3.305	3.316	0.052	0.0
41	2.328	164.6	7.0	3.241	3.567	0.052	0.0
ATT/HB Z1	0.913	36.3	93.7	3.642	3.652	0.831	0.0
25	0.920	36.6	91.1	3.652	3.511	0.831	0.0
24	2.006	79.8	88.4	3.511	0.775	0.831	0.0
23	1.133	45.1	86.9	0.775	0.675	0.831	0.0
22	3.580	142.4	86.7	0.675	1.105	0.831	0.0
14	2.216	88.1	1.2	1.800	1.665	0.009	0.0
5	2.493	44.0	10.2	1.900	1.740	0.072	0.0
J1	1.185	83.8	11.0	1.590	2.539	0.080	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
7	7	J2	6.508	0.600	15.500	15.240	0.260	25.0	150	5.05	39.3
J2	J2	J3	33.367	0.600	14.124	13.957	0.167	199.8	300	6.01	36.8
8	8	J3	5.914	0.600	16.500	16.263	0.237	25.0	150	5.05	39.3
J3	J3	13	18.850	0.600	13.957	13.863	0.094	200.5	300	6.29	36.2
13	13	12	37.385	0.600	13.863	13.676	0.187	199.9	300	6.85	34.9
45	45	12	12.673	0.600	18.000	17.747	0.253	50.1	150	5.15	39.0
12	12	11	35.394	0.600	13.676	13.499	0.177	200.0	300	7.39	33.9
11	11	10	19.524	0.600	13.499	13.401	0.098	199.2	375	7.64	33.4
10	10	J8	19.108	0.600	13.401	13.325	0.076	251.4	375	7.92	32.9
17	17	J8	6.611	0.600	16.480	16.348	0.132	50.1	150	5.08	39.2
J8	J8	J9	9.915	0.600	13.325	13.275	0.050	198.3	375	8.05	32.6
19	19	J9	12.003	0.600	15.686	15.446	0.240	50.0	150	5.14	39.0
J9	J9	9	2.446	0.600	13.275	13.259	0.016	152.9	375	8.08	32.6
9	9	ATT/HB Z2	35.784	0.600	12.500	11.460	1.040	34.4	375	8.27	32.3
16	16	15	56.605	0.600	15.000	13.050	1.950	29.0	225	5.39	38.4
20	20	J7	17.404	0.600	15.525	13.750	1.775	9.8	225	5.07	39.2
J7	J7	J6	17.225	0.600	13.750	13.250	0.500	34.5	300	5.18	38.9
18	18	J6	15.425	0.600	13.100	11.825	1.275	12.1	225	5.07	39.3
J6	J6	15	8.136	0.600	11.750	11.650	0.100	81.4	300	5.25	38.7
15	15	ATT/HB Z2	3.066	0.600	11.650	11.600	0.050	61.3	450	5.41	38.3
ATT/HB Z2	ATT/HB Z2	6	32.691	0.600	11.440	11.250	0.190	172.1	225	8.82	31.4
6	6	4	68.533	0.600	11.250	10.820	0.430	159.4	225	9.92	29.7
4	4	3	6.212	0.600	10.820	10.675	0.145	42.8	225	9.98	29.7
3	3	2	6.266	0.600	10.675	10.600	0.075	83.5	225	10.05	29.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
7	2.021	35.7	0.0	1.657	1.573	0.000	0.0
J2	1.108	78.3	25.7	2.539	3.574	0.193	0.0
8	2.024	35.8	17.4	1.432	1.418	0.122	0.0
J3	1.106	78.2	42.7	3.574	3.937	0.327	0.0
13	1.108	78.3	46.2	3.937	5.574	0.366	0.0
45	1.425	25.2	0.0	1.538	1.653	0.000	0.0
12	1.108	78.3	44.7	5.574	4.701	0.366	0.0
11	1.280	141.3	45.9	4.626	4.724	0.381	0.0
10	1.138	125.7	51.7	4.724	4.108	0.435	0.0
17	1.425	25.2	12.1	1.326	1.310	0.085	0.0
J8	1.283	141.7	65.8	4.108	3.795	0.558	0.0
19	1.426	25.2	0.0	1.325	1.849	0.000	0.0
J9	1.463	161.6	65.7	3.795	3.766	0.558	0.0
9	3.097	342.1	66.8	4.525	4.346	0.573	0.0
16	2.437	96.9	0.0	1.300	3.003	0.000	0.0
20	4.203	167.1	0.0	2.000	3.408	0.000	0.0
J7	2.687	189.9	0.0	3.333	3.101	0.000	0.0
18	3.782	150.4	53.9	3.175	4.601	0.380	0.0
J6	1.744	123.3	57.6	4.601	4.328	0.411	0.0
15	2.599	413.4	56.9	4.178	4.131	0.411	0.0
ATT/HB Z2	0.994	39.5	113.0	4.516	1.879	0.997	0.0
6	1.033	41.1	107.1	1.879	1.155	0.997	0.0
4	2.004	79.7	106.8	1.155	1.350	0.997	0.0
3	1.431	56.9	106.4	1.350	1.425	0.997	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
44	13.859	138.6	150	Circular	21.300	20.300	0.850	21.300	20.200	0.950
35	21.083	210.8	150	Circular	21.300	20.200	0.950	21.300	20.100	1.050
34	63.342	30.2	225	Circular	21.300	20.100	0.975	20.300	18.000	2.075
33	22.581	25.1	225	Circular	20.300	18.000	2.075	19.740	17.100	2.415
32	20.233	18.4	225	Circular	19.740	17.100	2.415	19.000	16.000	2.775
36	40.086	250.5	300	Circular	17.600	16.100	1.200	19.000	15.940	2.760
31	57.498	449.2	450	Circular	19.000	15.940	2.610	18.600	15.812	2.338
47	5.819	59.4	150	Circular	19.165	17.850	1.165	19.170	17.752	1.268
38	22.819	33.5	225	Circular	19.170	17.775	1.170	18.836	17.094	1.517
Depth/Area 1	3.737	35.3	150	Circular	18.439	17.200	1.089	18.836	17.094	1.592
J5	16.528	33.5	225	Circular	18.836	17.094	1.517	18.594	16.600	1.769
48	6.612	16.5	150	Circular	18.441	17.000	1.291	18.594	16.600	1.844
37	36.306	46.1	375	Circular	18.594	16.600	1.619	18.600	15.812	2.413
40	28.752	19.2	225	Circular	20.000	17.900	1.875	19.500	16.400	2.875
26	7.820	50.1	225	Circular	19.658	17.500	1.933	19.500	17.344	1.931
39	17.578	29.9	300	Circular	19.500	16.400	2.800	18.600	15.812	2.488
30	29.385	452.1	450	Circular	18.600	15.812	2.338	19.200	15.747	3.003
46	4.926	25.0	150	Circular	19.172	17.900	1.122	19.200	17.703	1.347
29	20.855	453.4	450	Circular	19.200	15.747	3.003	19.500	15.701	3.349
28	16.647	520.2	525	Circular	19.500	15.701	3.274	19.605	15.669	3.411
27	10.352	517.6	525	Circular	19.605	15.669	3.411	19.516	15.649	3.342
1	12.239	21.5	225	Circular	20.337	18.650	1.462	20.000	18.080	1.695
43	21.237	164.6	225	Circular	20.000	18.080	1.695	19.796	17.951	1.620
49	8.656	16.5	150	Circular	19.904	18.475	1.279	19.796	17.950	1.696
J4	19.638	162.3	225	Circular	19.796	17.951	1.620	19.600	17.830	1.545

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
44	44	1200	Manhole	Adoptable	35	1200	Manhole	Adoptable
35	35	1200	Manhole	Adoptable	34	1200	Manhole	Adoptable
34	34	1200	Manhole	Adoptable	33	1200	Manhole	Adoptable
33	33	1200	Manhole	Adoptable	32	1200	Manhole	Adoptable
32	32	1200	Manhole	Adoptable	31	1500	Manhole	Adoptable
36	36	1500	Manhole	Adoptable	31	1500	Manhole	Adoptable
31	31	1500	Manhole	Adoptable	30	1500	Manhole	Adoptable
47	47	1200	Manhole	Adoptable	38	1200	Manhole	Adoptable
38	38	1200	Manhole	Adoptable	J5		Junction	
Depth/Area 1	Depth/Area 1		Manhole	Adoptable	J5		Junction	
J5	J5		Junction		37	1350	Manhole	Adoptable
48	48	1200	Manhole	Adoptable	37	1350	Manhole	Adoptable
37	37	1350	Manhole	Adoptable	30	1500	Manhole	Adoptable
40	40	1200	Manhole	Adoptable	39	1200	Manhole	Adoptable
26	26	1200	Manhole	Adoptable	39	1200	Manhole	Adoptable
39	39	1200	Manhole	Adoptable	30	1500	Manhole	Adoptable
30	30	1500	Manhole	Adoptable	29	1350	Manhole	Adoptable
46	46	1200	Manhole	Adoptable	29	1350	Manhole	Adoptable
29	29	1350	Manhole	Adoptable	28	1500	Manhole	Adoptable
28	28	1500	Manhole	Adoptable	27	1500	Manhole	Adoptable
27	27	1500	Manhole	Adoptable	ATT/HB Z1	1500	Manhole	Adoptable
1	1	1200	Manhole	Adoptable	43	1200	Manhole	Adoptable
43	43	1200	Manhole	Adoptable	J4		Junction	
49	49		Manhole	Adoptable	J4		Junction	
J4	J4		Junction		42	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
42	3.537	176.8	225	Circular	19.600	16.070	3.305	19.591	16.050	3.316
41	18.381	45.8	300	Circular	19.591	16.050	3.241	19.516	15.649	3.567
ATT/HB Z1	5.284	203.2	225	Circular	19.516	15.649	3.642	19.500	15.623	3.652
25	31.832	200.2	225	Circular	19.500	15.623	3.652	19.200	15.464	3.511
24	75.403	42.7	225	Circular	19.200	15.464	3.511	14.700	13.700	0.775
23	26.537	132.7	225	Circular	14.700	13.700	0.775	14.400	13.500	0.675
22	9.852	13.5	225	Circular	14.400	13.500	0.675	14.100	12.770	1.105
14	9.646	35.1	225	Circular	16.600	14.575	1.800	16.190	14.300	1.665
5	7.420	16.5	150	Circular	16.800	14.750	1.900	16.190	14.300	1.740
J1	30.806	175.0	300	Circular	16.190	14.300	1.590	16.963	14.124	2.539
7	6.508	25.0	150	Circular	17.307	15.500	1.657	16.963	15.240	1.573
J2	33.367	199.8	300	Circular	16.963	14.124	2.539	17.831	13.957	3.574
8	5.914	25.0	150	Circular	18.082	16.500	1.432	17.831	16.263	1.418
J3	18.850	200.5	300	Circular	17.831	13.957	3.574	18.100	13.863	3.937
13	37.385	199.9	300	Circular	18.100	13.863	3.937	19.550	13.676	5.574
45	12.673	50.1	150	Circular	19.688	18.000	1.538	19.550	17.747	1.653
12	35.394	200.0	300	Circular	19.550	13.676	5.574	18.500	13.499	4.701
11	19.524	199.2	375	Circular	18.500	13.499	4.626	18.500	13.401	4.724
10	19.108	251.4	375	Circular	18.500	13.401	4.724	17.808	13.325	4.108
17	6.611	50.1	150	Circular	17.956	16.480	1.326	17.808	16.348	1.310
J8	9.915	198.3	375	Circular	17.808	13.325	4.108	17.445	13.275	3.795
19	12.003	50.0	150	Circular	17.161	15.686	1.325	17.445	15.446	1.849
J9	2.446	152.9	375	Circular	17.445	13.275	3.795	17.400	13.259	3.766
9	35.784	34.4	375	Circular	17.400	12.500	4.525	16.181	11.460	4.346
16	56.605	29.0	225	Circular	16.525	15.000	1.300	16.278	13.050	3.003

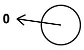
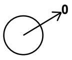
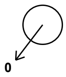
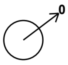
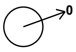
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
42	42	1200	Manhole	Adoptable	41	1200	Manhole	Adoptable
41	41	1200	Manhole	Adoptable	ATT/HB Z1	1500	Manhole	Adoptable
ATT/HB Z1	ATT/HB Z1	1500	Manhole	Adoptable	25	1200	Manhole	Adoptable
25	25	1200	Manhole	Adoptable	24	1200	Manhole	Adoptable
24	24	1200	Manhole	Adoptable	23	1200	Manhole	Adoptable
23	23	1200	Manhole	Adoptable	22	1200	Manhole	Adoptable
22	22	1200	Manhole	Adoptable	21	1200	Manhole	Adoptable
14	14	1200	Manhole	Adoptable	J1		Junction	
5	5	1200	Manhole	Adoptable	J1		Junction	
J1	J1		Junction		J2		Junction	
7	7	1200	Manhole	Adoptable	J2		Junction	
J2	J2		Junction		J3		Junction	
8	8		Manhole	Adoptable	J3		Junction	
J3	J3		Junction		13	1200	Manhole	Adoptable
13	13	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
45	45	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
12	12	1200	Manhole	Adoptable	11	1350	Manhole	Adoptable
11	11	1350	Manhole	Adoptable	10	1350	Manhole	Adoptable
10	10	1350	Manhole	Adoptable	J8		Junction	
17	17		Manhole	Adoptable	J8		Junction	
J8	J8		Junction		J9		Junction	
19	19		Manhole	Adoptable	J9		Junction	
J9	J9		Junction		9	1350	Manhole	Adoptable
9	9	1350	Manhole	Adoptable	ATT/HB Z2	1350	Manhole	Adoptable
16	16	1200	Manhole	Adoptable	15	1350	Manhole	Adoptable

Pipeline Schedule

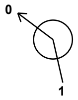
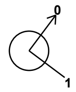
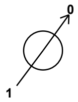
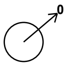
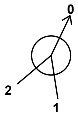
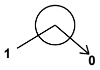
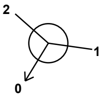
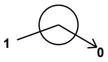
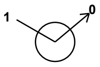
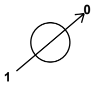
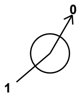
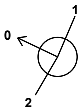
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
20	17.404	9.8	225	Circular	17.750	15.525	2.000	17.383	13.750	3.408
J7	17.225	34.5	300	Circular	17.383	13.750	3.333	16.651	13.250	3.101
18	15.425	12.1	225	Circular	16.500	13.100	3.175	16.651	11.825	4.601
J6	8.136	81.4	300	Circular	16.651	11.750	4.601	16.278	11.650	4.328
15	3.066	61.3	450	Circular	16.278	11.650	4.178	16.181	11.600	4.131
ATT/HB Z2	32.691	172.1	225	Circular	16.181	11.440	4.516	13.354	11.250	1.879
6	68.533	159.4	225	Circular	13.354	11.250	1.879	12.200	10.820	1.155
4	6.212	42.8	225	Circular	12.200	10.820	1.155	12.250	10.675	1.350
3	6.266	83.5	225	Circular	12.250	10.675	1.350	12.250	10.600	1.425

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
20	20	1200	Manhole	Adoptable	J7	1200	Junction	
J7	J7	1200	Junction		J6	1200	Junction	
18	18	1200	Manhole	Adoptable	J6	1200	Junction	
J6	J6	1200	Junction		15	1350	Manhole	Adoptable
15	15	1350	Manhole	Adoptable	ATT/HB Z2	1350	Manhole	Adoptable
ATT/HB Z2	ATT/HB Z2	1350	Manhole	Adoptable	6	1200	Manhole	Adoptable
6	6	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
4	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3	3	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable

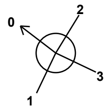
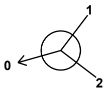
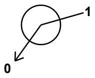
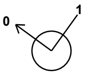
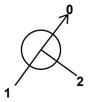
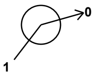
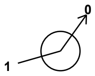
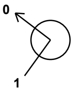
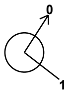
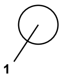
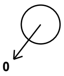
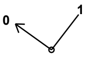
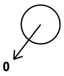
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
48	724844.682	728947.551	18.441	1.441	1200	 0	48	17.000	150
47	724803.423	728971.213	19.165	1.315	1200	 0	47	17.850	150
46	724798.764	728939.291	19.172	1.272	1200	 0	46	17.900	150
45	724728.932	728900.701	19.688	1.688	1200	 0	45	18.000	150
1	724780.075	728868.140	20.337	1.687	1200	 0	1	18.650	225
44	724763.809	728825.907	21.300	1.000	1200	 0	44	20.300	150

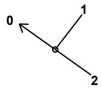
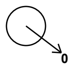
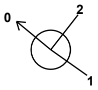
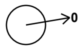
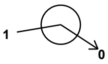
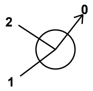
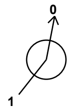
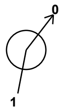
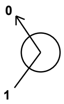
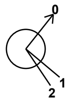
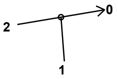
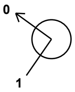
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
43	724777.352	728880.072	20.000	1.920	1200		1	1	18.080	225
							0	43	18.080	225
42	724744.645	728904.587	19.600	3.530	1200		1	J4	17.830	225
							0	42	16.070	225
41	724746.766	728907.417	19.591	3.541	1200		1	42	16.050	225
							0	41	16.050	300
40	724789.555	728883.155	20.000	2.100	1200		0	40	17.900	225
39	724811.544	728901.679	19.500	3.100	1200		1	26	17.344	225
							2	40	16.400	225
							0	39	16.400	300
38	724808.396	728974.235	19.170	1.418	1200		1	47	17.752	150
							0	38	17.775	225
37	724838.134	728948.472	18.594	1.994	1350		1	48	16.600	150
							2	J5	16.600	225
							0	37	16.600	375
36	724886.827	728929.655	17.600	1.500	1500		0	36	16.100	300
35	724776.861	728830.566	21.300	1.100	1200		1	44	20.200	150
							0	35	20.200	150
34	724795.107	728820.004	21.300	1.200	1200		1	35	20.100	150
							0	34	20.100	225
33	724843.614	728860.738	20.300	2.300	1200		1	34	18.000	225
							0	33	18.000	225
32	724860.844	728875.334	19.740	2.640	1200		1	33	17.100	225
							0	32	17.100	225
31	724871.049	728892.805	19.000	3.060	1500		1	36	15.940	300
							2	32	16.000	225
							0	31	15.940	450

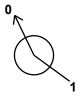
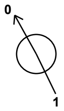
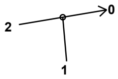
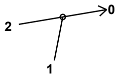
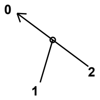
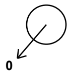
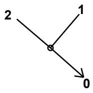
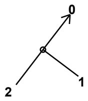
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
30	724819.139	728917.532	18.600	2.788	1500		1	39	15.812	300
							2	37	15.812	375
							3	31	15.812	450
							0	30	15.812	450
29	724795.786	728935.367	19.200	3.453	1350		1	46	17.703	150
							2	30	15.747	450
							0	29	15.747	450
28	724775.721	728929.683	19.500	3.799	1500		1	29	15.701	450
							0	28	15.701	525
27	724765.942	728916.211	19.605	3.936	1500		1	28	15.669	525
							0	27	15.669	525
ATT/HB Z1	724757.564	728922.292	19.516	3.867	1500		1	41	15.649	300
							2	27	15.649	525
							0	ATT/HB Z1	15.649	225
25	724760.775	728926.488	19.500	3.877	1200		1	ATT/HB Z1	15.623	225
							0	25	15.623	225
24	724791.402	728935.164	19.200	3.736	1200		1	25	15.464	225
							0	24	15.464	225
23	724835.551	728996.291	14.700	1.000	1200		1	24	13.700	225
							0	23	13.700	225
22	724814.438	729012.367	14.400	0.900	1200		1	23	13.500	225
							0	22	13.500	225
21	724819.816	729020.622	14.100	1.330	1200		1	22	12.770	225
20	724797.327	729007.046	17.750	2.225	1200		0	20	15.525	225
J7	724786.653	728993.299	17.383	3.633	1200		1	20	13.750	225
							0	J7	13.750	300
18	724782.036	729015.504	16.500	3.400	1200		0	18	13.100	225

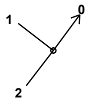
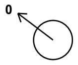
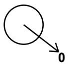
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
J6	724772.619	729003.287	16.651	4.901	1200		1	18	11.825	225
							2	J7	13.250	300
							0	J6	11.750	300
16	724730.955	729043.975	16.525	1.525	1200		0	16	15.000	225
15	724765.983	729007.995	16.278	4.628	1350		1	J6	11.650	300
							2	16	13.050	225
							0	15	11.650	450
14	724616.402	728913.463	16.600	2.025	1200		0	14	14.575	225
13	724707.784	728928.851	18.100	4.237	1200		1	J3	13.863	300
							0	13	13.863	300
12	724739.042	728908.343	19.550	5.874	1200		1	45	17.747	150
							2	13	13.676	300
							0	12	13.676	300
11	724760.883	728936.195	18.500	5.001	1350		1	12	13.499	300
							0	11	13.499	375
10	724764.552	728955.371	18.500	5.099	1350		1	11	13.401	375
							0	10	13.401	375
9	724783.708	728980.338	17.400	4.900	1350		1	J9	13.259	375
							0	9	12.500	375
ATT/HB Z2	724763.624	729009.954	16.181	4.741	1350		1	15	11.600	450
							2	9	11.460	375
							0	ATT/HB Z2	11.440	225
J1	724625.914	728915.064	16.190	1.890			1	5	14.300	150
							2	14	14.300	225
							0	J1	14.300	300
6	724784.031	729035.492	13.354	2.104	1200		1	ATT/HB Z2	11.250	225
							0	6	11.250	225
5	724626.479	728907.666	16.800	2.050	1200		0	5	14.750	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
4	724728.641	729075.850	12.200	1.380	1200		1	6	10.820	225
							0	4	10.820	225
3	724725.938	729081.443	12.250	1.575	1200		1	4	10.675	225
							0	3	10.675	225
2	724722.909	729086.928	12.250	1.650	1200		1	3	10.600	225
7	724656.857	728913.697	17.307	1.807	1200					
							0	7	15.500	150
J2	724656.292	728920.180	16.963	2.839			1	7	15.240	150
							2	J1	14.124	300
							0	J2	14.124	300
J3	724689.196	728925.721	17.831	3.874			1	8	16.263	150
							2	J2	13.957	300
							0	J3	13.957	300
8	724688.070	728919.915	18.082	1.582						
							0	8	16.500	150
26	724812.748	728893.952	19.658	2.158	1200					
							0	26	17.500	225
49	724757.912	728884.506	19.904	1.429						
							0	49	18.475	150
J4	724760.359	728892.809	19.796	1.846			1	49	17.950	150
							2	43	17.951	225
							0	J4	17.951	225
Depth/Area 1	724828.177	728962.261	18.439	1.239						
							0	Depth/Area 1	17.200	150
J5	724825.751	728959.419	18.836	1.742			1	Depth/Area 1	17.094	150
							2	38	17.094	225
							0	J5	17.094	225
J8	724776.184	728970.531	17.808	4.483			1	17	16.348	150
							2	10	13.325	375
							0	J8	13.325	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
J9	724782.249	728978.375	17.445	4.170			1	19	15.446	150
							2	J8	13.275	375
							0	J9	13.275	375
17	724781.465	728966.554	17.956	1.476			0	17	16.480	150
19	724772.732	728985.689	17.161	1.475			0	19	15.686	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	0.0
M5-60 (mm)	16.000	Starting Level (m)	
Ratio-R	0.277	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Detailed		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
10	20	10	0
20	20	10	0
30	20	10	0
50	20	10	0
75	20	10	0
100	20	10	0
120	20	10	0

Node ATT/HB Z1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	15.649	Product Number	CTL-SHE-0082-3400-1400-3400
Design Depth (m)	1.400	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.4	Min Node Diameter (mm)	1200

Node ATT/HB Z2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	11.440	Product Number	CTL-SHE-0074-3400-2110-3400
Design Depth (m)	2.110	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.4	Min Node Diameter (mm)	1200

Node ATT/HB Z1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	15.649
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.60	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	850.0	0.0	1.500	850.0	0.0	1.501	0.0	0.0

Node ATT/HB Z2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	11.440
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	490.0	0.0	2.110	490.0	0.0	2.111	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.059	0.059	12.9	0.0664	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.951	0.051	7.5	0.0578	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.330	0.030	1.3	0.0342	0.0000	OK
15 minute summer	43	10	18.152	0.072	8.8	0.0809	0.0000	OK
15 minute summer	42	10	16.146	0.076	8.6	0.0858	0.0000	OK
15 minute summer	41	9	16.116	0.066	8.7	0.0747	0.0000	OK
15 minute summer	40	10	17.933	0.033	5.5	0.0369	0.0000	OK
15 minute summer	39	10	16.507	0.107	56.3	0.1205	0.0000	OK
15 minute summer	38	10	17.822	0.070	8.7	0.0797	0.0000	OK
15 minute summer	37	10	16.668	0.068	21.9	0.0973	0.0000	OK
15 minute summer	36	12	16.251	0.151	17.2	0.2669	0.0000	OK
15 minute summer	35	11	20.233	0.033	1.3	0.0369	0.0000	OK
15 minute summer	34	10	20.156	0.056	12.7	0.0634	0.0000	OK
15 minute summer	33	11	18.053	0.053	12.4	0.0596	0.0000	OK
15 minute summer	32	11	17.158	0.058	17.9	0.0658	0.0000	OK
15 minute summer	31	12	16.245	0.305	42.9	0.5395	0.0000	OK
15 minute summer	30	12	16.213	0.401	103.2	0.7091	0.0000	OK
15 minute summer	29	11	16.177	0.429	121.6	0.6146	0.0000	OK
15 minute summer	28	11	16.160	0.459	130.5	0.8107	0.0000	OK
15 minute summer	27	11	16.147	0.478	140.0	0.8447	0.0000	OK
1440 minute summer	ATT/HB Z1	990	16.009	0.360	14.3	184.2445	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	12.8	1.818	0.292	0.0468	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0236	
15 minute summer	46	46	29	7.5	1.501	0.209	0.0245	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0663	
15 minute summer	44	44	35	1.3	0.516	0.087	0.0369	
15 minute summer	43	43	J4	8.6	0.807	0.213	0.2273	
15 minute summer	42	42	41	8.7	0.930	0.223	0.0376	
15 minute summer	41	41	ATT/HB Z1	9.0	1.870	0.055	0.2232	
15 minute summer	40	40	39	5.4	0.522	0.046	0.3168	
15 minute summer	39	39	30	56.0	1.330	0.274	0.8157	
15 minute summer	38	38	J5	8.6	1.436	0.096	0.1371	
15 minute summer	37	37	30	21.6	0.456	0.073	2.2478	
15 minute summer	36	36	31	23.9	0.558	0.341	2.1236	
15 minute summer	35	35	34	1.3	0.305	0.105	0.0925	
15 minute summer	34	34	33	12.4	1.706	0.131	0.4657	
15 minute summer	33	33	32	12.5	1.650	0.120	0.1713	
15 minute summer	32	32	31	17.9	1.830	0.147	0.4791	
15 minute summer	31	31	30	52.4	0.511	0.346	7.5823	
15 minute summer	30	30	29	117.7	0.886	0.779	4.3979	
15 minute summer	29	29	28	130.5	1.015	0.865	3.2779	
15 minute summer	28	28	27	140.0	1.082	0.664	3.3847	
15 minute summer	27	27	ATT/HB Z1	149.7	2.344	0.708	1.0768	
1440 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
1440 minute summer	25	990	15.670	0.047	3.1	0.0530	0.0000	OK
1440 minute summer	24	990	15.494	0.030	3.1	0.0344	0.0000	OK
1440 minute summer	23	990	13.744	0.044	3.1	0.0492	0.0000	OK
1440 minute summer	22	990	13.524	0.024	3.1	0.0267	0.0000	OK
1440 minute summer	21	990	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.207	0.107	64.5	0.1209	0.0000	OK
2880 minute summer	J6	1980	11.992	0.242	4.8	0.0000	0.0000	OK
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	1920	11.992	0.342	9.9	0.4898	0.0000	OK
15 minute summer	14	10	14.595	0.020	1.5	0.0230	0.0000	OK
15 minute summer	13	11	14.072	0.209	60.2	0.2365	0.0000	OK
15 minute summer	12	11	13.883	0.207	60.5	0.2342	0.0000	OK
15 minute summer	11	12	13.693	0.194	61.9	0.2779	0.0000	OK
15 minute summer	10	12	13.612	0.211	69.4	0.3017	0.0000	OK
15 minute summer	9	12	12.637	0.137	89.6	0.1955	0.0000	OK
2880 minute summer	ATT/HB Z2	1980	11.992	0.552	20.9	271.2127	0.0000	SURCHARGED
15 minute summer	J1	10	14.380	0.080	13.5	0.0000	0.0000	OK
120 minute summer	6	132	11.290	0.040	2.5	0.0448	0.0000	OK
15 minute summer	5	10	14.804	0.054	12.1	0.0607	0.0000	OK
120 minute summer	4	132	10.848	0.028	2.5	0.0311	0.0000	OK
120 minute summer	3	132	10.708	0.033	2.5	0.0378	0.0000	OK
120 minute summer	2	132	10.632	0.032	2.5	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
1440 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
1440 minute summer	24	24	23	3.1	0.738	0.039	0.3226	
1440 minute summer	23	23	22	3.1	0.849	0.069	0.1004	
1440 minute summer	22	22	21	3.1	1.444	0.022	0.0213	224.2
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	64.2	3.560	0.427	0.2784	
2880 minute summer	J6	J6	15	4.8	0.882	0.039	0.5341	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	15.2	0.746	0.037	0.4227	
15 minute summer	14	14	J1	1.5	0.224	0.017	0.0696	
15 minute summer	13	13	12	60.5	1.163	0.772	1.9495	
15 minute summer	12	12	11	59.4	1.195	0.759	1.7612	
15 minute summer	11	11	10	62.2	1.029	0.440	1.1849	
15 minute summer	10	10	J8	70.2	1.117	0.559	1.2217	
15 minute summer	9	9	ATT/HB Z2	90.2	2.576	0.264	1.2540	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.5				
15 minute summer	J1	J1	J2	13.3	0.603	0.159	0.6874	
120 minute summer	6	6	4	2.5	0.677	0.061	0.2553	
15 minute summer	5	5	J1	12.1	1.590	0.274	0.0565	
120 minute summer	4	4	3	2.5	0.779	0.031	0.0200	
120 minute summer	3	3	2	2.5	0.702	0.044	0.0223	46.4
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.86%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	J2	11	14.255	0.131	32.4	0.0000	0.0000	OK
15 minute summer	J3	11	14.152	0.195	54.3	0.0000	0.0000	OK
15 minute summer	8	10	16.588	0.088	20.7	0.0000	0.0000	OK
15 minute summer	26	10	17.663	0.163	51.1	0.1842	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.022	0.072	8.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.141	0.047	8.6	0.0000	0.0000	OK
15 minute summer	J8	11	13.537	0.212	87.5	0.0000	0.0000	OK
15 minute summer	J9	12	13.490	0.215	87.4	0.0000	0.0000	OK
15 minute summer	17	10	16.566	0.086	14.4	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	J2	J2	J3	31.8	0.814	0.406	1.3044	
15 minute summer	J3	J3	13	54.0	1.073	0.691	0.9517	
15 minute summer	8	8	J3	20.6	2.007	0.577	0.0608	
15 minute summer	26	26	39	50.8	1.814	0.690	0.2187	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0363	
15 minute summer	J4	J4	42	8.6	0.814	0.212	0.2085	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0087	
15 minute summer	J5	J5	37	8.6	1.077	0.095	0.1325	
15 minute summer	J8	J8	J9	87.4	1.350	0.617	0.6420	
15 minute summer	J9	J9	9	87.6	1.428	0.542	0.1500	
15 minute summer	17	17	J8	14.4	1.423	0.570	0.0667	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 3 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.063	0.063	14.3	0.0707	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.955	0.055	8.4	0.0617	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.332	0.032	1.5	0.0363	0.0000	OK
15 minute summer	43	10	18.156	0.076	9.8	0.0858	0.0000	OK
15 minute summer	42	10	16.150	0.080	9.6	0.0903	0.0000	OK
15 minute summer	41	9	16.119	0.069	9.7	0.0777	0.0000	OK
15 minute summer	40	10	17.934	0.034	6.1	0.0389	0.0000	OK
15 minute summer	39	10	16.513	0.113	62.4	0.1273	0.0000	OK
15 minute summer	38	10	17.825	0.073	9.6	0.0825	0.0000	OK
15 minute summer	37	10	16.672	0.072	24.3	0.1024	0.0000	OK
15 minute summer	36	12	16.360	0.260	15.4	0.4588	0.0000	OK
15 minute summer	35	11	20.235	0.035	1.5	0.0392	0.0000	OK
15 minute summer	34	10	20.159	0.059	14.1	0.0670	0.0000	OK
15 minute summer	33	11	18.056	0.056	13.9	0.0631	0.0000	OK
15 minute summer	32	11	17.161	0.061	19.9	0.0694	0.0000	OK
15 minute summer	31	12	16.269	0.329	42.6	0.5806	0.0000	OK
15 minute summer	30	12	16.236	0.424	121.6	0.7496	0.0000	OK
15 minute summer	29	11	16.204	0.457	140.5	0.6540	0.0000	SURCHARGED
15 minute summer	28	11	16.181	0.480	145.6	0.8474	0.0000	OK
15 minute summer	27	11	16.167	0.498	151.9	0.8808	0.0000	OK
1440 minute summer	ATT/HB Z1	990	16.042	0.393	15.2	200.8899	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	14.2	1.871	0.324	0.0503	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0247	
15 minute summer	46	46	29	8.3	1.543	0.234	0.0267	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0719	
15 minute summer	44	44	35	1.5	0.527	0.098	0.0399	
15 minute summer	43	43	J4	9.6	0.832	0.238	0.2464	
15 minute summer	42	42	41	9.7	0.974	0.249	0.0398	
15 minute summer	41	41	ATT/HB Z1	10.0	1.903	0.061	0.2561	
15 minute summer	40	40	39	6.0	0.538	0.051	0.3403	
15 minute summer	39	39	30	62.1	1.351	0.304	0.8311	
15 minute summer	38	38	J5	9.5	1.478	0.106	0.1472	
15 minute summer	37	37	30	24.0	0.465	0.081	2.2661	
15 minute summer	36	36	31	17.7	0.566	0.254	2.7100	
15 minute summer	35	35	34	1.4	0.320	0.118	0.0998	
15 minute summer	34	34	33	13.9	1.756	0.146	0.5030	
15 minute summer	33	33	32	13.9	1.700	0.134	0.1852	
15 minute summer	32	32	31	20.0	1.866	0.164	0.4909	
15 minute summer	31	31	30	67.8	0.530	0.447	8.0185	
15 minute summer	30	30	29	136.2	0.941	0.902	4.5872	
15 minute summer	29	29	28	145.6	1.054	0.965	3.3043	
15 minute summer	28	28	27	151.9	1.137	0.720	3.4861	
15 minute summer	27	27	ATT/HB Z1	160.4	2.412	0.758	1.1078	
1440 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 3 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute summer	25	555	15.670	0.047	3.1	0.0530	0.0000	OK
720 minute summer	24	555	15.494	0.030	3.1	0.0344	0.0000	OK
720 minute summer	23	555	13.744	0.044	3.1	0.0492	0.0000	OK
720 minute summer	22	555	13.524	0.024	3.1	0.0267	0.0000	OK
720 minute summer	21	555	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.213	0.113	71.6	0.1283	0.0000	OK
2880 minute summer	J6	2040	12.049	0.299	5.1	0.0000	0.0000	OK
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2040	12.049	0.399	7.3	0.5709	0.0000	OK
15 minute summer	14	11	14.596	0.021	1.6	0.0239	0.0000	OK
15 minute summer	13	11	14.091	0.228	66.8	0.2574	0.0000	OK
15 minute summer	12	11	13.901	0.225	67.0	0.2539	0.0000	OK
15 minute summer	11	12	13.707	0.208	68.5	0.2978	0.0000	OK
15 minute summer	10	12	13.626	0.225	76.9	0.3226	0.0000	OK
15 minute summer	9	12	12.645	0.145	99.3	0.2072	0.0000	OK
2880 minute summer	ATT/HB Z2	2040	12.049	0.609	22.1	299.2730	0.0000	SURCHARGED
15 minute summer	J1	10	14.385	0.085	15.1	0.0000	0.0000	OK
120 minute summer	6	244	11.290	0.040	2.5	0.0448	0.0000	OK
15 minute summer	5	10	14.807	0.057	13.5	0.0644	0.0000	OK
120 minute summer	4	246	10.848	0.028	2.5	0.0311	0.0000	OK
120 minute summer	3	246	10.708	0.033	2.5	0.0378	0.0000	OK
120 minute summer	2	246	10.632	0.032	2.5	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
720 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
720 minute summer	24	24	23	3.1	0.738	0.039	0.3227	
720 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
720 minute summer	22	22	21	3.1	1.445	0.022	0.0214	133.0
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	71.4	3.604	0.475	0.3069	
2880 minute summer	J6	J6	15	5.5	0.895	0.045	0.5727	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	14.8	0.724	0.036	0.4705	
15 minute summer	14	14	J1	1.6	0.231	0.018	0.0748	
15 minute summer	13	13	12	67.0	1.183	0.855	2.1292	
15 minute summer	12	12	11	65.9	1.217	0.841	1.9142	
15 minute summer	11	11	10	68.9	1.050	0.487	1.2881	
15 minute summer	10	10	J8	77.8	1.144	0.619	1.3227	
15 minute summer	9	9	ATT/HB Z2	100.0	2.645	0.292	1.3534	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.5				
15 minute summer	J1	J1	J2	14.9	0.621	0.177	0.7434	
120 minute summer	6	6	4	2.5	0.677	0.061	0.2553	
15 minute summer	5	5	J1	13.5	1.647	0.305	0.0607	
120 minute summer	4	4	3	2.5	0.779	0.031	0.0200	
120 minute summer	3	3	2	2.5	0.702	0.044	0.0223	46.8
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 3 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	11	14.263	0.139	36.0	0.0000	0.0000	OK
15 minute summer	J3	11	14.169	0.212	60.4	0.0000	0.0000	OK
15 minute summer	8	10	16.595	0.095	23.0	0.0000	0.0000	OK
15 minute summer	26	10	17.677	0.177	56.7	0.2004	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.026	0.076	9.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.143	0.049	9.5	0.0000	0.0000	OK
15 minute summer	J8	11	13.551	0.226	97.1	0.0000	0.0000	OK
15 minute summer	J9	12	13.504	0.229	96.7	0.0000	0.0000	OK
15 minute summer	17	10	16.572	0.092	16.0	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	35.3	0.830	0.451	1.4219	
15 minute summer	J3	J3	13	59.9	1.091	0.766	1.0418	
15 minute summer	8	8	J3	22.9	2.051	0.641	0.0661	
15 minute summer	26	26	39	56.4	1.846	0.766	0.2379	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0390	
15 minute summer	J4	J4	42	9.6	0.839	0.237	0.2259	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0093	
15 minute summer	J5	J5	37	9.5	1.109	0.105	0.1422	
15 minute summer	J8	J8	J9	96.7	1.385	0.683	0.6928	
15 minute summer	J9	J9	9	97.0	1.466	0.601	0.1619	
15 minute summer	17	17	J8	15.9	1.456	0.633	0.0724	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 4 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.065	0.065	15.4	0.0741	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.957	0.057	9.0	0.0642	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.333	0.033	1.6	0.0376	0.0000	OK
15 minute summer	43	10	18.159	0.079	10.6	0.0895	0.0000	OK
15 minute summer	42	10	16.153	0.083	10.4	0.0935	0.0000	OK
15 minute summer	41	9	16.121	0.071	10.5	0.0804	0.0000	OK
15 minute summer	40	10	17.936	0.036	6.6	0.0404	0.0000	OK
15 minute summer	39	10	16.517	0.117	67.3	0.1326	0.0000	OK
15 minute summer	38	10	17.827	0.075	10.3	0.0845	0.0000	OK
15 minute summer	37	10	16.674	0.074	26.1	0.1061	0.0000	OK
15 minute summer	36	12	16.350	0.250	23.8	0.4426	0.0000	OK
15 minute summer	35	11	20.236	0.036	1.6	0.0405	0.0000	OK
15 minute summer	34	10	20.162	0.061	15.2	0.0696	0.0000	OK
15 minute summer	33	11	18.058	0.058	14.9	0.0655	0.0000	OK
15 minute summer	32	11	17.164	0.064	21.4	0.0720	0.0000	OK
15 minute summer	31	12	16.335	0.395	58.7	0.6984	0.0000	OK
15 minute summer	30	11	16.270	0.458	145.0	0.8098	0.0000	SURCHARGED
15 minute summer	29	11	16.229	0.482	152.2	0.6899	0.0000	SURCHARGED
15 minute summer	28	11	16.189	0.488	161.4	0.8620	0.0000	OK
15 minute summer	27	11	16.167	0.498	169.0	0.8793	0.0000	OK
1440 minute summer	ATT/HB Z1	1020	16.070	0.421	16.0	215.5756	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	15.3	1.911	0.349	0.0531	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0255	
15 minute summer	46	46	29	8.9	1.569	0.251	0.0281	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0762	
15 minute summer	44	44	35	1.6	0.530	0.104	0.0418	
15 minute summer	43	43	J4	10.4	0.849	0.258	0.2604	
15 minute summer	42	42	41	10.5	1.005	0.269	0.0413	
15 minute summer	41	41	ATT/HB Z1	10.8	1.955	0.066	0.2822	
15 minute summer	40	40	39	6.5	0.551	0.055	0.3586	
15 minute summer	39	39	30	66.9	1.361	0.328	0.8430	
15 minute summer	38	38	J5	10.2	1.508	0.114	0.1549	
15 minute summer	37	37	30	25.8	0.470	0.087	2.2801	
15 minute summer	36	36	31	32.2	0.571	0.461	2.6707	
15 minute summer	35	35	34	1.5	0.320	0.126	0.1047	
15 minute summer	34	34	33	14.9	1.791	0.157	0.5300	
15 minute summer	33	33	32	15.0	1.735	0.144	0.1950	
15 minute summer	32	32	31	21.4	1.897	0.176	0.4955	
15 minute summer	31	31	30	60.9	0.478	0.402	8.7769	
15 minute summer	30	30	29	147.4	0.976	0.976	4.6559	
15 minute summer	29	29	28	161.4	1.116	1.071	3.3043	
15 minute summer	28	28	27	169.0	1.165	0.801	3.5042	
15 minute summer	27	27	ATT/HB Z1	176.2	2.492	0.833	1.1094	
1440 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 4 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	25	376	15.670	0.047	3.1	0.0530	0.0000	OK
480 minute summer	24	376	15.494	0.030	3.1	0.0344	0.0000	OK
480 minute summer	23	384	13.744	0.044	3.1	0.0492	0.0000	OK
480 minute summer	22	376	13.524	0.024	3.1	0.0267	0.0000	OK
480 minute summer	21	376	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.218	0.118	77.1	0.1334	0.0000	OK
2160 minute summer	J6	1680	12.096	0.346	6.3	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2160 minute summer	15	1680	12.096	0.446	6.7	0.6386	0.0000	OK
15 minute summer	14	10	14.597	0.022	1.8	0.0251	0.0000	OK
15 minute summer	13	11	14.107	0.244	71.9	0.2755	0.0000	OK
15 minute summer	12	11	13.915	0.239	71.9	0.2701	0.0000	OK
15 minute summer	11	12	13.718	0.219	73.4	0.3131	0.0000	OK
15 minute summer	10	12	13.638	0.237	82.5	0.3385	0.0000	OK
15 minute summer	9	12	12.651	0.151	106.5	0.2157	0.0000	OK
2160 minute summer	ATT/HB Z2	1680	12.096	0.656	18.4	322.4953	0.0000	SURCHARGED
15 minute summer	J1	10	14.388	0.088	16.2	0.0000	0.0000	OK
8640 minute summer	6	6780	11.290	0.040	2.5	0.0448	0.0000	OK
15 minute summer	5	10	14.809	0.059	14.5	0.0669	0.0000	OK
8640 minute summer	4	6780	10.848	0.028	2.5	0.0311	0.0000	OK
8640 minute summer	3	6780	10.708	0.033	2.5	0.0378	0.0000	OK
8640 minute summer	2	6780	10.632	0.032	2.5	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
480 minute summer	24	24	23	3.1	0.738	0.039	0.3227	
480 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
480 minute summer	22	22	21	3.1	1.445	0.022	0.0214	103.2
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	76.9	3.593	0.511	0.3314	
2160 minute summer	J6	J6	15	6.7	0.939	0.054	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2160 minute summer	15	15	ATT/HB Z2	9.5	0.780	0.023	0.4855	
15 minute summer	14	14	J1	1.8	0.237	0.020	0.0789	
15 minute summer	13	13	12	71.9	1.195	0.918	2.2697	
15 minute summer	12	12	11	70.7	1.231	0.903	2.0322	
15 minute summer	11	11	10	73.9	1.066	0.523	1.3663	
15 minute summer	10	10	J8	83.4	1.163	0.664	1.3978	
15 minute summer	9	9	ATT/HB Z2	107.3	2.692	0.314	1.4261	
2160 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.5				
15 minute summer	J1	J1	J2	16.0	0.632	0.191	0.7845	
8640 minute summer	6	6	4	2.5	0.677	0.061	0.2553	
15 minute summer	5	5	J1	14.4	1.684	0.328	0.0637	
8640 minute summer	4	4	3	2.5	0.779	0.031	0.0200	
8640 minute summer	3	3	2	2.5	0.702	0.044	0.0223	809.4
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 4 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	11	14.269	0.145	38.8	0.0000	0.0000	OK
15 minute summer	J3	11	14.183	0.226	65.0	0.0000	0.0000	OK
15 minute summer	8	10	16.600	0.100	24.8	0.0000	0.0000	OK
15 minute summer	26	10	17.690	0.190	61.1	0.2144	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.030	0.080	10.4	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.145	0.051	10.2	0.0000	0.0000	OK
15 minute summer	J8	11	13.562	0.237	104.4	0.0000	0.0000	OK
15 minute summer	J9	12	13.514	0.239	103.8	0.0000	0.0000	OK
15 minute summer	17	10	16.578	0.098	17.3	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	38.0	0.838	0.486	1.5166	
15 minute summer	J3	J3	13	64.5	1.101	0.824	1.1153	
15 minute summer	8	8	J3	24.7	2.082	0.691	0.0702	
15 minute summer	26	26	39	60.7	1.866	0.825	0.2530	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0410	
15 minute summer	J4	J4	42	10.4	0.857	0.256	0.2387	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0098	
15 minute summer	J5	J5	37	10.2	1.133	0.113	0.1494	
15 minute summer	J8	J8	J9	103.8	1.409	0.733	0.7308	
15 minute summer	J9	J9	9	104.1	1.492	0.644	0.1706	
15 minute summer	17	17	J8	17.2	1.480	0.685	0.0770	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	48	10	17.067	0.067	16.1	0.0761	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.958	0.058	9.4	0.0659	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.334	0.034	1.7	0.0388	0.0000	OK
15 minute summer	43	10	18.161	0.081	11.1	0.0918	0.0000	OK
15 minute summer	42	10	16.155	0.085	10.9	0.0956	0.0000	OK
15 minute summer	41	9	16.122	0.072	11.0	0.0817	0.0000	OK
15 minute summer	40	10	17.937	0.037	6.9	0.0413	0.0000	OK
15 minute summer	39	10	16.520	0.120	70.5	0.1361	0.0000	OK
15 minute summer	38	10	17.828	0.076	10.9	0.0862	0.0000	OK
15 minute summer	37	10	16.676	0.076	27.5	0.1087	0.0000	OK
15 minute summer	36	12	16.347	0.247	36.4	0.4356	0.0000	OK
15 minute summer	35	11	20.237	0.037	1.7	0.0418	0.0000	OK
15 minute summer	34	10	20.163	0.063	15.9	0.0712	0.0000	OK
15 minute summer	33	11	18.059	0.059	15.7	0.0672	0.0000	OK
15 minute summer	32	11	17.165	0.065	22.4	0.0738	0.0000	OK
15 minute summer	31	12	16.344	0.404	48.9	0.7139	0.0000	OK
15 minute summer	30	12	16.319	0.507	168.9	0.8956	0.0000	SURCHARGED
15 minute summer	29	11	16.242	0.495	170.3	0.7079	0.0000	SURCHARGED
15 minute summer	28	11	16.192	0.491	167.5	0.8679	0.0000	OK
15 minute summer	27	10	16.175	0.506	170.9	0.8941	0.0000	OK
1440 minute summer	ATT/HB Z1	1020	16.085	0.436	16.3	222.9052	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	48	48	37	16.0	1.932	0.365	0.0549	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0262	
15 minute summer	46	46	29	9.4	1.586	0.262	0.0291	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0789	
15 minute summer	44	44	35	1.7	0.541	0.111	0.0438	
15 minute summer	43	43	J4	10.9	0.860	0.270	0.2697	
15 minute summer	42	42	41	11.0	1.026	0.282	0.0422	
15 minute summer	41	41	ATT/HB Z1	11.3	1.984	0.069	0.3003	
15 minute summer	40	40	39	6.8	0.557	0.057	0.3703	
15 minute summer	39	39	30	70.2	1.371	0.344	0.8509	
15 minute summer	38	38	J5	10.8	1.532	0.120	0.1612	
15 minute summer	37	37	30	27.2	0.476	0.092	2.2915	
15 minute summer	36	36	31	21.2	0.579	0.304	2.6531	
15 minute summer	35	35	34	1.6	0.327	0.134	0.1088	
15 minute summer	34	34	33	15.7	1.814	0.165	0.5494	
15 minute summer	33	33	32	15.7	1.759	0.151	0.2019	
15 minute summer	32	32	31	22.5	1.907	0.185	0.4987	
15 minute summer	31	31	30	80.7	0.510	0.533	8.8671	
15 minute summer	30	30	29	162.7	1.027	1.077	4.6559	
15 minute summer	29	29	28	167.5	1.110	1.111	3.3043	
15 minute summer	28	28	27	170.9	1.186	0.810	3.5139	
15 minute summer	27	27	ATT/HB Z1	181.9	2.549	0.860	1.1103	
1440 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
720 minute summer	25	435	15.670	0.047	3.1	0.0530	0.0000	OK
360 minute summer	24	304	15.494	0.030	3.1	0.0344	0.0000	OK
360 minute summer	23	312	13.744	0.044	3.1	0.0492	0.0000	OK
360 minute summer	22	312	13.524	0.024	3.1	0.0267	0.0000	OK
360 minute summer	21	312	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.221	0.121	80.9	0.1371	0.0000	OK
2160 minute summer	J6	1740	12.136	0.386	6.5	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2160 minute summer	15	1740	12.136	0.486	6.5	0.6951	0.0000	SURCHARGED
15 minute summer	14	10	14.598	0.023	1.9	0.0257	0.0000	OK
15 minute summer	13	11	14.119	0.256	75.4	0.2898	0.0000	OK
15 minute summer	12	11	13.925	0.249	75.2	0.2821	0.0000	OK
15 minute summer	11	12	13.725	0.226	76.7	0.3236	0.0000	OK
15 minute summer	10	12	13.645	0.244	86.5	0.3496	0.0000	OK
15 minute summer	9	12	12.655	0.155	111.5	0.2215	0.0000	OK
2160 minute summer	ATT/HB Z2	1740	12.136	0.696	24.9	341.9142	0.0000	SURCHARGED
15 minute summer	J1	10	14.390	0.090	17.0	0.0000	0.0000	OK
5760 minute summer	6	5880	11.290	0.040	2.5	0.0448	0.0000	OK
15 minute summer	5	10	14.811	0.061	15.2	0.0687	0.0000	OK
5760 minute summer	4	5880	10.848	0.028	2.5	0.0311	0.0000	OK
5760 minute summer	3	5880	10.708	0.033	2.5	0.0378	0.0000	OK
5760 minute summer	2	5880	10.632	0.032	2.5	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
720 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
360 minute summer	24	24	23	3.1	0.738	0.039	0.3227	
360 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
360 minute summer	22	22	21	3.1	1.445	0.022	0.0214	87.7
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	80.7	3.588	0.537	0.3481	
2160 minute summer	J6	J6	15	6.5	0.950	0.053	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2160 minute summer	15	15	ATT/HB Z2	15.8	0.791	0.038	0.4858	
15 minute summer	14	14	J1	1.9	0.242	0.021	0.0816	
15 minute summer	13	13	12	75.2	1.201	0.961	2.3682	
15 minute summer	12	12	11	74.1	1.239	0.946	2.1136	
15 minute summer	11	11	10	77.3	1.075	0.547	1.4198	
15 minute summer	10	10	J8	87.3	1.175	0.695	1.4495	
15 minute summer	9	9	ATT/HB Z2	112.3	2.723	0.328	1.4762	
2160 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.5				
15 minute summer	J1	J1	J2	16.8	0.640	0.200	0.8141	
5760 minute summer	6	6	4	2.5	0.677	0.061	0.2553	
15 minute summer	5	5	J1	15.2	1.709	0.344	0.0658	
5760 minute summer	4	4	3	2.5	0.779	0.031	0.0200	
5760 minute summer	3	3	2	2.5	0.702	0.044	0.0223	618.0
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.85%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	11	14.274	0.150	40.8	0.0000	0.0000	OK
15 minute summer	J3	11	14.195	0.238	68.3	0.0000	0.0000	OK
15 minute summer	8	10	16.604	0.104	26.0	0.0000	0.0000	OK
15 minute summer	26	10	17.699	0.199	64.1	0.2252	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.032	0.082	10.9	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.146	0.052	10.8	0.0000	0.0000	OK
15 minute summer	J8	11	13.570	0.245	109.4	0.0000	0.0000	OK
15 minute summer	J9	12	13.521	0.246	108.7	0.0000	0.0000	OK
15 minute summer	17	10	16.581	0.101	18.1	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	40.0	0.843	0.510	1.5863	
15 minute summer	J3	J3	13	67.6	1.106	0.864	1.1691	
15 minute summer	8	8	J3	25.9	2.100	0.725	0.0730	
15 minute summer	26	26	39	63.7	1.874	0.865	0.2634	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0423	
15 minute summer	J4	J4	42	10.9	0.868	0.268	0.2470	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0102	
15 minute summer	J5	J5	37	10.7	1.155	0.119	0.1549	
15 minute summer	J8	J8	J9	108.7	1.426	0.767	0.7569	
15 minute summer	J9	J9	9	109.0	1.509	0.675	0.1766	
15 minute summer	17	17	J8	18.0	1.493	0.716	0.0799	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 10 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.090	0.090	24.6	0.1015	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.976	0.076	14.4	0.0856	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.342	0.042	2.5	0.0475	0.0000	OK
15 minute summer	43	10	18.183	0.103	16.9	0.1162	0.0000	OK
2160 minute summer	42	1680	16.416	0.346	1.2	0.3910	0.0000	SURCHARGED
2160 minute summer	41	1680	16.416	0.366	1.2	0.4136	0.0000	SURCHARGED
15 minute summer	40	10	17.945	0.045	10.5	0.0507	0.0000	OK
15 minute summer	39	11	16.932	0.532	107.4	0.6019	0.0000	SURCHARGED
15 minute summer	38	10	17.841	0.089	16.6	0.1008	0.0000	OK
15 minute summer	37	11	16.745	0.145	41.9	0.2077	0.0000	OK
15 minute summer	36	10	16.945	0.845	26.5	1.4930	0.0000	SURCHARGED
15 minute summer	35	11	20.245	0.045	2.5	0.0513	0.0000	OK
15 minute summer	34	10	20.179	0.079	24.3	0.0890	0.0000	OK
15 minute summer	33	11	18.074	0.074	24.0	0.0841	0.0000	OK
15 minute summer	32	11	17.181	0.081	34.3	0.0920	0.0000	OK
15 minute summer	31	11	16.740	0.800	81.8	1.4130	0.0000	SURCHARGED
15 minute summer	30	11	16.692	0.880	237.1	1.5555	0.0000	SURCHARGED
15 minute summer	29	11	16.462	0.715	252.3	1.0230	0.0000	SURCHARGED
2160 minute summer	28	1680	16.416	0.715	16.8	1.2629	0.0000	SURCHARGED
2160 minute summer	27	1680	16.416	0.747	16.5	1.3194	0.0000	SURCHARGED
2160 minute summer	ATT/HB Z1	1680	16.416	0.767	17.4	392.3732	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	24.5	2.170	0.557	0.0908	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0317	
15 minute summer	46	46	29	14.3	1.749	0.401	0.0403	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1080	
15 minute summer	44	44	35	2.5	0.599	0.164	0.0584	
15 minute summer	43	43	J4	16.7	0.956	0.413	0.3705	
2160 minute summer	42	42	41	1.2	0.561	0.031	0.1407	
2160 minute summer	41	41	ATT/HB Z1	1.2	0.196	0.007	1.2944	
15 minute summer	40	40	39	10.4	0.573	0.087	0.6522	
15 minute summer	39	39	30	112.4	1.596	0.551	1.2378	
15 minute summer	38	38	J5	16.5	1.724	0.183	0.2182	
15 minute summer	37	37	30	41.5	0.524	0.141	2.7165	
15 minute summer	36	36	31	27.6	0.616	0.395	2.8228	
15 minute summer	35	35	34	2.4	0.366	0.201	0.1445	
15 minute summer	34	34	33	24.0	2.029	0.252	0.7492	
15 minute summer	33	33	32	23.9	1.967	0.230	0.2749	
15 minute summer	32	32	31	34.4	1.888	0.282	0.5331	
15 minute summer	31	31	30	80.1	0.538	0.528	9.1102	
15 minute summer	30	30	29	240.8	1.520	1.594	4.6559	
15 minute summer	29	29	28	255.4	1.612	1.694	3.3043	
2160 minute summer	28	28	27	16.5	0.307	0.078	3.5963	
2160 minute summer	27	27	ATT/HB Z1	16.4	0.588	0.077	2.2364	
2160 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 10 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
180 minute summer	25	108	15.670	0.047	3.1	0.0530	0.0000	OK
120 minute summer	24	316	15.494	0.030	3.1	0.0344	0.0000	OK
120 minute summer	23	322	13.744	0.044	3.1	0.0492	0.0000	OK
120 minute summer	22	320	13.524	0.024	3.1	0.0267	0.0000	OK
120 minute summer	21	320	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.258	0.158	123.3	0.1792	0.0000	OK
4320 minute summer	J6	3000	12.598	0.848	6.4	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
4320 minute summer	15	3000	12.598	0.948	6.4	1.3570	0.0000	SURCHARGED
15 minute summer	14	12	14.755	0.180	5.1	0.2034	0.0000	OK
15 minute summer	13	12	14.511	0.648	100.2	0.7325	0.0000	SURCHARGED
15 minute summer	12	12	14.139	0.463	100.7	0.5238	0.0000	SURCHARGED
15 minute summer	11	12	13.796	0.297	104.4	0.4256	0.0000	OK
15 minute summer	10	12	13.724	0.323	118.4	0.4615	0.0000	OK
15 minute summer	9	12	12.690	0.190	157.2	0.2718	0.0000	OK
4320 minute summer	ATT/HB Z2	3000	12.598	1.158	15.9	569.2153	0.0000	SURCHARGED
15 minute summer	J1	12	14.752	0.452	26.9	0.0000	0.0000	SURCHARGED
4320 minute summer	6	3000	11.290	0.040	2.6	0.0456	0.0000	OK
15 minute summer	5	11	14.853	0.103	23.2	0.1170	0.0000	OK
4320 minute summer	4	3000	10.848	0.028	2.6	0.0317	0.0000	OK
4320 minute summer	3	3000	10.709	0.034	2.6	0.0385	0.0000	OK
4320 minute summer	2	3000	10.633	0.033	2.6	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
180 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
120 minute summer	24	24	23	3.1	0.738	0.039	0.3227	
120 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
120 minute summer	22	22	21	3.1	1.445	0.022	0.0214	58.5
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	123.1	3.582	0.819	0.5330	
4320 minute summer	J6	J6	15	6.4	0.808	0.052	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
4320 minute summer	15	15	ATT/HB Z2	7.8	0.702	0.019	0.4858	
15 minute summer	14	14	J1	3.6	0.265	0.041	0.3559	
15 minute summer	13	13	12	100.7	1.430	1.285	2.6326	
15 minute summer	12	12	11	100.5	1.427	1.283	2.4908	
15 minute summer	11	11	10	104.5	1.131	0.740	1.8999	
15 minute summer	10	10	J8	118.9	1.242	0.946	1.9212	
15 minute summer	9	9	ATT/HB Z2	157.6	2.951	0.461	1.9111	
4320 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.6				
15 minute summer	J1	J1	J2	29.6	0.688	0.353	2.1693	
4320 minute summer	6	6	4	2.6	0.684	0.063	0.2618	
15 minute summer	5	5	J1	23.2	1.942	0.526	0.1134	
4320 minute summer	4	4	3	2.6	0.786	0.032	0.0205	
4320 minute summer	3	3	2	2.6	0.709	0.045	0.0229	555.0
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 10 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.68%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	14.737	0.613	58.2	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	14.658	0.701	90.3	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	16.767	0.267	39.6	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	17.992	0.492	97.8	0.5568	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.053	0.103	16.7	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.159	0.065	16.5	0.0000	0.0000	OK
15 minute summer	J8	12	13.645	0.320	151.5	0.0000	0.0000	OK
15 minute summer	J9	12	13.595	0.320	152.9	0.0000	0.0000	OK
15 minute summer	17	10	16.683	0.203	27.6	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	54.0	0.863	0.689	2.3497	
15 minute summer	J3	J3	13	90.4	1.284	1.156	1.3274	
15 minute summer	8	8	J3	39.0	2.216	1.091	0.1041	
15 minute summer	26	26	39	97.0	2.439	1.318	0.3081	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0556	
15 minute summer	J4	J4	42	16.6	0.970	0.408	0.3362	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0136	
15 minute summer	J5	J5	37	16.4	1.312	0.181	0.3003	
15 minute summer	J8	J8	J9	152.9	1.527	1.079	0.9930	
15 minute summer	J9	J9	9	153.3	1.614	0.949	0.2317	
15 minute summer	17	17	J8	27.3	1.581	1.083	0.1150	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 20 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.122	0.122	28.6	0.1378	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.983	0.083	16.7	0.0943	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.346	0.046	3.0	0.0522	0.0000	OK
15 minute summer	43	10	18.192	0.112	19.6	0.1268	0.0000	OK
2160 minute summer	42	1740	16.544	0.474	1.4	0.5356	0.0000	SURCHARGED
2160 minute summer	41	1740	16.544	0.494	1.4	0.5582	0.0000	SURCHARGED
15 minute summer	40	10	17.948	0.048	12.2	0.0546	0.0000	OK
15 minute summer	39	11	17.130	0.730	124.6	0.8260	0.0000	SURCHARGED
15 minute summer	38	10	17.846	0.094	19.2	0.1068	0.0000	OK
15 minute summer	37	11	16.894	0.294	48.9	0.4204	0.0000	OK
15 minute summer	36	10	16.928	0.828	30.7	1.4622	0.0000	SURCHARGED
15 minute summer	35	11	20.250	0.050	2.9	0.0561	0.0000	OK
15 minute summer	34	10	20.185	0.085	28.3	0.0967	0.0000	OK
15 minute summer	33	10	18.079	0.079	27.9	0.0898	0.0000	OK
15 minute summer	32	10	17.202	0.102	40.6	0.1155	0.0000	OK
15 minute summer	31	10	16.927	0.987	98.0	1.7437	0.0000	SURCHARGED
15 minute summer	30	10	16.845	1.033	275.9	1.8252	0.0000	SURCHARGED
15 minute summer	29	10	16.600	0.853	291.9	1.2203	0.0000	SURCHARGED
2160 minute summer	28	1740	16.544	0.843	18.9	1.4888	0.0000	SURCHARGED
2160 minute summer	27	1740	16.544	0.875	18.8	1.5454	0.0000	SURCHARGED
2160 minute summer	ATT/HB Z1	1740	16.544	0.895	19.9	457.8104	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	28.8	2.241	0.654	0.1089	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0340	
15 minute summer	46	46	29	16.6	1.805	0.465	0.0453	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1208	
15 minute summer	44	44	35	2.9	0.622	0.196	0.0660	
15 minute summer	43	43	J4	19.4	0.990	0.479	0.4153	
2160 minute summer	42	42	41	1.4	0.546	0.036	0.1407	
2160 minute summer	41	41	ATT/HB Z1	1.3	0.179	0.008	1.2944	
15 minute summer	40	40	39	12.1	0.608	0.102	0.6613	
15 minute summer	39	39	30	119.9	1.702	0.588	1.2378	
15 minute summer	38	38	J5	19.1	1.795	0.212	0.2426	
15 minute summer	37	37	30	68.3	0.634	0.231	3.6838	
15 minute summer	36	36	31	31.0	0.605	0.444	2.8228	
15 minute summer	35	35	34	2.9	0.383	0.238	0.1616	
15 minute summer	34	34	33	27.9	2.120	0.294	0.8339	
15 minute summer	33	33	32	28.1	1.936	0.270	0.3390	
15 minute summer	32	32	31	39.7	1.872	0.326	0.5795	
15 minute summer	31	31	30	104.8	0.661	0.692	9.1102	
15 minute summer	30	30	29	276.4	1.744	1.830	4.6559	
15 minute summer	29	29	28	293.5	1.852	1.946	3.3043	
2160 minute summer	28	28	27	18.8	0.310	0.089	3.5963	
2160 minute summer	27	27	ATT/HB Z1	18.7	0.589	0.088	2.2364	
2160 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 20 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
120 minute summer	25	72	15.670	0.047	3.1	0.0530	0.0000	OK
60 minute summer	24	164	15.494	0.030	3.1	0.0344	0.0000	OK
60 minute summer	23	170	13.744	0.044	3.1	0.0492	0.0000	OK
60 minute summer	22	168	13.524	0.024	3.1	0.0267	0.0000	OK
60 minute summer	21	168	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.293	0.193	143.1	0.2186	0.0000	OK
2880 minute summer	J6	2280	12.775	1.025	9.2	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2280	12.775	1.125	9.2	1.6102	0.0000	SURCHARGED
15 minute summer	14	12	15.122	0.547	14.0	0.6183	0.0000	SURCHARGED
15 minute summer	13	12	14.813	0.950	115.2	1.0740	0.0000	SURCHARGED
15 minute summer	12	12	14.344	0.668	112.9	0.7557	0.0000	SURCHARGED
15 minute summer	11	12	13.893	0.394	117.8	0.5634	0.0000	SURCHARGED
15 minute summer	10	12	13.795	0.394	134.6	0.5641	0.0000	SURCHARGED
2880 minute summer	9	2280	12.775	0.275	12.7	0.3939	0.0000	OK
2880 minute summer	ATT/HB Z2	2280	12.775	1.335	22.1	656.1869	0.0000	SURCHARGED
15 minute summer	J1	12	15.119	0.819	29.3	0.0000	0.0000	SURCHARGED
2880 minute summer	6	2280	11.292	0.042	2.8	0.0471	0.0000	OK
15 minute summer	5	12	15.256	0.506	27.0	0.5718	0.0000	SURCHARGED
2880 minute summer	4	2280	10.849	0.029	2.8	0.0327	0.0000	OK
2880 minute summer	3	2280	10.710	0.035	2.8	0.0398	0.0000	OK
2880 minute summer	2	2280	10.634	0.034	2.8	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
120 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
60 minute summer	24	24	23	3.1	0.739	0.039	0.3227	
60 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
60 minute summer	22	22	21	3.1	1.445	0.022	0.0214	50.8
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	142.5	3.638	0.947	0.5867	
2880 minute summer	J6	J6	15	9.2	0.840	0.074	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	9.6	0.700	0.023	0.4858	
15 minute summer	14	14	J1	-10.7	0.275	-0.121	0.3836	
15 minute summer	13	13	12	112.9	1.604	1.442	2.6326	
15 minute summer	12	12	11	113.3	1.609	1.446	2.4924	
15 minute summer	11	11	10	118.5	1.131	0.838	2.1534	
15 minute summer	10	10	J8	135.1	1.270	1.075	2.1016	
2880 minute summer	9	9	ATT/HB Z2	12.7	0.717	0.037	3.5248	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.8				
15 minute summer	J1	J1	J2	35.4	0.688	0.422	2.1693	
2880 minute summer	6	6	4	2.8	0.697	0.067	0.2741	
15 minute summer	5	5	J1	25.4	2.030	0.576	0.1306	
2880 minute summer	4	4	3	2.8	0.799	0.035	0.0215	
2880 minute summer	3	3	2	2.8	0.723	0.049	0.0239	409.1
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 20 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.61%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	15.099	0.975	67.6	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.000	1.043	104.0	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	16.890	0.390	46.0	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	18.142	0.642	113.5	0.7255	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.062	0.112	19.4	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.164	0.070	19.1	0.0000	0.0000	OK
15 minute summer	J8	12	13.692	0.367	172.6	0.0000	0.0000	OK
15 minute summer	J9	12	13.627	0.352	173.0	0.0000	0.0000	OK
15 minute summer	17	10	16.751	0.271	32.1	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	61.3	0.876	0.782	2.3497	
15 minute summer	J3	J3	13	101.4	1.439	1.296	1.3274	
15 minute summer	8	8	J3	45.2	2.566	1.263	0.1031	
15 minute summer	26	26	39	112.4	2.828	1.527	0.3079	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0610	
15 minute summer	J4	J4	42	19.3	1.007	0.473	0.3757	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0150	
15 minute summer	J5	J5	37	19.0	1.340	0.210	0.4137	
15 minute summer	J8	J8	J9	173.0	1.591	1.221	1.0768	
15 minute summer	J9	J9	9	173.3	1.691	1.072	0.2490	
15 minute summer	17	17	J8	31.7	1.799	1.258	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.253	0.253	31.2	0.2860	0.0000	SURCHARGED
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.988	0.088	18.2	0.1000	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.348	0.048	3.2	0.0543	0.0000	OK
15 minute summer	43	10	18.198	0.118	21.4	0.1337	0.0000	OK
2160 minute summer	42	1800	16.632	0.561	1.5	0.6351	0.0000	SURCHARGED
2160 minute summer	41	1800	16.632	0.581	1.4	0.6577	0.0000	SURCHARGED
15 minute summer	40	10	17.950	0.050	13.3	0.0570	0.0000	OK
15 minute summer	39	11	17.294	0.894	135.8	1.0115	0.0000	SURCHARGED
15 minute summer	38	10	17.850	0.098	21.0	0.1107	0.0000	OK
15 minute summer	37	11	16.943	0.343	77.9	0.4909	0.0000	OK
15 minute summer	36	11	17.102	1.002	80.9	1.7704	0.0000	SURCHARGED
15 minute summer	35	11	20.252	0.052	3.2	0.0585	0.0000	OK
15 minute summer	34	10	20.190	0.090	30.9	0.1016	0.0000	OK
15 minute summer	33	11	18.083	0.083	30.4	0.0936	0.0000	OK
15 minute summer	32	11	17.227	0.127	43.7	0.1434	0.0000	OK
15 minute summer	31	11	17.006	1.066	98.2	1.8830	0.0000	SURCHARGED
15 minute summer	30	11	16.925	1.113	292.1	1.9662	0.0000	SURCHARGED
15 minute summer	29	10	16.642	0.895	311.2	1.2805	0.0000	SURCHARGED
2160 minute summer	28	1800	16.632	0.931	20.3	1.6442	0.0000	SURCHARGED
2160 minute summer	27	1800	16.632	0.963	20.2	1.7007	0.0000	SURCHARGED
2160 minute summer	ATT/HB Z1	1800	16.632	0.982	21.5	502.8092	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	31.9	2.288	0.726	0.1164	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0354	
15 minute summer	46	46	29	18.1	1.838	0.507	0.0485	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1293	
15 minute summer	44	44	35	3.2	0.637	0.211	0.0703	
15 minute summer	43	43	J4	21.1	1.009	0.523	0.4444	
2160 minute summer	42	42	41	1.4	0.561	0.037	0.1407	
2160 minute summer	41	41	ATT/HB Z1	1.3	0.174	0.008	1.2944	
15 minute summer	40	40	39	13.2	0.593	0.111	0.6670	
15 minute summer	39	39	30	136.1	1.932	0.667	1.2378	
15 minute summer	38	38	J5	20.9	1.839	0.231	0.2589	
15 minute summer	37	37	30	61.7	0.685	0.209	3.9212	
15 minute summer	36	36	31	-49.0	-0.696	-0.701	2.8228	
15 minute summer	35	35	34	3.1	0.394	0.258	0.1713	
15 minute summer	34	34	33	30.4	2.179	0.320	0.8847	
15 minute summer	33	33	32	30.4	1.985	0.291	0.4095	
15 minute summer	32	32	31	44.3	1.834	0.363	0.6354	
15 minute summer	31	31	30	104.9	0.662	0.692	9.1102	
15 minute summer	30	30	29	294.4	1.858	1.950	4.6559	
15 minute summer	29	29	28	313.5	1.979	2.079	3.3043	
2160 minute summer	28	28	27	20.2	0.317	0.096	3.5963	
2160 minute summer	27	27	ATT/HB Z1	20.2	0.585	0.095	2.2364	
2160 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
120 minute summer	25	70	15.670	0.047	3.1	0.0530	0.0000	OK
60 minute summer	24	283	15.494	0.030	3.1	0.0344	0.0000	OK
60 minute summer	23	289	13.744	0.044	3.1	0.0492	0.0000	OK
60 minute summer	22	287	13.524	0.024	3.1	0.0267	0.0000	OK
60 minute summer	21	287	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.745	0.645	156.2	0.7296	0.0000	SURCHARGED
2880 minute summer	J6	2280	12.887	1.137	9.8	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2280	12.887	1.237	9.8	1.7697	0.0000	SURCHARGED
15 minute summer	14	12	15.394	0.819	8.4	0.9263	0.0000	SURCHARGED
15 minute summer	13	12	15.036	1.173	121.2	1.3269	0.0000	SURCHARGED
15 minute summer	12	12	14.494	0.818	121.5	0.9250	0.0000	SURCHARGED
15 minute summer	11	12	13.972	0.473	126.6	0.6772	0.0000	SURCHARGED
15 minute summer	10	12	13.857	0.456	144.7	0.6520	0.0000	SURCHARGED
2880 minute summer	9	2280	12.887	0.387	13.7	0.5534	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z2	2280	12.887	1.447	23.7	710.9393	0.0000	SURCHARGED
15 minute summer	J1	12	15.392	1.092	31.9	0.0000	0.0000	SURCHARGED
2880 minute summer	6	2280	11.292	0.042	2.9	0.0479	0.0000	OK
15 minute summer	5	12	15.549	0.799	29.4	0.9034	0.0000	SURCHARGED
2880 minute summer	4	2280	10.849	0.029	2.9	0.0333	0.0000	OK
2880 minute summer	3	2280	10.711	0.036	2.9	0.0406	0.0000	OK
2880 minute summer	2	2280	10.634	0.034	2.9	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
120 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
60 minute summer	24	24	23	3.1	0.739	0.039	0.3227	
60 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
60 minute summer	22	22	21	3.1	1.445	0.022	0.0214	50.9
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	151.7	3.815	1.009	0.6135	
2880 minute summer	J6	J6	15	9.8	0.855	0.079	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	13.6	0.686	0.033	0.4858	
15 minute summer	14	14	J1	11.5	0.293	0.131	0.3836	
15 minute summer	13	13	12	121.5	1.726	1.551	2.6326	
15 minute summer	12	12	11	121.7	1.728	1.554	2.4924	
15 minute summer	11	11	10	127.2	1.153	0.900	2.1534	
15 minute summer	10	10	J8	145.3	1.318	1.156	2.1076	
2880 minute summer	9	9	ATT/HB Z2	13.7	0.736	0.040	3.9469	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.9				
15 minute summer	J1	J1	J2	38.8	0.702	0.463	2.1693	
2880 minute summer	6	6	4	2.9	0.704	0.070	0.2813	
15 minute summer	5	5	J1	27.9	1.988	0.634	0.1306	
2880 minute summer	4	4	3	2.9	0.807	0.036	0.0221	
2880 minute summer	3	3	2	2.9	0.730	0.050	0.0246	423.1
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0525	

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.58%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	15.369	1.245	62.4	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.255	1.298	110.2	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	16.980	0.480	50.2	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	18.251	0.751	123.8	0.8494	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.068	0.118	21.1	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.167	0.073	20.9	0.0000	0.0000	OK
15 minute summer	J8	11	13.737	0.412	187.5	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.649	0.374	186.9	0.0000	0.0000	OK
15 minute summer	17	10	16.800	0.320	35.0	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	66.2	0.940	0.845	2.3497	
15 minute summer	J3	J3	13	108.8	1.545	1.391	1.3274	
15 minute summer	8	8	J3	49.2	2.794	1.375	0.1041	
15 minute summer	26	26	39	122.5	3.082	1.665	0.3079	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0642	
15 minute summer	J4	J4	42	21.0	1.029	0.517	0.4012	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0159	
15 minute summer	J5	J5	37	20.7	1.378	0.230	0.4208	
15 minute summer	J8	J8	J9	186.9	1.695	1.319	1.0931	
15 minute summer	J9	J9	9	186.9	1.762	1.157	0.2559	
15 minute summer	17	17	J8	34.5	1.960	1.370	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 50 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.469	0.468	34.8	0.5299	0.0000	SURCHARGED
15 minute summer	47	10	17.854	0.004	0.1	0.0050	0.0000	OK
15 minute summer	46	10	17.996	0.096	20.3	0.1080	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.351	0.051	3.6	0.0577	0.0000	OK
15 minute summer	43	10	18.207	0.127	23.9	0.1433	0.0000	OK
2880 minute summer	42	2220	16.741	0.671	1.4	0.7592	0.0000	SURCHARGED
2880 minute summer	41	2220	16.741	0.691	1.4	0.7818	0.0000	SURCHARGED
15 minute summer	40	10	17.953	0.053	14.9	0.0603	0.0000	OK
15 minute summer	39	11	17.534	1.134	151.4	1.2822	0.0000	SURCHARGED
15 minute summer	38	10	17.854	0.102	23.4	0.1156	0.0000	OK
15 minute summer	37	10	17.213	0.613	57.3	0.8769	0.0000	SURCHARGED
15 minute summer	36	11	17.241	1.141	47.3	2.0153	0.0000	SURCHARGED
15 minute summer	35	11	20.255	0.055	3.5	0.0619	0.0000	OK
15 minute summer	34	10	20.196	0.096	34.5	0.1082	0.0000	OK
15 minute summer	33	11	18.088	0.088	34.0	0.0993	0.0000	OK
15 minute summer	32	11	17.344	0.244	48.7	0.2765	0.0000	SURCHARGED
15 minute summer	31	11	17.170	1.230	108.8	2.1730	0.0000	SURCHARGED
15 minute summer	30	11	17.095	1.283	323.4	2.2663	0.0000	SURCHARGED
2880 minute summer	29	2220	16.741	0.994	19.3	1.4228	0.0000	SURCHARGED
2880 minute summer	28	2220	16.741	1.040	19.2	1.8381	0.0000	SURCHARGED
2880 minute summer	27	2220	16.741	1.072	19.2	1.8947	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z1	2220	16.741	1.092	20.4	558.9708	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	33.3	2.349	0.757	0.1164	
15 minute summer	47	47	38	-0.1	-0.023	-0.005	0.0376	
15 minute summer	46	46	29	20.2	1.878	0.565	0.0529	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1408	
15 minute summer	44	44	35	3.5	0.652	0.236	0.0759	
15 minute summer	43	43	J4	23.6	1.034	0.584	0.4845	
2880 minute summer	42	42	41	1.4	0.515	0.035	0.1407	
2880 minute summer	41	41	ATT/HB Z1	1.3	0.184	0.008	1.2944	
15 minute summer	40	40	39	14.8	0.565	0.124	0.6750	
15 minute summer	39	39	30	148.2	2.105	0.726	1.2378	
15 minute summer	38	38	J5	23.4	1.873	0.260	0.2946	
15 minute summer	37	37	30	69.5	0.683	0.235	4.0044	
15 minute summer	36	36	31	40.8	0.597	0.584	2.8228	
15 minute summer	35	35	34	3.5	0.404	0.288	0.1846	
15 minute summer	34	34	33	34.0	2.247	0.358	0.9585	
15 minute summer	33	33	32	33.9	1.995	0.325	0.6107	
15 minute summer	32	32	31	50.9	1.874	0.418	0.8047	
15 minute summer	31	31	30	105.2	0.664	0.695	9.1102	
15 minute summer	30	30	29	324.8	2.050	2.151	4.6559	
2880 minute summer	29	29	28	19.2	0.358	0.128	3.3043	
2880 minute summer	28	28	27	19.2	0.310	0.091	3.5963	
2880 minute summer	27	27	ATT/HB Z1	19.1	0.582	0.090	2.2364	
2880 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 50 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute summer	25	39	15.670	0.047	3.1	0.0530	0.0000	OK
30 minute summer	24	69	15.494	0.030	3.1	0.0344	0.0000	OK
30 minute summer	23	75	13.744	0.044	3.1	0.0492	0.0000	OK
30 minute summer	22	73	13.524	0.024	3.1	0.0267	0.0000	OK
30 minute summer	21	73	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	14.201	1.101	174.3	1.2455	0.0000	SURCHARGED
2880 minute summer	J6	2340	13.050	1.300	10.7	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2340	13.050	1.400	10.7	2.0034	0.0000	SURCHARGED
15 minute summer	14	12	15.742	1.167	19.0	1.3201	0.0000	SURCHARGED
15 minute summer	13	12	15.323	1.460	132.5	1.6516	0.0000	SURCHARGED
15 minute summer	12	12	14.680	1.004	132.2	1.1351	0.0000	SURCHARGED
15 minute summer	11	12	14.065	0.566	137.4	0.8102	0.0000	SURCHARGED
15 minute summer	10	12	13.929	0.528	157.6	0.7554	0.0000	SURCHARGED
2880 minute summer	9	2340	13.050	0.550	14.9	0.7871	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z2	2340	13.050	1.610	25.8	791.2184	0.0000	SURCHARGED
15 minute summer	J1	12	15.738	1.438	34.3	0.0000	0.0000	SURCHARGED
2880 minute summer	6	2340	11.293	0.043	3.0	0.0490	0.0000	OK
15 minute summer	5	12	15.917	1.167	32.8	1.3203	0.0000	SURCHARGED
2880 minute summer	4	2340	10.850	0.030	3.0	0.0342	0.0000	OK
2880 minute summer	3	2340	10.712	0.037	3.0	0.0416	0.0000	OK
2880 minute summer	2	2340	10.635	0.035	3.0	0.0000	0.0000	OK
15 minute summer	7	12	15.701	0.201	3.3	0.2268	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute summer	25	25	24	3.1	0.693	0.086	0.1457	
30 minute summer	24	24	23	3.1	0.836	0.039	0.3227	
30 minute summer	23	23	22	3.1	0.849	0.069	0.1005	
30 minute summer	22	22	21	3.1	1.445	0.022	0.0214	47.0
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	169.4	4.259	1.126	0.6135	
2880 minute summer	J6	J6	15	10.7	0.816	0.086	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	16.2	0.670	0.039	0.4858	
15 minute summer	14	14	J1	-15.2	-0.529	-0.172	0.3836	
15 minute summer	13	13	12	132.2	1.878	1.688	2.6326	
15 minute summer	12	12	11	131.9	1.873	1.684	2.4924	
15 minute summer	11	11	10	138.0	1.251	0.976	2.1534	
15 minute summer	10	10	J8	158.4	1.436	1.261	2.1076	
2880 minute summer	9	9	ATT/HB Z2	14.9	0.753	0.044	3.9469	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	3.0				
15 minute summer	J1	J1	J2	44.3	0.717	0.529	2.1693	
2880 minute summer	6	6	4	3.0	0.714	0.073	0.2913	
15 minute summer	5	5	J1	25.0	2.053	0.567	0.1306	
2880 minute summer	4	4	3	3.0	0.818	0.038	0.0229	
2880 minute summer	3	3	2	3.0	0.740	0.053	0.0255	440.6
15 minute summer	7	7	J2	7.2	0.512	0.201	0.1146	

Results for 50 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	15.708	1.584	67.9	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.581	1.624	119.7	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.116	0.616	56.0	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	18.419	0.919	138.1	1.0398	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.076	0.126	23.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.177	0.083	23.4	0.0000	0.0000	OK
15 minute summer	J8	11	13.787	0.462	206.7	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.679	0.404	206.3	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	16.873	0.393	39.0	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	72.6	1.031	0.926	2.3497	
15 minute summer	J3	J3	13	118.4	1.682	1.514	1.3274	
15 minute summer	8	8	J3	54.7	3.107	1.529	0.1031	
15 minute summer	26	26	39	136.6	3.436	1.856	0.3079	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0683	
15 minute summer	J4	J4	42	23.5	1.056	0.577	0.4363	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0188	
15 minute summer	J5	J5	37	22.6	1.424	0.250	0.4391	
15 minute summer	J8	J8	J9	206.3	1.870	1.456	1.0936	
15 minute summer	J9	J9	9	205.9	1.880	1.275	0.2601	
15 minute summer	17	17	J8	38.4	2.179	1.524	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 75 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.651	0.651	38.0	0.7363	0.0000	SURCHARGED
15 minute summer	47	10	17.857	0.007	0.2	0.0081	0.0000	OK
15 minute summer	46	10	18.002	0.102	22.2	0.1154	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.353	0.053	3.9	0.0603	0.0000	OK
15 minute summer	43	10	18.214	0.134	26.1	0.1517	0.0000	OK
2160 minute summer	42	1860	16.846	0.776	1.7	0.8773	0.0000	SURCHARGED
2160 minute summer	41	1860	16.846	0.796	1.6	0.8999	0.0000	SURCHARGED
15 minute summer	40	10	17.956	0.056	16.2	0.0630	0.0000	OK
15 minute summer	39	11	17.727	1.327	160.9	1.5012	0.0000	SURCHARGED
15 minute summer	38	10	17.857	0.105	25.6	0.1182	0.0000	OK
15 minute summer	37	11	17.255	0.655	63.5	0.9372	0.0000	SURCHARGED
15 minute summer	36	11	17.370	1.270	40.8	2.2449	0.0000	FLOOD RISK
15 minute summer	35	11	20.257	0.057	3.8	0.0647	0.0000	OK
15 minute summer	34	10	20.201	0.101	37.7	0.1139	0.0000	OK
15 minute summer	33	11	18.092	0.092	37.2	0.1041	0.0000	OK
15 minute summer	32	11	17.564	0.464	53.2	0.5243	0.0000	SURCHARGED
15 minute summer	31	11	17.311	1.371	112.2	2.4220	0.0000	SURCHARGED
15 minute summer	30	11	17.218	1.406	345.4	2.4836	0.0000	SURCHARGED
2160 minute summer	29	1860	16.846	1.099	25.0	1.5723	0.0000	SURCHARGED
2160 minute summer	28	1860	16.846	1.145	25.0	2.0227	0.0000	SURCHARGED
2160 minute summer	27	1860	16.846	1.177	24.9	2.0792	0.0000	SURCHARGED
2160 minute summer	ATT/HB Z1	1860	16.846	1.197	26.4	612.4241	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	36.0	2.304	0.819	0.1164	
15 minute summer	47	47	38	-0.2	-0.039	-0.009	0.0390	
15 minute summer	46	46	29	22.1	1.909	0.618	0.0569	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1509	
15 minute summer	44	44	35	3.8	0.665	0.256	0.0806	
15 minute summer	43	43	J4	25.7	1.053	0.637	0.5194	
2160 minute summer	42	42	41	1.6	0.531	0.042	0.1407	
2160 minute summer	41	41	ATT/HB Z1	1.6	0.250	0.010	1.2944	
15 minute summer	40	40	39	16.1	0.565	0.135	0.6814	
15 minute summer	39	39	30	159.6	2.266	0.782	1.2378	
15 minute summer	38	38	J5	25.5	1.906	0.283	0.5344	
15 minute summer	37	37	30	67.0	0.607	0.227	4.0044	
15 minute summer	36	36	31	48.0	0.682	0.687	2.8228	
15 minute summer	35	35	34	3.8	0.415	0.312	0.1960	
15 minute summer	34	34	33	37.2	2.300	0.391	1.0243	
15 minute summer	33	33	32	37.0	1.919	0.355	0.6214	
15 minute summer	32	32	31	52.8	1.876	0.433	0.8047	
15 minute summer	31	31	30	111.4	0.703	0.736	9.1102	
15 minute summer	30	30	29	345.8	2.183	2.290	4.6559	
2160 minute summer	29	29	28	25.0	0.380	0.166	3.3043	
2160 minute summer	28	28	27	24.9	0.331	0.118	3.5963	
2160 minute summer	27	27	ATT/HB Z1	24.8	0.589	0.117	2.2364	
2160 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.1				

Results for 75 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
2160 minute summer	25	1860	15.670	0.047	3.1	0.0531	0.0000	OK
2160 minute summer	24	1860	15.494	0.030	3.1	0.0344	0.0000	OK
2160 minute summer	23	1860	13.744	0.044	3.1	0.0493	0.0000	OK
2160 minute summer	22	1860	13.524	0.024	3.1	0.0268	0.0000	OK
2160 minute summer	21	1860	12.793	0.023	3.1	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	11	14.626	1.526	190.2	1.7253	0.0000	SURCHARGED
2880 minute summer	J6	2400	13.187	1.437	11.5	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2400	13.187	1.537	11.4	2.1999	0.0000	SURCHARGED
15 minute summer	14	12	16.042	1.467	14.4	1.6586	0.0000	SURCHARGED
15 minute summer	13	12	15.575	1.712	142.0	1.9368	0.0000	SURCHARGED
15 minute summer	12	12	14.840	1.164	141.2	1.3170	0.0000	SURCHARGED
15 minute summer	11	12	14.142	0.643	146.7	0.9206	0.0000	SURCHARGED
15 minute summer	10	11	13.989	0.588	168.5	0.8415	0.0000	SURCHARGED
2880 minute summer	9	2400	13.187	0.687	15.8	0.9836	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z2	2400	13.187	1.747	27.5	858.6977	0.0000	SURCHARGED
15 minute summer	J1	12	16.041	1.741	39.3	0.0000	0.0000	FLOOD RISK
2880 minute summer	6	2400	11.294	0.044	3.1	0.0499	0.0000	OK
15 minute summer	5	12	16.259	1.509	35.8	1.7065	0.0000	SURCHARGED
2880 minute summer	4	2400	10.851	0.031	3.1	0.0348	0.0000	OK
2880 minute summer	3	2400	10.713	0.038	3.1	0.0424	0.0000	OK
2880 minute summer	2	2400	10.636	0.036	3.1	0.0000	0.0000	OK
15 minute summer	7	12	16.025	0.525	7.2	0.5935	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
2160 minute summer	25	25	24	3.1	0.694	0.086	0.1460	
2160 minute summer	24	24	23	3.1	0.739	0.039	0.3233	
2160 minute summer	23	23	22	3.1	0.850	0.070	0.1007	
2160 minute summer	22	22	21	3.1	1.446	0.022	0.0214	362.2
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	184.8	4.647	1.229	0.6135	
2880 minute summer	J6	J6	15	11.4	0.792	0.093	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	16.8	0.661	0.041	0.4858	
15 minute summer	14	14	J1	12.3	0.309	0.139	0.3836	
15 minute summer	13	13	12	141.2	2.005	1.803	2.6326	
15 minute summer	12	12	11	140.7	1.998	1.796	2.4924	
15 minute summer	11	11	10	147.8	1.340	1.046	2.1534	
15 minute summer	10	10	J8	169.1	1.533	1.345	2.1076	
2880 minute summer	9	9	ATT/HB Z2	15.8	0.753	0.046	3.9469	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	3.1				
15 minute summer	J1	J1	J2	46.0	0.693	0.549	2.1693	
2880 minute summer	6	6	4	3.1	0.722	0.076	0.2992	
15 minute summer	5	5	J1	28.6	2.108	0.650	0.1306	
2880 minute summer	4	4	3	3.1	0.827	0.039	0.0236	
2880 minute summer	3	3	2	3.1	0.747	0.055	0.0262	454.5
15 minute summer	7	7	J2	-7.2	0.453	-0.201	0.1146	

Results for 75 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	16.019	1.895	74.1	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.873	1.916	127.8	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.246	0.746	61.1	0.0000	0.0000	SURCHARGED
15 minute summer	26	11	18.695	1.195	150.7	1.3514	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	10	18.083	0.133	25.7	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	12	17.262	0.062	3.9	0.0000	0.0000	OK
15 minute summer	J5	11	17.275	0.181	25.5	0.0000	0.0000	OK
15 minute summer	J8	11	13.827	0.502	222.7	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.700	0.425	222.4	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	16.945	0.465	42.6	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	77.2	1.096	0.985	2.3497	
15 minute summer	J3	J3	13	126.8	1.802	1.622	1.3274	
15 minute summer	8	8	J3	59.5	3.380	1.664	0.1041	
15 minute summer	26	26	39	144.8	3.641	1.967	0.3110	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0716	
15 minute summer	J4	J4	42	25.6	1.078	0.629	0.4665	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	-3.9	-0.343	-0.131	0.0457	
15 minute summer	J5	J5	37	29.0	1.358	0.322	0.6116	
15 minute summer	J8	J8	J9	222.4	2.017	1.570	1.0936	
15 minute summer	J9	J9	9	222.3	2.017	1.376	0.2625	
15 minute summer	17	17	J8	41.8	2.375	1.661	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	48	11	17.808	0.808	40.4	0.9137	0.0000	SURCHARGED
30 minute summer	47	17	17.859	0.009	0.1	0.0097	0.0000	OK
15 minute summer	46	10	18.007	0.107	23.6	0.1211	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.356	0.056	4.2	0.0629	0.0000	OK
15 minute summer	43	10	18.220	0.140	27.8	0.1582	0.0000	OK
2880 minute summer	42	2220	16.919	0.849	1.5	0.9602	0.0000	SURCHARGED
2880 minute summer	41	2220	16.919	0.869	1.5	0.9829	0.0000	SURCHARGED
15 minute summer	40	10	17.958	0.058	17.3	0.0651	0.0000	OK
15 minute summer	39	11	17.894	1.494	170.3	1.6897	0.0000	SURCHARGED
15 minute summer	38	10	17.859	0.107	27.3	0.1214	0.0000	OK
15 minute summer	37	11	17.384	0.784	63.9	1.1225	0.0000	SURCHARGED
15 minute summer	36	11	17.488	1.388	43.4	2.4530	0.0000	FLOOD RISK
15 minute summer	35	11	20.260	0.060	4.1	0.0675	0.0000	OK
15 minute summer	34	10	20.204	0.104	40.1	0.1181	0.0000	OK
15 minute summer	33	11	18.096	0.096	39.6	0.1090	0.0000	OK
15 minute summer	32	11	17.701	0.601	56.7	0.6795	0.0000	SURCHARGED
15 minute summer	31	11	17.424	1.484	122.0	2.6218	0.0000	SURCHARGED
15 minute summer	30	11	17.332	1.520	363.3	2.6860	0.0000	SURCHARGED
2880 minute summer	29	2220	16.919	1.172	22.3	1.6772	0.0000	SURCHARGED
2880 minute summer	28	2220	16.919	1.218	22.3	2.1523	0.0000	SURCHARGED
2880 minute summer	27	2220	16.919	1.250	22.2	2.2088	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z1	2220	16.919	1.270	23.6	649.9555	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	48	48	37	37.5	2.336	0.852	0.1164	
30 minute summer	47	47	38	-0.1	-0.027	-0.006	0.0402	
15 minute summer	46	46	29	23.5	1.929	0.657	0.0598	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1587	
15 minute summer	44	44	35	4.1	0.678	0.276	0.0854	
15 minute summer	43	43	J4	27.4	1.065	0.678	0.5463	
2880 minute summer	42	42	41	1.5	0.531	0.037	0.1407	
2880 minute summer	41	41	ATT/HB Z1	1.4	0.174	0.009	1.2944	
15 minute summer	40	40	39	17.2	0.600	0.144	0.6866	
15 minute summer	39	39	30	167.4	2.378	0.821	1.2378	
15 minute summer	38	38	J5	27.2	1.935	0.302	0.6042	
15 minute summer	37	37	30	77.4	0.858	0.262	4.0044	
15 minute summer	36	36	31	47.4	0.673	0.678	2.8228	
15 minute summer	35	35	34	4.1	0.426	0.337	0.2051	
15 minute summer	34	34	33	39.6	2.337	0.417	1.0735	
15 minute summer	33	33	32	39.0	1.910	0.374	0.6321	
15 minute summer	32	32	31	55.6	1.867	0.456	0.8047	
15 minute summer	31	31	30	116.6	0.736	0.770	9.1102	
15 minute summer	30	30	29	364.2	2.299	2.412	4.6559	
2880 minute summer	29	29	28	22.3	0.367	0.148	3.3043	
2880 minute summer	28	28	27	22.2	0.314	0.105	3.5963	
2880 minute summer	27	27	ATT/HB Z1	22.1	0.585	0.105	2.2364	
2880 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.2				

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
2880 minute summer	25	2220	15.671	0.048	3.2	0.0538	0.0000	OK
2880 minute summer	24	2220	15.495	0.031	3.2	0.0349	0.0000	OK
2880 minute summer	23	2220	13.744	0.044	3.2	0.0500	0.0000	OK
2880 minute summer	22	2220	13.524	0.024	3.2	0.0271	0.0000	OK
2880 minute summer	21	2220	12.793	0.023	3.2	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	11	14.987	1.887	202.3	2.1345	0.0000	SURCHARGED
2880 minute summer	J6	2400	13.283	1.533	12.0	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2400	13.283	1.633	19.4	2.3373	0.0000	SURCHARGED
15 minute summer	14	12	16.285	1.710	20.7	1.9345	0.0000	SURCHARGED
15 minute summer	13	12	15.772	1.909	148.8	2.1586	0.0000	SURCHARGED
15 minute summer	12	12	14.966	1.290	147.9	1.4585	0.0000	SURCHARGED
15 minute summer	11	12	14.200	0.701	153.8	1.0032	0.0000	SURCHARGED
15 minute summer	10	12	14.030	0.629	176.8	0.9005	0.0000	SURCHARGED
2880 minute summer	9	2400	13.283	0.783	16.7	1.1210	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z2	2400	13.283	1.843	29.0	905.8841	0.0000	SURCHARGED
15 minute summer	J1	12	16.190	1.890	35.5	0.0000	0.0000	FLOOD RISK
2880 minute summer	6	2400	11.295	0.045	3.2	0.0505	0.0000	OK
15 minute summer	5	12	16.517	1.767	38.1	1.9988	0.0000	FLOOD RISK
2880 minute summer	4	2400	10.851	0.031	3.2	0.0353	0.0000	OK
2880 minute summer	3	2400	10.713	0.038	3.2	0.0430	0.0000	OK
2880 minute summer	2	2400	10.636	0.036	3.2	0.0000	0.0000	OK
15 minute summer	7	12	16.254	0.754	6.0	0.8527	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
2880 minute summer	25	25	24	3.2	0.700	0.088	0.1489	
2880 minute summer	24	24	23	3.2	0.745	0.040	0.3295	
2880 minute summer	23	23	22	3.2	0.857	0.072	0.1026	
2880 minute summer	22	22	21	3.2	1.458	0.023	0.0218	478.2
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	196.5	4.940	1.306	0.6135	
2880 minute summer	J6	J6	15	11.9	0.800	0.097	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	11.9	0.670	0.029	0.4858	
15 minute summer	14	14	J1	-16.3	-0.410	-0.185	0.3836	
15 minute summer	13	13	12	147.9	2.101	1.889	2.6326	
15 minute summer	12	12	11	147.7	2.097	1.886	2.4924	
15 minute summer	11	11	10	154.6	1.402	1.094	2.1534	
15 minute summer	10	10	J8	177.3	1.608	1.411	2.1076	
2880 minute summer	9	9	ATT/HB Z2	16.7	0.753	0.049	3.9469	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	3.2				
15 minute summer	J1	J1	J2	46.2	0.664	0.552	2.1693	
2880 minute summer	6	6	4	3.2	0.727	0.078	0.3045	
15 minute summer	5	5	J1	28.9	2.143	0.657	0.1306	
2880 minute summer	4	4	3	3.2	0.832	0.040	0.0240	
2880 minute summer	3	3	2	3.2	0.752	0.056	0.0267	464.9
15 minute summer	7	7	J2	10.5	0.597	0.294	0.1146	

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	J2	12	16.253	2.129	76.3	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	16.097	2.140	133.3	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.352	0.852	65.0	0.0000	0.0000	SURCHARGED
15 minute summer	26	11	18.980	1.480	160.3	1.6735	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	10	18.089	0.139	27.4	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	11	17.433	0.233	2.3	0.0000	0.0000	SURCHARGED
15 minute summer	J5	11	17.420	0.326	27.2	0.0000	0.0000	SURCHARGED
15 minute summer	J8	11	13.850	0.525	233.4	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.711	0.436	233.1	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	17.003	0.523	45.3	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	J2	J2	J3	83.7	1.189	1.068	2.3497	
15 minute summer	J3	J3	13	132.6	1.884	1.696	1.3274	
15 minute summer	8	8	J3	63.1	3.587	1.766	0.1034	
15 minute summer	26	26	39	153.1	3.850	2.080	0.3110	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0737	
15 minute summer	J4	J4	42	27.3	1.093	0.672	0.4912	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	-2.3	0.142	-0.078	0.0658	
15 minute summer	J5	J5	37	33.7	1.385	0.373	0.6573	
15 minute summer	J8	J8	J9	233.1	2.114	1.645	1.0936	
15 minute summer	J9	J9	9	233.0	2.113	1.442	0.2638	
15 minute summer	17	17	J8	44.4	2.522	1.763	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 120 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.919	0.919	42.0	1.0394	0.0000	SURCHARGED
30 minute summer	47	18	17.860	0.010	0.2	0.0118	0.0000	OK
15 minute summer	46	10	18.011	0.111	24.6	0.1252	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.356	0.056	4.3	0.0637	0.0000	OK
15 minute summer	43	10	18.224	0.144	28.9	0.1625	0.0000	OK
2880 minute summer	42	2220	16.969	0.899	1.6	1.0164	0.0000	SURCHARGED
2880 minute summer	41	2220	16.969	0.919	1.6	1.0390	0.0000	SURCHARGED
15 minute summer	40	12	17.987	0.087	17.9	0.0984	0.0000	OK
15 minute summer	39	11	17.985	1.585	176.8	1.7927	0.0000	SURCHARGED
15 minute summer	38	10	17.861	0.109	28.3	0.1234	0.0000	OK
15 minute summer	37	11	17.460	0.860	82.4	1.2303	0.0000	SURCHARGED
15 minute summer	36	11	17.572	1.472	45.2	2.6004	0.0000	FLOOD RISK
15 minute summer	35	11	20.260	0.060	4.2	0.0684	0.0000	OK
15 minute summer	34	10	20.207	0.107	41.7	0.1208	0.0000	OK
15 minute summer	33	11	18.105	0.105	41.1	0.1184	0.0000	OK
15 minute summer	32	11	17.786	0.686	58.9	0.7763	0.0000	SURCHARGED
15 minute summer	31	11	17.499	1.559	128.7	2.7544	0.0000	SURCHARGED
15 minute summer	30	11	17.404	1.592	372.6	2.8135	0.0000	SURCHARGED
2880 minute summer	29	2220	16.969	1.222	22.9	1.7483	0.0000	SURCHARGED
2880 minute summer	28	2220	16.969	1.268	22.9	2.2400	0.0000	SURCHARGED
2880 minute summer	27	2220	16.969	1.300	22.8	2.2965	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z1	2220	16.969	1.320	24.2	675.3577	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	38.6	2.356	0.877	0.1164	
30 minute summer	47	47	38	-0.2	-0.039	-0.009	0.0414	
15 minute summer	46	46	29	24.5	1.941	0.685	0.0619	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1637	
15 minute summer	44	44	35	4.2	0.682	0.282	0.0869	
15 minute summer	43	43	J4	28.5	1.075	0.705	0.5627	
2880 minute summer	42	42	41	1.6	0.546	0.040	0.1407	
2880 minute summer	41	41	ATT/HB Z1	1.5	0.174	0.009	1.2944	
15 minute summer	40	40	39	21.5	0.679	0.180	0.7752	
15 minute summer	39	39	30	170.5	2.422	0.836	1.2378	
15 minute summer	38	38	J5	28.3	1.956	0.313	0.6129	
15 minute summer	37	37	30	72.7	0.753	0.246	4.0044	
15 minute summer	36	36	31	42.5	0.603	0.608	2.8228	
15 minute summer	35	35	34	4.2	0.434	0.345	0.2099	
15 minute summer	34	34	33	41.1	2.359	0.433	1.1412	
15 minute summer	33	33	32	40.5	1.930	0.389	0.6532	
15 minute summer	32	32	31	57.4	1.852	0.471	0.8047	
15 minute summer	31	31	30	119.3	0.753	0.788	9.1102	
15 minute summer	30	30	29	375.7	2.372	2.488	4.6559	
2880 minute summer	29	29	28	22.9	0.369	0.152	3.3043	
2880 minute summer	28	28	27	22.8	0.317	0.108	3.5963	
2880 minute summer	27	27	ATT/HB Z1	22.7	0.585	0.107	2.2364	
2880 minute summer	ATT/HB Z1	Hydro-Brake®	25	3.3				

Results for 120 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute summer	25	2220	15.671	0.048	3.3	0.0543	0.0000	OK
2880 minute summer	24	2220	15.495	0.031	3.3	0.0352	0.0000	OK
2880 minute summer	23	2220	13.745	0.045	3.3	0.0504	0.0000	OK
2880 minute summer	22	2220	13.524	0.024	3.3	0.0274	0.0000	OK
2880 minute summer	21	2220	12.794	0.024	3.3	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	11	15.243	2.143	210.4	2.4234	0.0000	SURCHARGED
2880 minute summer	J6	2460	13.355	1.605	12.3	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
2880 minute summer	15	2460	13.355	1.705	12.2	2.4399	0.0000	SURCHARGED
15 minute summer	14	12	16.446	1.871	9.1	2.1163	0.0000	FLOOD RISK
15 minute summer	13	12	15.904	2.041	153.4	2.3085	0.0000	SURCHARGED
15 minute summer	12	12	15.049	1.373	152.3	1.5534	0.0000	SURCHARGED
15 minute summer	11	12	14.239	0.740	158.2	1.0585	0.0000	SURCHARGED
15 minute summer	10	12	14.059	0.658	182.2	0.9415	0.0000	SURCHARGED
2880 minute summer	9	2520	13.362	0.862	17.5	1.2334	0.0000	SURCHARGED
2880 minute summer	ATT/HB Z2	2460	13.355	1.915	29.9	941.0957	0.0000	SURCHARGED
15 minute summer	J1	12	16.190	1.890	36.7	0.0000	0.0000	FLOOD RISK
2880 minute summer	6	2460	11.295	0.045	3.3	0.0510	0.0000	OK
15 minute summer	5	12	16.695	1.945	39.6	2.2002	0.0000	FLOOD RISK
2880 minute summer	4	2460	10.851	0.031	3.3	0.0356	0.0000	OK
2880 minute summer	3	2460	10.713	0.038	3.3	0.0434	0.0000	OK
2880 minute summer	2	2460	10.636	0.036	3.3	0.0000	0.0000	OK
15 minute summer	7	12	16.417	0.917	13.0	1.0371	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
2880 minute summer	25	25	24	3.3	0.703	0.090	0.1507	
2880 minute summer	24	24	23	3.3	0.749	0.041	0.3336	
2880 minute summer	23	23	22	3.3	0.861	0.073	0.1039	
2880 minute summer	22	22	21	3.3	1.465	0.023	0.0221	485.9
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	204.2	5.135	1.358	0.6135	
2880 minute summer	J6	J6	15	12.2	0.808	0.099	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
2880 minute summer	15	15	ATT/HB Z2	21.6	0.644	0.052	0.4858	
15 minute summer	14	14	J1	14.2	0.401	0.161	0.3836	
15 minute summer	13	13	12	152.3	2.163	1.945	2.6326	
15 minute summer	12	12	11	152.4	2.164	1.946	2.4924	
15 minute summer	11	11	10	159.6	1.447	1.129	2.1534	
15 minute summer	10	10	J8	182.7	1.657	1.454	2.1076	
2880 minute summer	9	9	ATT/HB Z2	17.4	0.768	0.051	3.9469	
2880 minute summer	ATT/HB Z2	Hydro-Brake®	6	3.3				
15 minute summer	J1	J1	J2	49.0	0.696	0.585	2.1693	
2880 minute summer	6	6	4	3.3	0.731	0.079	0.3085	
15 minute summer	5	5	J1	30.1	2.170	0.684	0.1306	
2880 minute summer	4	4	3	3.3	0.836	0.041	0.0243	
2880 minute summer	3	3	2	3.3	0.756	0.057	0.0270	472.3
15 minute summer	7	7	J2	-13.0	-0.891	-0.363	0.1146	

Results for 120 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.53%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	16.414	2.290	79.5	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	16.251	2.294	137.8	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.426	0.926	67.6	0.0000	0.0000	SURCHARGED
15 minute summer	26	11	19.169	1.669	166.7	1.8877	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.092	0.142	28.5	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	11	17.506	0.305	1.3	0.0000	0.0000	SURCHARGED
15 minute summer	J5	11	17.517	0.423	28.3	0.0000	0.0000	SURCHARGED
15 minute summer	J8	11	13.868	0.543	241.1	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.719	0.444	240.7	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	17.044	0.564	47.1	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	86.6	1.230	1.105	2.3497	
15 minute summer	J3	J3	13	136.7	1.941	1.748	1.3274	
15 minute summer	8	8	J3	65.6	3.729	1.836	0.1031	
15 minute summer	26	26	39	159.7	4.017	2.170	0.3110	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0748	
15 minute summer	J4	J4	42	28.4	1.102	0.697	0.5059	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	2.9	0.208	0.098	0.0658	
15 minute summer	J5	J5	37	33.8	1.401	0.375	0.6573	
15 minute summer	J8	J8	J9	240.7	2.183	1.699	1.0936	
15 minute summer	J9	J9	9	240.5	2.181	1.489	0.2647	
15 minute summer	17	17	J8	46.1	2.621	1.833	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Appendix F – Storm Drain Calculations – 50% Blockage

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	Scotland and Ireland	Connection Type	Level Soffits
M5-60 (mm)	16.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.277	Preferred Cover Depth (m)	1.200
CV	1.000	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
48	0.076	5.00	18.441	1200	724844.682	728947.551	1.441
47		5.00	19.165	1200	724803.423	728971.213	1.315
46	0.044	5.00	19.172	1200	724798.764	728939.291	1.272
45		5.00	19.688	1200	724728.932	728900.701	1.688
1		5.00	20.337	1200	724780.075	728868.140	1.687
44	0.008	5.00	21.300	1200	724763.809	728825.907	1.000
43	0.052	5.00	20.000	1200	724777.352	728880.072	1.920
42			19.600	1200	724744.645	728904.587	3.530
41			19.591	1200	724746.766	728907.417	3.541
40	0.032	5.00	20.000	1200	724789.555	728883.155	2.100
39			19.500	1200	724811.544	728901.679	3.100
38	0.051	5.00	19.170	1200	724808.396	728974.235	1.418
37	0.003	5.00	18.594	1350	724838.134	728948.472	1.994
36	0.082	5.00	17.600	1500	724886.827	728929.655	1.500
35			21.300	1200	724776.861	728830.566	1.100
34	0.068	5.00	21.300	1200	724795.107	728820.004	1.200
33			20.300	1200	724843.614	728860.738	2.300
32	0.033	5.00	19.740	1200	724860.844	728875.334	2.640
31	0.043	5.00	19.000	1500	724871.049	728892.805	3.060
30	0.037	5.00	18.600	1500	724819.139	728917.532	2.788
29			19.200	1350	724795.786	728935.367	3.453
28			19.500	1500	724775.721	728929.683	3.799
27			19.605	1500	724765.942	728916.211	3.936
ATT/HB Z1			19.516	1500	724757.564	728922.292	3.867
25			19.500	1200	724760.775	728926.488	3.877
24			19.200	1200	724791.402	728935.164	3.736
23			14.700	1200	724835.551	728996.291	1.000
22			14.400	1200	724814.438	729012.367	0.900
21			14.100	1200	724819.816	729020.622	1.330
20		5.00	17.750	1200	724797.327	729007.046	2.225
J7			17.383	1200	724786.653	728993.299	3.633
18	0.380	5.00	16.500	1200	724782.036	729015.504	3.400
J6	0.031	5.00	16.651	1200	724772.619	729003.287	4.901
16		5.00	16.525	1200	724730.955	729043.975	1.525
15			16.278	1350	724765.983	729007.995	4.628
14	0.009	5.00	16.600	1200	724616.402	728913.463	2.025
13	0.038	5.00	18.100	1200	724707.784	728928.851	4.237
12			19.550	1200	724739.042	728908.343	5.874
11	0.015	5.00	18.500	1350	724760.883	728936.195	5.001
10	0.054	5.00	18.500	1350	724764.552	728955.371	5.099

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
9	0.015	5.00	17.400	1350	724783.708	728980.338	4.900
ATT/HB Z2	0.013	5.00	16.181	1350	724763.624	729009.954	4.741
J1			16.190		724625.914	728915.064	1.890
6			13.354	1200	724784.031	729035.492	2.104
5	0.072	5.00	16.800	1200	724626.479	728907.666	2.050
4			12.200	1200	724728.641	729075.850	1.380
3			12.250	1200	724725.938	729081.443	1.575
2			12.250	1200	724722.909	729086.928	1.650
7		5.00	17.307	1200	724656.857	728913.697	1.807
J2	0.113	5.00	16.963		724656.292	728920.180	2.839
J3	0.012	5.00	17.831		724689.196	728925.721	3.874
8	0.122	5.00	18.082		724688.070	728919.915	1.582
26	0.301	5.00	19.658	1200	724812.748	728893.952	2.158
49		5.00	19.904		724757.912	728884.506	1.429
J4			19.796		724760.359	728892.809	1.846
Depth/Area 1		5.00	18.439		724828.177	728962.261	1.239
J5			18.836		724825.751	728959.419	1.742
J8	0.037	5.00	17.808		724776.184	728970.531	4.483
J9			17.445		724782.249	728978.375	4.170
17	0.085	5.00	17.956		724781.465	728966.554	1.476
19		5.00	17.161		724772.732	728985.689	1.475

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
44	44	35	13.859	0.600	20.300	20.200	0.100	138.6	150	5.27	38.7
35	35	34	21.083	0.600	20.200	20.100	0.100	210.8	150	5.78	37.4
34	34	33	63.342	0.600	20.100	18.000	2.100	30.2	225	6.22	36.3
33	33	32	22.581	0.600	18.000	17.100	0.900	25.1	225	6.37	36.0
32	32	31	20.233	0.600	17.100	16.000	1.100	18.4	225	6.48	35.7
36	36	31	40.086	0.600	16.100	15.940	0.160	250.5	300	5.68	37.6
31	31	30	57.498	0.600	15.940	15.812	0.128	449.2	450	7.48	33.7
47	47	38	5.819	0.600	17.850	17.752	0.098	59.4	150	5.07	39.2
38	38	J5	22.819	0.600	17.775	17.094	0.681	33.5	225	5.24	38.8
Depth/Area 1	Depth/Area 1	J5	3.737	0.600	17.200	17.094	0.106	35.3	150	5.04	39.3
J5	J5	37	16.528	0.600	17.094	16.600	0.494	33.5	225	5.36	38.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
44	0.852	15.0	1.1	0.850	0.950	0.008	0.0
35	0.688	12.2	1.1	0.950	1.050	0.008	0.0
34	2.391	95.1	9.9	0.975	2.075	0.076	0.0
33	2.622	104.3	9.8	2.075	2.415	0.076	0.0
32	3.065	121.9	14.1	2.415	2.775	0.109	0.0
36	0.989	69.9	11.1	1.200	2.760	0.082	0.0
31	0.952	151.5	28.5	2.610	2.338	0.234	0.0
47	1.307	23.1	0.0	1.165	1.268	0.000	0.0
38	2.267	90.2	7.1	1.170	1.517	0.051	0.0
Depth/Area 1	1.701	30.1	0.0	1.089	1.592	0.000	0.0
J5	2.269	90.2	7.1	1.517	1.769	0.051	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
48	48	37	6.612	0.600	17.000	16.600	0.400	16.5	150	5.04	39.3
37	37	30	36.306	0.600	16.600	15.812	0.788	46.1	375	5.59	37.8
40	40	39	28.752	0.600	17.900	16.400	1.500	19.2	225	5.16	39.0
26	26	39	7.820	0.600	17.500	17.344	0.156	50.1	225	5.07	39.2
39	39	30	17.578	0.600	16.400	15.812	0.588	29.9	300	5.26	38.7
30	30	29	29.385	0.600	15.812	15.747	0.065	452.1	450	8.00	32.7
46	46	29	4.926	0.600	17.900	17.703	0.197	25.0	150	5.04	39.3
29	29	28	20.855	0.600	15.747	15.701	0.046	453.4	450	8.37	32.1
28	28	27	16.647	0.600	15.701	15.669	0.032	520.2	525	8.65	31.6
27	27	ATT/HB Z1	10.352	0.600	15.669	15.649	0.020	517.6	525	8.83	31.3
1	1	43	12.239	0.600	18.650	18.080	0.570	21.5	225	5.07	39.2
43	43	J4	21.237	0.600	18.080	17.951	0.129	164.6	225	5.42	38.3
49	49	J4	8.656	0.600	18.475	17.950	0.525	16.5	150	5.06	39.3
J4	J4	42	19.638	0.600	17.951	17.830	0.121	162.3	225	5.74	37.5
42	42	41	3.537	0.600	16.070	16.050	0.020	176.8	225	5.80	37.3
41	41	ATT/HB Z1	18.381	0.600	16.050	15.649	0.401	45.8	300	5.93	37.0
ATT/HB Z1	ATT/HB Z1	25	5.284	0.600	15.649	15.623	0.026	203.2	225	8.92	31.2
25	25	24	31.832	0.600	15.623	15.464	0.159	200.2	225	9.50	30.3
24	24	23	75.403	0.600	15.464	13.700	1.764	42.7	225	10.13	29.4
23	23	22	26.537	0.600	13.700	13.500	0.200	132.7	225	10.52	28.9
22	22	21	9.852	0.600	13.500	12.770	0.730	13.5	225	10.56	28.9
14	14	J1	9.646	0.600	14.575	14.300	0.275	35.1	225	5.07	39.2
5	5	J1	7.420	0.600	14.750	14.300	0.450	16.5	150	5.05	39.3
J1	J1	J2	30.806	0.600	14.300	14.124	0.176	175.0	300	5.51	38.1

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
48	2.489	44.0	10.8	1.291	1.844	0.076	0.0
37	2.675	295.4	17.8	1.619	2.413	0.130	0.0
40	3.002	119.4	4.6	1.875	2.875	0.032	0.0
26	1.851	73.6	42.7	1.933	1.931	0.301	0.0
39	2.886	204.0	46.7	2.800	2.488	0.334	0.0
30	0.949	151.0	86.9	2.338	3.003	0.734	0.0
46	2.022	35.7	6.3	1.122	1.347	0.044	0.0
29	0.948	150.8	90.3	3.003	3.349	0.779	0.0
28	0.975	211.0	89.0	3.274	3.411	0.779	0.0
27	0.977	211.6	88.2	3.411	3.342	0.779	0.0
1	2.836	112.8	0.0	1.462	1.695	0.000	0.0
43	1.016	40.4	7.2	1.695	1.620	0.052	0.0
49	2.493	44.0	0.0	1.279	1.696	0.000	0.0
J4	1.023	40.7	7.1	1.620	1.545	0.052	0.0
42	0.980	39.0	7.0	3.305	3.316	0.052	0.0
41	2.328	164.6	7.0	3.241	3.567	0.052	0.0
ATT/HB Z1	0.913	36.3	93.7	3.642	3.652	0.831	0.0
25	0.920	36.6	91.1	3.652	3.511	0.831	0.0
24	2.006	79.8	88.4	3.511	0.775	0.831	0.0
23	1.133	45.1	86.9	0.775	0.675	0.831	0.0
22	3.580	142.4	86.7	0.675	1.105	0.831	0.0
14	2.216	88.1	1.2	1.800	1.665	0.009	0.0
5	2.493	44.0	10.2	1.900	1.740	0.072	0.0
J1	1.185	83.8	11.0	1.590	2.539	0.080	0.0

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
7	7	J2	6.508	0.600	15.500	15.240	0.260	25.0	150	5.05	39.3
J2	J2	J3	33.367	0.600	14.124	13.957	0.167	199.8	300	6.01	36.8
8	8	J3	5.914	0.600	16.500	16.263	0.237	25.0	150	5.05	39.3
J3	J3	13	18.850	0.600	13.957	13.863	0.094	200.5	300	6.29	36.2
13	13	12	37.385	0.600	13.863	13.676	0.187	199.9	300	6.85	34.9
45	45	12	12.673	0.600	18.000	17.747	0.253	50.1	150	5.15	39.0
12	12	11	35.394	0.600	13.676	13.499	0.177	200.0	300	7.39	33.9
11	11	10	19.524	0.600	13.499	13.401	0.098	199.2	375	7.64	33.4
10	10	J8	19.108	0.600	13.401	13.325	0.076	251.4	375	7.92	32.9
17	17	J8	6.611	0.600	16.480	16.348	0.132	50.1	150	5.08	39.2
J8	J8	J9	9.915	0.600	13.325	13.275	0.050	198.3	375	8.05	32.6
19	19	J9	12.003	0.600	15.686	15.446	0.240	50.0	150	5.14	39.0
J9	J9	9	2.446	0.600	13.275	13.259	0.016	152.9	375	8.08	32.6
9	9	ATT/HB Z2	35.784	0.600	12.500	11.460	1.040	34.4	375	8.27	32.3
16	16	15	56.605	0.600	15.000	13.050	1.950	29.0	225	5.39	38.4
20	20	J7	17.404	0.600	15.525	13.750	1.775	9.8	225	5.07	39.2
J7	J7	J6	17.225	0.600	13.750	13.250	0.500	34.5	300	5.18	38.9
18	18	J6	15.425	0.600	13.100	11.825	1.275	12.1	225	5.07	39.3
J6	J6	15	8.136	0.600	11.750	11.650	0.100	81.4	300	5.25	38.7
15	15	ATT/HB Z2	3.066	0.600	11.650	11.600	0.050	61.3	450	5.41	38.3
ATT/HB Z2	ATT/HB Z2	6	32.691	0.600	11.440	11.250	0.190	172.1	225	8.82	31.4
6	6	4	68.533	0.600	11.250	10.820	0.430	159.4	225	9.92	29.7
4	4	3	6.212	0.600	10.820	10.675	0.145	42.8	225	9.98	29.7
3	3	2	6.266	0.600	10.675	10.600	0.075	83.5	225	10.05	29.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
7	2.021	35.7	0.0	1.657	1.573	0.000	0.0
J2	1.108	78.3	25.7	2.539	3.574	0.193	0.0
8	2.024	35.8	17.4	1.432	1.418	0.122	0.0
J3	1.106	78.2	42.7	3.574	3.937	0.327	0.0
13	1.108	78.3	46.2	3.937	5.574	0.366	0.0
45	1.425	25.2	0.0	1.538	1.653	0.000	0.0
12	1.108	78.3	44.7	5.574	4.701	0.366	0.0
11	1.280	141.3	45.9	4.626	4.724	0.381	0.0
10	1.138	125.7	51.7	4.724	4.108	0.435	0.0
17	1.425	25.2	12.1	1.326	1.310	0.085	0.0
J8	1.283	141.7	65.8	4.108	3.795	0.558	0.0
19	1.426	25.2	0.0	1.325	1.849	0.000	0.0
J9	1.463	161.6	65.7	3.795	3.766	0.558	0.0
9	3.097	342.1	66.8	4.525	4.346	0.573	0.0
16	2.437	96.9	0.0	1.300	3.003	0.000	0.0
20	4.203	167.1	0.0	2.000	3.408	0.000	0.0
J7	2.687	189.9	0.0	3.333	3.101	0.000	0.0
18	3.782	150.4	53.9	3.175	4.601	0.380	0.0
J6	1.744	123.3	57.6	4.601	4.328	0.411	0.0
15	2.599	413.4	56.9	4.178	4.131	0.411	0.0
ATT/HB Z2	0.994	39.5	113.0	4.516	1.879	0.997	0.0
6	1.033	41.1	107.1	1.879	1.155	0.997	0.0
4	2.004	79.7	106.8	1.155	1.350	0.997	0.0
3	1.431	56.9	106.4	1.350	1.425	0.997	0.0

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
44	13.859	138.6	150	Circular	21.300	20.300	0.850	21.300	20.200	0.950
35	21.083	210.8	150	Circular	21.300	20.200	0.950	21.300	20.100	1.050
34	63.342	30.2	225	Circular	21.300	20.100	0.975	20.300	18.000	2.075
33	22.581	25.1	225	Circular	20.300	18.000	2.075	19.740	17.100	2.415
32	20.233	18.4	225	Circular	19.740	17.100	2.415	19.000	16.000	2.775
36	40.086	250.5	300	Circular	17.600	16.100	1.200	19.000	15.940	2.760
31	57.498	449.2	450	Circular	19.000	15.940	2.610	18.600	15.812	2.338
47	5.819	59.4	150	Circular	19.165	17.850	1.165	19.170	17.752	1.268
38	22.819	33.5	225	Circular	19.170	17.775	1.170	18.836	17.094	1.517
Depth/Area 1	3.737	35.3	150	Circular	18.439	17.200	1.089	18.836	17.094	1.592
J5	16.528	33.5	225	Circular	18.836	17.094	1.517	18.594	16.600	1.769
48	6.612	16.5	150	Circular	18.441	17.000	1.291	18.594	16.600	1.844
37	36.306	46.1	375	Circular	18.594	16.600	1.619	18.600	15.812	2.413
40	28.752	19.2	225	Circular	20.000	17.900	1.875	19.500	16.400	2.875
26	7.820	50.1	225	Circular	19.658	17.500	1.933	19.500	17.344	1.931
39	17.578	29.9	300	Circular	19.500	16.400	2.800	18.600	15.812	2.488
30	29.385	452.1	450	Circular	18.600	15.812	2.338	19.200	15.747	3.003
46	4.926	25.0	150	Circular	19.172	17.900	1.122	19.200	17.703	1.347
29	20.855	453.4	450	Circular	19.200	15.747	3.003	19.500	15.701	3.349
28	16.647	520.2	525	Circular	19.500	15.701	3.274	19.605	15.669	3.411
27	10.352	517.6	525	Circular	19.605	15.669	3.411	19.516	15.649	3.342
1	12.239	21.5	225	Circular	20.337	18.650	1.462	20.000	18.080	1.695
43	21.237	164.6	225	Circular	20.000	18.080	1.695	19.796	17.951	1.620
49	8.656	16.5	150	Circular	19.904	18.475	1.279	19.796	17.950	1.696
J4	19.638	162.3	225	Circular	19.796	17.951	1.620	19.600	17.830	1.545

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
44	44	1200	Manhole	Adoptable	35	1200	Manhole	Adoptable
35	35	1200	Manhole	Adoptable	34	1200	Manhole	Adoptable
34	34	1200	Manhole	Adoptable	33	1200	Manhole	Adoptable
33	33	1200	Manhole	Adoptable	32	1200	Manhole	Adoptable
32	32	1200	Manhole	Adoptable	31	1500	Manhole	Adoptable
36	36	1500	Manhole	Adoptable	31	1500	Manhole	Adoptable
31	31	1500	Manhole	Adoptable	30	1500	Manhole	Adoptable
47	47	1200	Manhole	Adoptable	38	1200	Manhole	Adoptable
38	38	1200	Manhole	Adoptable	J5		Junction	
Depth/Area 1	Depth/Area 1		Manhole	Adoptable	J5		Junction	
J5	J5		Junction		37	1350	Manhole	Adoptable
48	48	1200	Manhole	Adoptable	37	1350	Manhole	Adoptable
37	37	1350	Manhole	Adoptable	30	1500	Manhole	Adoptable
40	40	1200	Manhole	Adoptable	39	1200	Manhole	Adoptable
26	26	1200	Manhole	Adoptable	39	1200	Manhole	Adoptable
39	39	1200	Manhole	Adoptable	30	1500	Manhole	Adoptable
30	30	1500	Manhole	Adoptable	29	1350	Manhole	Adoptable
46	46	1200	Manhole	Adoptable	29	1350	Manhole	Adoptable
29	29	1350	Manhole	Adoptable	28	1500	Manhole	Adoptable
28	28	1500	Manhole	Adoptable	27	1500	Manhole	Adoptable
27	27	1500	Manhole	Adoptable	ATT/HB Z1	1500	Manhole	Adoptable
1	1	1200	Manhole	Adoptable	43	1200	Manhole	Adoptable
43	43	1200	Manhole	Adoptable	J4		Junction	
49	49		Manhole	Adoptable	J4		Junction	
J4	J4		Junction		42	1200	Manhole	Adoptable

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
42	3.537	176.8	225	Circular	19.600	16.070	3.305	19.591	16.050	3.316
41	18.381	45.8	300	Circular	19.591	16.050	3.241	19.516	15.649	3.567
ATT/HB Z1	5.284	203.2	225	Circular	19.516	15.649	3.642	19.500	15.623	3.652
25	31.832	200.2	225	Circular	19.500	15.623	3.652	19.200	15.464	3.511
24	75.403	42.7	225	Circular	19.200	15.464	3.511	14.700	13.700	0.775
23	26.537	132.7	225	Circular	14.700	13.700	0.775	14.400	13.500	0.675
22	9.852	13.5	225	Circular	14.400	13.500	0.675	14.100	12.770	1.105
14	9.646	35.1	225	Circular	16.600	14.575	1.800	16.190	14.300	1.665
5	7.420	16.5	150	Circular	16.800	14.750	1.900	16.190	14.300	1.740
J1	30.806	175.0	300	Circular	16.190	14.300	1.590	16.963	14.124	2.539
7	6.508	25.0	150	Circular	17.307	15.500	1.657	16.963	15.240	1.573
J2	33.367	199.8	300	Circular	16.963	14.124	2.539	17.831	13.957	3.574
8	5.914	25.0	150	Circular	18.082	16.500	1.432	17.831	16.263	1.418
J3	18.850	200.5	300	Circular	17.831	13.957	3.574	18.100	13.863	3.937
13	37.385	199.9	300	Circular	18.100	13.863	3.937	19.550	13.676	5.574
45	12.673	50.1	150	Circular	19.688	18.000	1.538	19.550	17.747	1.653
12	35.394	200.0	300	Circular	19.550	13.676	5.574	18.500	13.499	4.701
11	19.524	199.2	375	Circular	18.500	13.499	4.626	18.500	13.401	4.724
10	19.108	251.4	375	Circular	18.500	13.401	4.724	17.808	13.325	4.108
17	6.611	50.1	150	Circular	17.956	16.480	1.326	17.808	16.348	1.310
J8	9.915	198.3	375	Circular	17.808	13.325	4.108	17.445	13.275	3.795
19	12.003	50.0	150	Circular	17.161	15.686	1.325	17.445	15.446	1.849
J9	2.446	152.9	375	Circular	17.445	13.275	3.795	17.400	13.259	3.766
9	35.784	34.4	375	Circular	17.400	12.500	4.525	16.181	11.460	4.346
16	56.605	29.0	225	Circular	16.525	15.000	1.300	16.278	13.050	3.003

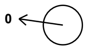
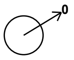
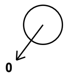
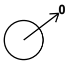
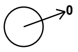
Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
42	42	1200	Manhole	Adoptable	41	1200	Manhole	Adoptable
41	41	1200	Manhole	Adoptable	ATT/HB Z1	1500	Manhole	Adoptable
ATT/HB Z1	ATT/HB Z1	1500	Manhole	Adoptable	25	1200	Manhole	Adoptable
25	25	1200	Manhole	Adoptable	24	1200	Manhole	Adoptable
24	24	1200	Manhole	Adoptable	23	1200	Manhole	Adoptable
23	23	1200	Manhole	Adoptable	22	1200	Manhole	Adoptable
22	22	1200	Manhole	Adoptable	21	1200	Manhole	Adoptable
14	14	1200	Manhole	Adoptable	J1		Junction	
5	5	1200	Manhole	Adoptable	J1		Junction	
J1	J1		Junction		J2		Junction	
7	7	1200	Manhole	Adoptable	J2		Junction	
J2	J2		Junction		J3		Junction	
8	8		Manhole	Adoptable	J3		Junction	
J3	J3		Junction		13	1200	Manhole	Adoptable
13	13	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
45	45	1200	Manhole	Adoptable	12	1200	Manhole	Adoptable
12	12	1200	Manhole	Adoptable	11	1350	Manhole	Adoptable
11	11	1350	Manhole	Adoptable	10	1350	Manhole	Adoptable
10	10	1350	Manhole	Adoptable	J8		Junction	
17	17		Manhole	Adoptable	J8		Junction	
J8	J8		Junction		J9		Junction	
19	19		Manhole	Adoptable	J9		Junction	
J9	J9		Junction		9	1350	Manhole	Adoptable
9	9	1350	Manhole	Adoptable	ATT/HB Z2	1350	Manhole	Adoptable
16	16	1200	Manhole	Adoptable	15	1350	Manhole	Adoptable

Pipeline Schedule

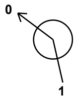
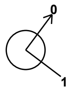
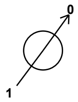
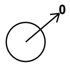
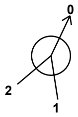
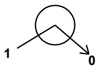
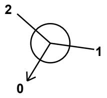
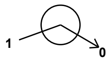
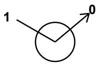
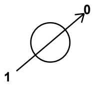
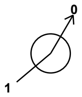
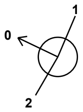
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
20	17.404	9.8	225	Circular	17.750	15.525	2.000	17.383	13.750	3.408
J7	17.225	34.5	300	Circular	17.383	13.750	3.333	16.651	13.250	3.101
18	15.425	12.1	225	Circular	16.500	13.100	3.175	16.651	11.825	4.601
J6	8.136	81.4	300	Circular	16.651	11.750	4.601	16.278	11.650	4.328
15	3.066	61.3	450	Circular	16.278	11.650	4.178	16.181	11.600	4.131
ATT/HB Z2	32.691	172.1	225	Circular	16.181	11.440	4.516	13.354	11.250	1.879
6	68.533	159.4	225	Circular	13.354	11.250	1.879	12.200	10.820	1.155
4	6.212	42.8	225	Circular	12.200	10.820	1.155	12.250	10.675	1.350
3	6.266	83.5	225	Circular	12.250	10.675	1.350	12.250	10.600	1.425

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
20	20	1200	Manhole	Adoptable	J7	1200	Junction	
J7	J7	1200	Junction		J6	1200	Junction	
18	18	1200	Manhole	Adoptable	J6	1200	Junction	
J6	J6	1200	Junction		15	1350	Manhole	Adoptable
15	15	1350	Manhole	Adoptable	ATT/HB Z2	1350	Manhole	Adoptable
ATT/HB Z2	ATT/HB Z2	1350	Manhole	Adoptable	6	1200	Manhole	Adoptable
6	6	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
4	4	1200	Manhole	Adoptable	3	1200	Manhole	Adoptable
3	3	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable

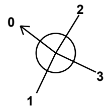
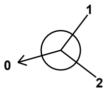
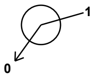
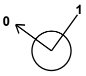
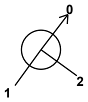
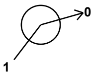
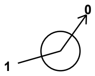
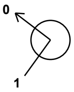
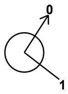
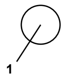
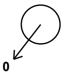
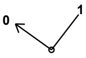
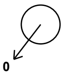
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
48	724844.682	728947.551	18.441	1.441	1200	 0	48	17.000	150
47	724803.423	728971.213	19.165	1.315	1200	 0	47	17.850	150
46	724798.764	728939.291	19.172	1.272	1200	 0	46	17.900	150
45	724728.932	728900.701	19.688	1.688	1200	 0	45	18.000	150
1	724780.075	728868.140	20.337	1.687	1200	 0	1	18.650	225
44	724763.809	728825.907	21.300	1.000	1200	 0	44	20.300	150

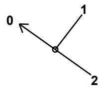
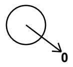
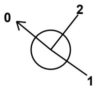
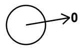
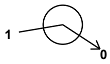
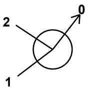
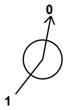
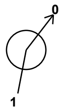
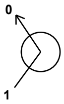
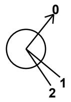
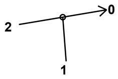
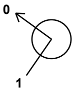
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
43	724777.352	728880.072	20.000	1.920	1200		1	1	18.080	225
							0	43	18.080	225
42	724744.645	728904.587	19.600	3.530	1200		1	J4	17.830	225
							0	42	16.070	225
41	724746.766	728907.417	19.591	3.541	1200		1	42	16.050	225
							0	41	16.050	300
40	724789.555	728883.155	20.000	2.100	1200		0	40	17.900	225
39	724811.544	728901.679	19.500	3.100	1200		1	26	17.344	225
							2	40	16.400	225
							0	39	16.400	300
38	724808.396	728974.235	19.170	1.418	1200		1	47	17.752	150
							0	38	17.775	225
37	724838.134	728948.472	18.594	1.994	1350		1	48	16.600	150
							2	J5	16.600	225
							0	37	16.600	375
36	724886.827	728929.655	17.600	1.500	1500		0	36	16.100	300
35	724776.861	728830.566	21.300	1.100	1200		1	44	20.200	150
							0	35	20.200	150
34	724795.107	728820.004	21.300	1.200	1200		1	35	20.100	150
							0	34	20.100	225
33	724843.614	728860.738	20.300	2.300	1200		1	34	18.000	225
							0	33	18.000	225
32	724860.844	728875.334	19.740	2.640	1200		1	33	17.100	225
							0	32	17.100	225
31	724871.049	728892.805	19.000	3.060	1500		1	36	15.940	300
							2	32	16.000	225
							0	31	15.940	450

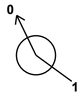
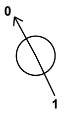
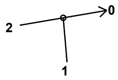
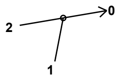
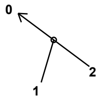
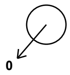
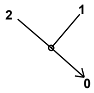
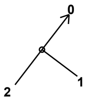
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
30	724819.139	728917.532	18.600	2.788	1500		1	39	15.812	300
							2	37	15.812	375
							3	31	15.812	450
							0	30	15.812	450
29	724795.786	728935.367	19.200	3.453	1350		1	46	17.703	150
							2	30	15.747	450
							0	29	15.747	450
28	724775.721	728929.683	19.500	3.799	1500		1	29	15.701	450
							0	28	15.701	525
27	724765.942	728916.211	19.605	3.936	1500		1	28	15.669	525
							0	27	15.669	525
ATT/HB Z1	724757.564	728922.292	19.516	3.867	1500		1	41	15.649	300
							2	27	15.649	525
							0	ATT/HB Z1	15.649	225
25	724760.775	728926.488	19.500	3.877	1200		1	ATT/HB Z1	15.623	225
							0	25	15.623	225
24	724791.402	728935.164	19.200	3.736	1200		1	25	15.464	225
							0	24	15.464	225
23	724835.551	728996.291	14.700	1.000	1200		1	24	13.700	225
							0	23	13.700	225
22	724814.438	729012.367	14.400	0.900	1200		1	23	13.500	225
							0	22	13.500	225
21	724819.816	729020.622	14.100	1.330	1200		1	22	12.770	225
20	724797.327	729007.046	17.750	2.225	1200		0	20	15.525	225
J7	724786.653	728993.299	17.383	3.633	1200		1	20	13.750	225
							0	J7	13.750	300
18	724782.036	729015.504	16.500	3.400	1200		0	18	13.100	225

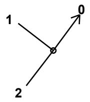
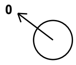
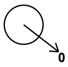
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
J6	724772.619	729003.287	16.651	4.901	1200		1	18	11.825	225
							2	J7	13.250	300
							0	J6	11.750	300
16	724730.955	729043.975	16.525	1.525	1200		0	16	15.000	225
15	724765.983	729007.995	16.278	4.628	1350		1	J6	11.650	300
							2	16	13.050	225
							0	15	11.650	450
14	724616.402	728913.463	16.600	2.025	1200		0	14	14.575	225
13	724707.784	728928.851	18.100	4.237	1200		1	J3	13.863	300
							0	13	13.863	300
12	724739.042	728908.343	19.550	5.874	1200		1	45	17.747	150
							2	13	13.676	300
							0	12	13.676	300
11	724760.883	728936.195	18.500	5.001	1350		1	12	13.499	300
							0	11	13.499	375
10	724764.552	728955.371	18.500	5.099	1350		1	11	13.401	375
							0	10	13.401	375
9	724783.708	728980.338	17.400	4.900	1350		1	J9	13.259	375
							0	9	12.500	375
ATT/HB Z2	724763.624	729009.954	16.181	4.741	1350		1	15	11.600	450
							2	9	11.460	375
							0	ATT/HB Z2	11.440	225
J1	724625.914	728915.064	16.190	1.890			1	5	14.300	150
							2	14	14.300	225
							0	J1	14.300	300
6	724784.031	729035.492	13.354	2.104	1200		1	ATT/HB Z2	11.250	225
							0	6	11.250	225
5	724626.479	728907.666	16.800	2.050	1200		0	5	14.750	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
4	724728.641	729075.850	12.200	1.380	1200		1	6	10.820	225
							0	4	10.820	225
3	724725.938	729081.443	12.250	1.575	1200		1	4	10.675	225
							0	3	10.675	225
2	724722.909	729086.928	12.250	1.650	1200		1	3	10.600	225
7	724656.857	728913.697	17.307	1.807	1200		0	7	15.500	150
J2	724656.292	728920.180	16.963	2.839			1	7	15.240	150
							2	J1	14.124	300
							0	J2	14.124	300
J3	724689.196	728925.721	17.831	3.874			1	8	16.263	150
							2	J2	13.957	300
							0	J3	13.957	300
8	724688.070	728919.915	18.082	1.582			0	8	16.500	150
26	724812.748	728893.952	19.658	2.158	1200		0	26	17.500	225
49	724757.912	728884.506	19.904	1.429			0	49	18.475	150
J4	724760.359	728892.809	19.796	1.846			1	49	17.950	150
							2	43	17.951	225
							0	J4	17.951	225
Depth/Area 1	724828.177	728962.261	18.439	1.239			0	Depth/Area 1	17.200	150
J5	724825.751	728959.419	18.836	1.742			1	Depth/Area 1	17.094	150
							2	38	17.094	225
							0	J5	17.094	225
J8	724776.184	728970.531	17.808	4.483			1	17	16.348	150
							2	10	13.325	375
							0	J8	13.325	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
J9	724782.249	728978.375	17.445	4.170			1	19	15.446	150
							2	J8	13.275	375
							0	J9	13.275	375
17	724781.465	728966.554	17.956	1.476			0	17	16.480	150
19	724772.732	728985.689	17.161	1.475			0	19	15.686	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
Rainfall Events	Singular	Drain Down Time (mins)	240
FSR Region	Scotland and Ireland	Additional Storage (m³/ha)	0.0
M5-60 (mm)	16.000	Starting Level (m)	
Ratio-R	0.277	Check Discharge Rate(s)	x
Summer CV	1.000	Check Discharge Volume	x
Analysis Speed	Detailed		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
3	0	0	0
4	0	0	0
5	0	0	0
10	20	10	0
20	20	10	0
30	20	10	0
50	20	10	0
75	20	10	0
100	20	10	0
120	20	10	0

Node ATT/HB Z1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	15.649	Product Number	CTL-SHE-0057-1700-1400-1700
Design Depth (m)	1.400	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.7	Min Node Diameter (mm)	1200

Node ATT/HB Z2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	11.440	Product Number	CTL-SHE-0052-1700-2110-1700
Design Depth (m)	2.110	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.7	Min Node Diameter (mm)	1200

Node ATT/HB Z1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	15.649
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.60	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	850.0	0.0	1.500	850.0	0.0	1.501	0.0	0.0

Node ATT/HB Z2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	11.440
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	490.0	0.0	2.110	490.0	0.0	2.111	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.059	0.059	12.9	0.0664	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.951	0.051	7.5	0.0578	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.330	0.030	1.3	0.0342	0.0000	OK
15 minute summer	43	10	18.152	0.072	8.8	0.0809	0.0000	OK
4320 minute summer	42	3360	16.165	0.095	0.5	0.1070	0.0000	OK
4320 minute summer	41	3360	16.165	0.115	0.5	0.1297	0.0000	OK
15 minute summer	40	10	17.933	0.033	5.5	0.0369	0.0000	OK
15 minute summer	39	10	16.507	0.107	56.3	0.1205	0.0000	OK
15 minute summer	38	10	17.822	0.070	8.7	0.0797	0.0000	OK
15 minute summer	37	10	16.668	0.068	21.9	0.0973	0.0000	OK
15 minute summer	36	12	16.251	0.151	17.2	0.2669	0.0000	OK
15 minute summer	35	11	20.233	0.033	1.3	0.0369	0.0000	OK
15 minute summer	34	10	20.156	0.056	12.7	0.0634	0.0000	OK
15 minute summer	33	11	18.053	0.053	12.4	0.0596	0.0000	OK
15 minute summer	32	11	17.158	0.058	17.9	0.0658	0.0000	OK
15 minute summer	31	12	16.245	0.305	42.9	0.5394	0.0000	OK
15 minute summer	30	12	16.213	0.401	103.2	0.7090	0.0000	OK
15 minute summer	29	11	16.176	0.429	121.6	0.6146	0.0000	OK
4320 minute summer	28	3360	16.165	0.464	6.6	0.8192	0.0000	OK
4320 minute summer	27	3360	16.165	0.496	6.5	0.8758	0.0000	OK
4320 minute summer	ATT/HB Z1	3360	16.165	0.516	6.9	263.8843	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	12.8	1.818	0.292	0.0468	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0236	
15 minute summer	46	46	29	7.5	1.501	0.209	0.0245	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0663	
15 minute summer	44	44	35	1.3	0.516	0.087	0.0369	
15 minute summer	43	43	J4	8.6	0.807	0.213	0.2273	
4320 minute summer	42	42	41	0.5	0.429	0.013	0.0639	
4320 minute summer	41	41	ATT/HB Z1	0.5	0.050	0.003	0.8745	
15 minute summer	40	40	39	5.4	0.522	0.046	0.3168	
15 minute summer	39	39	30	56.0	1.330	0.274	0.8157	
15 minute summer	38	38	J5	8.6	1.436	0.096	0.1371	
15 minute summer	37	37	30	21.6	0.456	0.073	2.2478	
15 minute summer	36	36	31	23.9	0.558	0.341	2.1235	
15 minute summer	35	35	34	1.3	0.305	0.105	0.0925	
15 minute summer	34	34	33	12.4	1.706	0.131	0.4657	
15 minute summer	33	33	32	12.5	1.650	0.120	0.1713	
15 minute summer	32	32	31	17.9	1.830	0.147	0.4791	
15 minute summer	31	31	30	52.4	0.511	0.346	7.5818	
15 minute summer	30	30	29	117.7	0.886	0.779	4.3978	
15 minute summer	29	29	28	130.5	1.016	0.865	3.2779	
4320 minute summer	28	28	27	6.5	0.237	0.031	3.4387	
4320 minute summer	27	27	ATT/HB Z1	6.4	0.444	0.030	2.2068	
4320 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.3				

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	25	124	15.654	0.031	1.3	0.0349	0.0000	OK
120 minute summer	24	116	15.484	0.020	1.3	0.0229	0.0000	OK
120 minute summer	23	124	13.729	0.029	1.3	0.0325	0.0000	OK
120 minute summer	22	122	13.516	0.016	1.3	0.0177	0.0000	OK
120 minute summer	21	122	12.785	0.015	1.3	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.207	0.107	64.5	0.1209	0.0000	OK
7200 minute summer	J6	4920	12.234	0.484	2.7	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
7200 minute summer	15	4920	12.234	0.584	12.4	0.8355	0.0000	SURCHARGED
15 minute summer	14	10	14.595	0.020	1.5	0.0230	0.0000	OK
15 minute summer	13	11	14.072	0.209	60.2	0.2365	0.0000	OK
15 minute summer	12	11	13.883	0.207	60.5	0.2342	0.0000	OK
15 minute summer	11	12	13.693	0.194	61.9	0.2779	0.0000	OK
15 minute summer	10	12	13.612	0.211	69.4	0.3017	0.0000	OK
15 minute summer	9	12	12.637	0.137	89.6	0.1955	0.0000	OK
7200 minute summer	ATT/HB Z2	4920	12.234	0.794	9.8	390.1156	0.0000	SURCHARGED
15 minute summer	J1	10	14.380	0.080	13.5	0.0000	0.0000	OK
7200 minute summer	6	4920	11.277	0.027	1.1	0.0302	0.0000	OK
15 minute summer	5	10	14.804	0.054	12.1	0.0607	0.0000	OK
7200 minute summer	4	4920	10.839	0.019	1.1	0.0209	0.0000	OK
7200 minute summer	3	4920	10.697	0.022	1.1	0.0252	0.0000	OK
7200 minute summer	2	4920	10.622	0.022	1.1	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	25	25	24	1.3	0.535	0.036	0.0798	
120 minute summer	24	24	23	1.3	0.571	0.017	0.1766	
120 minute summer	23	23	22	1.3	0.657	0.029	0.0549	
120 minute summer	22	22	21	1.3	1.116	0.009	0.0117	24.2
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	64.2	3.560	0.427	0.2784	
7200 minute summer	J6	J6	15	4.8	0.681	0.039	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
7200 minute summer	15	15	ATT/HB Z2	-7.5	0.605	-0.018	0.4858	
15 minute summer	14	14	J1	1.5	0.224	0.017	0.0696	
15 minute summer	13	13	12	60.5	1.163	0.772	1.9495	
15 minute summer	12	12	11	59.4	1.195	0.759	1.7612	
15 minute summer	11	11	10	62.2	1.029	0.440	1.1849	
15 minute summer	10	10	J8	70.2	1.117	0.559	1.2217	
15 minute summer	9	9	ATT/HB Z2	90.2	2.576	0.264	1.2540	
7200 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.1				
15 minute summer	J1	J1	J2	13.3	0.603	0.159	0.6874	
7200 minute summer	6	6	4	1.1	0.530	0.027	0.1431	
15 minute summer	5	5	J1	12.1	1.590	0.274	0.0565	
7200 minute summer	4	4	3	1.1	0.620	0.014	0.0110	
7200 minute summer	3	3	2	1.1	0.554	0.019	0.0124	370.4
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.84%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	11	14.255	0.131	32.4	0.0000	0.0000	OK
15 minute summer	J3	11	14.152	0.195	54.3	0.0000	0.0000	OK
15 minute summer	8	10	16.588	0.088	20.7	0.0000	0.0000	OK
15 minute summer	26	10	17.663	0.163	51.1	0.1842	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.022	0.072	8.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.141	0.047	8.6	0.0000	0.0000	OK
15 minute summer	J8	11	13.537	0.212	87.5	0.0000	0.0000	OK
15 minute summer	J9	12	13.490	0.215	87.4	0.0000	0.0000	OK
15 minute summer	17	10	16.566	0.086	14.4	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	31.8	0.814	0.406	1.3044	
15 minute summer	J3	J3	13	54.0	1.073	0.691	0.9517	
15 minute summer	8	8	J3	20.6	2.007	0.577	0.0608	
15 minute summer	26	26	39	50.8	1.814	0.690	0.2187	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0363	
15 minute summer	J4	J4	42	8.6	0.814	0.212	0.2085	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0087	
15 minute summer	J5	J5	37	8.6	1.077	0.095	0.1325	
15 minute summer	J8	J8	J9	87.4	1.350	0.617	0.6420	
15 minute summer	J9	J9	9	87.6	1.428	0.542	0.1500	
15 minute summer	17	17	J8	14.4	1.423	0.570	0.0667	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 3 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.063	0.063	14.3	0.0707	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.955	0.055	8.4	0.0617	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.332	0.032	1.5	0.0363	0.0000	OK
15 minute summer	43	10	18.156	0.076	9.8	0.0858	0.0000	OK
4320 minute summer	42	3300	16.205	0.135	0.5	0.1523	0.0000	OK
4320 minute summer	41	3300	16.205	0.155	0.5	0.1749	0.0000	OK
15 minute summer	40	10	17.934	0.034	6.1	0.0389	0.0000	OK
15 minute summer	39	10	16.513	0.113	62.4	0.1273	0.0000	OK
15 minute summer	38	10	17.825	0.073	9.6	0.0825	0.0000	OK
15 minute summer	37	10	16.672	0.072	24.3	0.1024	0.0000	OK
15 minute summer	36	12	16.360	0.260	15.4	0.4587	0.0000	OK
15 minute summer	35	11	20.235	0.035	1.5	0.0392	0.0000	OK
15 minute summer	34	10	20.159	0.059	14.1	0.0670	0.0000	OK
15 minute summer	33	11	18.056	0.056	13.9	0.0631	0.0000	OK
15 minute summer	32	11	17.161	0.061	19.9	0.0694	0.0000	OK
15 minute summer	31	12	16.269	0.329	42.6	0.5805	0.0000	OK
15 minute summer	30	12	16.236	0.424	121.6	0.7495	0.0000	OK
4320 minute summer	29	3300	16.205	0.458	7.2	0.6549	0.0000	SURCHARGED
4320 minute summer	28	3300	16.205	0.504	7.0	0.8899	0.0000	OK
4320 minute summer	27	3300	16.205	0.536	6.9	0.9464	0.0000	SURCHARGED
4320 minute summer	ATT/HB Z1	3300	16.205	0.556	7.3	284.3475	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	14.2	1.871	0.324	0.0503	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0247	
15 minute summer	46	46	29	8.3	1.543	0.234	0.0267	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0719	
15 minute summer	44	44	35	1.5	0.527	0.098	0.0399	
15 minute summer	43	43	J4	9.6	0.832	0.238	0.2464	
4320 minute summer	42	42	41	0.5	0.429	0.013	0.0953	
4320 minute summer	41	41	ATT/HB Z1	0.5	0.057	0.003	0.9835	
15 minute summer	40	40	39	6.0	0.538	0.051	0.3403	
15 minute summer	39	39	30	62.1	1.351	0.304	0.8311	
15 minute summer	38	38	J5	9.5	1.478	0.106	0.1472	
15 minute summer	37	37	30	24.0	0.465	0.081	2.2661	
15 minute summer	36	36	31	17.7	0.566	0.254	2.7098	
15 minute summer	35	35	34	1.4	0.320	0.118	0.0998	
15 minute summer	34	34	33	13.9	1.756	0.146	0.5030	
15 minute summer	33	33	32	13.9	1.700	0.134	0.1852	
15 minute summer	32	32	31	20.0	1.866	0.164	0.4909	
15 minute summer	31	31	30	67.7	0.530	0.447	8.0178	
15 minute summer	30	30	29	136.2	0.941	0.902	4.5872	
4320 minute summer	29	29	28	7.0	0.325	0.047	3.3043	
4320 minute summer	28	28	27	6.9	0.237	0.033	3.5712	
4320 minute summer	27	27	ATT/HB Z1	6.8	0.463	0.032	2.2364	
4320 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.3				

Results for 3 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
480 minute summer	25	256	15.654	0.031	1.3	0.0349	0.0000	OK
120 minute summer	24	94	15.484	0.020	1.3	0.0229	0.0000	OK
120 minute summer	23	102	13.729	0.029	1.3	0.0325	0.0000	OK
120 minute summer	22	100	13.516	0.016	1.3	0.0177	0.0000	OK
120 minute summer	21	102	12.785	0.015	1.3	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.213	0.113	71.6	0.1283	0.0000	OK
7200 minute summer	J6	4980	12.298	0.548	2.9	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
7200 minute summer	15	4980	12.298	0.648	10.4	0.9271	0.0000	SURCHARGED
15 minute summer	14	11	14.596	0.021	1.6	0.0239	0.0000	OK
15 minute summer	13	11	14.091	0.228	66.8	0.2574	0.0000	OK
15 minute summer	12	11	13.901	0.225	67.0	0.2539	0.0000	OK
15 minute summer	11	12	13.707	0.208	68.5	0.2978	0.0000	OK
15 minute summer	10	12	13.626	0.225	76.9	0.3226	0.0000	OK
15 minute summer	9	12	12.645	0.145	99.3	0.2072	0.0000	OK
7200 minute summer	ATT/HB Z2	4980	12.298	0.858	8.4	421.5828	0.0000	SURCHARGED
15 minute summer	J1	10	14.385	0.085	15.1	0.0000	0.0000	OK
7200 minute summer	6	4980	11.277	0.027	1.1	0.0307	0.0000	OK
15 minute summer	5	10	14.807	0.057	13.5	0.0644	0.0000	OK
7200 minute summer	4	4980	10.839	0.019	1.1	0.0213	0.0000	OK
7200 minute summer	3	4980	10.698	0.023	1.1	0.0256	0.0000	OK
7200 minute summer	2	4980	10.622	0.022	1.1	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
480 minute summer	25	25	24	1.3	0.535	0.036	0.0798	
120 minute summer	24	24	23	1.3	0.571	0.017	0.1766	
120 minute summer	23	23	22	1.3	0.657	0.029	0.0549	
120 minute summer	22	22	21	1.3	1.116	0.009	0.0117	24.4
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	71.4	3.604	0.475	0.3069	
7200 minute summer	J6	J6	15	4.6	0.681	0.037	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
7200 minute summer	15	15	ATT/HB Z2	-5.8	0.605	-0.014	0.4858	
15 minute summer	14	14	J1	1.6	0.231	0.018	0.0748	
15 minute summer	13	13	12	67.0	1.183	0.855	2.1292	
15 minute summer	12	12	11	65.9	1.217	0.841	1.9143	
15 minute summer	11	11	10	68.9	1.050	0.487	1.2881	
15 minute summer	10	10	J8	77.8	1.144	0.619	1.3227	
15 minute summer	9	9	ATT/HB Z2	100.0	2.645	0.292	1.3534	
7200 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.1				
15 minute summer	J1	J1	J2	14.9	0.621	0.177	0.7434	
7200 minute summer	6	6	4	1.1	0.536	0.028	0.1465	
15 minute summer	5	5	J1	13.5	1.647	0.305	0.0607	
7200 minute summer	4	4	3	1.1	0.625	0.014	0.0113	
7200 minute summer	3	3	2	1.1	0.559	0.020	0.0127	385.3
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 3 year Critical Storm Duration. Lowest mass balance: 99.81%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	11	14.263	0.139	36.0	0.0000	0.0000	OK
15 minute summer	J3	11	14.169	0.212	60.4	0.0000	0.0000	OK
15 minute summer	8	10	16.595	0.095	23.0	0.0000	0.0000	OK
15 minute summer	26	10	17.677	0.177	56.7	0.2004	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.026	0.076	9.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.143	0.049	9.5	0.0000	0.0000	OK
15 minute summer	J8	11	13.551	0.226	97.1	0.0000	0.0000	OK
15 minute summer	J9	12	13.504	0.229	96.7	0.0000	0.0000	OK
15 minute summer	17	10	16.572	0.092	16.0	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	35.3	0.830	0.451	1.4219	
15 minute summer	J3	J3	13	59.9	1.091	0.766	1.0418	
15 minute summer	8	8	J3	22.9	2.051	0.641	0.0661	
15 minute summer	26	26	39	56.4	1.846	0.766	0.2379	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0390	
15 minute summer	J4	J4	42	9.6	0.839	0.237	0.2259	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0093	
15 minute summer	J5	J5	37	9.5	1.109	0.105	0.1422	
15 minute summer	J8	J8	J9	96.7	1.385	0.683	0.6928	
15 minute summer	J9	J9	9	97.0	1.466	0.601	0.1619	
15 minute summer	17	17	J8	15.9	1.456	0.633	0.0724	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 4 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	48	10	17.065	0.065	15.4	0.0741	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.957	0.057	9.0	0.0642	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.333	0.033	1.6	0.0376	0.0000	OK
15 minute summer	43	10	18.159	0.079	10.6	0.0895	0.0000	OK
4320 minute summer	42	3300	16.247	0.177	0.5	0.1997	0.0000	OK
4320 minute summer	41	3300	16.247	0.197	0.5	0.2223	0.0000	OK
15 minute summer	40	10	17.936	0.036	6.6	0.0404	0.0000	OK
15 minute summer	39	10	16.517	0.117	67.3	0.1326	0.0000	OK
15 minute summer	38	10	17.827	0.075	10.3	0.0845	0.0000	OK
15 minute summer	37	10	16.674	0.074	26.1	0.1061	0.0000	OK
15 minute summer	36	12	16.350	0.250	23.8	0.4425	0.0000	OK
15 minute summer	35	11	20.236	0.036	1.6	0.0405	0.0000	OK
15 minute summer	34	10	20.162	0.061	15.2	0.0696	0.0000	OK
15 minute summer	33	11	18.058	0.058	14.9	0.0655	0.0000	OK
15 minute summer	32	11	17.164	0.064	21.4	0.0720	0.0000	OK
15 minute summer	31	12	16.335	0.395	58.7	0.6982	0.0000	OK
15 minute summer	30	11	16.270	0.458	145.0	0.8098	0.0000	SURCHARGED
4320 minute summer	29	3300	16.247	0.500	7.5	0.7149	0.0000	SURCHARGED
4320 minute summer	28	3300	16.247	0.546	7.4	0.9641	0.0000	SURCHARGED
4320 minute summer	27	3300	16.247	0.578	7.3	1.0206	0.0000	SURCHARGED
4320 minute summer	ATT/HB Z1	3300	16.247	0.598	7.6	305.8265	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	48	48	37	15.3	1.911	0.349	0.0531	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0255	
15 minute summer	46	46	29	8.9	1.569	0.251	0.0281	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0762	
15 minute summer	44	44	35	1.6	0.530	0.104	0.0418	
15 minute summer	43	43	J4	10.4	0.849	0.258	0.2604	
4320 minute summer	42	42	41	0.5	0.429	0.013	0.1242	
4320 minute summer	41	41	ATT/HB Z1	0.5	0.082	0.003	1.0968	
15 minute summer	40	40	39	6.5	0.551	0.055	0.3586	
15 minute summer	39	39	30	66.9	1.361	0.328	0.8430	
15 minute summer	38	38	J5	10.2	1.508	0.114	0.1549	
15 minute summer	37	37	30	25.8	0.470	0.087	2.2801	
15 minute summer	36	36	31	32.2	0.571	0.461	2.6705	
15 minute summer	35	35	34	1.5	0.320	0.126	0.1047	
15 minute summer	34	34	33	14.9	1.791	0.157	0.5300	
15 minute summer	33	33	32	15.0	1.735	0.144	0.1950	
15 minute summer	32	32	31	21.4	1.897	0.176	0.4955	
15 minute summer	31	31	30	60.9	0.479	0.402	8.7758	
15 minute summer	30	30	29	147.4	0.976	0.976	4.6559	
4320 minute summer	29	29	28	7.4	0.320	0.049	3.3043	
4320 minute summer	28	28	27	7.3	0.243	0.034	3.5963	
4320 minute summer	27	27	ATT/HB Z1	7.1	0.463	0.034	2.2364	
4320 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.3				

Results for 4 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	25	84	15.654	0.031	1.3	0.0349	0.0000	OK
120 minute summer	24	88	15.484	0.020	1.3	0.0229	0.0000	OK
120 minute summer	23	338	13.729	0.029	1.3	0.0325	0.0000	OK
120 minute summer	22	336	13.516	0.016	1.3	0.0177	0.0000	OK
120 minute summer	21	338	12.785	0.015	1.3	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.218	0.118	77.1	0.1334	0.0000	OK
8640 minute summer	J6	5880	12.353	0.603	2.7	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
8640 minute summer	15	5880	12.353	0.703	11.0	1.0062	0.0000	SURCHARGED
15 minute summer	14	10	14.597	0.022	1.8	0.0251	0.0000	OK
15 minute summer	13	11	14.107	0.244	71.9	0.2755	0.0000	OK
15 minute summer	12	11	13.915	0.239	71.9	0.2701	0.0000	OK
15 minute summer	11	12	13.718	0.219	73.4	0.3131	0.0000	OK
15 minute summer	10	12	13.638	0.237	82.5	0.3385	0.0000	OK
15 minute summer	9	12	12.651	0.151	106.5	0.2157	0.0000	OK
8640 minute summer	ATT/HB Z2	5880	12.353	0.913	8.8	448.7523	0.0000	SURCHARGED
15 minute summer	J1	10	14.388	0.088	16.2	0.0000	0.0000	OK
8640 minute summer	6	5880	11.278	0.027	1.2	0.0311	0.0000	OK
15 minute summer	5	10	14.809	0.059	14.5	0.0669	0.0000	OK
8640 minute summer	4	5880	10.839	0.019	1.2	0.0216	0.0000	OK
8640 minute summer	3	5880	10.698	0.023	1.2	0.0260	0.0000	OK
8640 minute summer	2	5880	10.622	0.022	1.2	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	25	25	24	1.3	0.535	0.036	0.0798	
120 minute summer	24	24	23	1.3	0.571	0.017	0.1766	
120 minute summer	23	23	22	1.3	0.657	0.029	0.0549	
120 minute summer	22	22	21	1.3	1.116	0.009	0.0117	24.4
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	76.9	3.593	0.511	0.3314	
8640 minute summer	J6	J6	15	4.3	0.668	0.035	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
8640 minute summer	15	15	ATT/HB Z2	-6.6	0.596	-0.016	0.4858	
15 minute summer	14	14	J1	1.8	0.237	0.020	0.0789	
15 minute summer	13	13	12	71.9	1.195	0.918	2.2697	
15 minute summer	12	12	11	70.7	1.231	0.903	2.0322	
15 minute summer	11	11	10	73.9	1.066	0.523	1.3663	
15 minute summer	10	10	J8	83.4	1.163	0.664	1.3978	
15 minute summer	9	9	ATT/HB Z2	107.3	2.692	0.314	1.4261	
8640 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.2				
15 minute summer	J1	J1	J2	16.0	0.632	0.191	0.7845	
8640 minute summer	6	6	4	1.2	0.541	0.028	0.1494	
15 minute summer	5	5	J1	14.4	1.684	0.328	0.0637	
8640 minute summer	4	4	3	1.2	0.630	0.015	0.0115	
8640 minute summer	3	3	2	1.2	0.564	0.020	0.0130	462.5
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 4 year Critical Storm Duration. Lowest mass balance: 99.77%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	J2	11	14.269	0.145	38.8	0.0000	0.0000	OK
15 minute summer	J3	11	14.183	0.226	65.0	0.0000	0.0000	OK
15 minute summer	8	10	16.600	0.100	24.8	0.0000	0.0000	OK
15 minute summer	26	10	17.690	0.190	61.1	0.2144	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.030	0.080	10.4	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.145	0.051	10.2	0.0000	0.0000	OK
15 minute summer	J8	11	13.562	0.237	104.4	0.0000	0.0000	OK
15 minute summer	J9	12	13.514	0.239	103.8	0.0000	0.0000	OK
15 minute summer	17	10	16.578	0.098	17.3	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	J2	J2	J3	38.0	0.838	0.486	1.5166	
15 minute summer	J3	J3	13	64.5	1.101	0.824	1.1153	
15 minute summer	8	8	J3	24.7	2.082	0.691	0.0702	
15 minute summer	26	26	39	60.7	1.866	0.825	0.2530	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0410	
15 minute summer	J4	J4	42	10.4	0.857	0.256	0.2387	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0098	
15 minute summer	J5	J5	37	10.2	1.133	0.113	0.1494	
15 minute summer	J8	J8	J9	103.8	1.409	0.733	0.7308	
15 minute summer	J9	J9	9	104.1	1.492	0.644	0.1706	
15 minute summer	17	17	J8	17.2	1.480	0.685	0.0770	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	10	17.067	0.067	16.1	0.0761	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.958	0.058	9.4	0.0659	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.334	0.034	1.7	0.0388	0.0000	OK
15 minute summer	43	10	18.161	0.081	11.1	0.0918	0.0000	OK
4320 minute summer	42	3360	16.282	0.212	0.6	0.2393	0.0000	OK
4320 minute summer	41	3360	16.282	0.232	0.6	0.2619	0.0000	OK
15 minute summer	40	10	17.937	0.037	6.9	0.0413	0.0000	OK
15 minute summer	39	10	16.520	0.120	70.5	0.1361	0.0000	OK
15 minute summer	38	10	17.828	0.076	10.9	0.0862	0.0000	OK
15 minute summer	37	10	16.676	0.076	27.5	0.1087	0.0000	OK
15 minute summer	36	12	16.346	0.246	36.4	0.4354	0.0000	OK
15 minute summer	35	11	20.237	0.037	1.7	0.0418	0.0000	OK
15 minute summer	34	10	20.163	0.063	15.9	0.0712	0.0000	OK
15 minute summer	33	11	18.059	0.059	15.7	0.0672	0.0000	OK
15 minute summer	32	11	17.165	0.065	22.4	0.0738	0.0000	OK
15 minute summer	31	12	16.344	0.404	48.9	0.7139	0.0000	OK
15 minute summer	30	12	16.319	0.507	168.9	0.8953	0.0000	SURCHARGED
4320 minute summer	29	3360	16.282	0.535	7.9	0.7650	0.0000	SURCHARGED
4320 minute summer	28	3360	16.282	0.581	7.7	1.0259	0.0000	SURCHARGED
4320 minute summer	27	3360	16.282	0.613	7.6	1.0824	0.0000	SURCHARGED
4320 minute summer	ATT/HB Z1	3360	16.282	0.633	8.1	323.7298	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	16.0	1.932	0.365	0.0549	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0262	
15 minute summer	46	46	29	9.4	1.586	0.262	0.0291	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.0789	
15 minute summer	44	44	35	1.7	0.541	0.111	0.0438	
15 minute summer	43	43	J4	10.9	0.860	0.270	0.2697	
4320 minute summer	42	42	41	0.6	0.452	0.015	0.1389	
4320 minute summer	41	41	ATT/HB Z1	0.6	0.126	0.004	1.1836	
15 minute summer	40	40	39	6.8	0.557	0.057	0.3703	
15 minute summer	39	39	30	70.2	1.371	0.344	0.8509	
15 minute summer	38	38	J5	10.8	1.532	0.120	0.1612	
15 minute summer	37	37	30	27.2	0.476	0.092	2.2915	
15 minute summer	36	36	31	21.2	0.579	0.304	2.6525	
15 minute summer	35	35	34	1.6	0.327	0.134	0.1088	
15 minute summer	34	34	33	15.7	1.814	0.165	0.5494	
15 minute summer	33	33	32	15.7	1.759	0.151	0.2019	
15 minute summer	32	32	31	22.5	1.907	0.185	0.4987	
15 minute summer	31	31	30	80.7	0.510	0.533	8.8674	
15 minute summer	30	30	29	162.7	1.027	1.077	4.6559	
4320 minute summer	29	29	28	7.7	0.321	0.051	3.3043	
4320 minute summer	28	28	27	7.6	0.246	0.036	3.5963	
4320 minute summer	27	27	ATT/HB Z1	7.5	0.463	0.035	2.2364	
4320 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.3				

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
180 minute summer	25	108	15.654	0.031	1.3	0.0349	0.0000	OK
60 minute summer	24	69	15.484	0.020	1.3	0.0229	0.0000	OK
60 minute summer	23	76	13.729	0.029	1.3	0.0325	0.0000	OK
60 minute summer	22	75	13.516	0.016	1.3	0.0177	0.0000	OK
60 minute summer	21	76	12.785	0.015	1.3	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.221	0.121	80.9	0.1371	0.0000	OK
7200 minute summer	J6	5100	12.401	0.651	3.1	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
7200 minute summer	15	5100	12.401	0.751	10.3	1.0754	0.0000	SURCHARGED
15 minute summer	14	10	14.598	0.023	1.9	0.0257	0.0000	OK
15 minute summer	13	11	14.119	0.256	75.4	0.2898	0.0000	OK
15 minute summer	12	11	13.925	0.249	75.2	0.2821	0.0000	OK
15 minute summer	11	12	13.725	0.226	76.7	0.3236	0.0000	OK
15 minute summer	10	12	13.645	0.244	86.5	0.3496	0.0000	OK
15 minute summer	9	12	12.655	0.155	111.5	0.2215	0.0000	OK
7200 minute summer	ATT/HB Z2	5100	12.401	0.961	12.0	472.5067	0.0000	SURCHARGED
15 minute summer	J1	10	14.390	0.090	17.0	0.0000	0.0000	OK
7200 minute summer	6	5100	11.278	0.028	1.2	0.0314	0.0000	OK
15 minute summer	5	10	14.811	0.061	15.2	0.0687	0.0000	OK
7200 minute summer	4	5100	10.839	0.019	1.2	0.0218	0.0000	OK
7200 minute summer	3	5100	10.698	0.023	1.2	0.0263	0.0000	OK
7200 minute summer	2	5100	10.623	0.023	1.2	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
180 minute summer	25	25	24	1.3	0.535	0.036	0.0798	
60 minute summer	24	24	23	1.3	0.573	0.017	0.1766	
60 minute summer	23	23	22	1.3	0.657	0.029	0.0549	
60 minute summer	22	22	21	1.3	1.116	0.009	0.0117	21.2
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	80.7	3.588	0.537	0.3481	
7200 minute summer	J6	J6	15	4.7	0.681	0.038	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
7200 minute summer	15	15	ATT/HB Z2	7.9	0.605	0.019	0.4858	
15 minute summer	14	14	J1	1.9	0.242	0.021	0.0816	
15 minute summer	13	13	12	75.2	1.201	0.961	2.3682	
15 minute summer	12	12	11	74.1	1.239	0.946	2.1136	
15 minute summer	11	11	10	77.3	1.075	0.547	1.4198	
15 minute summer	10	10	J8	87.3	1.175	0.695	1.4495	
15 minute summer	9	9	ATT/HB Z2	112.3	2.723	0.328	1.4762	
7200 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.2				
15 minute summer	J1	J1	J2	16.8	0.640	0.200	0.8141	
7200 minute summer	6	6	4	1.2	0.545	0.029	0.1517	
15 minute summer	5	5	J1	15.2	1.709	0.344	0.0658	
7200 minute summer	4	4	3	1.2	0.633	0.015	0.0117	
7200 minute summer	3	3	2	1.2	0.567	0.021	0.0132	406.2
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 5 year Critical Storm Duration. Lowest mass balance: 99.75%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	11	14.274	0.150	40.8	0.0000	0.0000	OK
15 minute summer	J3	11	14.195	0.238	68.3	0.0000	0.0000	OK
15 minute summer	8	10	16.604	0.104	26.0	0.0000	0.0000	OK
15 minute summer	26	10	17.699	0.199	64.1	0.2252	0.0000	OK
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.032	0.082	10.9	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.146	0.052	10.8	0.0000	0.0000	OK
15 minute summer	J8	11	13.570	0.245	109.4	0.0000	0.0000	OK
15 minute summer	J9	12	13.521	0.246	108.7	0.0000	0.0000	OK
15 minute summer	17	10	16.581	0.101	18.1	0.0000	0.0000	OK
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	40.0	0.843	0.510	1.5863	
15 minute summer	J3	J3	13	67.6	1.106	0.864	1.1691	
15 minute summer	8	8	J3	25.9	2.100	0.725	0.0730	
15 minute summer	26	26	39	63.7	1.874	0.865	0.2634	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0423	
15 minute summer	J4	J4	42	10.9	0.868	0.268	0.2470	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0102	
15 minute summer	J5	J5	37	10.7	1.155	0.119	0.1549	
15 minute summer	J8	J8	J9	108.7	1.426	0.767	0.7569	
15 minute summer	J9	J9	9	109.0	1.509	0.675	0.1766	
15 minute summer	17	17	J8	18.0	1.493	0.716	0.0799	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 10 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	48	10	17.090	0.090	24.6	0.1015	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.976	0.076	14.4	0.0856	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.342	0.042	2.5	0.0475	0.0000	OK
15 minute summer	43	10	18.183	0.103	16.9	0.1162	0.0000	OK
5760 minute summer	42	4560	16.701	0.631	0.7	0.7136	0.0000	SURCHARGED
5760 minute summer	41	4560	16.701	0.651	0.7	0.7362	0.0000	SURCHARGED
15 minute summer	40	10	17.945	0.045	10.5	0.0507	0.0000	OK
15 minute summer	39	11	16.932	0.532	107.4	0.6019	0.0000	SURCHARGED
15 minute summer	38	10	17.841	0.089	16.6	0.1008	0.0000	OK
15 minute summer	37	11	16.745	0.145	41.9	0.2075	0.0000	OK
15 minute summer	36	10	16.945	0.845	26.5	1.4929	0.0000	SURCHARGED
15 minute summer	35	11	20.245	0.045	2.5	0.0513	0.0000	OK
15 minute summer	34	10	20.179	0.079	24.3	0.0890	0.0000	OK
15 minute summer	33	11	18.074	0.074	24.0	0.0841	0.0000	OK
15 minute summer	32	11	17.181	0.081	34.3	0.0920	0.0000	OK
15 minute summer	31	11	16.740	0.800	81.8	1.4129	0.0000	SURCHARGED
5760 minute summer	30	4560	16.701	0.889	9.2	1.5707	0.0000	SURCHARGED
5760 minute summer	29	4560	16.701	0.954	9.5	1.3651	0.0000	SURCHARGED
5760 minute summer	28	4560	16.701	1.000	9.5	1.7668	0.0000	SURCHARGED
5760 minute summer	27	4560	16.701	1.032	9.5	1.8234	0.0000	SURCHARGED
5760 minute summer	ATT/HB Z1	4560	16.701	1.052	10.1	538.3314	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	48	48	37	24.5	2.170	0.557	0.0908	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0317	
15 minute summer	46	46	29	14.3	1.749	0.401	0.0403	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1080	
15 minute summer	44	44	35	2.5	0.599	0.164	0.0584	
15 minute summer	43	43	J4	16.7	0.956	0.413	0.3705	
5760 minute summer	42	42	41	0.7	0.429	0.017	0.1407	
5760 minute summer	41	41	ATT/HB Z1	0.6	0.396	0.004	1.2944	
15 minute summer	40	40	39	10.4	0.573	0.087	0.6522	
15 minute summer	39	39	30	112.4	1.596	0.551	1.2378	
15 minute summer	38	38	J5	16.5	1.724	0.183	0.2182	
15 minute summer	37	37	30	41.5	0.524	0.141	2.7157	
15 minute summer	36	36	31	27.6	0.616	0.395	2.8228	
15 minute summer	35	35	34	2.4	0.366	0.201	0.1445	
15 minute summer	34	34	33	24.0	2.029	0.252	0.7492	
15 minute summer	33	33	32	23.9	1.967	0.230	0.2749	
15 minute summer	32	32	31	34.4	1.888	0.282	0.5331	
15 minute summer	31	31	30	80.1	0.538	0.528	9.1102	
5760 minute summer	30	30	29	8.9	0.339	0.059	4.6559	
5760 minute summer	29	29	28	9.5	0.303	0.063	3.3043	
5760 minute summer	28	28	27	9.5	0.254	0.045	3.5963	
5760 minute summer	27	27	ATT/HB Z1	9.4	0.473	0.045	2.2364	
5760 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.5				

Results for 10 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute summer	25	4560	15.656	0.033	1.5	0.0370	0.0000	OK
5760 minute summer	24	4560	15.485	0.021	1.5	0.0242	0.0000	OK
5760 minute summer	23	4560	13.730	0.030	1.5	0.0344	0.0000	OK
5760 minute summer	22	4560	13.517	0.017	1.5	0.0187	0.0000	OK
5760 minute summer	21	4560	12.786	0.016	1.5	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.258	0.158	123.3	0.1792	0.0000	OK
8640 minute summer	J6	6300	12.984	1.234	4.1	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
8640 minute summer	15	6300	12.984	1.334	5.2	1.9094	0.0000	SURCHARGED
15 minute summer	14	12	14.755	0.180	5.1	0.2034	0.0000	OK
15 minute summer	13	12	14.511	0.648	100.2	0.7325	0.0000	SURCHARGED
15 minute summer	12	12	14.139	0.463	100.7	0.5238	0.0000	SURCHARGED
15 minute summer	11	12	13.796	0.297	104.4	0.4256	0.0000	OK
15 minute summer	10	12	13.724	0.323	118.4	0.4615	0.0000	OK
8640 minute summer	9	6300	12.984	0.484	5.7	0.6930	0.0000	SURCHARGED
8640 minute summer	ATT/HB Z2	6300	12.984	1.544	13.0	758.9074	0.0000	SURCHARGED
15 minute summer	J1	12	14.752	0.452	26.9	0.0000	0.0000	SURCHARGED
8640 minute summer	6	6300	11.281	0.031	1.5	0.0348	0.0000	OK
15 minute summer	5	11	14.853	0.103	23.2	0.1170	0.0000	OK
8640 minute summer	4	6300	10.841	0.021	1.5	0.0241	0.0000	OK
8640 minute summer	3	6300	10.701	0.026	1.5	0.0292	0.0000	OK
8640 minute summer	2	6300	10.625	0.025	1.5	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
5760 minute summer	25	25	24	1.5	0.554	0.041	0.0868	
5760 minute summer	24	24	23	1.5	0.591	0.019	0.1922	
5760 minute summer	23	23	22	1.5	0.682	0.033	0.0597	
5760 minute summer	22	22	21	1.5	1.157	0.010	0.0127	426.5
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	123.1	3.582	0.819	0.5330	
8640 minute summer	J6	J6	15	4.1	0.641	0.033	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
8640 minute summer	15	15	ATT/HB Z2	9.5	0.572	0.023	0.4858	
15 minute summer	14	14	J1	3.6	0.265	0.041	0.3559	
15 minute summer	13	13	12	100.7	1.430	1.285	2.6326	
15 minute summer	12	12	11	100.5	1.427	1.283	2.4908	
15 minute summer	11	11	10	104.5	1.131	0.740	1.8999	
15 minute summer	10	10	J8	118.9	1.242	0.946	1.9212	
8640 minute summer	9	9	ATT/HB Z2	5.7	0.531	0.017	3.9469	
8640 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.5				
15 minute summer	J1	J1	J2	29.6	0.688	0.353	2.1693	
8640 minute summer	6	6	4	1.5	0.581	0.036	0.1761	
15 minute summer	5	5	J1	23.2	1.942	0.526	0.1134	
8640 minute summer	4	4	3	1.5	0.674	0.019	0.0137	
8640 minute summer	3	3	2	1.5	0.604	0.026	0.0153	586.6
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 10 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.54%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	14.737	0.613	58.2	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	14.658	0.701	90.3	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	16.767	0.267	39.6	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	17.992	0.492	97.8	0.5568	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.053	0.103	16.7	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.159	0.065	16.5	0.0000	0.0000	OK
15 minute summer	J8	12	13.645	0.320	151.5	0.0000	0.0000	OK
15 minute summer	J9	12	13.595	0.320	152.9	0.0000	0.0000	OK
15 minute summer	17	10	16.683	0.203	27.6	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	54.0	0.863	0.689	2.3497	
15 minute summer	J3	J3	13	90.4	1.284	1.156	1.3274	
15 minute summer	8	8	J3	39.0	2.216	1.091	0.1041	
15 minute summer	26	26	39	97.0	2.439	1.318	0.3081	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0556	
15 minute summer	J4	J4	42	16.6	0.970	0.408	0.3362	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0136	
15 minute summer	J5	J5	37	16.4	1.312	0.181	0.3001	
15 minute summer	J8	J8	J9	152.9	1.527	1.079	0.9930	
15 minute summer	J9	J9	9	153.3	1.614	0.949	0.2317	
15 minute summer	17	17	J8	27.3	1.581	1.083	0.1150	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 20 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.122	0.122	28.6	0.1378	0.0000	OK
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.983	0.083	16.7	0.0943	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.346	0.046	3.0	0.0522	0.0000	OK
15 minute summer	43	10	18.192	0.112	19.6	0.1268	0.0000	OK
5760 minute summer	42	4500	16.853	0.783	0.8	0.8860	0.0000	SURCHARGED
5760 minute summer	41	4500	16.853	0.803	0.8	0.9087	0.0000	SURCHARGED
15 minute summer	40	10	17.948	0.048	12.2	0.0546	0.0000	OK
15 minute summer	39	11	17.130	0.730	124.6	0.8258	0.0000	SURCHARGED
15 minute summer	38	10	17.846	0.094	19.2	0.1068	0.0000	OK
15 minute summer	37	11	16.894	0.294	48.9	0.4202	0.0000	OK
15 minute summer	36	10	16.927	0.827	30.7	1.4621	0.0000	SURCHARGED
15 minute summer	35	11	20.250	0.050	2.9	0.0561	0.0000	OK
15 minute summer	34	10	20.185	0.085	28.3	0.0967	0.0000	OK
15 minute summer	33	10	18.079	0.079	27.9	0.0898	0.0000	OK
15 minute summer	32	10	17.202	0.102	40.6	0.1155	0.0000	OK
15 minute summer	31	10	16.927	0.987	98.0	1.7436	0.0000	SURCHARGED
5760 minute summer	30	4500	16.853	1.041	10.3	1.8402	0.0000	SURCHARGED
5760 minute summer	29	4500	16.853	1.106	10.7	1.5833	0.0000	SURCHARGED
5760 minute summer	28	4500	16.853	1.152	10.7	2.0363	0.0000	SURCHARGED
5760 minute summer	27	4500	16.853	1.184	10.7	2.0929	0.0000	SURCHARGED
5760 minute summer	ATT/HB Z1	4500	16.853	1.204	11.4	616.3827	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	28.8	2.241	0.654	0.1088	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0340	
15 minute summer	46	46	29	16.6	1.805	0.465	0.0453	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1208	
15 minute summer	44	44	35	2.9	0.622	0.196	0.0660	
15 minute summer	43	43	J4	19.4	0.990	0.479	0.4153	
5760 minute summer	42	42	41	0.8	0.429	0.020	0.1407	
5760 minute summer	41	41	ATT/HB Z1	0.7	0.330	0.005	1.2944	
15 minute summer	40	40	39	12.1	0.608	0.102	0.6613	
15 minute summer	39	39	30	119.9	1.702	0.588	1.2378	
15 minute summer	38	38	J5	19.1	1.795	0.212	0.2426	
15 minute summer	37	37	30	68.3	0.634	0.231	3.6830	
15 minute summer	36	36	31	31.0	0.605	0.444	2.8228	
15 minute summer	35	35	34	2.9	0.383	0.238	0.1616	
15 minute summer	34	34	33	27.9	2.120	0.294	0.8339	
15 minute summer	33	33	32	28.1	1.936	0.270	0.3390	
15 minute summer	32	32	31	39.7	1.872	0.326	0.5795	
15 minute summer	31	31	30	104.8	0.661	0.692	9.1102	
5760 minute summer	30	30	29	10.1	0.329	0.067	4.6559	
5760 minute summer	29	29	28	10.7	0.303	0.071	3.3043	
5760 minute summer	28	28	27	10.7	0.254	0.051	3.5963	
5760 minute summer	27	27	ATT/HB Z1	10.6	0.513	0.050	2.2364	
5760 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.6				

Results for 20 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute summer	25	4500	15.657	0.034	1.6	0.0381	0.0000	OK
5760 minute summer	24	4500	15.486	0.022	1.6	0.0249	0.0000	OK
5760 minute summer	23	4500	13.731	0.031	1.6	0.0355	0.0000	OK
5760 minute summer	22	4500	13.517	0.017	1.6	0.0193	0.0000	OK
5760 minute summer	21	4500	12.787	0.017	1.6	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.293	0.193	143.1	0.2186	0.0000	OK
10080 minute summer	J6	7080	13.196	1.446	4.1	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
10080 minute summer	15	7080	13.196	1.546	7.5	2.2123	0.0000	SURCHARGED
15 minute summer	14	12	15.122	0.547	14.0	0.6183	0.0000	SURCHARGED
15 minute summer	13	12	14.813	0.950	115.2	1.0740	0.0000	SURCHARGED
15 minute summer	12	12	14.344	0.668	112.9	0.7557	0.0000	SURCHARGED
15 minute summer	11	12	13.893	0.394	117.8	0.5634	0.0000	SURCHARGED
15 minute summer	10	12	13.795	0.394	134.6	0.5641	0.0000	SURCHARGED
10080 minute summer	9	7080	13.196	0.696	5.7	0.9959	0.0000	SURCHARGED
10080 minute summer	ATT/HB Z2	7080	13.196	1.756	10.4	862.9322	0.0000	SURCHARGED
15 minute summer	J1	12	15.119	0.819	29.3	0.0000	0.0000	SURCHARGED
10080 minute summer	6	7080	11.282	0.032	1.6	0.0358	0.0000	OK
15 minute summer	5	12	15.256	0.506	27.0	0.5718	0.0000	SURCHARGED
10080 minute summer	4	7080	10.842	0.022	1.6	0.0247	0.0000	OK
10080 minute summer	3	7080	10.702	0.027	1.6	0.0300	0.0000	OK
10080 minute summer	2	7080	10.626	0.026	1.6	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
5760 minute summer	25	25	24	1.6	0.565	0.043	0.0905	
5760 minute summer	24	24	23	1.6	0.601	0.020	0.2007	
5760 minute summer	23	23	22	1.6	0.696	0.035	0.0623	
5760 minute summer	22	22	21	1.6	1.179	0.011	0.0133	451.3
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	142.5	3.638	0.947	0.5867	
10080 minute summer	J6	J6	15	4.1	0.628	0.033	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
10080 minute summer	15	15	ATT/HB Z2	7.6	0.545	0.018	0.4858	
15 minute summer	14	14	J1	-10.7	0.275	-0.121	0.3836	
15 minute summer	13	13	12	112.9	1.604	1.442	2.6326	
15 minute summer	12	12	11	113.3	1.609	1.446	2.4924	
15 minute summer	11	11	10	118.5	1.131	0.838	2.1534	
15 minute summer	10	10	J8	135.1	1.270	1.075	2.1016	
10080 minute summer	9	9	ATT/HB Z2	5.7	0.531	0.017	3.9469	
10080 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.6				
15 minute summer	J1	J1	J2	35.4	0.688	0.422	2.1693	
10080 minute summer	6	6	4	1.6	0.591	0.038	0.1834	
15 minute summer	5	5	J1	25.4	2.030	0.576	0.1306	
10080 minute summer	4	4	3	1.6	0.686	0.020	0.0142	
10080 minute summer	3	3	2	1.6	0.614	0.028	0.0160	714.5
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0000	

Results for 20 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.51%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	15.099	0.975	67.6	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.000	1.043	104.0	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	16.890	0.390	46.0	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	18.142	0.642	113.5	0.7255	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.062	0.112	19.4	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.164	0.070	19.1	0.0000	0.0000	OK
15 minute summer	J8	12	13.692	0.367	172.6	0.0000	0.0000	OK
15 minute summer	J9	12	13.627	0.352	173.0	0.0000	0.0000	OK
15 minute summer	17	10	16.751	0.271	32.1	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	61.3	0.876	0.782	2.3497	
15 minute summer	J3	J3	13	101.4	1.439	1.296	1.3274	
15 minute summer	8	8	J3	45.2	2.566	1.263	0.1031	
15 minute summer	26	26	39	112.4	2.828	1.527	0.3079	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0610	
15 minute summer	J4	J4	42	19.3	1.007	0.473	0.3757	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0150	
15 minute summer	J5	J5	37	19.0	1.340	0.210	0.4137	
15 minute summer	J8	J8	J9	173.0	1.591	1.221	1.0768	
15 minute summer	J9	J9	9	173.3	1.691	1.072	0.2490	
15 minute summer	17	17	J8	31.7	1.799	1.258	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	48	11	17.253	0.253	31.2	0.2859	0.0000	SURCHARGED
15 minute summer	47	1	17.850	0.000	0.0	0.0000	0.0000	OK
15 minute summer	46	10	17.988	0.088	18.2	0.1000	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.348	0.048	3.2	0.0543	0.0000	OK
15 minute summer	43	10	18.198	0.118	21.4	0.1337	0.0000	OK
5760 minute summer	42	4560	16.952	0.882	0.8	0.9972	0.0000	SURCHARGED
5760 minute summer	41	4560	16.952	0.902	0.8	1.0198	0.0000	SURCHARGED
15 minute summer	40	10	17.950	0.050	13.3	0.0570	0.0000	OK
15 minute summer	39	11	17.294	0.894	135.8	1.0113	0.0000	SURCHARGED
15 minute summer	38	10	17.850	0.098	21.0	0.1107	0.0000	OK
5760 minute summer	37	4560	16.952	0.352	2.0	0.5033	0.0000	OK
15 minute summer	36	11	17.102	1.002	80.9	1.7701	0.0000	SURCHARGED
15 minute summer	35	11	20.252	0.052	3.2	0.0585	0.0000	OK
15 minute summer	34	10	20.190	0.090	30.9	0.1016	0.0000	OK
15 minute summer	33	11	18.083	0.083	30.4	0.0936	0.0000	OK
15 minute summer	32	11	17.227	0.127	43.7	0.1434	0.0000	OK
15 minute summer	31	11	17.005	1.065	98.2	1.8827	0.0000	SURCHARGED
5760 minute summer	30	4560	16.952	1.140	11.3	2.0139	0.0000	SURCHARGED
5760 minute summer	29	4560	16.952	1.205	11.8	1.7239	0.0000	SURCHARGED
5760 minute summer	28	4560	16.952	1.251	11.8	2.2100	0.0000	SURCHARGED
5760 minute summer	27	4560	16.952	1.283	11.8	2.2665	0.0000	SURCHARGED
5760 minute summer	ATT/HB Z1	4560	16.952	1.303	12.5	666.6711	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	48	48	37	31.9	2.288	0.726	0.1164	
15 minute summer	47	47	38	0.0	0.000	0.000	0.0354	
15 minute summer	46	46	29	18.1	1.838	0.507	0.0485	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1293	
15 minute summer	44	44	35	3.2	0.637	0.211	0.0703	
15 minute summer	43	43	J4	21.1	1.009	0.523	0.4444	
5760 minute summer	42	42	41	0.8	0.429	0.020	0.1407	
5760 minute summer	41	41	ATT/HB Z1	0.8	0.330	0.005	1.2944	
15 minute summer	40	40	39	13.2	0.593	0.111	0.6670	
15 minute summer	39	39	30	136.1	1.932	0.667	1.2378	
15 minute summer	38	38	J5	20.9	1.839	0.231	0.2589	
5760 minute summer	37	37	30	2.0	0.157	0.007	3.9521	
15 minute summer	36	36	31	-48.9	-0.696	-0.700	2.8228	
15 minute summer	35	35	34	3.1	0.394	0.258	0.1713	
15 minute summer	34	34	33	30.4	2.179	0.320	0.8847	
15 minute summer	33	33	32	30.4	1.985	0.291	0.4094	
15 minute summer	32	32	31	44.3	1.834	0.363	0.6354	
15 minute summer	31	31	30	104.9	0.662	0.692	9.1102	
5760 minute summer	30	30	29	11.1	0.328	0.074	4.6559	
5760 minute summer	29	29	28	11.8	0.303	0.078	3.3043	
5760 minute summer	28	28	27	11.8	0.261	0.056	3.5963	
5760 minute summer	27	27	ATT/HB Z1	11.7	0.513	0.055	2.2364	
5760 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.6				

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute summer	25	4560	15.657	0.034	1.6	0.0387	0.0000	OK
5760 minute summer	24	4560	15.486	0.022	1.6	0.0253	0.0000	OK
5760 minute summer	23	4560	13.732	0.032	1.6	0.0361	0.0000	OK
5760 minute summer	22	4560	13.517	0.017	1.6	0.0196	0.0000	OK
5760 minute summer	21	4560	12.787	0.017	1.6	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	13.745	0.645	156.2	0.7296	0.0000	SURCHARGED
7200 minute summer	J6	5580	13.327	1.577	5.4	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
7200 minute summer	15	5580	13.327	1.677	5.4	2.4004	0.0000	SURCHARGED
15 minute summer	14	12	15.394	0.819	8.4	0.9263	0.0000	SURCHARGED
15 minute summer	13	12	15.036	1.173	121.2	1.3269	0.0000	SURCHARGED
15 minute summer	12	12	14.494	0.818	121.5	0.9250	0.0000	SURCHARGED
15 minute summer	11	12	13.972	0.473	126.6	0.6772	0.0000	SURCHARGED
15 minute summer	10	12	13.857	0.456	144.7	0.6520	0.0000	SURCHARGED
7200 minute summer	9	5520	13.333	0.833	7.5	1.1918	0.0000	SURCHARGED
7200 minute summer	ATT/HB Z2	5580	13.327	1.887	13.0	927.5537	0.0000	SURCHARGED
15 minute summer	J1	12	15.392	1.092	31.9	0.0000	0.0000	SURCHARGED
7200 minute summer	6	5580	11.282	0.032	1.6	0.0363	0.0000	OK
15 minute summer	5	12	15.549	0.799	29.4	0.9034	0.0000	SURCHARGED
7200 minute summer	4	5580	10.842	0.022	1.6	0.0251	0.0000	OK
7200 minute summer	3	5580	10.702	0.027	1.6	0.0305	0.0000	OK
7200 minute summer	2	5580	10.626	0.026	1.6	0.0000	0.0000	OK
15 minute summer	7	1	15.500	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
5760 minute summer	25	25	24	1.6	0.571	0.045	0.0928	
5760 minute summer	24	24	23	1.6	0.608	0.021	0.2058	
5760 minute summer	23	23	22	1.6	0.704	0.036	0.0639	
5760 minute summer	22	22	21	1.6	1.191	0.012	0.0136	464.6
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	151.7	3.815	1.009	0.6135	
7200 minute summer	J6	J6	15	5.4	0.633	0.044	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
7200 minute summer	15	15	ATT/HB Z2	8.1	0.545	0.020	0.4858	
15 minute summer	14	14	J1	11.5	0.293	0.131	0.3836	
15 minute summer	13	13	12	121.5	1.726	1.551	2.6326	
15 minute summer	12	12	11	121.7	1.728	1.554	2.4924	
15 minute summer	11	11	10	127.2	1.153	0.900	2.1534	
15 minute summer	10	10	J8	145.3	1.318	1.156	2.1076	
7200 minute summer	9	9	ATT/HB Z2	7.5	0.570	0.022	3.9469	
7200 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.6				
15 minute summer	J1	J1	J2	38.8	0.702	0.463	2.1693	
7200 minute summer	6	6	4	1.6	0.597	0.039	0.1877	
15 minute summer	5	5	J1	27.9	1.988	0.634	0.1306	
7200 minute summer	4	4	3	1.6	0.694	0.020	0.0146	
7200 minute summer	3	3	2	1.6	0.620	0.028	0.0164	538.6
15 minute summer	7	7	J2	0.0	0.000	0.000	0.0525	

Results for 30 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.50%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	15.369	1.245	62.4	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.255	1.298	110.2	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	16.980	0.480	50.2	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	18.251	0.751	123.8	0.8494	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.068	0.118	21.1	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.167	0.073	20.9	0.0000	0.0000	OK
15 minute summer	J8	11	13.737	0.412	187.5	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.649	0.374	186.9	0.0000	0.0000	OK
15 minute summer	17	10	16.800	0.320	35.0	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	66.2	0.940	0.845	2.3497	
15 minute summer	J3	J3	13	108.8	1.545	1.391	1.3274	
15 minute summer	8	8	J3	49.2	2.794	1.375	0.1041	
15 minute summer	26	26	39	122.5	3.082	1.665	0.3079	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0642	
15 minute summer	J4	J4	42	21.0	1.029	0.517	0.4012	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0159	
15 minute summer	J5	J5	37	20.7	1.378	0.230	0.4208	
15 minute summer	J8	J8	J9	186.9	1.695	1.319	1.0931	
15 minute summer	J9	J9	9	186.9	1.762	1.157	0.2559	
15 minute summer	17	17	J8	34.5	1.960	1.370	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 50 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.468	0.468	34.8	0.5297	0.0000	SURCHARGED
15 minute summer	47	10	17.854	0.004	0.1	0.0050	0.0000	OK
15 minute summer	46	10	17.996	0.096	20.3	0.1080	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.351	0.051	3.6	0.0577	0.0000	OK
15 minute summer	43	10	18.207	0.127	23.9	0.1433	0.0000	OK
5760 minute summer	42	4620	17.088	1.018	0.9	1.1514	0.0000	SURCHARGED
5760 minute summer	41	4620	17.088	1.038	0.9	1.1740	0.0000	SURCHARGED
15 minute summer	40	10	17.953	0.053	14.9	0.0603	0.0000	OK
15 minute summer	39	11	17.534	1.133	151.4	1.2820	0.0000	SURCHARGED
15 minute summer	38	10	17.854	0.102	23.4	0.1156	0.0000	OK
15 minute summer	37	10	17.213	0.613	57.3	0.8767	0.0000	SURCHARGED
15 minute summer	36	11	17.240	1.140	47.2	2.0149	0.0000	SURCHARGED
15 minute summer	35	11	20.255	0.055	3.5	0.0619	0.0000	OK
15 minute summer	34	10	20.196	0.096	34.5	0.1082	0.0000	OK
15 minute summer	33	11	18.088	0.088	34.0	0.0993	0.0000	OK
15 minute summer	32	11	17.344	0.244	48.7	0.2763	0.0000	SURCHARGED
15 minute summer	31	11	17.170	1.230	108.8	2.1727	0.0000	SURCHARGED
15 minute summer	30	11	17.094	1.282	323.5	2.2660	0.0000	SURCHARGED
5760 minute summer	29	4620	17.088	1.341	12.7	1.9190	0.0000	SURCHARGED
5760 minute summer	28	4620	17.088	1.387	12.7	2.4508	0.0000	SURCHARGED
5760 minute summer	27	4620	17.088	1.419	12.6	2.5074	0.0000	SURCHARGED
5760 minute summer	ATT/HB Z1	4620	17.088	1.439	13.4	736.4300	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	33.3	2.349	0.757	0.1164	
15 minute summer	47	47	38	-0.1	-0.023	-0.005	0.0376	
15 minute summer	46	46	29	20.2	1.878	0.565	0.0529	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1408	
15 minute summer	44	44	35	3.5	0.652	0.236	0.0759	
15 minute summer	43	43	J4	23.6	1.034	0.584	0.4845	
5760 minute summer	42	42	41	0.9	0.428	0.022	0.1407	
5760 minute summer	41	41	ATT/HB Z1	0.8	0.307	0.005	1.2944	
15 minute summer	40	40	39	14.8	0.565	0.124	0.6750	
15 minute summer	39	39	30	148.2	2.105	0.726	1.2378	
15 minute summer	38	38	J5	23.4	1.873	0.260	0.2946	
15 minute summer	37	37	30	69.5	0.683	0.235	4.0044	
15 minute summer	36	36	31	40.8	0.597	0.584	2.8228	
15 minute summer	35	35	34	3.5	0.404	0.288	0.1846	
15 minute summer	34	34	33	34.0	2.247	0.358	0.9585	
15 minute summer	33	33	32	33.9	1.995	0.325	0.6107	
15 minute summer	32	32	31	51.0	1.874	0.418	0.8047	
15 minute summer	31	31	30	105.2	0.664	0.695	9.1102	
15 minute summer	30	30	29	324.8	2.050	2.151	4.6559	
5760 minute summer	29	29	28	12.7	0.303	0.084	3.3043	
5760 minute summer	28	28	27	12.6	0.273	0.060	3.5963	
5760 minute summer	27	27	ATT/HB Z1	12.6	0.523	0.059	2.2364	
5760 minute summer	ATT/HB Z1	Hydro-Brake®	25	1.7				

Results for 50 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
5760 minute summer	25	4620	15.658	0.035	1.7	0.0396	0.0000	OK
5760 minute summer	24	4620	15.487	0.023	1.7	0.0258	0.0000	OK
5760 minute summer	23	4620	13.733	0.033	1.7	0.0368	0.0000	OK
5760 minute summer	22	4620	13.518	0.018	1.7	0.0200	0.0000	OK
5760 minute summer	21	4620	12.787	0.017	1.7	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J7	1	13.750	0.000	0.0	0.0000	0.0000	OK
15 minute summer	18	10	14.201	1.101	174.3	1.2455	0.0000	SURCHARGED
8640 minute summer	J6	6480	13.518	1.768	5.2	0.0000	0.0000	SURCHARGED
15 minute summer	16	1	15.000	0.000	0.0	0.0000	0.0000	OK
8640 minute summer	15	6480	13.518	1.868	5.8	2.6733	0.0000	SURCHARGED
15 minute summer	14	12	15.742	1.167	18.9	1.3201	0.0000	SURCHARGED
15 minute summer	13	12	15.323	1.460	132.5	1.6516	0.0000	SURCHARGED
15 minute summer	12	12	14.680	1.004	132.2	1.1351	0.0000	SURCHARGED
15 minute summer	11	12	14.065	0.566	137.4	0.8102	0.0000	SURCHARGED
15 minute summer	10	12	13.929	0.528	157.6	0.7554	0.0000	SURCHARGED
8640 minute summer	9	6480	13.523	1.023	7.3	1.4645	0.0000	SURCHARGED
8640 minute summer	ATT/HB Z2	6480	13.518	2.078	12.5	1021.2530	0.0000	SURCHARGED
15 minute summer	J1	12	15.738	1.438	34.3	0.0000	0.0000	SURCHARGED
8640 minute summer	6	6480	11.283	0.033	1.7	0.0371	0.0000	OK
15 minute summer	5	12	15.917	1.167	32.8	1.3203	0.0000	SURCHARGED
8640 minute summer	4	6480	10.843	0.023	1.7	0.0257	0.0000	OK
8640 minute summer	3	6480	10.703	0.028	1.7	0.0312	0.0000	OK
8640 minute summer	2	6480	10.627	0.027	1.7	0.0000	0.0000	OK
15 minute summer	7	12	15.701	0.201	3.3	0.2268	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
5760 minute summer	25	25	24	1.7	0.579	0.047	0.0958	
5760 minute summer	24	24	23	1.7	0.616	0.022	0.2124	
5760 minute summer	23	23	22	1.7	0.713	0.038	0.0660	
5760 minute summer	22	22	21	1.7	1.208	0.012	0.0140	484.3
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
15 minute summer	J7	J7	J6	0.0	0.000	0.000	0.0000	
15 minute summer	18	18	J6	169.4	4.259	1.126	0.6135	
8640 minute summer	J6	J6	15	5.2	0.614	0.042	0.5729	
15 minute summer	16	16	15	0.0	0.000	0.000	0.0000	
8640 minute summer	15	15	ATT/HB Z2	7.2	0.529	0.017	0.4858	
15 minute summer	14	14	J1	-15.2	-0.529	-0.172	0.3836	
15 minute summer	13	13	12	132.2	1.878	1.688	2.6326	
15 minute summer	12	12	11	131.9	1.873	1.684	2.4924	
15 minute summer	11	11	10	138.0	1.251	0.976	2.1534	
15 minute summer	10	10	J8	158.4	1.436	1.261	2.1076	
8640 minute summer	9	9	ATT/HB Z2	7.1	0.570	0.021	3.9469	
8640 minute summer	ATT/HB Z2	Hydro-Brake®	6	1.7				
15 minute summer	J1	J1	J2	44.3	0.717	0.529	2.1693	
8640 minute summer	6	6	4	1.7	0.605	0.041	0.1935	
15 minute summer	5	5	J1	25.0	2.053	0.567	0.1306	
8640 minute summer	4	4	3	1.7	0.702	0.021	0.0150	
8640 minute summer	3	3	2	1.7	0.628	0.030	0.0169	665.4
15 minute summer	7	7	J2	7.2	0.512	0.201	0.1146	

Results for 50 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	15.708	1.584	67.9	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.581	1.624	119.7	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.116	0.616	56.0	0.0000	0.0000	SURCHARGED
15 minute summer	26	10	18.419	0.919	138.1	1.0398	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.076	0.126	23.6	0.0000	0.0000	OK
15 minute summer	Depth/Area 1	1	17.200	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J5	10	17.177	0.083	23.4	0.0000	0.0000	OK
15 minute summer	J8	11	13.787	0.462	206.7	0.0000	0.0000	SURCHARGED
15 minute summer	J9	11	13.679	0.404	206.3	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	16.873	0.393	39.0	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	72.6	1.031	0.926	2.3497	
15 minute summer	J3	J3	13	118.4	1.682	1.514	1.3274	
15 minute summer	8	8	J3	54.7	3.107	1.529	0.1031	
15 minute summer	26	26	39	136.6	3.436	1.856	0.3079	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0683	
15 minute summer	J4	J4	42	23.5	1.056	0.577	0.4363	
15 minute summer	Depth/Area 1	Depth/Area 1	J5	0.0	0.000	0.000	0.0188	
15 minute summer	J5	J5	37	22.6	1.424	0.250	0.4391	
15 minute summer	J8	J8	J9	206.3	1.870	1.456	1.0936	
15 minute summer	J9	J9	9	205.9	1.880	1.275	0.2601	
15 minute summer	17	17	J8	38.4	2.179	1.524	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 75 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	48	11	17.651	0.651	38.0	0.7362	0.0000	SURCHARGED
15 minute summer	47	10	17.857	0.007	0.2	0.0081	0.0000	OK
15 minute summer	46	10	18.002	0.102	22.2	0.1154	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.353	0.053	3.9	0.0603	0.0000	OK
15 minute summer	43	10	18.214	0.134	26.1	0.1517	0.0000	OK
7200 minute summer	42	4800	17.601	1.531	0.8	1.7320	0.0000	SURCHARGED
7200 minute summer	41	4800	17.601	1.551	0.8	1.7546	0.0000	SURCHARGED
15 minute summer	40	10	17.956	0.056	16.2	0.0630	0.0000	OK
15 minute summer	39	11	17.727	1.327	160.9	1.5010	0.0000	SURCHARGED
15 minute summer	38	10	17.857	0.105	25.6	0.1182	0.0000	OK
7200 minute summer	37	4800	17.601	1.001	2.0	1.4327	0.0000	SURCHARGED
7200 minute summer	36	4800	17.600	1.500	1.2	2.6505	5.5037	FLOOD
15 minute summer	35	11	20.257	0.057	3.8	0.0647	0.0000	OK
15 minute summer	34	10	20.201	0.101	37.7	0.1139	0.0000	OK
15 minute summer	33	11	18.092	0.092	37.2	0.1041	0.0000	OK
7200 minute summer	32	4800	17.601	0.501	1.6	0.5665	0.0000	SURCHARGED
7200 minute summer	31	4800	17.601	1.661	3.5	2.9349	0.0000	SURCHARGED
7200 minute summer	30	4800	17.601	1.789	11.0	3.1617	0.0000	SURCHARGED
7200 minute summer	29	4800	17.601	1.854	11.5	2.6535	0.0000	SURCHARGED
7200 minute summer	28	4800	17.601	1.900	11.5	3.3578	0.0000	SURCHARGED
7200 minute summer	27	4800	17.601	1.932	11.5	3.4144	0.0000	SURCHARGED
7200 minute summer	ATT/HB Z1	4800	17.601	1.952	12.2	768.7047	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	48	48	37	36.0	2.304	0.819	0.1164	
15 minute summer	47	47	38	-0.2	-0.039	-0.009	0.0390	
15 minute summer	46	46	29	22.1	1.909	0.618	0.0569	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1509	
15 minute summer	44	44	35	3.8	0.665	0.256	0.0806	
15 minute summer	43	43	J4	25.7	1.053	0.637	0.5194	
7200 minute summer	42	42	41	0.8	0.398	0.020	0.1407	
7200 minute summer	41	41	ATT/HB Z1	0.8	0.330	0.005	1.2944	
15 minute summer	40	40	39	16.1	0.565	0.135	0.6814	
15 minute summer	39	39	30	159.6	2.266	0.782	1.2378	
15 minute summer	38	38	J5	25.5	1.906	0.283	0.5339	
7200 minute summer	37	37	30	2.0	0.157	0.007	4.0044	
7200 minute summer	36	36	31	1.2	0.187	0.017	2.8228	
15 minute summer	35	35	34	3.8	0.415	0.312	0.1960	
15 minute summer	34	34	33	37.2	2.300	0.391	1.0243	
15 minute summer	33	33	32	37.0	1.919	0.355	0.6214	
7200 minute summer	32	32	31	1.6	0.895	0.013	0.8047	
7200 minute summer	31	31	30	3.4	0.170	0.022	9.1102	
7200 minute summer	30	30	29	10.8	0.323	0.072	4.6559	
7200 minute summer	29	29	28	11.5	0.303	0.076	3.3043	
7200 minute summer	28	28	27	11.5	0.254	0.054	3.5963	
7200 minute summer	27	27	ATT/HB Z1	11.4	0.513	0.054	2.2364	
7200 minute summer	ATT/HB Z1	Hydro-Brake®	25	2.0				

Results for 75 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
7200 minute summer	25	4800	15.660	0.037	2.0	0.0424	0.0000	OK
5760 minute summer	24	4260	15.488	0.024	2.0	0.0276	0.0000	OK
7200 minute summer	23	5040	13.735	0.035	2.0	0.0394	0.0000	OK
7200 minute summer	22	5040	13.519	0.019	2.0	0.0214	0.0000	OK
7200 minute summer	21	5040	12.789	0.019	2.0	0.0000	0.0000	OK
15 minute summer	20	1	15.525	0.000	0.0	0.0000	0.0000	OK
7200 minute summer	J7	5280	15.002	1.252	0.1	0.0000	0.0000	SURCHARGED
7200 minute summer	18	5280	15.002	1.902	5.8	2.1514	0.0000	SURCHARGED
7200 minute summer	J6	5280	15.002	3.252	6.3	0.0000	0.0000	SURCHARGED
7200 minute summer	16	5280	15.002	0.002	0.0	0.0025	0.0000	OK
7200 minute summer	15	5280	15.002	3.352	6.3	4.7970	0.0000	SURCHARGED
15 minute summer	14	12	16.042	1.467	14.4	1.6586	0.0000	SURCHARGED
15 minute summer	13	12	15.575	1.712	142.0	1.9368	0.0000	SURCHARGED
7200 minute summer	12	5280	15.002	1.326	5.6	1.5000	0.0000	SURCHARGED
7200 minute summer	11	5280	15.002	1.503	5.8	2.1511	0.0000	SURCHARGED
7200 minute summer	10	5280	15.002	1.601	6.6	2.2913	0.0000	SURCHARGED
7200 minute summer	9	5280	15.002	2.502	8.7	3.5806	0.0000	SURCHARGED
7200 minute summer	ATT/HB Z2	5280	15.002	3.562	14.9	1039.2420	0.0000	SURCHARGED
15 minute summer	J1	12	16.041	1.741	39.3	0.0000	0.0000	FLOOD RISK
7200 minute summer	6	5280	11.287	0.037	2.2	0.0418	0.0000	OK
15 minute summer	5	12	16.259	1.509	35.8	1.7065	0.0000	SURCHARGED
7200 minute summer	4	5280	10.846	0.026	2.2	0.0290	0.0000	OK
7200 minute summer	3	5280	10.706	0.031	2.2	0.0352	0.0000	OK
7200 minute summer	2	5280	10.630	0.030	2.2	0.0000	0.0000	OK
15 minute summer	7	12	16.025	0.525	7.2	0.5935	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
7200 minute summer	25	25	24	2.0	0.603	0.054	0.1056	
5760 minute summer	24	24	23	2.0	0.643	0.025	0.2337	
7200 minute summer	23	23	22	2.0	0.741	0.044	0.0726	
7200 minute summer	22	22	21	2.0	1.262	0.014	0.0154	624.4
15 minute summer	20	20	J7	0.0	0.000	0.000	0.0000	
7200 minute summer	J7	J7	J6	-0.1	0.001	0.000	1.2130	
7200 minute summer	18	18	J6	5.8	1.343	0.039	0.6135	
7200 minute summer	J6	J6	15	6.3	0.596	0.051	0.5729	
7200 minute summer	16	16	15	0.0	0.000	0.000	1.1275	
7200 minute summer	15	15	ATT/HB Z2	6.8	0.529	0.016	0.4858	
15 minute summer	14	14	J1	12.3	0.309	0.139	0.3836	
15 minute summer	13	13	12	141.2	2.005	1.803	2.6326	
7200 minute summer	12	12	11	5.6	0.661	0.072	2.4924	
7200 minute summer	11	11	10	5.8	0.578	0.041	2.1534	
7200 minute summer	10	10	J8	6.6	0.583	0.053	2.1076	
7200 minute summer	9	9	ATT/HB Z2	8.5	0.628	0.025	3.9469	
7200 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.2				
15 minute summer	J1	J1	J2	46.0	0.693	0.549	2.1693	
7200 minute summer	6	6	4	2.2	0.650	0.053	0.2305	
15 minute summer	5	5	J1	28.6	2.108	0.650	0.1306	
7200 minute summer	4	4	3	2.2	0.749	0.027	0.0180	
7200 minute summer	3	3	2	2.2	0.674	0.038	0.0201	618.0
15 minute summer	7	7	J2	-7.2	0.453	-0.201	0.1146	

Results for 75 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.48%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	16.019	1.895	74.1	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	15.873	1.916	127.8	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.246	0.746	61.1	0.0000	0.0000	SURCHARGED
15 minute summer	26	11	18.695	1.195	150.7	1.3512	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	10	18.083	0.133	25.7	0.0000	0.0000	OK
7200 minute summer	Depth/Area 1	4800	17.601	0.401	0.1	0.0000	0.0000	SURCHARGED
7200 minute summer	J5	4800	17.601	0.507	0.8	0.0000	0.0000	SURCHARGED
7200 minute summer	J8	5280	15.002	1.677	12.4	0.0000	0.0000	SURCHARGED
7200 minute summer	J9	5280	15.002	1.727	14.8	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	16.945	0.465	42.6	0.0000	0.0000	SURCHARGED
15 minute summer	19	1	15.686	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	77.2	1.096	0.985	2.3497	
15 minute summer	J3	J3	13	126.8	1.802	1.622	1.3274	
15 minute summer	8	8	J3	59.5	3.380	1.664	0.1041	
15 minute summer	26	26	39	144.8	3.641	1.967	0.3110	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0716	
15 minute summer	J4	J4	42	25.6	1.078	0.629	0.4665	
7200 minute summer	Depth/Area 1	Depth/Area 1	J5	-0.1	-0.004	-0.002	0.0658	
7200 minute summer	J5	J5	37	0.8	0.517	0.009	0.6573	
7200 minute summer	J8	J8	J9	14.8	0.721	0.104	1.0936	
7200 minute summer	J9	J9	9	8.5	0.754	0.053	0.2698	
15 minute summer	17	17	J8	41.8	2.375	1.661	0.1152	
15 minute summer	19	19	J9	0.0	0.000	0.000	0.0000	

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.808	0.808	40.4	0.9134	0.0000	SURCHARGED
30 minute summer	47	17	17.859	0.009	0.1	0.0097	0.0000	OK
15 minute summer	46	10	18.007	0.107	23.6	0.1211	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.356	0.056	4.2	0.0629	0.0000	OK
15 minute summer	43	10	18.220	0.140	27.8	0.1582	0.0000	OK
10080 minute summer	42	6180	17.601	1.531	0.6	1.7320	0.0000	SURCHARGED
10080 minute summer	41	6180	17.601	1.551	0.6	1.7546	0.0000	SURCHARGED
15 minute summer	40	10	17.958	0.058	17.3	0.0651	0.0000	OK
15 minute summer	39	11	17.894	1.494	170.3	1.6894	0.0000	SURCHARGED
15 minute summer	38	10	17.859	0.107	27.3	0.1214	0.0000	OK
10080 minute summer	37	6180	17.602	1.002	1.5	1.4338	0.0000	SURCHARGED
5760 minute summer	36	3600	17.600	1.500	3.1	2.6505	53.8995	FLOOD
15 minute summer	35	11	20.260	0.060	4.1	0.0675	0.0000	OK
15 minute summer	34	10	20.204	0.104	40.1	0.1181	0.0000	OK
15 minute summer	33	11	18.096	0.096	39.6	0.1090	0.0000	OK
15 minute summer	32	11	17.701	0.601	56.7	0.6793	0.0000	SURCHARGED
10080 minute summer	31	6180	17.601	1.661	2.8	2.9348	0.0000	SURCHARGED
10080 minute summer	30	6180	17.601	1.789	8.7	3.1620	0.0000	SURCHARGED
10080 minute summer	29	6180	17.601	1.854	9.2	2.6536	0.0000	SURCHARGED
10080 minute summer	28	6180	17.601	1.900	9.2	3.3579	0.0000	SURCHARGED
10080 minute summer	27	6180	17.601	1.932	9.2	3.4145	0.0000	SURCHARGED
10080 minute summer	ATT/HB Z1	6180	17.601	1.952	9.7	768.7048	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	37.5	2.336	0.852	0.1164	
30 minute summer	47	47	38	-0.1	-0.027	-0.006	0.0402	
15 minute summer	46	46	29	23.5	1.929	0.657	0.0598	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1587	
15 minute summer	44	44	35	4.1	0.678	0.276	0.0854	
15 minute summer	43	43	J4	27.4	1.065	0.678	0.5463	
10080 minute summer	42	42	41	0.6	0.397	0.015	0.1407	
10080 minute summer	41	41	ATT/HB Z1	0.6	0.396	0.003	1.2944	
15 minute summer	40	40	39	17.2	0.600	0.144	0.6866	
15 minute summer	39	39	30	167.4	2.378	0.821	1.2378	
15 minute summer	38	38	J5	27.2	1.935	0.302	0.6042	
10080 minute summer	37	37	30	1.5	0.157	0.005	4.0044	
5760 minute summer	36	36	31	-2.6	0.199	-0.038	2.8228	
15 minute summer	35	35	34	4.1	0.426	0.337	0.2051	
15 minute summer	34	34	33	39.6	2.337	0.417	1.0735	
15 minute summer	33	33	32	39.0	1.910	0.374	0.6321	
15 minute summer	32	32	31	55.6	1.867	0.456	0.8047	
10080 minute summer	31	31	30	2.7	0.168	0.018	9.1102	
10080 minute summer	30	30	29	8.6	0.317	0.057	4.6559	
10080 minute summer	29	29	28	9.2	0.281	0.061	3.3043	
10080 minute summer	28	28	27	9.2	0.230	0.043	3.5963	
10080 minute summer	27	27	ATT/HB Z1	9.1	0.473	0.043	2.2364	
10080 minute summer	ATT/HB Z1	Hydro-Brake®	25	2.0				

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
10080 minute summer	25	6180	15.660	0.037	2.0	0.0424	0.0000	OK
7200 minute summer	24	4440	15.488	0.024	2.0	0.0277	0.0000	OK
5760 minute summer	23	3600	13.735	0.035	2.0	0.0394	0.0000	OK
5760 minute summer	22	3600	13.519	0.019	2.0	0.0214	0.0000	OK
5760 minute summer	21	3600	12.789	0.019	2.0	0.0000	0.0000	OK
8640 minute summer	20	5760	16.181	0.656	0.2	0.7422	0.0000	SURCHARGED
10080 minute summer	J7	6660	16.181	2.431	0.5	0.0000	0.0000	SURCHARGED
8640 minute summer	18	5820	16.181	3.081	5.3	3.4849	0.0000	SURCHARGED
5760 minute summer	J6	4140	16.181	4.431	7.7	0.0000	0.0000	SURCHARGED
8640 minute summer	16	5760	16.181	1.181	0.8	1.3362	0.0000	SURCHARGED
7200 minute summer	15	4980	16.181	4.531	6.5	6.4839	0.0000	FLOOD RISK
15 minute summer	14	12	16.285	1.710	20.7	1.9345	0.0000	SURCHARGED
8640 minute summer	13	5640	16.181	2.318	5.1	2.6220	0.0000	SURCHARGED
8640 minute summer	12	5640	16.181	2.505	5.1	2.8335	0.0000	SURCHARGED
8640 minute summer	11	5640	16.181	2.682	5.3	3.8383	0.0000	SURCHARGED
8640 minute summer	10	5640	16.181	2.780	6.1	3.9785	0.0000	SURCHARGED
8640 minute summer	9	5640	16.181	3.681	8.5	5.2677	0.0000	SURCHARGED
10080 minute summer	ATT/HB Z2	6480	16.181	4.741	12.3	1040.9290	7.6899	FLOOD
15 minute summer	J1	12	16.190	1.890	35.5	0.0000	0.0000	FLOOD RISK
5760 minute summer	6	4080	11.289	0.039	2.5	0.0446	0.0000	OK
15 minute summer	5	12	16.517	1.767	38.1	1.9988	0.0000	FLOOD RISK
5760 minute summer	4	4080	10.847	0.027	2.5	0.0309	0.0000	OK
5760 minute summer	3	4080	10.708	0.033	2.5	0.0376	0.0000	OK
5760 minute summer	2	4080	10.632	0.032	2.5	0.0000	0.0000	OK
15 minute summer	7	12	16.254	0.754	6.0	0.8527	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
10080 minute summer	25	25	24	2.0	0.603	0.054	0.1056	
7200 minute summer	24	24	23	2.0	0.643	0.025	0.2337	
5760 minute summer	23	23	22	2.0	0.741	0.044	0.0726	
5760 minute summer	22	22	21	2.0	1.262	0.014	0.0154	521.4
8640 minute summer	20	20	J7	-0.2	-0.005	-0.001	0.6922	
10080 minute summer	J7	J7	J6	-0.5	-0.009	-0.003	1.2130	
8640 minute summer	18	18	J6	5.3	1.282	0.035	0.6135	
5760 minute summer	J6	J6	15	7.7	0.628	0.062	0.5729	
8640 minute summer	16	16	15	-0.8	-0.033	-0.008	2.2512	
7200 minute summer	15	15	ATT/HB Z2	7.3	0.529	0.018	0.4858	
15 minute summer	14	14	J1	-16.3	-0.410	-0.185	0.3836	
8640 minute summer	13	13	12	5.1	0.622	0.065	2.6326	
8640 minute summer	12	12	11	5.1	0.644	0.065	2.4924	
8640 minute summer	11	11	10	5.3	0.562	0.037	2.1534	
8640 minute summer	10	10	J8	6.1	0.572	0.049	2.1076	
8640 minute summer	9	9	ATT/HB Z2	11.8	0.570	0.034	3.9469	
10080 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.5				
15 minute summer	J1	J1	J2	46.2	0.664	0.552	2.1693	
5760 minute summer	6	6	4	2.5	0.675	0.060	0.2532	
15 minute summer	5	5	J1	28.9	2.143	0.657	0.1306	
5760 minute summer	4	4	3	2.5	0.777	0.031	0.0198	
5760 minute summer	3	3	2	2.5	0.700	0.043	0.0221	549.3
15 minute summer	7	7	J2	10.5	0.597	0.294	0.1146	

Results for 100 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.46%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	16.252	2.128	76.3	0.0000	0.0000	SURCHARGED
8640 minute summer	J3	5640	16.181	2.224	4.6	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.352	0.852	65.0	0.0000	0.0000	SURCHARGED
15 minute summer	26	11	18.979	1.479	160.3	1.6733	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	10	18.089	0.139	27.4	0.0000	0.0000	OK
10080 minute summer	Depth/Area 1	6180	17.602	0.402	0.2	0.0000	0.0000	SURCHARGED
10080 minute summer	J5	6180	17.602	0.508	0.6	0.0000	0.0000	SURCHARGED
8640 minute summer	J8	5640	16.181	2.856	12.7	0.0000	0.0000	SURCHARGED
8640 minute summer	J9	5640	16.181	2.906	12.6	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	17.003	0.523	45.3	0.0000	0.0000	SURCHARGED
5760 minute summer	19	4080	16.181	0.495	0.1	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	83.7	1.189	1.068	2.3497	
8640 minute summer	J3	J3	13	4.6	0.586	0.059	1.3274	
15 minute summer	8	8	J3	63.1	3.587	1.766	0.1034	
15 minute summer	26	26	39	153.1	3.850	2.080	0.3110	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0737	
15 minute summer	J4	J4	42	27.3	1.093	0.672	0.4912	
10080 minute summer	Depth/Area 1	Depth/Area 1	J5	-0.2	-0.013	-0.007	0.0658	
10080 minute summer	J5	J5	37	0.6	0.474	0.007	0.6573	
8640 minute summer	J8	J8	J9	12.6	0.704	0.089	1.0936	
8640 minute summer	J9	J9	9	8.4	0.737	0.052	0.2698	
15 minute summer	17	17	J8	44.4	2.522	1.763	0.1152	
5760 minute summer	19	19	J9	-0.1	-0.003	-0.002	0.2113	

Results for 120 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
15 minute summer	48	11	17.919	0.919	42.0	1.0392	0.0000	SURCHARGED
30 minute summer	47	18	17.860	0.010	0.2	0.0118	0.0000	OK
15 minute summer	46	10	18.011	0.111	24.6	0.1252	0.0000	OK
15 minute summer	45	1	18.000	0.000	0.0	0.0000	0.0000	OK
15 minute summer	1	1	18.650	0.000	0.0	0.0000	0.0000	OK
15 minute summer	44	10	20.356	0.056	4.3	0.0637	0.0000	OK
15 minute summer	43	10	18.224	0.144	28.9	0.1625	0.0000	OK
5760 minute summer	42	3480	17.602	1.532	1.0	1.7330	0.0000	SURCHARGED
5760 minute summer	41	3480	17.602	1.552	1.0	1.7555	0.0000	SURCHARGED
15 minute summer	40	12	17.987	0.087	17.9	0.0982	0.0000	OK
15 minute summer	39	11	17.985	1.585	176.8	1.7925	0.0000	SURCHARGED
15 minute summer	38	10	17.861	0.109	28.3	0.1234	0.0000	OK
4320 minute summer	37	2700	17.603	1.003	3.0	1.4347	0.0000	SURCHARGED
5760 minute summer	36	3480	17.600	1.500	3.9	2.6505	81.6033	FLOOD
15 minute summer	35	11	20.260	0.060	4.2	0.0684	0.0000	OK
15 minute summer	34	10	20.207	0.107	41.7	0.1208	0.0000	OK
15 minute summer	33	11	18.105	0.105	41.1	0.1184	0.0000	OK
15 minute summer	32	11	17.786	0.686	58.9	0.7761	0.0000	SURCHARGED
4320 minute summer	31	2700	17.602	1.662	5.4	2.9364	0.0000	SURCHARGED
4320 minute summer	30	2700	17.602	1.790	16.6	3.1629	0.0000	SURCHARGED
4320 minute summer	29	2700	17.602	1.855	17.4	2.6543	0.0000	SURCHARGED
4320 minute summer	28	2700	17.602	1.901	17.3	3.3588	0.0000	SURCHARGED
4320 minute summer	27	2700	17.602	1.933	17.3	3.4151	0.0000	SURCHARGED
4320 minute summer	ATT/HB Z1	2700	17.602	1.953	18.3	768.7054	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
15 minute summer	48	48	37	38.6	2.356	0.877	0.1164	
30 minute summer	47	47	38	-0.2	-0.039	-0.009	0.0414	
15 minute summer	46	46	29	24.5	1.941	0.685	0.0619	
15 minute summer	45	45	12	0.0	0.000	0.000	0.0000	
15 minute summer	1	1	43	0.0	0.000	0.000	0.1637	
15 minute summer	44	44	35	4.2	0.682	0.282	0.0869	
15 minute summer	43	43	J4	28.5	1.075	0.705	0.5627	
5760 minute summer	42	42	41	1.0	0.429	0.025	0.1407	
5760 minute summer	41	41	ATT/HB Z1	0.9	0.248	0.006	1.2944	
15 minute summer	40	40	39	21.5	0.680	0.180	0.7747	
15 minute summer	39	39	30	170.5	2.422	0.836	1.2378	
15 minute summer	38	38	J5	28.3	1.956	0.313	0.6129	
4320 minute summer	37	37	30	3.0	0.157	0.010	4.0044	
5760 minute summer	36	36	31	-3.3	0.199	-0.048	2.8228	
15 minute summer	35	35	34	4.2	0.433	0.345	0.2099	
15 minute summer	34	34	33	41.1	2.359	0.433	1.1411	
15 minute summer	33	33	32	40.5	1.930	0.389	0.6532	
15 minute summer	32	32	31	57.4	1.852	0.471	0.8047	
4320 minute summer	31	31	30	5.3	0.179	0.035	9.1102	
4320 minute summer	30	30	29	16.4	0.339	0.109	4.6559	
4320 minute summer	29	29	28	17.3	0.331	0.115	3.3043	
4320 minute summer	28	28	27	17.3	0.297	0.082	3.5963	
4320 minute summer	27	27	ATT/HB Z1	17.2	0.573	0.081	2.2364	
4320 minute summer	ATT/HB Z1	Hydro-Brake®	25	2.0				

Results for 120 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m^3)	Flood (m^3)	Status
7200 minute summer	25	4320	15.660	0.037	2.0	0.0424	0.0000	OK
7200 minute summer	24	4320	15.488	0.024	2.0	0.0277	0.0000	OK
5760 minute summer	23	3540	13.735	0.035	2.0	0.0394	0.0000	OK
2880 minute summer	22	1980	13.519	0.019	2.0	0.0214	0.0000	OK
2880 minute summer	21	1980	12.789	0.019	2.0	0.0000	0.0000	OK
10080 minute summer	20	6180	16.182	0.657	0.1	0.7431	0.0000	SURCHARGED
10080 minute summer	J7	6180	16.182	2.432	0.9	0.0000	0.0000	SURCHARGED
10080 minute summer	18	6180	16.182	3.082	4.9	3.4854	0.0000	SURCHARGED
10080 minute summer	J6	6180	16.181	4.431	5.3	0.0000	0.0000	SURCHARGED
7200 minute summer	16	4500	16.182	1.182	0.2	1.3369	0.0000	SURCHARGED
10080 minute summer	15	6180	16.181	4.531	6.3	6.4839	0.0000	FLOOD RISK
15 minute summer	14	12	16.446	1.871	9.1	2.1163	0.0000	FLOOD RISK
10080 minute summer	13	6180	16.184	2.321	4.7	2.6247	0.0000	SURCHARGED
10080 minute summer	12	6180	16.183	2.507	4.7	2.8357	0.0000	SURCHARGED
10080 minute summer	11	6180	16.183	2.684	4.9	3.8401	0.0000	SURCHARGED
10080 minute summer	10	6180	16.182	2.781	5.6	3.9800	0.0000	SURCHARGED
10080 minute summer	9	6180	16.182	3.682	7.8	5.2686	0.0000	SURCHARGED
7200 minute summer	ATT/HB Z2	4500	16.181	4.741	16.0	1040.9290	48.6825	FLOOD
15 minute summer	J1	12	16.190	1.890	36.7	0.0000	0.0000	FLOOD RISK
4320 minute summer	6	3060	11.289	0.039	2.5	0.0446	0.0000	OK
15 minute summer	5	12	16.695	1.945	39.6	2.2002	0.0000	FLOOD RISK
4320 minute summer	4	3060	10.847	0.027	2.5	0.0309	0.0000	OK
4320 minute summer	3	3060	10.708	0.033	2.5	0.0376	0.0000	OK
4320 minute summer	2	3060	10.632	0.032	2.5	0.0000	0.0000	OK
15 minute summer	7	12	16.417	0.917	13.0	1.0371	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m^3)	Discharge Vol (m^3)
7200 minute summer	25	25	24	2.0	0.603	0.054	0.1056	
7200 minute summer	24	24	23	2.0	0.643	0.025	0.2337	
5760 minute summer	23	23	22	2.0	0.741	0.044	0.0726	
2880 minute summer	22	22	21	2.0	1.262	0.014	0.0154	270.8
10080 minute summer	20	20	J7	-0.1	-0.003	-0.001	0.6922	
10080 minute summer	J7	J7	J6	-0.9	-0.015	-0.005	1.2130	
10080 minute summer	18	18	J6	4.9	1.280	0.033	0.6135	
10080 minute summer	J6	J6	15	5.3	0.595	0.043	0.5729	
7200 minute summer	16	16	15	-0.2	0.005	-0.002	2.2512	
10080 minute summer	15	15	ATT/HB Z2	8.3	0.529	0.020	0.4858	
15 minute summer	14	14	J1	14.2	0.401	0.161	0.3836	
10080 minute summer	13	13	12	4.7	0.608	0.060	2.6326	
10080 minute summer	12	12	11	4.7	0.628	0.060	2.4924	
10080 minute summer	11	11	10	4.9	0.552	0.035	2.1534	
10080 minute summer	10	10	J8	5.6	0.557	0.045	2.1076	
10080 minute summer	9	9	ATT/HB Z2	12.7	0.570	0.037	3.9469	
7200 minute summer	ATT/HB Z2	Hydro-Brake®	6	2.5				
15 minute summer	J1	J1	J2	49.0	0.696	0.585	2.1693	
4320 minute summer	6	6	4	2.5	0.675	0.060	0.2532	
15 minute summer	5	5	J1	30.1	2.170	0.684	0.1306	
4320 minute summer	4	4	3	2.5	0.777	0.031	0.0198	
4320 minute summer	3	3	2	2.5	0.700	0.043	0.0221	428.5
15 minute summer	7	7	J2	-13.0	-0.891	-0.363	0.1146	

Results for 120 year +20% CC +10% A Critical Storm Duration. Lowest mass balance: 99.23%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J2	12	16.414	2.290	79.5	0.0000	0.0000	SURCHARGED
15 minute summer	J3	12	16.251	2.294	137.8	0.0000	0.0000	SURCHARGED
15 minute summer	8	10	17.426	0.926	67.6	0.0000	0.0000	SURCHARGED
15 minute summer	26	11	19.169	1.669	166.7	1.8876	0.0000	SURCHARGED
15 minute summer	49	1	18.475	0.000	0.0	0.0000	0.0000	OK
15 minute summer	J4	11	18.092	0.142	28.5	0.0000	0.0000	OK
4320 minute summer	Depth/Area 1	2700	17.603	0.403	0.1	0.0000	0.0000	SURCHARGED
4320 minute summer	J5	2700	17.603	0.509	1.2	0.0000	0.0000	SURCHARGED
10080 minute summer	J8	6180	16.182	2.857	11.8	0.0000	0.0000	SURCHARGED
10080 minute summer	J9	6180	16.182	2.907	15.2	0.0000	0.0000	SURCHARGED
15 minute summer	17	10	17.044	0.564	47.1	0.0000	0.0000	SURCHARGED
10080 minute summer	19	6180	16.182	0.496	0.1	0.0000	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J2	J2	J3	86.6	1.230	1.105	2.3497	
15 minute summer	J3	J3	13	136.7	1.941	1.748	1.3274	
15 minute summer	8	8	J3	65.6	3.729	1.836	0.1031	
15 minute summer	26	26	39	159.7	4.017	2.170	0.3110	
15 minute summer	49	49	J4	0.0	0.000	0.000	0.0748	
15 minute summer	J4	J4	42	28.4	1.102	0.697	0.5059	
4320 minute summer	Depth/Area 1	Depth/Area 1	J5	0.1	0.005	0.003	0.0658	
4320 minute summer	J5	J5	37	1.2	0.587	0.013	0.6573	
10080 minute summer	J8	J8	J9	15.2	0.688	0.107	1.0936	
10080 minute summer	J9	J9	9	7.6	0.720	0.047	0.2698	
15 minute summer	17	17	J8	46.1	2.621	1.833	0.1152	
10080 minute summer	19	19	J9	-0.1	-0.006	-0.004	0.2113	

Appendix G – Hydro-Brake Flow Control Details for Z1 and Z2

N.B. A penstock valve will be provided in the Hydro-Brake manhole, upstream of the Hydro-Brake. The Hydro-Brake shall be installed without a bypass door. Details presented are standard details and will be customised to the project at final design stage.

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	1.400	3.800
Flush-Flo™	0.379	3.597
Kick-Flo®	0.771	2.888
Mean Flow		3.223

hydro-int.com/patents

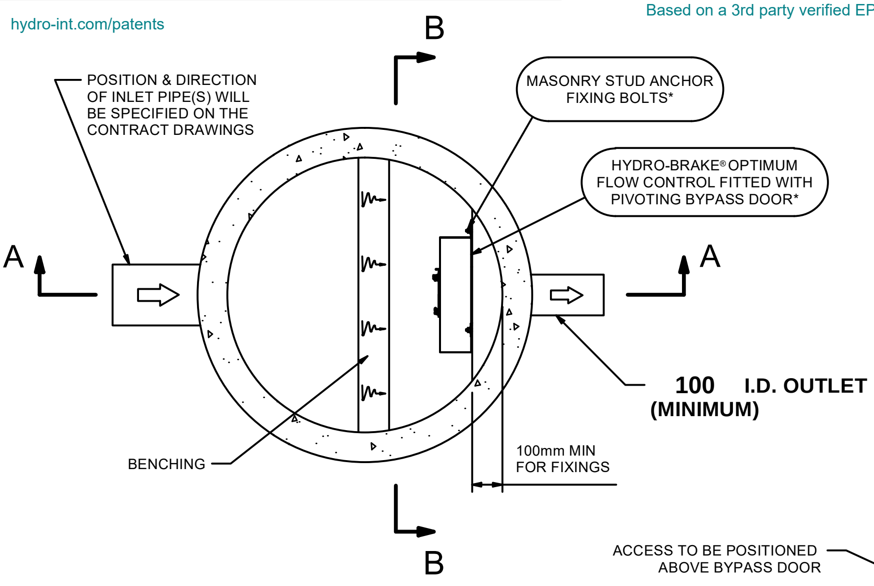
This Hydro-Brake® Optimum includes:

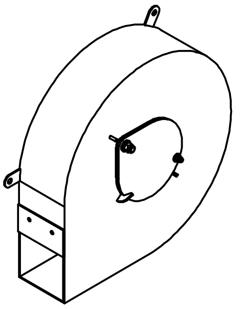
- •All in 3 mm Grade 304L stainless steel
- Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- Media blasted for corrosion resistance
- Variable flow rate post installation via adjustable inlet (if necessary)
- Indicative Weight: 15 kg
- Product Carbon Footprint: 63.53 kgCO2e

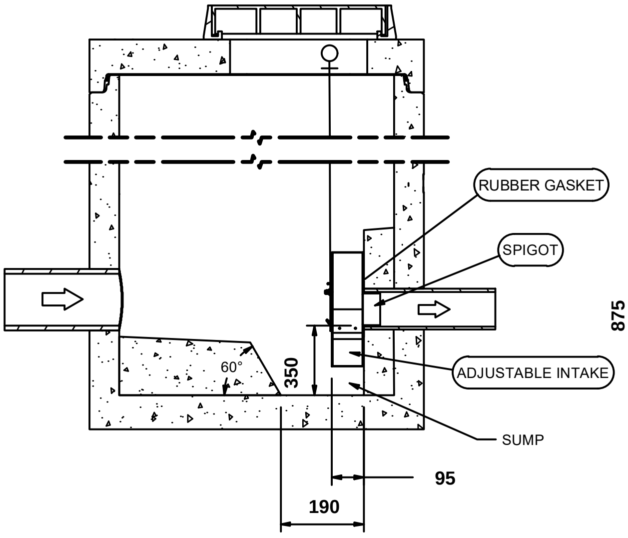
Based on a 3rd party verified EPD: hydro-int.com/epd

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4596

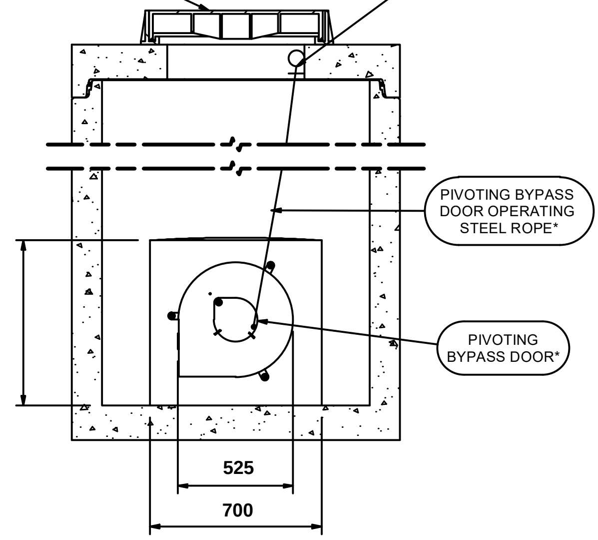
wrc approved
PT/503/0422
Valid: 01/04/2022 - 31/03/2027







SECTION A-A



SECTION B-B

IMPORTANT: ⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !

The head/flow characteristics of this SHE-0087-3800-1400-3800 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve. **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

Hydro International
A CRH COMPANY

DATE	09/12/2025 12:27
SITE	Temple Hill
DESIGNER	Airton Brandini
REF	2511-01

SHE-0087-3800-1400-3800
Hydro-Brake® Optimum

airton.brandini@jjc.ie

Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**
Primary Design	1.400	3.800	1.400	3.415	1.400	4.126
Flush-Flo™	0.379	3.597	0.479	2.946	0.347	4.145
Kick-Flo®	0.771	2.888	0.771	2.592	0.773	3.146
Mean Flow		3.223		2.774		3.592

BBA APPROVAL INSPECTION TESTING CERTIFICATION CERTIFICATE No 08/4596

wrc approved PT/503/0422 Valid: 01/04/2022 - 31/03/2027

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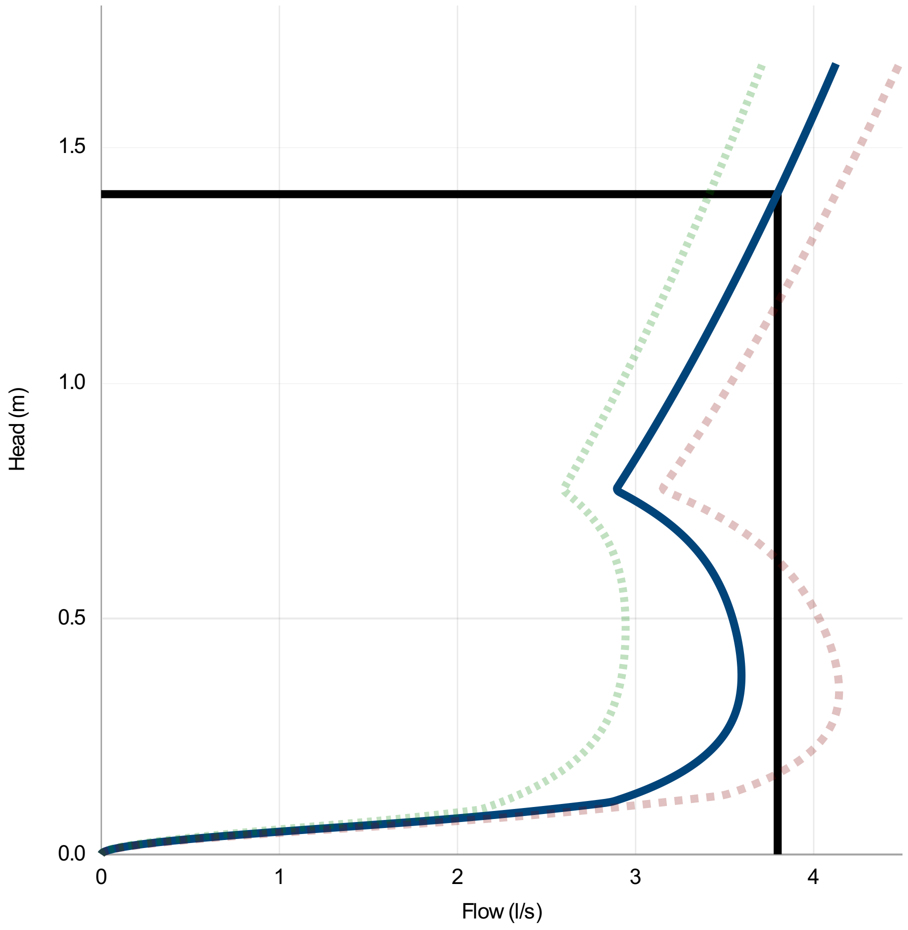


Head (m)	Flow (l/s)
0.000	0.000
0.048	1.010
0.097	2.548
0.145	3.107
0.193	3.336
0.241	3.474
0.290	3.552
0.338	3.588
0.386	3.596
0.434	3.585
0.483	3.559
0.531	3.519
0.579	3.462
0.628	3.382
0.676	3.267
0.724	3.107
0.772	2.899
0.821	2.971
0.869	3.050
0.917	3.126
0.966	3.200
1.014	3.273
1.062	3.343
1.110	3.412
1.159	3.480
1.207	3.546
1.255	3.610
1.303	3.674
1.352	3.736
1.400	3.797

DESIGN ADVICE

!

The head/flow characteristics of this SHE-0087-3800-1400-3800 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International
A CRH COMPANY

DATE	09/12/2025 12:27
Site	Temple Hill
DESIGNER	Airton Brandini
Ref	2511-01

SHE-0087-3800-1400-3800

Hydro-Brake® Optimum

Technical Specification

Control Point	Head (m)	Flow (l/s)
Primary Design	2.110	3.800
Flush-Flo™	0.347	2.846
Kick-Flo®	0.703	2.295
Mean Flow		2.900

hydro-int.com/patents

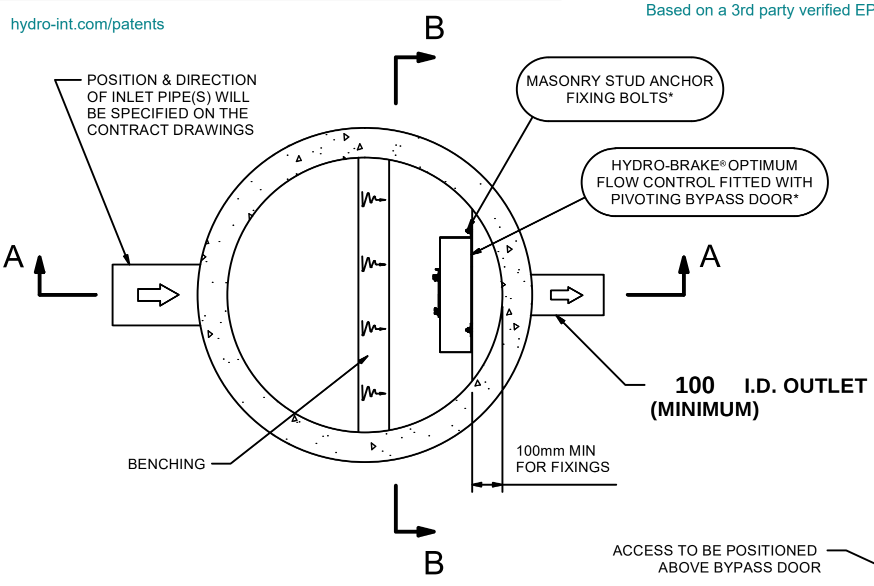
This Hydro-Brake® Optimum includes:

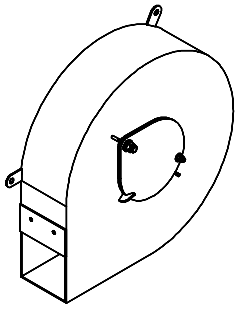
- •All in 3 mm Grade 304L stainless steel
- • Integral pivoting by-pass door allowing clear line of sight through to outlet, c/w operating rope
- • Media blasted for corrosion resistance
- • Variable flow rate post installation via adjustable inlet (if necessary)
- • Indicative Weight: 15 kg
- • Product Carbon Footprint: 52.19 kgCO2e

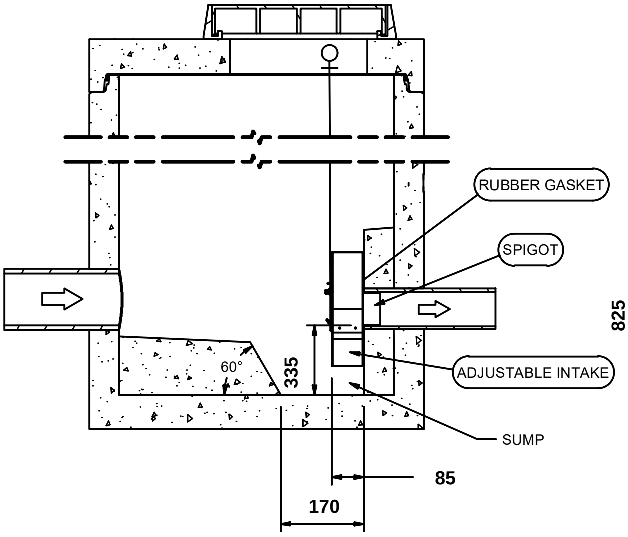
Based on a 3rd party verified EPD: hydro-int.com/epd

BBA APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE 08/4596

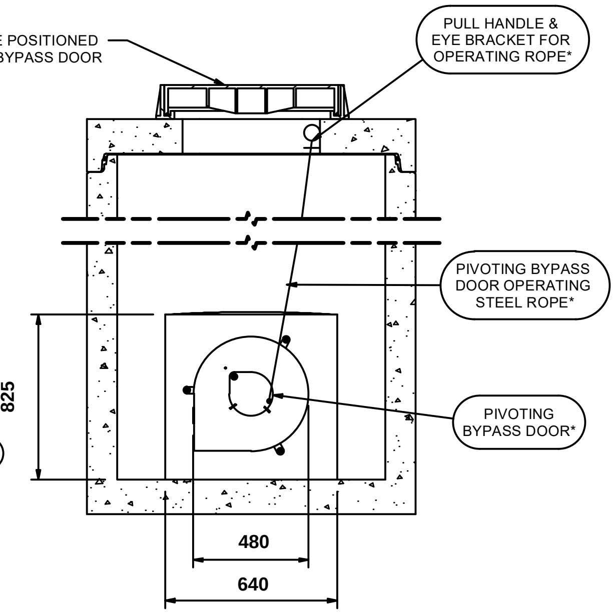
wrc approved
PT/503/0422
Valid: 01/04/2022 - 31/03/2027







SECTION A-A



SECTION B-B

IMPORTANT: ⬭ LIMIT OF HYDRO INTERNATIONAL SUPPLY
THE DEVICE WILL BE HANDED TO SUIT SITE CONDITIONS
FOR SITE SPECIFIC DETAILS AND MINIMUM CHAMBER SIZE REFER TO HYDRO INTERNATIONAL
ALL CIVIL AND INSTALLATION WORK BY OTHERS
* WHERE SUPPLIED
HYDRO-BRAKE® IS A REGISTERED TRADEMARK FOR FLOW CONTROLS DESIGNED AND MANUFACTURED EXCLUSIVELY BY HYDRO INTERNATIONAL

THIS DESIGN LAYOUT IS FOR ILLUSTRATIVE PURPOSES ONLY. NOT TO SCALE.

DESIGN ADVICE !

The head/flow characteristics of this SHE-0078-3800-2110-3800 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve. **The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.**

Hydro International
A CRH COMPANY

DATE	09/12/2025 12:29
SITE	Temple Hill - Zone 2
DESIGNER	Airton Brandini
REF	2511-01

SHE-0078-3800-2110-3800
Hydro-Brake® Optimum

airton.brandini@jjc.ie

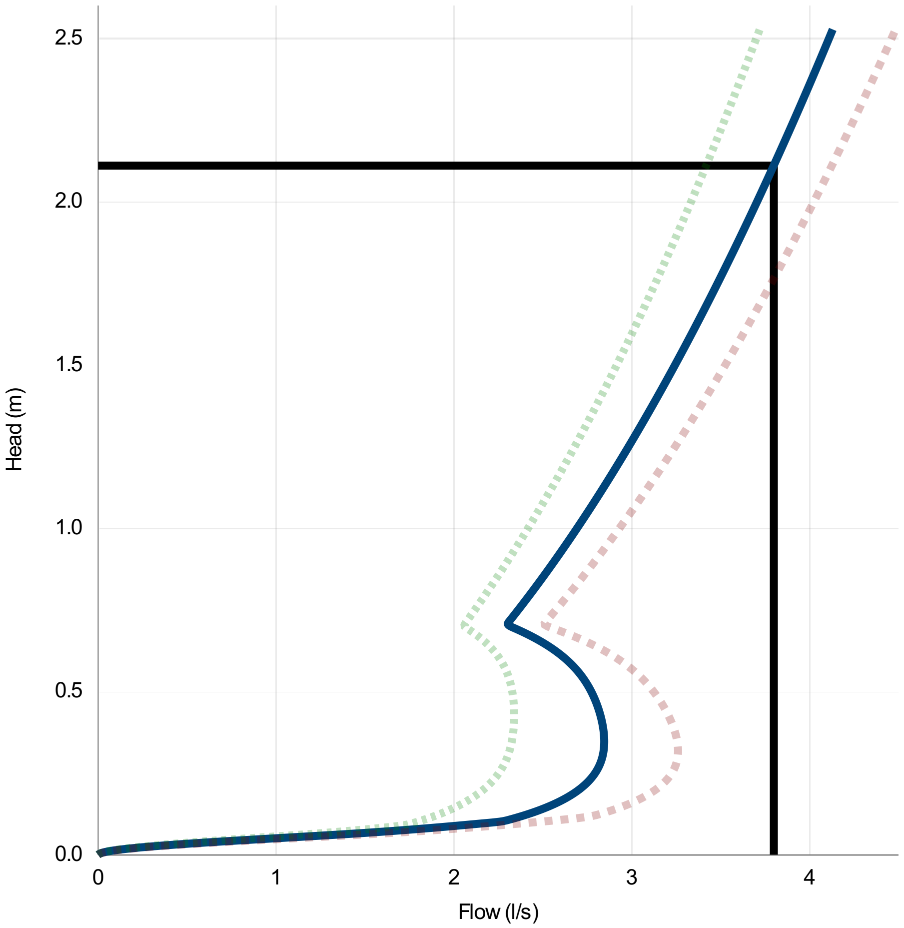
Technical Specification

	Original Setting		Minimum Setting		Maximum Setting	
Control Point	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**	**Head (m)**	**Flow (l/s)**
Primary Design	2.110	3.800	2.110	3.420	2.110	4.126
Flush-Flo™	0.347	2.846	0.427	2.340	0.318	3.262
Kick-Flo®	0.703	2.295	0.699	2.052	0.703	2.500
Mean Flow		2.900		2.550		3.191

APPROVAL INSPECTION TESTING CERTIFICATION
CERTIFICATE No 08/4596

wrc approved™
PT/503/0422
Valid: 01/04/2022 - 31/03/2027

hydro-int.com/patents



Head (m)	Flow (l/s)
0.000	0.000
0.073	1.654
0.146	2.524
0.218	2.746
0.291	2.831
0.364	2.845
0.437	2.820
0.509	2.764
0.582	2.663
0.655	2.485
0.728	2.331
0.800	2.434
0.873	2.532
0.946	2.626
1.019	2.717
1.091	2.804
1.164	2.888
1.237	2.969
1.310	3.048
1.382	3.125
1.455	3.200
1.528	3.272
1.601	3.343
1.673	3.413
1.746	3.480
1.819	3.547
1.892	3.612
1.964	3.675
2.037	3.738
2.110	3.799

DESIGN ADVICE

!

The head/flow characteristics of this SHE-0078-3800-2110-3800 Hydro-Brake® Optimum Flow Control are unique. Dynamic hydraulic modelling evaluates the full head/flow characteristic curve.

The use of any other flow control will invalidate any design based on this data and could constitute a flood risk.

Hydro International
A CRH COMPANY

DATE	09/12/2025 12:29
Site	Temple Hill - Zone 2
DESIGNER	Airton Brandini
Ref	2511-01

SHE-0078-3800-2110-3800

Hydro-Brake® Optimum

Appendix H – JBA – Surface Water Audit

STORMWATER AUDIT (STAGE 1)

JBA Project Code	2025s0525
Contract	Temple Hill, Blackrock– Stage 1 Stormwater Audit
Client	JJ Campbell & Associates Ltd.
Prepared by	Jack Shanahan & Leanne Leonard
Subject	Stormwater Audit Stage 1 Report

Revision History

Issue	Date	Status	Issued to
S3-P01	28/11/2025	First issue	JJ Campbell & Associates
S3-P02	16/01/2026	Final Issue	JJ Campbell & Associates

1 Introduction

JBA Consulting have been contracted by JJ Campbell & Associates Consulting Engineers (JJC) on behalf of Oval Target Ltd, to undertake a Stage 1 Stormwater Audit of the surface water drainage for the proposed LRD Temple Hill, Blackrock, Co. Dublin. This audit has been completed in accordance with Dún Laoghaire Rathdown County Council's (DLRCC) Stormwater Audit Procedure (DLR CDP 2022-2028, Appendix 7) as set out below.

Stage 1 – Pre Planning Stage: *A Stage 1 Audit shall be carried out of the applicant's proposed Stormwater drainage proposals based on the drawings submitted for planning approval.*

The Stage 1 Audit report must be submitted to DLRCC for approval prior to lodging the planning application. All recommendations shall be complied with, unless otherwise agreed in writing with DLRCC.

In certain circumstances, where there has been a constructive engagement with Municipal Services on SuDS proposals from an early stage of the design process, consideration may be given for waiving the requirement of a Stage 1 Audit.

The subject of this Stage 1 Stormwater audit is to review the proposed surface water drainage design and sustainable urban drainage system (SuDS) proposals for the proposed development.

1.1 Report Structure

The Feedback Form in Appendix A identifies queries raised in this report which are to be answered by the Design Engineers. Once an 'Acceptable' status is achieved for each query the audit is deemed to be closed out.

The results of the audit are set out hereunder, where items raised in the feedback form are shown in bold within this report.

1.2 Relevant Studies and Documents

The following documents were considered as part of this surface water audit:

- Greater Dublin Strategic Drainage Strategy (GDSDS);
- Greater Dublin Regional Code of Practice for Drainage Works;
- The SuDS Manual (CIRIA C753).
- Dún Laoghaire-Rathdown County Development Plan 2022-2028, particularly Appendix 7
- BRE Digest 365
- DLRCC Stormwater Management Policy

The following documentation was provided by JJC on 17/11/2025:

- 01 – Document Issue Register – Stage III.pdf
- C1 - Existing Site Plan.pdf
- C2-0 - Foul and Surface Water.pdf
- C2-1 - Foul and Surface Water.pdf
- C2-2 - Foul and Surface Water.pdf
- C2-3 - Foul and Surface Water.pdf
- C2-4 - Foul and Surface Water.pdf
- C2-5 - Foul and Surface Water.pdf
- C2-6 - Foul and Surface Water.pdf
- C2-7 - Foul and Surface Water.pdf
- C2-9 – Long Sections.pdf
- C2-10 – Long Sections.pdf
- C2-11 – Long Sections.pdf
- C3 – Qbar.pdf
- C4-1 – Basements.pdf
- C4-2 – Basements.pdf
- C5 - Tree Root Protection.pdf
- C6-1 - SuDS Zones.pdf
- C6-2 - Attenuation Tank.pdf
- C6-3 - Attenuation Tank.pdf
- C7 - Interception Areas at Ground Level.pdf
- C8 - SUDs details.pdf
- C11 - Roof Areas.pdf
- C12 - Construction Phasing.pdf
- C13 - Foul Discharge.pdf
- C14 - Diversion manhole C3.pdf
- C15 - Diversion manhole C1.pdf
- D1 - Demolition Plan.pdf
- F1-1 - Flood Directions.pdf
- F1-2 - Flood Extents.pdf
- G01 - Water Main Layout.pdf
- JBA SW Audit Checklist-P01.xlsx
- Si-1 - Soakaway Tests.pdf
- Stage III - Drainage Report.pdf

1.3 Key Considerations and Benefits of SuDS

The key benefits and objectives of SuDS considered as part of this audit and listed below include:

- Water Quantity
- Water Quality
- Amenity
- Biodiversity

Which can be achieved by;

- Storing runoff and releasing it slowly (attenuation)
- Harvesting and using the rain close to where it falls
- Allowing water to soak into the ground (infiltration)
- Slowly transporting (conveying) water on the surface
- Filtering out pollutants
- Allowing sediments to settle out by controlling the flow of the water

1.3.1 SuDS Management Train

A SuDS Management Train is a robust pollutant removal strategy. The treatment train can comprise four stages:

1. *Prevention*
2. *Source Control*
3. *Site Control*
4. *Regional control*

2 Proposed Development (LRD) Temple Hill, Blackrock, Co. Dublin.

The proposed development consists of 414 no. residential units across twelve buildings, vehicular entrances, undercroft carparking area, a creche facility, a gate lodge/café and all associated works. The site is bound by the N31 to the north, Avondale Court to the south, Rockfield to the east and Brookfield Court and Barclay Court to the west.

The site was previously granted planning permission under SHD ABP-303804-19 to which this current application will be a revision with an uplift of 123 no. units).

The proposed site layout is shown in Figure 1 below.

Figure 1- Proposed Site Layout (extract from Drainage Report)

2.1 Review of SW Drainage Proposals

2.1.1 Site Characteristics

The total area is stated to be 4.56ha in the Drainage Report, including the protected structures “St. Teresa’s House”, “St. Teresa’s Lodge” and associated entrance gates and is largely undeveloped. The total site area in the completed audit checklist is stated to be 3.90 ha. The total contributing area is stated as being 2.12ha. How will the areas deemed not to contribute be prevented from entering the network?

The drainage layout drawing indicates the site sloping from south to north from elevations of c.21.0m to c.12.0m.

There is an existing combined network passing through the site, which the designer states caters for the existing surface water runoff from St. Teresa’s, and discharges to a 1200mm diameter combined sewer in Temple Hill Road where it is conveyed to Dún Laoghaire West Pier pumping station before being pumped to Ringsend WWTW. The existing 900mm diameter combined sewer running along the western boundary of the site will be diverted locally on the north west corner of the site to accommodate the basement of Block A1.

It is proposed to split the site into two catchments with each having its own attenuation and discharge point. The eastern catchment will discharge to an existing public sewer to the northeast of the site, whereas the western catchment will discharge to an existing publicmanhole at the north corner of the site.

JJC to clarify the total site area and how areas deemed not to contribute will be prevented from entering the network.

2.1.2 Ground Investigation

The 'Drainage Report' contains two sets of ground investigation tests, both carried out by Ground Investigations Ireland. One set is dated January 2019 and includes boreholes and groundwater measurements for two locations within the site. The boreholes encountered 1m of made ground over sandy gravelly clay, which was described as stiff below 2.0m bgl, and occasional granular lenses. Bedrock was encountered at 8m bgl in BH-A and at 6.8m bgl in BH-B. While a table titled "Groundwater monitoring" is appended to the SI report, just one measurement was taken in each borehole. Groundwater was measured at 1.02m bgl in BH-A, suggesting that infiltration will not be suitable in this location (south of the site in the vicinity of Block D1). Groundwater was measured at 3.74m bgl at BH-B, suggesting that infiltration may be suitable at the north of the site (in the vicinity of Block A) subject to further groundwater monitoring.

The SI Report is dated November 2020 and contains trial pits, slit trenches, cable percussion boreholes and rotary core boreholes. This investigation encountered topsoil and made ground to depths of 1.1m-1.5m bgl over sandy gravelly clay over clayey sandy gravel. Bedrock was encountered from 2.10m bgl in BH03 (in the vicinity of Blocks B3 and B4) to 5.05m bgl in BH02 (in the vicinity of Block B2). Groundwater was not encountered.

Drawing Si-1 shows 14 locations where infiltration testing was carried out. Six of these are shown to have failed, one does not indicate an infiltration rate and the other seven indicate infiltration rates between 2.5x10^{-6} m/s and 1.8x10^{-5} m/s. The results suggest that the east of the site is unlikely to be suitable for infiltration while there may be potential in the western half.

The uksuds website suggests that the underlying soil may be a Soil Type 4 (SPR = 0.47). However, the designer has chosen a Soil Type 3 (SPR = 0.37) for the calculations on the basis that 50% of infiltration tests failed and 50% passed. As the site has been split into two catchments that align with these results, consideration should be given to assigning the appropriate SPR to each catchment, in line with what was encountered in the SI reports.

Can consideration be given to giving different SPR values to each catchment, in line with SI findings? Where infiltration is poor and bedrock is high, this may be indicative of a soil type 4.

2.1.3 Design Parameters

Rainfall parameters can be estimated using Met Eireann data, using the Flood Studies Report (FSR) values or the values in the GDSDS. The Met Eireann method can be more representative of a site if selected correctly. The design values used by KB and considered by JBA are shown below:

Rainfall parameters	Designer values	JBA Comment
M5_60 (mm)	17.0	16.0– JBA obtained Met Éireann 2023 DDF The designer's value is greater than the 2023 MÉ value, which may overestimate the runoff volumes.
Ratio R	0.3	0.324– JBA obtained Met Éireann 2023 DDF The designer's value is less than the calculated r ratio using the 2023 MÉ values.
SAAR (mm)	900	765 – JBA obtained Met Éireann 2023 SAAR value

		The designer's value is greater than the 2023 Met Éireann value, which may overestimate the value of Qbar.
Qbar l/s	8.2l/s for the site. 4.1l/s for each catchment.	6.8l/s based on UKSuDS – Soil Type 3 – Area 2.1189ha – SAAR 765mm If using a Soil Type 4, Qbar = The designer's value of Qbar would appear to be overestimated due to the inflated SAAR value used.
Climate Change	20%	OK – As per DLRCC CDP 2022-2028
Urban Creep	0% -	10% should be applied as per DLRCC CDP 2022-2028

JJC to consider using most recent Met Éireann 2023 DDF and SAAR values and applying Urban Creep to the calculations.

2.2 Surface Water Drainage Strategy

2.2.1 Site Drainage Strategy

The proposed surface water network consists of two surface water drainage catchments. Infiltration systems have not been proposed due to inconsistent soakaway test success rate. The proposed surface water networks are to typically comprise a gravity pipe network, with Sustainable Drainage Systems (SuDS) including permeable paving, green roof and swales implemented and integrated, wherever practicable. An RC concrete tank is proposed under the road by unit B2. A StormTech attenuation has also been proposed to the north of the D block of units.

Discharge from the site will be limited by a flow control device downstream of each attenuation tank to 4.1l/s. Qbar was calculated by the designer to be 8.2l/s for the total site and is halved for each catchment.

The network has been modelled in Causeway Flow software and is discussed further in Section 2.3.4 of this report.

No infiltration has been allowed for in the design.

2.2.2 SuDS Measures Considered

SuDS Technology	Comments
Green/Blue Roofs	Extensive Green Roofs are proposed to most apartment roofs. JJC drawing C11 shows coverage varying from 49% to 90%, with a collective coverage of 70%. Intensive Green Roofs are proposed to most apartment roofs. JJC drawing C11 shows coverage varying from 37% to 69%, with a collective coverage of 59%. **There appears to be a typo on drawing C11 – The Extensive green roof table states "Total Intensive" and the Intensive green roof states "Total Extensive". JJC to amend for clarity.**
Swale, Filter Drain, Infiltration Trench	The Comparison between the 2019 and 2025 Schemes contained in Appendix N of the Drainage report states that swales will be located along roads. The drainage layout drawing shows short sections of swales adjacent to some roads. The detail on drawing C8 – "SuDS details" does not indicate any liner. An impermeable liner may be required in some locations depending on the results of groundwater monitoring. **JJC to indicate whether a permeable/impermeable liner is proposed.**

Tree Pits, Bioretention Areas, Rain Gardens	None proposed. There appear to be a number of proposed trees in the layout. Can tree pit structural systems be incorporated into these to provide water quality benefits? **JJC to consider the inclusion of tree pit structural cell systems where new trees are proposed adjacent to hardstanding areas.**
Permeable Paving	Pervious paving is proposed to all parking spaces proposed for the site. Drawing C8 includes the typical build up for permeable paving areas but it does not include an outlet detail. A permeable liner has been shown however, subject to groundwater monitoring, this may not be suitable in all areas. Drawing C7 refers to permeable asphalt for area 12 however, this has not been referenced in the Drainage Report or included on the details drawings. **JJC to update the permeable paving detail to include the proposed outlet arrangement.** **JJC to include porous asphalt detail on the SuDS details drawings.**
Soakaways	None proposed.
Detention Basins, Retention Ponds, Stormwater Wetlands	None proposed
Rainwater Harvesting	None proposed.
Petrol Interceptor	Petrol interceptors have been proposed for the basement drainage systems prior to discharging to the foul network. Petrol interceptors have not been included on the surface water network. **JJC to consider the inclusion of petrol interceptors upstream of the attenuation structures.**
Attenuation	An RC attenuation tank is proposed for Zone 2, under the road between Unit B2 and C1. DLRCC are generally opposed to RC tanks and discourage locating attenuation structures beneath roadways. It is noted that the JJC response to DLR Item 7 in Appendix O of the Drainage Report states that the location of this tank is due to the sloping and restricted nature of the site, so the tank forms part of the basement under Blocks A1 to B3. A StormTech tank is proposed for Zone 1, it is also noted on drawings as It is not clear whether a permeable or impermeable liner is proposed to this attenuation structure. **JJC to advise whether the use of a RC attenuation tank has been discussed with DLRCC.** **JJC to update the attenuation tank drawing to indicate whether a permeable or impermeable liner is proposed to the StormTech structure.**
Other	N/A

2.2.3 Review of drainage drawings and SuDS drawings;

The following drawings have not been provided:

- Detail section drawings of drainage elements such as manholes and pipes

It is unclear how runoff from some road areas will be captured. Gullies are shown in six locations only, all adjacent to proposed swales. While drawing C7 indicates that the majority of road runoff will be conveyed through the permeable paving, it is not clear how all runoff will be directed to the permeable paved areas only. Furthermore, while drawing C8 includes the proposed permeable paving build-up, no outlet arrangement has been provided.

Drawing C11 – “Roof Areas” includes a typo in the Intensive/Extensive tables.

The volume of the attenuation tank in Zone 2 is stated to be 920m3 on the drawings but a modelled volume of 735m2 has been included in Flow. Similarly, the volume of the StormTech tank in Zone 1 is stated to be 920m3 pm the drawings but has a modelled volume of 772.5m3 in Flow.

The attenuation drawings note that a hydrobrake without a penstock is proposed. DLRCC typically require the use of hydrobrakes with penstocks in case of blockages.

Drawing F1-2 is named Flood Extents however, it contains details regarding the height of grills on the west boundary wall.

JJC to provide details drawing for manholes and pipes.

JJC to clarify how runoff from roads will be conveyed to the permeable paved areas and update permeable paving detail to include outlet arrangement.

JJC to update the typo on the roof areas drawing (C11) to clarify which table is for intensive and which table is for extensive green roofs.

JJC to review the attenuation volumes stated on the drawings to ensure that they match what has been modelled.

JJC to consider the use of hydrobrakes with penstocks.

JJC to update drawing F1-2 to show flood extents.

2.2.4 Review of Network and Attenuation Calculations

The pipe network has been designed for the 1 year return period however, rainfall intensities have been capped at 50mm/hr which may not be fully representative.

Appendix D of the Drainage Report includes an area breakdown and the runoff factors applied to each area/surface. The runoff factor for the green roofs and podiums varies from 83.4% - 91.7%. Runoff from paths/roads has been assumed to be 90% and 100% has been assumed from miscellaneous areas. However, 50% runoff has been assumed from all permeable parking areas. It is not clear how the remaining 50% will be prevented from entering the network. Green/landscaped areas have not been included in the catchment calculations.

The equivalent impermeable catchment area included in Appendix D is stated to be 2.075 ha however, only 1.679 ha appears to have been included in the Flow model.

Urban Creep has not been applied to the Flow Model.

The volume of the attenuation tank in Zone 2 is stated to be 920m3 on the drawings but a modelled volume of 772.5m2 has been included in Flow. Similarly, the volume of the StormTech tank in Zone 1 is stated to be 920m3 pm the drawings but has a modelled volume of 735m3 in Flow.

The simulation results show no flooding up to the 1 in 100-year event plus 20% Climate change.

As noted above an outdated value has been used for the SAAR, m5-60 and Ratio r. The Flow model should be rerun with these updated values.

The full set of storm durations have not been simulated in the Flow model meaning flooding may occur in the longer durations.

Appendix 7 of the DLRCC CDP 2022-2028 notes that all SW Audits must include the table in S 7.1.5, to be completed by the scheme designers.

JJC to advise how 50% runoff will be prevented from entering the permeable paving areas. Consideration should be given to increasing this to a more realistic value and to the inclusion of runoff from green/landscaped areas.

JJC to review the catchment area included in the Flow model and update if necessary.

JJC to run Flow model with Urban Creep included.

JJC to review the attenuation volumes in both the Flow model and the drawings to ensure that the correct values are used in both.

JJC to run Flow model with updated SAAR, m5-60 and Ratio r.

JJC to run Flow model for the full suite of storm durations.

JJC to provide the completed Table in S7.1.5 of the DLRCC CDP 2022-2028.

2.2.5 Interception/Treatment

Interception of runoff is intended to prevent any runoff for small rainfall events which are less than 5mm (and up to 10mm if possible). Treatment of 15mm is required if interception is not provided.

Interception mechanisms are based on runoff retention. This can be achieved using rainwater harvesting or using soil storage and evaporation. Either infiltration or transpiration rates can dispose of the runoff from minor events to enable the next event to be captured. A high level of Interception provided for some parts of the site is not to be considered as adequate compensation for a low degree of interception provision for other locations. Compliance is required for the whole site, or at least for road/paved areas, for it to be considered effective.

SuDS have been proposed throughout the site. In the Drainage Report, the designer has assessed Interception in terms of calculating Interception requirement (5mm over the catchment area) in comparison to the storage volume available throughout the site. This is incorrect as Interception is defined in the CIRIA SuDS Manual as "*The prevention of runoff from the site for the majority of small (frequent) rainfall events*". This means that where storage features use impermeable liners, they do not provide Interception for additional areas because all runoff will flow through and be discharged from the structure. However, the tables on drawing “C7 – Interception Areas” demonstrate compliance with the requirements of Table 24.6 of the CIRIA SuDS manual by outlining the ratio of the catchment area of each feature to its own area.

However, permeable liners have been proposed in locations where the groundwater table was encountered close to the surface, suggesting that a minimum separation distance of 1m may not be achieved between the liner and the highest likely groundwater table. If impermeable liners are required due to groundwater (subject to groundwater monitoring over a full winter period) this will affect the deemed to satisfy criteria and further SuDS measures may be required to satisfy Interception requirements.

The Simple Index Approach, as set out in S26.7 of the CIRIA SuDS Manual should be undertaken to assess the hazard indices for each surface and whether the proposed SuDS measures will adequately mitigate against these.

JJC to review the suitability of permeable liners, with regard to the groundwater levels encountered in the Site Investigation. Where permeable liners are not suitable, compliance with Table 24.6 should be updated accordingly.

JJC to examine water quality using the Simple Index Approach, in accordance with S26.7 of the CIRIA SuDS Manual.

2.2.6 Exceedance Flows

The drainage layout drawing shows overland flood route in the event of a blockage in the network. Exceedance flows are shown to be routed along roadways away from buildings.

2.3 Health & Safety and Maintenance Issues

The proposed drainage system comprises SuDS devices, road gullies, manholes, RC attenuation tank, a petrol interceptor and underground pipes. These elements are considered acceptable from a Health & Safety perspective once supplier/manufacturers guides are followed and complied with during the detailed design, construction and operation.

Optimum performance of the SUDs treatment train is subject to the frequency of maintenance provided. At detailed design stage, it is recommended that a maintenance regime be adopted.

Particular consideration is required at detailed design stage to the design, maintenance requirements and whole life plan (and replacement) of the SuDS system as a whole.

Regular maintenance of the hydrobrakes will be required to remove any blockages, particularly in the wake of heavy rainfall events or local floods.

It is recommended that the petrol interceptors be fitted with an audible high-level silt and oil alarm for maintenance and safety purposes. Regular inspection and maintenance are recommended for the petrol interceptor.

Please note that silt and debris removed from the petrol interceptor during maintenance will be classified as contaminated material and should only be handled and transported by a suitably licensed contractor and haulier and disposed of at a suitably licensed landfill only.

An O&M Plan has not been provided.

JJC to provide O&M Plan.

3 Audit Conclusions

This report outlines the review of the initial submission by the designer. JBA comments are also included in the Audit Feedback Form in Appendix A. This feedback form shows the audit trail and the responses from the designer. The audit will be deemed closed out once an “Acceptable” status has been achieved for each query. The following items have been highlighted for Local Authority agreement.

- The SI, and in particular, the infiltration test results suggest that the soil in the eastern catchment is likely to be a different soil type to the soil in the western catchment. The designer has applied an average soil type to the entire catchment, which may overestimate/underestimate runoff from green areas in some pipe runs. However, given the scale of the catchment the difference is unlikely to be significant. This could be revisited at detailed design stage.
- Reinforced concrete tanks have been proposed as part of the development. The designer notes that this was discussed with DLRCC and included as part of the 2019 granted scheme and the proposals for these tanks have not been modified.

It is recommended that the following items are considered at detailed design stage:

- Attenuation volumes on the C2 drawings appear to be slightly rounded up from the Flow model but should be adjusted to match exactly in detailed design.
- A full AutoCAD detail for the proposed tree pits should be provided at detailed design including details on inlets, outlets, depth, materials used etc.
- The application of the urban creep allowance to the rainfall depths instead of the areas may be slightly conservative. The designer may wish to review this at detailed design stage.

Audit Report Prepared by:

Jack Shanahan

Jack Shanahan MEng
Graduate Engineer

Approved by:

Leanne Leonard

Leanne Leonard BEng (Hons) MIEI
Senior Engineer

__Audit Report Findings are accepted by the Design Engineer__

Representative:	
Name of Company:	
Date:	

Note:

JBA Consulting Engineers & Scientists Ltd. role on this project is as an independent reviewer/auditor. JBA Consulting Engineers & Scientists hold no design responsibility on this project. All issues raised and comments made by JBA are for the consideration of the Design Engineer. Final design, construction supervision, with sign-off and/or commissioning of the surface water system so that the final product is fit for purpose with a suitable design, capacity and lifespan, remains the responsibility of the Design Engineers.

Appendix A – Audit Feedback Form

JBA Consulting Stormwater Audit - Stage 1 Feedback Form

Project:	Temple Hill, Blackrock - Stage 1 Stormwater Audit
Date:	13/01/2026(P03)
JBA Reviewers	Jack Shanahan & Leanne Leonard
Project Number:	2025s1071

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
	28/11/2025	28/11/2025	10/12/2025	
	Reference Documents: 01 - Document Issue Register - Stage III.pdf C1 - Existing Site Plan.pdf C2-0 - Foul and Surface Water.pdf C2-1 - Foul and Surface Water.pdf C2-2 - Foul and Surface Water.pdf C2-3 - Foul and Surface Water.pdf C2-4 - Foul and Surface Water.pdf C2-5 - Foul and Surface Water.pdf C2-6 - Foul and Surface Water.pdf C2-7 - Foul and Surface Water.pdf C2-9 - Long Sections.pdf C2-10 - Long Sections.pdf C2-11 - Long Sections.pdf C3 - Qbar.pdf C4-1 - Basements.pdf C4-2 - Basements.pdf C5 - Tree Root Protection.pdf C6-1 - SuDS Zones.pdf C6-2 - Attenuation Tank.pdf C6-3 - Attenuation Tank.pdf C7 - Interception Areas at Ground Level.pdf C8 - SUDs details.pdf C11 - Roof Areas.pdf C12 - Construction Phasing.pdf C13 - Foul Discharge.pdf C14 - Diversion manhole C3.pdf C15 - Diversion manhole C1.pdf D1 - Demolition Plan.pdf F1-1 - Flood Directions.pdf F1-2 - Flood Extents.pdf G01 - Water Main Layout.pdf JBA SW Audit Checklist-P01.xlsx Si-1 - Soakaway Tests.pdf Stage III - Drainage Report.pdf			
1	The Drainage Report states that the total site area is 4.56ha whereas the completed audit checklist states that it is 4.56 ha. As only 2.12 ha is deemed to contribute, how will the other areas be prevented from entering the network?	**JJC to clarify site area.** **JJC to advise how areas deemed not to contribute will be prevented from entering the network. (i.e. why they are deemed not to contribute)**	4.56 ha is the area including the junction in Temple Road. 3.9 ha is the area excluding the junction. The allowable discharge has been calculated using only positively drained areas in calculation of Qbar (net). It is the Qbar (net) and not the Qbar (whole site) that determines the allowable runoff area. This was discussed and recommended by DLRCC in 2021 revised planning (ABP309696-21). This area was used to calculate the Qbar only.	Acceptable
2	Most soakaway tests in Zone 1 failed while most soakaway tests in Zone 2 were successful. As the two subcatchments roughly align with the findings, can consideration be given to the application of different SPR values in each catchment? Where infiltration is poor and bedrock is high, this may be indicative of a Soil Type 4.	**JJC to review the SPR values applied and the associated calculations.**	Soil type 3 (SPR = 0.37) was used as deemed more conservative to calculate the storage volume. If we calculate the Qbar for each zone usign different soil types we obtain the following (usign UKSuDS): Zone 1: A = 1 ha, Soil Type 3, Qbar = 3.9 l/s --> Attenuation required = 652m3 Zone 2: A = 1 ha, Soil Type 4, Qbar = 6.5 l/s --> Attenuation required = 518m3 Total Attenuation Required: 1170m3 If we calculate the Qbar for each zone usign soil type 3 we obtain the following (usign UKSuDS): Zone 1 + Zone 2: A = 2 ha, Soil Type 3, Qbar = 8.2 l/s --> Attenuation required = 1570m3 Total Attenuation Required: 1570m3 > 1170m3	Acceptable subject to DLRCC Approval

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
3	The M5_60 and SAAR values obtained by JBA differ to those used in the calculations. Is the designer using the 2023 updated Met Éireann values?	**JJC to review the M5_60 and SAAR values used in the design to ensure that the most recent values are being applied, and update calculations (Flow and Qbar) accordingly.**	2023 ME rainfall data values shall be used. SAAR value of 765 shall be used.	Acceptable
4	There appears to be a typo on drawing C11 – The Extensive green roof table states "Total Intensive" and the Intensive green roof states "Total Extensive".	**JJC to amend for clarity.**	Drawing amended.	Acceptable
5	The detail on drawing C8 – "SuDS details" does not indicate any liner on the swale detail. An impermeable liner may be required in some locations depending on the results of groundwater monitoring.	**JJC to indicate whether a permeable/impermeable liner is proposed.**	Impermeable liner is provided on swales. See updated C8 drawing.	Acceptable
6	There appear to be a number of proposed trees in the layout. Can tree pit structural systems be incorporated into these to provide water quality benefits?	**JJC to consider the inclusion of tree pit structural cell systems where new trees are proposed adjacent to hardstanding areas.**	Tree pits are incorporated. See updated C2 drawing series.	See Note 23
7	Drawing C8 includes the typical build up for permeable paving areas but it does not include an outlet detail. A permeable liner has been shown however, subject to groundwater monitoring, this may not be suitable in all areas. Drawing C7 refers to permeable asphalt for area 12 however, this has not been referenced in the Drainage Report or included on the details drawings.	**JJC to update the permeable paving detail to include the proposed outlet arrangement.** **JJC to include porous asphalt detail on the SuDS details drawings.**	Permeable paving detail has been amended. See updated C8 drawing. Porous asphalt detail is included in C8 drawing and in report.	Acceptable
8	Petrol interceptors have not been included on the surface water network.	**JJC to consider the inclusion of petrol interceptors upstream of the attenuation tanks.**	Petrol interceptor are included upstream of the attenuation tanks. See updated drawing C2.	Acceptable
9	DLRCC are generally opposed to RC tanks. It is not clear whether a permeable or impermeable liner is proposed to the StormTech attenuation structure.	**JJC to advise whether the use of a RC attenuation tank has been discussed with DLRCC.** **JJC to update the attenuation tank drawing to indicate whether a permeable or impermeable liner is proposed to the StormTech structure.**	Blocks A1 to B4, basements and the RC attenuation tank was discussed with DLRCC and are part of the 2019 granted scheme. These blocks and the attenuation tank are not being altered or modified for the 2025 amendment planning submission. Impermeable liner is proposed to StormTech structure due to water table. See updated drawing C6.	Acceptable subject to DLRCC Approval
10	Detail section drawings of drainage elements such as manholes and pipes has not been provided.	**JJC to provide details drawing for manholes and pipes.**	Details are provided. See drawing C9.	Acceptable
11	It is unclear how runoff from some road areas will be captured. Gullies are shown in six locations only, all adjacent to proposed swales. While drawing C7 indicates that the majority of road runoff will be conveyed through the permeable paving, it is not clear how all runoff will be directed to the permeable paved areas only. Furthermore, while drawing C8 includes the proposed permeable paving build-up, no outlet arrangement has been provided.	**JJC to clarify how runoff from roads will be conveyed to the permeable paved areas and update permeable paving detail to include outlet arrangement.**	Permeable paving detail has been amended. See updated C8 drawing.	Acceptable
12	The volume of the attenuation tank in Zone 2 is stated to be 920m3 on the drawings but a modelled volume of 735m2 has been included in Flow. Similarly, the volume of the StormTech tank in Zone 1 is stated to be 920m3 pm the drawings but has a modelled volume of 772.5m3 in Flow.	**JJC to review the attenuation volumes stated on the drawings and used in the Flow model to ensure that the correct value is used.**	Calculation to be updated	See Note 24
13	The attenuation drawings note that a hydrobrake without a penstock is proposed. DLRCC typically require the use of hydrobrakes with penstocks in case of blockages.	**JJC to consider the use of hydrobrakes with penstocks.**	Hydrobrake with penstock at inlet are considered. They are specified in drawing C2-3. The drawing specify hydrobrake with no bypass	Acceptable

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
14	Drawing F1-2 is named Flood Extents however, it contains details regarding the height of grills on the west boundary wall.	**JJC to update drawing F1-2 to show flood extents.**	File to be renamed to "height of grills at west boundary wall"	Acceptable
15	50% runoff has been assumed from all permeable parking areas. It is not clear how the remaining 50% will be prevented from entering the network.	**JJC to advise how 50% runoff will be prevented from entering the permeable paving areas. Consideration should be given to increasing this to a more realistic value and to the inclusion of runoff from green/landscaped areas.**	80% runoff is now assumed from all permeable parking areas.	Acceptable
16	The equivalent impermeable catchment area included in Appendix D is stated to be 2.075 ha however, only 1.679 ha appears to have been included in the Flow model.	**JJC to review the catchment area included in the Flow model and update if necessary.**	Flow model shall be re-calculated using updated equivalent area	See Note 25
17	Urban Creep has not been applied to the Flow Model.	**JJC to run Flow model with Urban Creep included.**	Flow model shall be re-calculated with urban creep applied	Acceptable
18	The full set of storm durations have not been simulated in the Flow model meaning flooding may occur in the longer durations.	**JJC to run Flow model for the full suite of storm durations.**	Flow model shall be re-calculated for the full set of storm durantion	See Note 26
19	Appendix 7 of the DLRCC CDP 2022-2028 notes that all SW Audits must include the table in S 7.1.5, to be completed by the scheme designers.	**JJC to provide the completed Table in S7.1.5 of the DLRCC CDP 2022-2028.**	Complete table in S7.1.5 is provided. See Appendix R of Engineer Service Report.	Acceptable
20	Permeable liners have been proposed in locations where the groundwater table was encountered close to the surface, suggesting that a minimum separation distance of 1m may not be achieved between the liner and the highest likely groundwater table.	**JJC to review the suitability of permeable liners, with regard to the groundwater levels encountered in the Site Investigation. Where permeable liners are not suitable, compliance with Table 24.6 should be updated accordingly.**	Impermeable liner shall be provided for stormtech underground and for permeable paving car park near block D1	See Note 27
21	The Simple Index Approach, as set out in S26.7 of the CIRIA SuDS Manual should be undertaken to assess the hazard indices for each surface and whether the proposed SuDS measures will adequately mitigate against these.	**JJC to examine water quality using the Simple Index Approach, in accordance with S26.7 of the CIRIA SuDS Manual.**	Simple Index Approach table is provided. See Appendix Q of Engineer Service Report.	Acceptable
22	An O&M Plan has not been provided.	**JJC to provide O&M Plan for all proposed SuDS, drainage and attenuation features.**	O&M is provided. See Appendix P of Engineer Service Report.	Acceptable
P02	19/12/2025	19/12/2025	13/01/2026	
23	A detail for the proposed tree pits does not appear to have been provided. Connectivity between the tree pits and the main drainage networks should be shown on the C2 series of drawings as connection point is not clear. The C2 series of drawings show a tree pit directly above the concrete attenuation tank. Has consideration been given to any effect it may have on the attenuation tank (e.g. the potential for damege due to root growth).	**JJC to provide detail drawing for tree pits** **JJC to update C2 series of drawings to show connection points to main network from tree pits.** **JJC to clarify Tree pit and attenuation tank interaction.**	Tree pit typical detail is provided in the Drainage Report. Please see Figure 7 in Section 4.3. Connection points to main network from tree pits are shown in drawing C2 series. Tree pit over attenuation tank has been removed so there won`t be any interaction between tree pit and the concrete attenuation tank.	Acceptable (An AutoCAD detail with information regarding inlets, outlets, depth and material should be provided at detailed design stage)
24	There is still an inconsistency between the modelled attenuation volumes and the attenuation volumes listed on the C2 series of drawings	**JJC to clarify the intended attenuation volumes.**	Attenuation volumes listed on the C2 series of drawings have been updated to match modelled attenuation volumes from causeway flow model calculation. The volumes to be provided for each zone were conservatively taken from Causeway flow model as it resulted in larger volume than the one calcualted using the spreadsheet.	Acceptable (Note volumes appear to be rounded up slightly and should be amended at detailed design stage)

Item No.	JBA Review Comment	Comment/Clarification Request/Suggested Mitigation	Response from Client/Client Representative	Acceptable / Not Acceptable
25	There is still an inconsistency between the impermeable area stated in the model and the impermeable area in Appendix D	**JJC to clarify the intended impermeable area for the design.**	Impermeable area in Appendix D has been amended. The difference between the areas stated in the model and in Appendix D was due to the way that the additional 10% urban creep was applied. Now, the additional 10% is applied together with the 20% addtional for climate change instead of being applied directly to the areas, similar to how it is applied in the model. The impermeable area in the model is 1.828 ha (0.997+0.831), the impermeable area in Appndix D is now 1.827 ha.	Acceptable (Note: This may be conservative but can be reviewed at detailed design stage.)
26	The storm durations 4320 mins, 5760 mins, 7200 mins, 8640 mins and 10080 mins should also be simulated in the Flow model	**JJC to run Flow model with updated storm durations**	Storm durations added to the model calcualtion	Acceptable
27	Due to the permeable paving being lined, area 3 on drawing C7 may no longer be in compliance with Table 24.6 of the CIRIA SuDS Manual.	**JJC to ensure that interception is provided in all areas in compliance with Table 24.6**	Table 24.6 of CIRIA SuDS Manual states that if permeable paving is lined, additional measures to intercept the first 5mm rainfall shall be provided. Therefore, an additional dry swale has been added to provide the interception area required in Table 24.6 for area 3 on drawing C7. See drawing C2 for dry swale location.	Acceptable subject to full compliance with Table 24.6 and the SIA approach.

Appendix I – Uisce Eireann– Confirmation of Feasibility (COF)

Uisce Éireann
Irish Water

CONFIRMATION OF FEASIBILITY

Airton Brandini
JJ Campbell & Associates
F1 Nutgrove Office Park
Rathfarnham
Dublin 14
D14A895

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 December 2025

Our Ref: CDS25008526 Pre-Connection Enquiry St Teresa's Lands, Temple Hill, Blackrock, 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 450 unit(s) at St Teresa's Lands, Temple Hill, Blackrock, 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 proposed Development indicates that Uisce Éireann assets are present on the site. The Developer has to 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. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Éireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact the Uisce Éireann Diversions Team via email address diversions@water.ie.

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

- The proposed Development indicates that Uisce Éireann assets are present on the site. The Developer has to 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. Drawings (showing clearance distances, changing to ground levels) and Method Statements should be included in the Detailed Design of the Development. A wayleave in favour of Uisce Éireann will be required over the assets that are not located within the Public Space. For design submissions and queries related to diversion/build near or over, please contact the Uisce Éireann Diversions 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

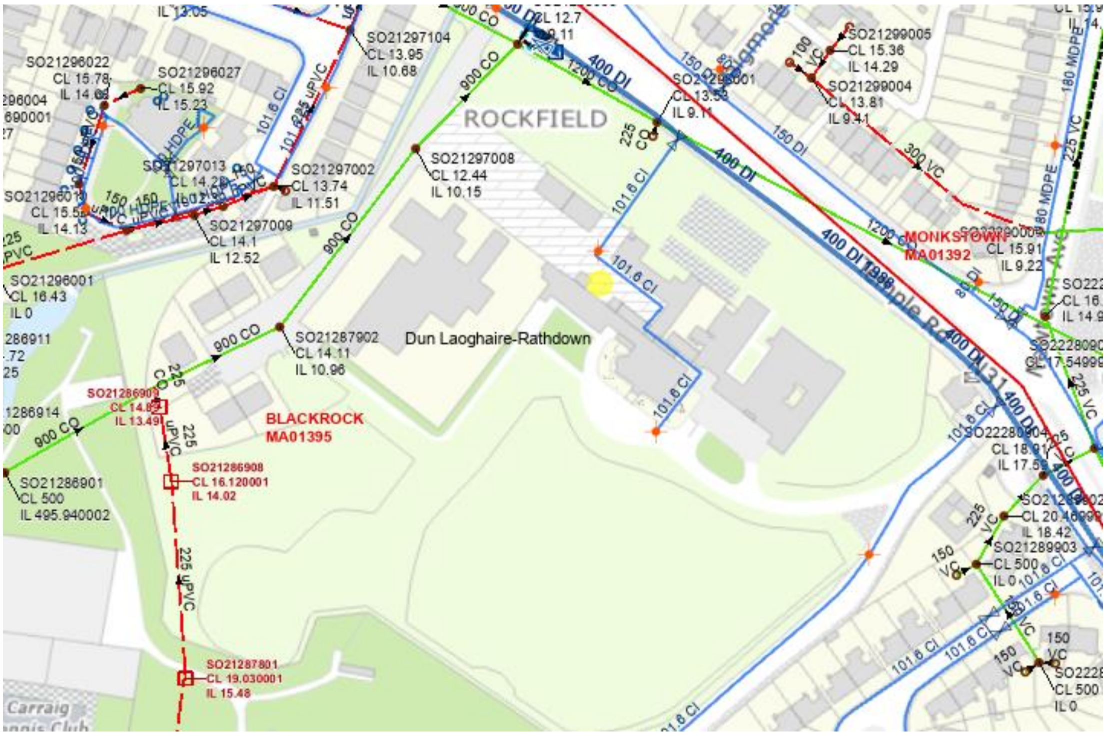
Section A - What is important to know?

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



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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.

Appendix J – Uisce Eireann– Statement of Design Acceptance

Uisce Éireann
Irish Water

Marcus Wallace
J. J. Campbell & Associates
F1 Nutgrove Office Park
Rathfarnham
Dublin 14
D14 A895

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

12 January 2026

Re: Design Submission for St Teresa's Lands, Temple Hill, Blackrock, Dublin (the "Development")
(the "Design Submission") / Connection Reference No: CDS25004579

Dear Marcus Wallace,

Many thanks for your recent Design Submission.

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

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

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

If you have any further questions, please contact your Uisce Éireann representative:
Name: Antonio Garzón Mielgo
Email: antonio.garzonmielgo@water.ie

Yours sincerely,

Dermot Phelan

Dermot Phelan
Connections and Developer Services

Appendix A

Document Title & Revision

- C2-0 **-** Foul and Surface Water Rev D
- C2-1 **-** Foul and Surface Water Rev D
- C2-2 - Foul and Surface Water Rev D
- C2-3 - Foul and Surface Water Rev D
- C2-4 **-** Foul and Surface Water Rev D
- C2-5 - Foul and Surface Water Rev D
- C2-6 - Foul and Surface Water Rev D
- C2-7 - Foul and Surface Water Rev D
- C2-10 **-** Long Sections Rev C
- G01 - Water Main Layout Rev C

Additional Comments

The design submission will be subject to further technical review at connection application stage.

Uisce Éireann cannot guarantee that its Network in any location will have the capacity to deliver a particular flow rate and associated residual pressure to meet the requirements of the relevant Fire Authority, see Section 1.17 of Water Code of Practice.

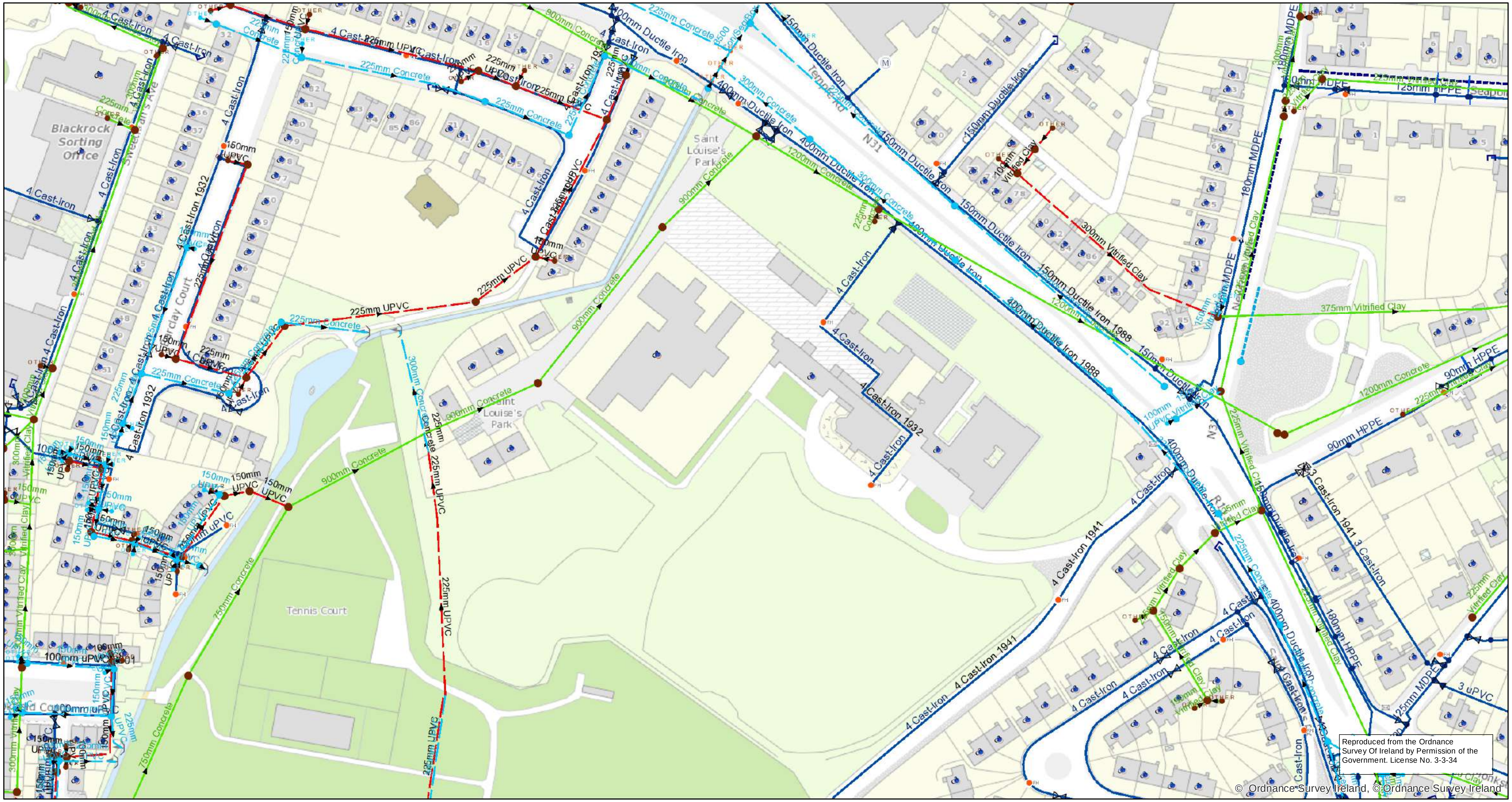
Please confirm at Connection Application Stage that the wastewater and surface water layouts comply with the required minimum separation distances between services.

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

Notwithstanding any matters listed above, the Customer (including any appointed designers/contractors, etc.) is entirely responsible for the design and construction of the Self-Lay Works. Acceptance of the Design Submission by Uisce Éireann will not, in any way, render Uisce Éireann liable for any elements of the design and/or construction of the Self-Lay Works.

Appendix K – Uisce Eireann Drawings – 4 Number Drawings

Temple Hill Area Overview



January 9, 2018

1:2,500

0 0.03 0.06 0.12 mi

0 0.05 0.1 0.2 km

Legend

Gravity Main (Irish Water Owned)
- Surface

Gravity Main (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

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

- Storm Culverts
- Storm Clean Outs

Sewer Discharge Points
- Outfall
- Overflow
- Soakaway
- Standard Outlet
- Other; Unknown

Sewer Clean Outs
- Rodding Eye
- Flushing Structure
- Other; Unknown
- Sewer Flow Control Valves
- Treatment plant
- Pump station

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

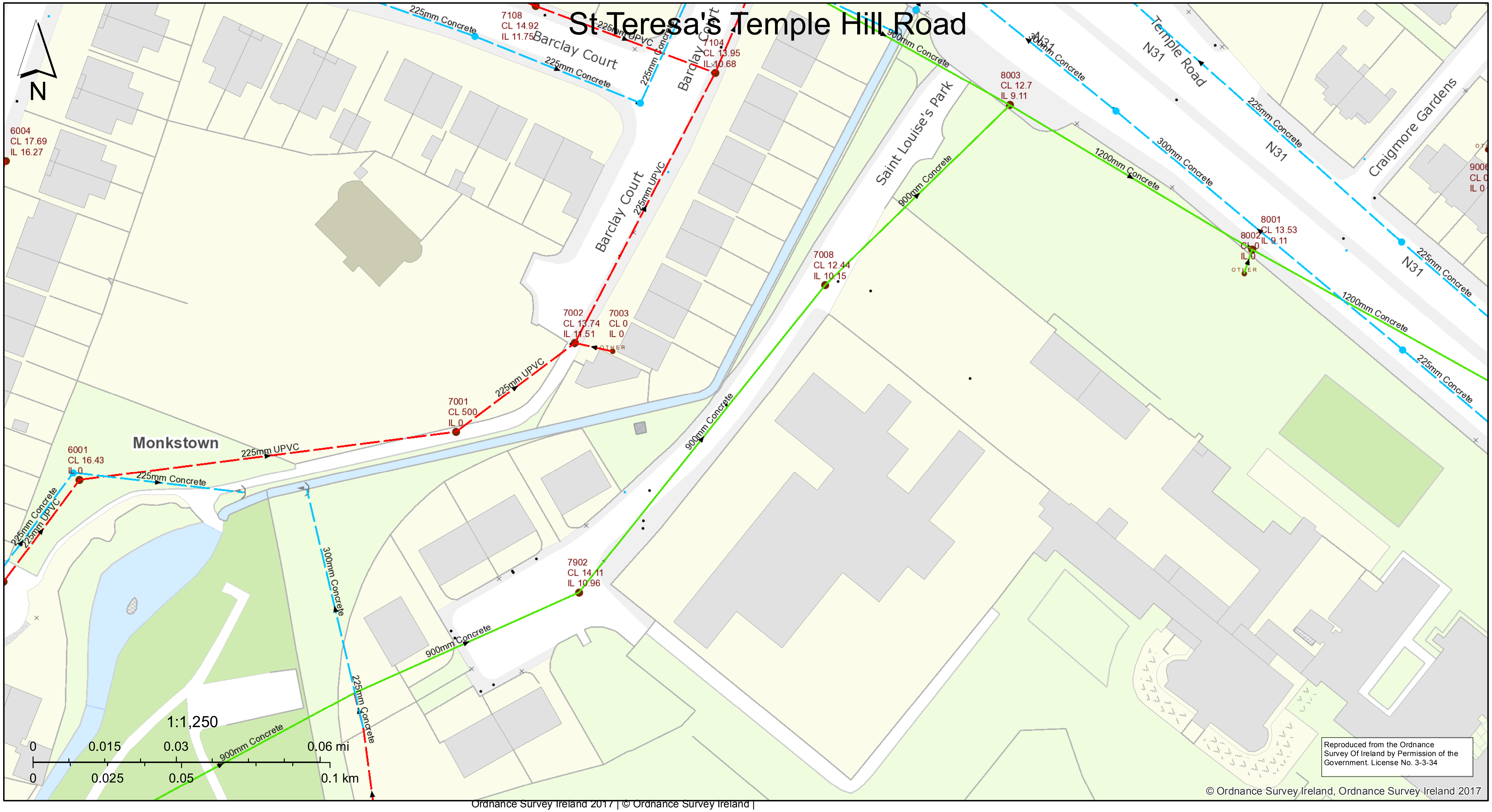
Sewer Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Sewer Fittings
- Vent/Col
- Other; Unknown

Whilst every care has been taken in its compilation Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland to Irish water. Irish Water can assume no responsibility for and give no guarantees, undertakings or warranties concerning the accuracy, completeness or up to date nature of the information provided and does not accept any liability whatsoever arising from any errors or omissions. This information should not be relied upon in the event of excavations or any other works being carried out in the vicinity of the Irish Water underground network. The onus is on the parties carrying out excavations or any other works to ensure the exact location of the Irish Water underground network is identified prior to excavations or any other works being carried out. Service connection pipes are not generally shown but their presence should be anticipated.

UISCE ÉIREANN : IRISH WATER

St Teresa's Temple Hill Road



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Legend

Stormwater Gravity Mains (Irish Water Owned)

Surface

Stormwater Gravity Mains (Non-Irish Water Owned)

Surface

Storm Manholes

Cascade

Catchpit

Hatchbox

Lamphole

Standard

Other; Unknown

Storm Inlets

Gully

Standard

Other; Unknown

Storm Fittings

Vent/Col

Other; Unknown

Storm Discharge Points

Outfall

Overflow

Soakaway

Other; Unknown

Storm Culverts

Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)

Combined

Foul

Overflow

Unknown

Sewer Gravity Mains (Non-Irish Water owned)

Combined

Foul

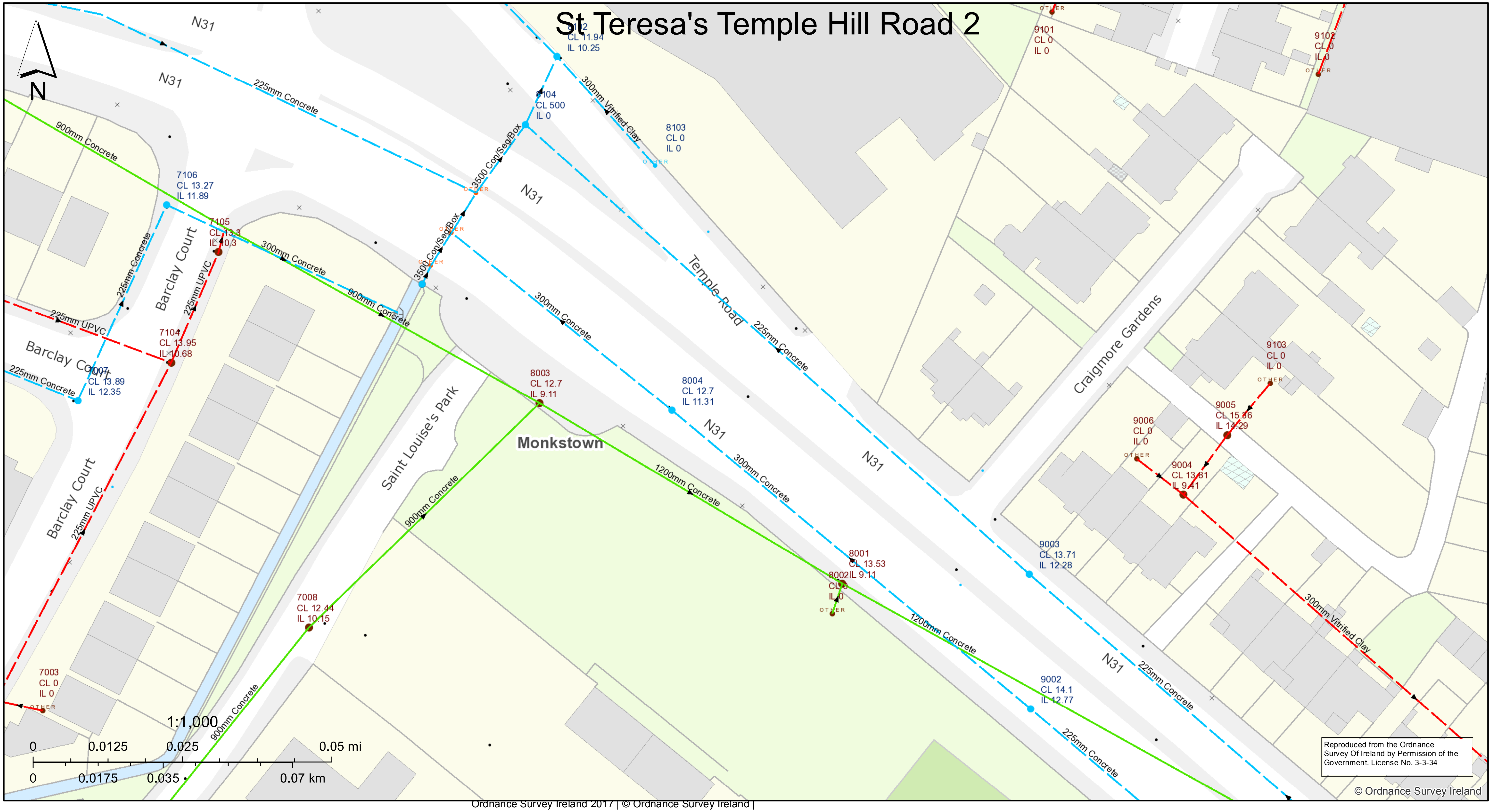
Overflow

Unknown

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

“Gas Networks Ireland (GNI), their affiliates and assigns, accept no responsibility for any information contained in this document concerning location and technical designation of the gas distribution and transmission network (“the Information”). Any representations and warranties express or implied, are excluded to the fullest extent permitted by law. No liability shall be accepted for any loss or damage including, without limitation, direct, indirect, special, incidental, punitive or consequential loss including loss of profits, arising out of or in connection with the use of the Information (including maps or mapping data). NOTE: DIAL BEFORE YOU DIG Phone 1850 427 747 or e-mail dig@gasnetworks.ie – The actual position of the gas/electricity distribution and transmission network must be verified on site before any mechanical excavating takes place. If any mechanical excavation is proposed, hard copy maps must be requested from GNI re gas. All work in the vicinity of the gas distribution and transmission network must be completed in accordance with the current edition of the Health & Safety Authority publication, ‘Code of Practice For Avoiding Danger From Underground Services’ which is available from the Health and Safety Authority (1890 28 93 89) or can be downloaded free of charge at www.hsa.ie.”

St Teresa's Temple Hill Road 2



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Legend

Stormwater Gravity Mains (Irish Water Owned)
- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)
- Surface

Storm Manholes
- Cascade
- Catchpit
- Hatchbox
- Lamphole
- Standard
- Other; Unknown

Storm Inlets
- Gully
- Standard
- Other; Unknown

Storm Fittings
- Vent/Col
- Other; Unknown

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

- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)
- Combined
- Foul
- Overflow
- Unknown

Irish Water gives this information as to the position of its underground network as a general guide only on the strict understanding that it is based on the best available information provided by each Local Authority in Ireland. It should not be relied upon in the event of excavations or other works being carried out in the vicinity of the network. The onus is on the parties carrying out the works to ensure the exact location of the network is identified prior to mechanical works being carried out. Service pipes are not generally shown but their presence should be anticipated. © Irish Water

UISCE ÉIREANN : IRISH WATER

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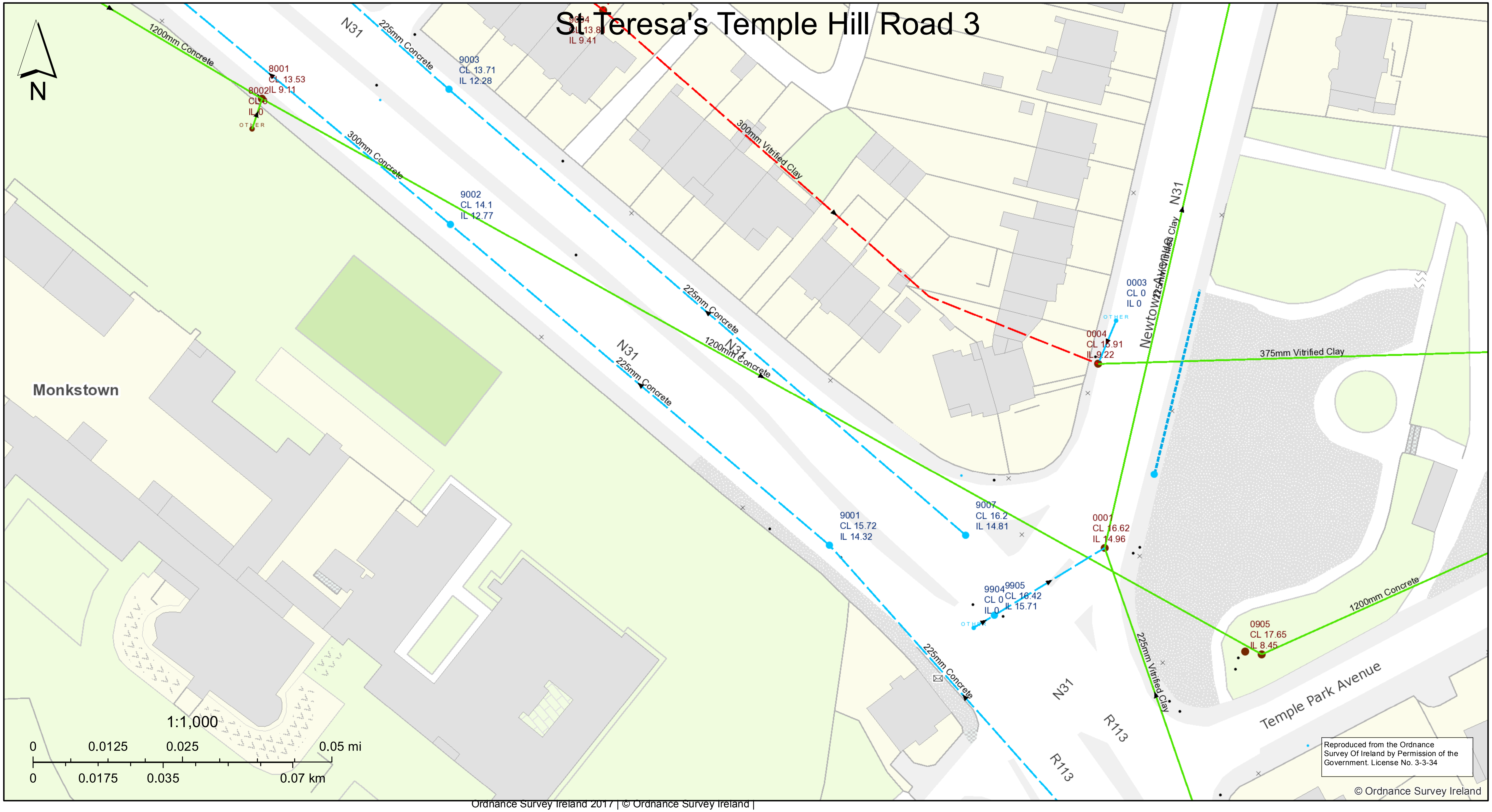
St Teresa's Temple Hill Road 3



Ordnance Survey Ireland 2017 | © Ordnance Survey Ireland |

1/16/2018 2:56:50 PM

Legend

Stormwater Gravity Mains (Irish Water Owned)

- Surface

Stormwater Gravity Mains (Non-Irish Water Owned)

- Surface

Storm Manholes

- Cascade
- Catchpit
- Hatchbox

- Lamphole
- Standard
- Other; Unknown

Storm Inlets

- Gully
- Standard
- Other; Unknown

Storm Fittings

- Vent/Col
- Other; Unknown

Storm Discharge Points

- Outfall
- Overflow
- Soakaway
- Other; Unknown

- Storm Culverts
- Storm Clean Outs

Sewer Gravity Mains (Irish Water owned)

- Combined
- Foul
- Overflow
- Unknown

Sewer Gravity Mains (Non-Irish Water owned)

- Combined
- Foul
- Overflow
- Unknown

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Appendix L – Site Investigation Reports

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Ground Investigations Ireland

St Teresas Lands Temple Hill, Monkstown, Blackrock, Co Dublin

Ground Investigation Report

DOCUMENT CONTROL SHEET

Project Title	St Teresas Lands Temple Hill, Monkstown, Blackrock, Co Dublin
Engineer	JJ Campbell & Associates
Project No	8236-11-18
Document Title	Ground Investigation Report

Rev.	Status	Author(s)	Reviewed By	Approved By	Office of Origin	Issue Date
A	Final	G Kelliher	C Finnerty	C Finnerty	Dublin	17 January 2019

CONTENTS

APPENDICES

1.0 Preamble

On the instructions of JJ Campbell & Associates, a site investigation was carried out by Ground Investigations Ireland Ltd., in December 2018 at the site of the proposed residential development at St Teresas Lands Temple Hill, Monkstown, Blackrock, Co Dublin

2.0 Overview

2.1. Background

It is proposed to construct a new residential development with associated services, access roads and car parking at the proposed site. The site is currently greenfield partially vegetated in palaces with a convent building over a portion of the site in Blackrock, Co. Dublin. The proposed construction is envisaged to consist of conventional foundations and pavement make up with some local excavations for services and plant.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 2 No. Rotary Core Boreholes to a maximum depth of 13.5m BGL
- Installation of 2 No. Groundwater monitoring wells
- Groundwater monitoring
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.

The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 2 of this Report.

3.3. Groundwater Monitoring Installations

Groundwater and or Gas Monitoring Installation were installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil
- Made Ground
- Cohesive Deposits
- Bedrock

TOPSOIL: Topsoil was encountered in BH-B and was present to a maximum depth of 0.1m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil in BH-B and was present to a depth of 1.0m BGL. These deposits were described generally as *brown sandy gravelly CLAY with frequent cobbles and contained occasional fragments of concrete, red brick, glass and plastic.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown sandy gravelly CLAY with occasional cobbles and boulders* overlying a *stiff black sandy gravelly CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. The strength of the cohesive deposits typically increased with depth and was firm to stiff or stiff below 2.0m BGL in the majority of the exploratory holes. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

BEDROCK: The rotary core boreholes recovered strong to very strong phaneritic Granite in BH-A. The rotary core recovered extremely weak (residual) to Medium strong phaneritic Granite in BH-B.
The depth to rock in BH-A is 8.0m and in BH-B depth to rock is6.8m BGL. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, mainly in BH-B, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

No groundwater was noted during the investigation however we would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the time of year, rainfall, nearby construction and other factors. For this reason, standpipes were installed in BH-A and BH-B to allow the equilibrium groundwater level to be determined.

5.0 Recommendations & Conclusions

5.1. General

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 exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

Based on the limited number of investigative points compared to the size of the site, the recommendations are preliminary and should be verified by further ground investigation to ensure the depth of the founding strata don’t vary significantly over the area of the proposed building. A previous investigation to complete soakaway testing indicated shallow rock at the location of DS01 which is in the eastern portion of the site closest to the tennis ground.

An allowable bearing capacity in the location of BH-A where a single basement is proposed, of 250 kN/m^2 is recommended for conventional strip or pad foundations on the stiff cohesive deposits at a depth of 4.0m BGL. An allowable bearing capacity in the location of BH-B, where a double basement is proposed, of 350 kN/m^2 is recommended for conventional strip or pad foundations on the weak granite at a depth of 8.0m BGL.

In any part of the site, should part of the foundation be on rock we would recommend that all the foundations of the unit in question be lowered to the competent rock stratum to avoid differential settlement. The possibility for variation in the depth of the made ground in the vicinity of these foundations should be considered and foundation inspections should be carried out. Any soft spots encountered at the proposed foundation depths should be excavated and replaced with lean mix concrete.

A ground bearing floor slab is recommended to be based on the stiff cohesive deposits or weak bedrock with an appropriate depth of compacted hardcore specified by the consulting engineer and in accordance with the limits and guidelines in SR21:2014+ A1:2016 and/or NRA SRW CL808 Type E granular stone fill.

5.1. Excavations

Excavations in the Made Ground will require to be appropriately battered or the sides supported due to the low strength of these deposits. Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

Any excavations which penetrate the granular or weathered bedrock deposits will require to be appropriately battered or the sides supported and are likely to require dewatering due to the groundwater seepages noted in the exploratory hole logs in the Appendices of this Report.

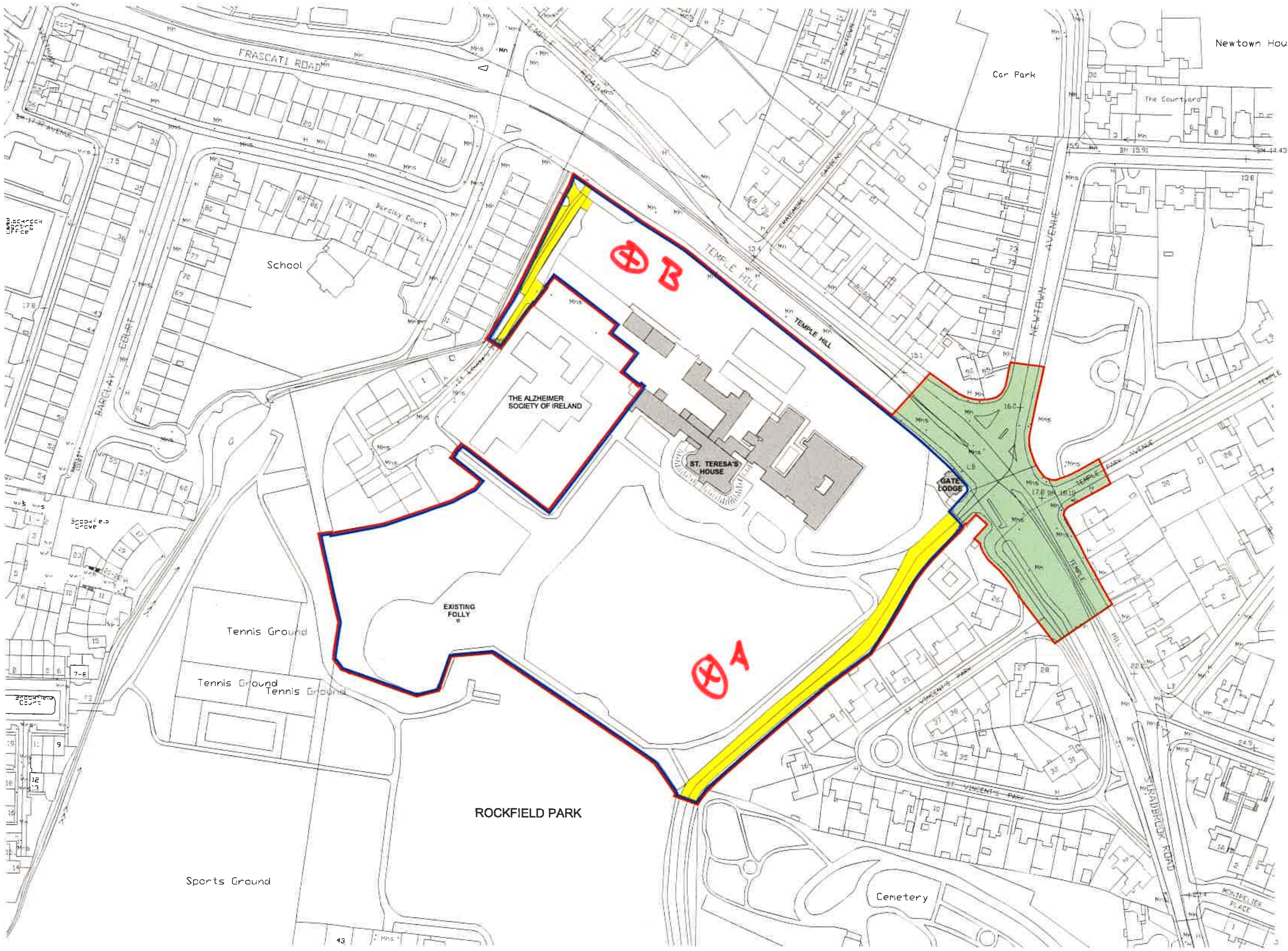
Generally, where significant excavations are required in water bearing granular deposits a cut-off wall may be more cost effective than extensive dewatering. An assessment by a specialist dewatering contractor is recommended to determine the most cost effective approach to the proposed excavation. A retaining wall is recommended to extend into the intact granite bedrock to enable the construction of the double basement, particularly if the weathered granite is persistent across the basement footprint. The groundwater level is above the basement depth at both locations and dewatering may be required to enable the construction of the basement in a dry environment.

The excavations proposed are estimated to be 8.0m BGL for Block B which will penetrate into the weathered Granite between 6.8m and the base of the excavation. Excavations in the upper cohesive and weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring specialist techniques. Where the rock is present in such weathered state it should be excavatable with conventional excavation techniques however where more competent rock is encountered specialist hydraulic splitting equipment can be utilised to eliminates shocks and vibrations associated with rock breaking with impact hammers. This technique has been used successfully in the strong granite bedrock in the South Dublin area in the vicinity of existing structures and services. The excavation for Block A may not encounter bedrock which was not found until a depth of 8.0m BGL and therefore should be excavatable with conventional excavation equipment. Large boulders which can be present in the glacial till may require specialist techniques to split and permit excavation and removal from site.

Any material to be removed off site should be disposed of to a suitably licenced landfill.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



Site Location Plan

OS MAP SERIES: 1:1000 / datum - Malin Head
OS MAP REF: 3393-03, 3393-02, 3330-22, 3330-23
ITM Centre Point Co-ordinate: X,Y = 721758,729006
Copyright Ordnance Survey Ireland and Government of Ireland
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All levels (in meters) are related to Malin Head levelling datum. All dimensions in millimetres. figured dimensions only are to be taken from this drawing. All work to be carried out in accordance with the current building regulations. All dimensions to be checked on site before work is carried out. All consultants are to be notified of any discrepancies.

🟥	Application site outlined in red (4.55 Ha)
🟦	Lands in the ownership of the applicant and/or landowner (3.97 Ha)
🟩	Area of land for which consent is being sought that is in the ownership of the Local Authority (DLRCC)
🟨	Wayleave Access to be retained

Revision Description	Date	Rev. No.	Issued by

Figured dimensions only to be used. This drawing is copyright of O'Mahony Pike Architects Ltd. All information is shared as per approved use in accordance with BS1192(2007) + A2(2016), Table 5; Standard Codes for Suitability of Models and Documents. If 'Information Approval Check' is empty, this information has been shared at S0 - WIP.

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Project No.: 1706
Project Lead: DM
Drawn By: DÓS
Model No.: 1706-OMP-00-00-M2-A-XX-01000
Purpose: Pre-Planning
Scale @ A1: 1:1,000
Date Printed: 19-09-2018
Current Rev.:

Project: Residential Development
Location: St. Teresa's, Temple Road, Blackrock
Client: Oval Target Ltd

Drawing Title: Site Location Plan
Drawing No.: 1706-OMP-00-000-DR-A-XX-01001

APPENDIX 2 –Rotary Core Records

Ground Investigations Ireland Ltd www.gii.ie		**Site** Rotary Core, St Teresas' School	**Borehole Number** BH-A
Machine : Beretta T44 **Flush :** **Core Dia :** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number** 8236-11-18
	Location Blackrock, Dublin	**Dates** 01/01/2019	**Project Contractor** Ground Investigations Ireland	**Sheet** 1/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	24						(2.30)	Poor Recovery of brown slightly sandy gravelly CLAY with occasional gravelly lenses. Driller notes: Stiff brown sandy gravelly Clay			
2.30 2.30-2.75	20				3,4/6,5,5,5 SPT N=21		2.30 (1.40)	Poor Recovery of brown black slightly sandy gravelly CLAY with occasional gravelly lenses. Driller notes: Stiff black sandy gravelly Clay			
3.70 3.70-3.72	75				23,2/50 SPT 25*/10 50/10		3.70 (1.10)	Granite BOULDER			
							4.80 (3.20)	Poor Recovery of black slightly sandy gravelly CLAY. Driller notes: Stiff to very stiff black gravelly Clay			
5.30 5.30-5.75	20				4,6/7,5,7,9 SPT N=28						
6.80 6.80-7.25	40	17	17		7,10/8,6,9,7 SPT N=30						
8.00							8.00	Strong to very strong white grey mottled pink phaneritic GRANITE, partially to unweathered			
8.30	100	97	97								
9.80											

Remarks	**Scale (approx)** 1:50	**Logged By** TMI
	Figure No. 8236-11-18.BH-B	

Ground Investigations Ireland Ltd www.gii.ie	**Site** Rotary Core, St Teresas' School		**Borehole Number** **BH-A**
Machine : Beretta T44 **Flush :** **Core Dia :** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client**
	Location Blackrock, Dublin	**Dates** 01/01/2019	**Project Contractor** Ground Investigations Ireland
		Job Number 8236-11-18	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	100	100	100	2			(5.50)	8.0m - 13.5m Fractures are 40 to 50 degrees, planar, rough, medium to widely spaced, slight staining on fracture surfaces			
11.20	100	100	0								
11.30											
12.80	100	100	100								
13.50	100	100	100				13.50				
								Complete at 13.50m			

Remarks

Scale (approx) 1:50	**Logged By** TMI
Figure No. 8236-11-18.BH-B	

Ground Investigations Ireland Ltd

www.gii.ie

Machine : Beretta T44 **Flush :** **Core Dia :** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Site** Rotary Core, St Teresas' School	**Borehole Number** BH-B	
	Location Blackrock, Dublin	**Dates** 11/12/2018	**Client**	**Job Number** 8236-11-18	
			Project Contractor Ground Investigations Ireland	**Sheet** 1/2	

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00	15						0.10	TOPSOIL			
							(2.20)	Driller Notes: MADE GROUND consisting of brown Clay. Recovery consists of medium to coarse Gravel and cobble fragments			
2.30 2.30-2.75	30				4,6/6,8,5,7 SPT N=26		2.30	Poor Recovery of grey sub rounded to sub angular fine to coarse Gravel with occasional sandy lenses. Driller notes: gravelly cobbly CLAY			
3.80	40						(4.50)				
5.30 5.30-5.75	27				6,9/9,15,26 SPT N=50						
6.80 6.80-6.82	70	30	10	12	25/50 SPT 25*/10 50/10		6.80 (1.20)	Very weak white brown mottled orange phaneritic GRANITE, distinctly weathered 6.8m - 8.0m - Fractures are sub horizontal 10 to 20 degrees, undulating, rough, closely spaced with sandy infill.			
8.00				NI			8.00 (1.50)	Exrtemely weak brownish grey GRANITE, residual rock			
8.30	87	13	7								
9.50							9.50	Weak to medium strong white brown mottled orange phaneritic GRANITE, distinctly to partially weathered			
9.80											

Remarks

Scale (approx)	**Logged By**
1:50	TMI

Figure No.
8236-11-18.BH-B

Ground Investigations Ireland Ltd
www.gii.ie

Site Rotary Core, St Teresas' School				**Borehole Number** BH-B
Machine : Beretta T44 **Flush :** **Core Dia :** mm **Method :** Rotary Cored	**Casing Diameter**	**Ground Level (mOD)**	**Client**	**Job Number** 8236-11-18
	Location Blackrock, Dublin	**Dates** 11/12/2018	**Project Contractor** Ground Investigations Ireland	**Sheet** 2/2

Depth (m)	TCR	SCR	RQD	FI	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
	87	57	50	13			(2.00)	9.5m - 11.5m - Two Fracture sets. F1) 40 to 50 degrees, planar, smooth to rough, close to very close spaced with oxiation on fracture surfaces. F2) Sub horizontal 25 to 35 degrees, undulating, rough, closely spaced			
11.30											
11.50	100	60	53	10			11.50	Medium strong white brown mottled orange phaeritic GRANITE, partially weathered			
							(2.00)	11.5m - 13.5m - Two Fracture sets. F1) 40 to 50 degrees, planar, smooth, close spaced with oxiation on fracture surfaces. F2) Sub vertical 60 to 70 degrees, undulating, rough, close to medium spaced and oxidation on fracture surfaces			
12.80	100	71	14								
13.50							13.50	Complete at 13.50m			

Remarks

Scale (approx) 1:50	**Logged By** TMI
Figure No. 8236-11-18.BH-B	

APPENDIX 3 –Groundwater Monitoring

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Email: info@gii.ie | Web: gii.ie

GROUNDWATER MONITORING

St Teresa's Blackrock

BOREHOLE	DATE	TIME	GROUNDWATER (mBGL)	Comments
BHA	14/01/2019	11.00	1.02	
BHB	14/01/2019	11.15	3.74	

Ground Investigations Ireland Ltd.,
Catherinestown House,
Hazelhatch Road,
Newcastle, Co Dublin.
Tel: 01 601 5175 / 5176 | Fax: 01 601 5173
Email: info@gii.ie | Web: gii.ie

GROUNDWATER MONITORING

St Teresa's Blackrock

BOREHOLE	**DATE**	**TIME**	**GROUNDWATER (mBGL)**	**Comments**
BHA	14/01/2019	11.00	1.02	
BHB	14/01/2019	11.15	3.74	

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Ground Investigations Ireland

St. Teresa's Lands Temple Hill, Monkstown Blackrock, Co Dublin

Ground Investigation Report

December 2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

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Co. Dublin.
D22 YD52

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Email: info@gii.ie
Web: www.gii.ie

DOCUMENT CONTROL SHEET

Project Title	St. Teresa's Lands Temple Hill, Monkstown, Blackrock, Co Dublin
Engineer	JJ Campbell & Associates
Client	Oval Target Ltd
Project No	10069-10-20
Document Title	Ground Investigation Report

Rev.	**Status**	**Author(s)**	**Reviewed By**	**Approved By**	**Office of Origin**	**Issue Date**
B	Final	E Byrne	S Kealy	C Finnerty	Dublin	16 December 2020

Ground Investigations Ireland Ltd. present the results of the fieldworks and laboratory testing in accordance with the specification and related documents provided by or on behalf of the client The possibility of variation in the ground and/or groundwater conditions between or below exploratory locations or due to the investigation techniques employed must be taken into account when this report and the appendices inform designs or decisions where such variation may be considered relevant. Ground and/or groundwater conditions may vary due to seasonal, man-made or other activities not apparent during the fieldworks and no responsibility can be taken for such variation. The data presented and the recommendations included in this report and associated appendices are intended for the use of the client and the client's geotechnical representative only and any duty of care to others is excluded unless approved in writing.

CONTENTS

APPENDICES

Appendix 1	Site Location Plan
Appendix 2	Trial Pit Records
Appendix 3	Cable Percussion and Rotary Core Records
Appendix 4	Slit Trench Records
Appendix 5	Laboratory Testing

1.0 Preamble

On the instructions of JJ Campbell & Associates, a site investigation was carried out by Ground Investigations Ireland Ltd., November 2020 at the site of the proposed residential development at St Teresa's Lands Temple Hill, Monkstown, Blackrock, Co Dublin.

2.0 Overview

2.1. Background

The proposed development comprises 493 residential units with underground car parkingand the relocation of exisitng Gate Lodge.

2.2. Purpose and Scope

The purpose of the site investigation was to investigate subsurface conditions utilising a variety of investigative methods in accordance with the project specification. The scope of the work undertaken for this project included the following:

- Visit project site to observe existing conditions
- Carry out 6 No. Trial Pits to a maximum depth of 3.20m BGL
- Carry out 6 No. Slit Trenches to ascertain existing service details
- Carry out 3 No. Cable Percussion boreholes to a maximum depth of 2.50m BGL
- Carry out 2 No. Rotary Core Boreholes to a maximum depth of 8.50m BGL
- Geotechnical & Environmental Laboratory testing
- Report with recommendations

3.0 Subsurface Exploration

3.1. General

During the ground investigation a programme of intrusive investigation specified by the Consulting Engineer was undertaken to determine the sub surface conditions at the proposed site. Regular sampling and in-situ testing was undertaken in the exploratory holes to facilitate the geotechnical descriptions and to enable laboratory testing to be carried out on the soil samples recovered during excavation and drilling.
The procedures used in this site investigation are in accordance with Eurocode 7 Part 2: Ground Investigation and testing (ISEN 1997 – 2:2007) and B.S. 5930:2015.

3.2. Trial Pits

The trial pits were excavated using a JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The trial pits were sampled, logged and photographed by an Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the trial pit logs which are provided in Appendix 2 of this Report.

3.3. Slit Trenching

The slit trenches were excavated using a JCB 3CX excavator at the locations shown in the exploratory hole location plan in Appendix 1. The locations were checked using a CAT scan to minimise the potential for encountering services during the excavation. The soil was slowly stripped using a spotter on the trench to alert the driver if any services were seen, to avoid damage to any underlying services. The slit trenches were sampled, logged and photographed by an Engineering Geologist prior to backfilling with arisings. Notes were made of any services, inclusions, pit stability, groundwater encountered and the characteristics of the strata encountered and are presented on the slit trench records which are provided in Appendix 4 of this Report.

3.4. Cable Percussion Boreholes

The Cable Percussion Boreholes were drilled using a Dando 2000 drilling rig with regular in-situ testing and sampling undertaken to facilitate the production of geotechnical logs and laboratory testing.

The standard method of boring in soil for site investigation is known as the Cable Percussion method. It consists of using a Shell in non cohesive soils and a clay cutter in cohesive soils, both operated on a wire cable. Very hard soils, boulders and other hard obstructions are broken up by chiselling and the fragments removed with the Shell. Where ground conditions made it necessary, the borehole was lined with 200mm diameter steel casing. While the use of the Cable Percussion method of boring gives the maximum data on soil conditions, some mixing of laminated soil is inevitable. For this reason, thin lenses of granular material may not be noticed. Disturbed samples were taken from the boring tools at suitable depths, so that there is a representative sample at the top of each change in stratum and thereafter at regular intervals down the borehole until the next stratum was encountered. The disturbed samples were then sealed and sent to the laboratory where they were visually examined to confirm the description of the relevant strata.

Standard Penetration Tests were carried out in the boreholes. The results of these tests, together with the depths at which the tests were taken are shown on the accompanying borehole records. The test consists of a thick wall sampler tube, 50mm external diameter, being driven into the soil by a monkey weighing 63.5kg and with a free drop of 760mm. For gravels and glacial till the driving shoe was replaced by a solid 60º cone. The Standard Penetration Test number referred to as the 'N' value is the number of blows required to drive the tube 300mm, after an initial penetration of 150mm. The number gives a guide to the consistency of the soil and can also be used to estimate the relative strength/density at the depth of the test and also to estimate the bearing capacity and compressibility of the soil. The cable percussion borehole logs are provided in Appendix 3 of this Report.

3.5. Rotary Boreholes

The rotary coring was carried out by a track mounted T44 Beretta rig at the locations shown on the location plan in Appendix 1. The rotary boreholes were completed from the ground surface or alternatively, where noted on the individual borehole log, from the base of the cable percussion borehole where a temporary liner was installed to facilitate follow-on rotary coring.

The T44 Beretta is equipped with rubber tracks which allow for short travel on pavement surfaces avoiding any damage to the surface. The T44 Beretta utilises a triple tube core barrel system operated using a wireline drilling process. The outer barrel is rotated by the drill rods and at its lower end, carries the coring bit. The inner barrel is mounted on a swivel so that it does not rotate during the process. The third barrel or liner is placed within the second one to retain the core intact and to preserve as much as possible the fabric of the drilling stratum. The core is cut by the coring bit and passes to the inner liner. The core is brought up to the surface within the inner barrel on a small diameter wire rope or line attached to the "overshoot" recovery tool which is then placed into a core box in order of recovery. A drilling fluid, typically air mist or water flush is passed from the surface through hollow drill rods to the drill bit, and is used to cool the drill bit. Temporary casing is used in some situations to support unstable ground or to seal off fissures or voids. It should be noted that the rotary coring can only achieve limited recovery in overburden, particularly granular or weakly cemented strata due to the flushing medium washing away the cohesive fraction during coring. The recovery achieved, where required is noted on the borehole logs and core photographs are provided to allow assessment of the core recovered. The rotary borehole logs are provided in Appendix 3 of this Report.

3.6. Surveying

The exploratory hole locations have been recorded using a Trimble R10 GNSS System which records the coordinates and elevation of the locations to ITM or Irish National Grid as required by the project specification. The coordinates and elevations are provided on the exploratory hole logs in the appendices of this Report.

3.7. Groundwater Installations

A Groundwater Monitoring Installation was installed upon the completion of the boreholes to enable sampling and the determination of the equilibrium groundwater level. The typical groundwater monitoring installation consists of a 50mm HDPE slotted pipe with a pea gravel response zone and bentonite seal installed to the Engineers specification. Where required the standpipe is sealed with a gas tap and finished with a durable steel cover fixed in place with a concrete surround. The installation details are provided on the exploratory hole logs in the appendices of this Report.

3.8. Laboratory Testing

Samples were selected from the exploratory holes for a range of geotechnical testing to assist in the classification of soils and to provide information for the proposed design.

Chemical testing as required by the specification, including the pH and sulphate testing was carried out by Element Materials Technology Laboratory in the UK.

Geotechnical testing consisting of moisture content, Atterberg limits, Particle Size Distribution (PSD), hydrometer tests were carried out in NMTL's Geotechnical Laboratory in Carlow. Specialist shear strength testing consisting of quick undrained, consolidated undrained triaxial, shear box and consolidation testing was carried out on undisturbed U100 or piston samples where recovered.

Rock strength testing including Point Load (Is_{50}) and Unconfined Compressive Strength (UCS) testing was carried out in James Fischer's Geotechnical Laboratory. The results of the laboratory testing are included in Appendix 5 of this Report.

4.0 Ground Conditions

4.1. General

The ground conditions encountered during the investigation are summarised below with reference to insitu and laboratory test results. The full details of the strata encountered during the ground investigation are provided in the exploratory hole logs included in the appendices of this report.

The sequence of strata encountered were consistent across the site and are generally comprised;

- Topsoil/Surfacing
- Made Ground
- Granular Deposits
- Cohesive Deposits
- Bedrock

TOPSOIL: Topsoil was encountered in most of the exploratory holes and was present to a maximum depth of 0.40m BGL. Tarmac surfacing was present typically to a depth of 0.10m BGL.

MADE GROUND: Made Ground deposits were encountered beneath the Topsoil/Surfacing and were present to a relatively consistent depth of between 0.70m and 1.20m BGL. These deposits were described generally as *brown slightly sandy slightly gravelly Clay with occasional fragments of red brick.*

COHESIVE DEPOSITS: Cohesive deposits were encountered beneath the Made Ground and were described typically as *brown/light brown slightly sandy gravelly CLAY with occasional cobbles and boulders*. The secondary sand and gravel constituents varied across the site and with depth, with granular lenses occasionally present in the glacial till matrix. These deposits had some, occasional or frequent cobble and boulder content where noted on the exploratory hole logs.

GRANULAR DEPOSITS: The granular deposits were encountered at the base of the cohesive deposits and were typically described as *Grey/brown clayey sandy sub rounded to sub angular fine to coarse GRAVEL with occasional cobbles and rare boulders.* The secondary sand/gravel and silt/clay constituents varied across the site and with depth while occasional or frequent cobble and boulder content also present where noted on the exploratory hole logs.

Based on the SPT N values the deposits are typically dense. It should be noted that many of the trial pits where granular deposits were encountered, experienced instability. This was described either as side wall spalling or as side wall collapse in the remarks section at the base of the trial pit logs.

BEDROCK: The rotary core boreholes recovered *Medium strong to strong light brownish grey coarsely crystalline GRANITE*.

The depth to rock varies from 2.10m BGL in BH03 to a maximum of 5.05m BGL in BH02. The total core recovery is good, typically 100% with some of the uppermost runs dropping to 80 or 90%. The SCR and RQD both are relatively poor in the upper weathered zone, often recovered as non-intact, however both indices show an increase with depth in each of the boreholes.

4.2. Groundwater

Groundwater strikes are noted on the exploratory hole logs where they occurred and where possible drilling was suspended for twenty minutes to allow the subsequent rise in groundwater to be recorded. We would point out that these exploratory holes did not remain open for sufficiently long periods of time to establish the hydrogeological regime and groundwater levels would be expected to vary with the tide, time of year, rainfall, nearby construction and other factors. For this reason, a standpipe was installed in BH2019 allow the equilibrium groundwater level to be determined. The groundwater monitoring is included in Appendix 6 of this Report.

4.3. Laboratory Testing

4.3.1. Chemical Laboratory Testing

The pH and sulphate testing carried out indicate that pH results are near neutral and that the water soluble sulphate results is low when compared to the guideline values from BRE Special Digest 1:2005. The samples tested classify the soil as a Design Sulphate Level DS-1.

4.3.2. Rock Laboratory Testing

The rock testing carried out on samples recovered from the boreholes reported point load testing gave Is_{50} values ranging between 1.66 to 1.93 MPa. The Is_{50} results correlate to the UCS values using a factor of approximately 20, giving values of 33.2 MPa and 38.6 MPa. The results from the completed laboratory testing is included in Appendix 5 of this report.

5.0 Recommendations & Conclusions

5.1. General

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 exploratory hole locations, this is for guidance only and no liability can be accepted for its accuracy. No responsibility can be accepted for conditions which have not been revealed by the exploratory holes. Limited information has been provided at the ground investigation stage and any designs based on the recommendations or conclusions should be completed in accordance with the current design codes, taking into account the variation and the specific details contained within the exploratory hole logs.

5.2. Foundations

An allowable bearing capacity of 250 kN/m^2 is recommended for conventional strip or pad foundations on the dense granular deposits at a depth of 4.0m BGL at the location of BH02. Should a higher bearing capacity be required at this depth we would recommend an allowable bearing capacity of 1000 kN/m^2 on the medium strong Granite deposits encountered at 5.0m BGL. Where the granite deposits are shallower, such as at the location of BH03 an allowable bearing capacity of 1000 kN/m^2 is recommended on the medium strong Granite deposit at a depth of 2.10m BGL.

In any part of the site, should part of the foundation be on rock we would recommend that all the foundations of the unit in question be lowered to the competent rock stratum to avoid differential settlement.

The pH and sulphate testing completed on samples recovered from the exploratory holes indicates the pH results are near neutral and the sulphate results are low, when compared to the guideline values from BRE Special Digest 1:2005. No special precautions are required for concrete foundations to prevent sulphate attack. The samples tested were below the limits of DS1 in the BRE Special Digest 1:2005.

5.3. Excavations

Short term temporary excavations in the cohesive deposits will remain stable for a limited time only and will require to be appropriately battered or the sides supported if the excavation is below 1.25m BGL or is required to permit man entry.

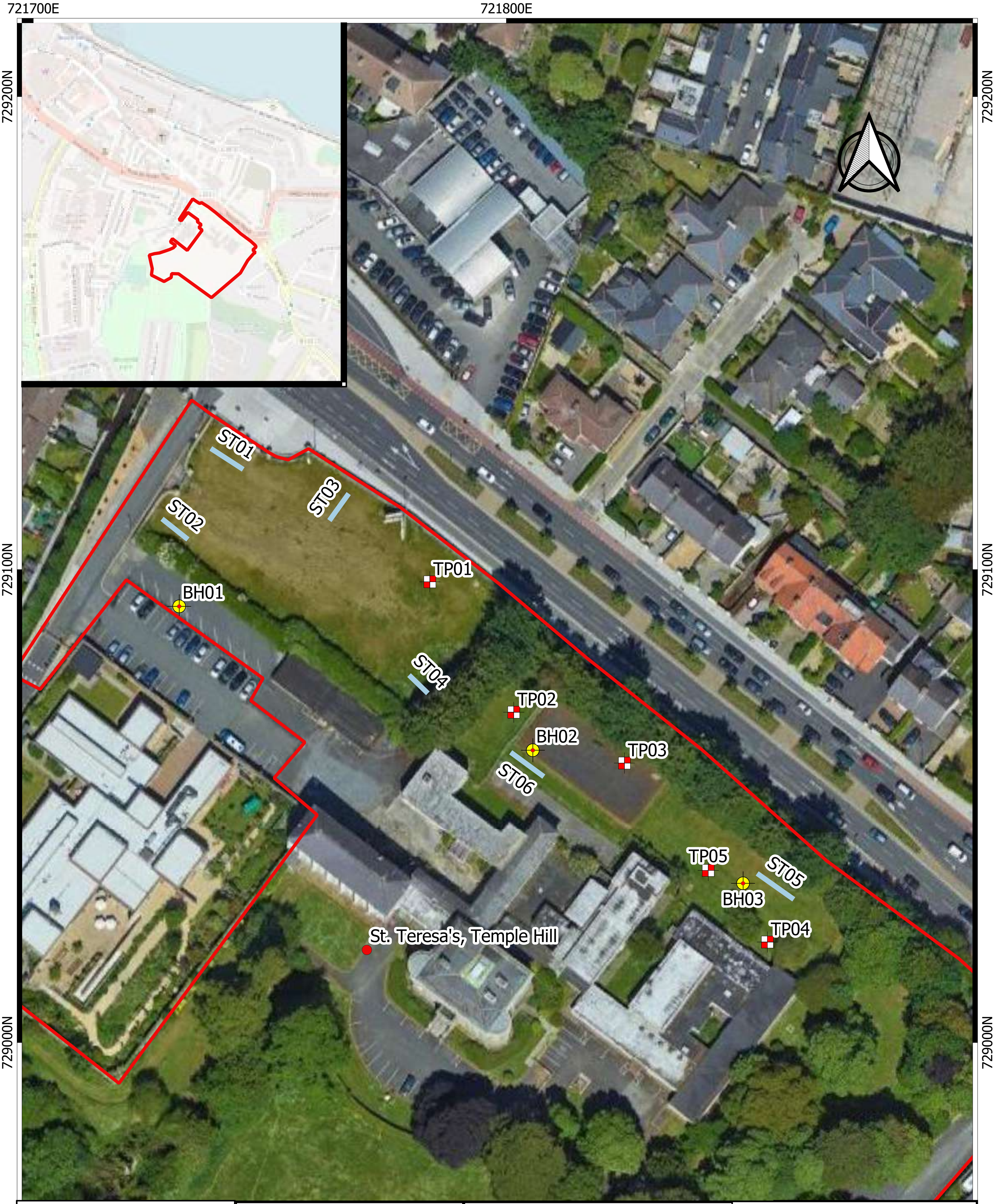
Excavations in the Made Ground or soft Cohesive Deposits will require to be appropriately battered or the sides supported due to the low strength of these deposits.

Excavations in the upper cohesive and weathered rock deposits are expected to be excavatable with conventional excavation equipment, with zones of more intact bedrock below this depth requiring rock breaking techniques. If rock breaking is required, we would recommend carrying out a rock rippability test or trial excavation.

Any waste material to be removed off site should be disposed of to a suitably licenced landfill.

The recommendations provided in this report should be verified in the design of the proposed buildings, using the full details of the loading conditions and taking into consideration the allowable tolerable settlements/movements that the building can accommodate. The founding strata should be inspected and verified by a suitably qualified engineer prior to construction of the building foundations.

APPENDIX 1 - Site Location Plan



GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

Ground Investigations Ireland Ltd.
Catherinstown House,
Hazelhatch Road,
Newcastle, Co. Dublin
www.gii.ie 01-6015175/5176

Client:

JJ CAMPBELL & ASSOCIATES
CONSULTING CIVIL & STRUCTURAL ENGINEERS

0 20 40 m

Project Title:
St. Teresa's, Temple Hill,

Drawing Title:
Figure 1 Site Location

GII Project Reference:
10069-10-20

Drawn By:
EB

Date:
13/11/2020

Legend
⊕ Borehole
⊞ Trial Pit
— Slit Trench
▭ Inidicative Site Boundary

APPENDIX 2 – Trial Pit Records

Ground Investigations Ireland Ltd
www.gii.ie

Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 3.00x0.65x3.20m	**Ground Level (mOD)** 14.75	**Site** St. Teresa's Lands, Temple Hill, Blackrock	**Trial Pit Number** TP01
			Client	**Job Number** 10069-10-20
	Location 721783.8 E 729097.2 N	**Dates** 09/11/2020	**Engineer** JJ Campbell & Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly sandy slightly gravelly TOPSOIL		
				14.45	0.30	MADE GROUND: Brown slightly sandy gravelly Clay with red brick fragments		
0.50	B							
					(0.90)			
1.00	B							
				13.55	1.20	Soft light brown slightly sandy slightly gravelly CLAY		
					(0.50)			
				13.05	1.70	Brown clayey very sandy fine to coarse angular to subrounded GRAVEL with some cobbles and boulders		
2.00	B							
					(1.50)			
				11.55	3.20	Complete at 3.20m		

Plan

Remarks

Trial Pit collapsing from 1.70m BGL
No groundwater encountered
Trial Pit backfilled upon completion

Scale (approx)	Logged By	Figure No.
1:25	EB	10069-10-20.TP01

Ground Investigations Ireland Ltd
www.gii.ie

Site	St. Teresa's Lands, Temple Hill, Blackrock			**Trial Pit Number** **TP02**
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 2.80x0.65x3.00m	**Ground Level (mOD)** 16.81	**Client**	**Job Number** 10069-10-20
	Location 721801.6 E 729069.6 N	**Dates** 09/11/2020	**Engineer** JJ Campbell & Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.35)	Brown slightly sandy slightly gravelly TOPSOIL	▨	
				16.46	0.35 (0.35)	MADE GROUND: Brown slightly sandy gravelly Clay with red brick fragments	▩	
				16.11	0.70 (0.50)	Grey/brown very clayey sandy fine to coarse angular to subrounded GRAVEL with some cobbles and boulders	⁙	
				15.61	1.20 (1.80)	Grey clayey very sandy fine to coarse angular to subrounded GRAVEL with some cobbles and boulders	⁙	
				13.81	3.00	Complete at 3.00m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion

Scale (approx)	**Logged By**	**Figure No.**
1:25	EB	10069-10-20.TP02

Ground Investigations Ireland Ltd www.gii.ie			**Site** St. Teresa's Lands, Temple Hill, Blackrock	**Trial Pit Number** **TP03**
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 3.00x0.65x3.10m	**Ground Level (mOD)** 16.96	**Client**	**Job Number** 10069-10-20
	Location 721824.9 E 729058.9 N	**Dates** 09/11/2020	**Engineer** JJ Campbell & Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
				16.86	(0.10) 0.10	TARMACADAM	▨	
				16.61	(0.25) 0.35	MADE GROUND: Brown grey angular fine to coarse crushed rock FILL	▨	
0.50	B			16.16	(0.45) 0.80	MADE GROUND: Grey/brown slightly sandy gravelly Clay	▨	
1.00	B			15.86	(0.30) 1.10	Grey/brown clayey very sandy fine to coarse angular to subrounded GRAVEL with some cobbles and boulders	∴	
2.00	B			13.86	(2.00) 3.10	Grey very sandy fine to coarse angular to subrounded GRAVEL with some cobbles and boulders	∴	
						Complete at 3.10m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion

Scale (approx)	**Logged By**	**Figure No.**
1:25	EB	10069-10-20.TP03

Ground Investigations Ireland Ltd
www.gii.ie

Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 2.50x0.65x3.10m	**Ground Level (mOD)** 18.46	**Site** St. Teresa's Lands, Temple Hill, Blackrock	**Trial Pit Number** TP04	
	Location 721855.2 E 729021 N	**Dates** 09/11/2020	**Client**	**Job Number** 10069-10-20	
			Engineer JJ Campbell & Associates	**Sheet** 1/1	

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.40)	Brown slightly gravelly TOPSOIL	▨	
0.50	B			18.06	0.40 (0.45)	MADE GROUND: Brown slightly sandy gravelly Clay with a gas pipe	▨	
1.00	B			17.61	0.85 (0.35)	Stiff reddish brown slightly sandy gravelly CLAY	⁘	
2.00	B			17.26	1.20 (1.90)	Stiff grey/brown slightly sandy gravelly CLAY with some angular to subrounded cobbles and boulders	⁘	
				15.36	3.10	Complete at 3.10m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion
0.10m diameter Gas Pipe encountered at 0.55m BGL

Scale (approx)	Logged By	Figure No.
1:25	EB	10069-10-20.TP04

Ground Investigations Ireland Ltd
www.gii.ie

Site	St. Teresa's Lands, Temple Hill, Blackrock			**Trial Pit Number** TP05
Machine : JCB 3CX **Method :** Trial Pit	**Dimensions** 2.80x0.65x2.80m	**Ground Level (mOD)** 17.84	**Client**	**Job Number** 10069-10-20
	Location 721842.7 E 729036.2 N	**Dates** 09/11/2020	**Engineer** JJ Campbell & Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.30)	Brown slightly gravelly TOPSOIL		
				17.54	0.30 (0.30)	MADE GROUND: Brown slightly sandy gravelly Clay with a gas pipe		
				17.24	0.60 (0.40)	POSSIBLE MADE GROUND: Brown slightly sandy gravelly Clay with occasional subrounded cobbles		
				16.84	1.00 (0.50)	Stiff brown slightly sandy gravelly CLAY with some angular to subrounded cobbles and boulders		
				16.34	1.50 (1.30)	Grey/brown very clayey sandy fine to coarse angular to subrounded GRAVEL with many cobbles and boulders		
				15.04	2.80	Complete at 2.80m		

Plan

Remarks

Trial Pit stable
No groundwater encountered
Trial Pit backfilled upon completion

Scale (approx)	**Logged By**	**Figure No.**
1:25	EB	10069-10-20.TP05

APPENDIX 3 – Cable Percussion & Rotary Borehole Records

Ground Investigations Ireland Ltd
www.gii.ie

Site
St. Teresa's Lands, Temple Hill, Blackrock

Borehole Number
BH01

Machine : Dando 2000
Method : Cable Percussion

Casing Diameter
200mm to 2.20m

Ground Level (mOD)
13.41

Client

Job Number
10069-10-20

Location
721730.9 E 729092.2 N

Dates
09/11/2020

Engineer
JJ Campbell & Associates

Sheet
1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					13.21	(0.20) 0.20	TARMACADAM	▨	
					12.96	(0.25) 0.45	Grey angular fine to coarse crushed rock FILL	▨	
0.50	B				12.66	(0.30) 0.75	MADE GROUND: Grey slightly sandy fine to coarse angular Gravel	▨	
0.80	B				12.41	(0.25) 1.00	MADE GROUND: Dark grey sandy slightly gravelly Clay	▨	
1.00-1.45	SPT(C) N=9			1,2/2,2,2,3			MADE GROUND: Brown slightly sandy gravelly Clay with red brick fragments	▨	
1.30	B				11.71	(0.70) 1.70			
1.80	B						Stiff brown sandy slightly gravelly CLAY with occasional subrounded cobbles	⁘	
2.00-2.20	SPT(C) 50/50			11,14/50	11.21	(0.50) 2.20			
							Complete at 2.20m		

Remarks
Chiselling from 2.20m to 2.20m for 1 hour.

Scale (approx)
1:50

Logged By
EB

Figure No.
10069-10-20.BH01

Ground Investigations Ireland Ltd
www.gii.ie

Site	St. Teresa's Lands, Temple Hill, Blackrock
Borehole Number	BH02
Machine :	Dando 2000 & Beretta T44
Method :	Cable Percussion & Rotary Coring
Casing Diameter	200mm to 2.30m 100mm to 8.50m
Ground Level (mOD)	17.10
Client	
Job Number	10069-10-20
Location	721805.6 E 729061.8 N
Dates	05/11/2020- 11/11/2020
Engineer	JJ Campbell & Associates
Sheet	1/1

Depth (m)	Sample / Tests	TCR	SCR	RQD	FI	Field Records
0.60	B					
1.00-1.45	SPT(C) N=34					6,7/6,9,10,9
1.30	B					
2.00	B					
2.00-2.30	SPT(C) 50/150					10,18/20,22,8
2.30		48				
3.50-3.95						8,14/14,17,19 SPT N=50
3.50		45				
5.00-5.45						10,12/12,38 SPT N=50
5.00		83	43	21		
5.05					10	
6.50		100	55	47	7	
8.00		98	46	46		
8.50						

Level (mOD)	Depth (m) (Thickness)	Description
17.07	0.03	TARMACADAM
	(0.27)	
16.80	0.30	Grey angular fine to coarse crushed rock FILL
	(0.25)	
16.55	0.55	MADE GROUND: Grey slightly sandy fine to coarse angular Gravel
	(0.55)	Brown/grey slightly sandy gravelly CLAY
16.00	1.10	Stiff brown sandy slightly gravelly CLAY with occasional subrounded cobbles
	(1.20)	
14.80	2.30	Poor recovery. Recovery consists of dark brown to grey slightly sandy fine to coarse subangular to subrounded Gravel. Driller notes brown sandy gravelly Clay (Very Stiff).
	(1.20)	
13.60	3.50	Poor recovery. Recovery consists of fine to coarse subangular to subrounded Gravel with frequent cobbles and boulder fragments. Driller notes brown sandy cobbly Gravel (Dense).
	(1.55)	
12.05	5.05	Medium strong to strong light brownish grey coarsely crystalline GRANITE. Partially weathered. 5.05m - 6.50m BGL: 2 Fracture sets. F1: 5 - 10 degrees, very closely to closely spaced, undulating, rough, clay smearing, orange oxidation staining. F2: 25 - 35 degrees, closely spaced, undulating to planar, rough, clay smearing, orange oxidation staining.
	(1.45)	
10.60	6.50	Strong light brownish grey coarsely crystalline GRANITE. Partially weathered. 6.50m - 8.50m BGL: 2 Fracture sets. F1: 5 - 30 degrees, closely to widely spaced, undulating, rough, clay smearing, orange oxidation staining. F2: 70 - 80 degrees, closely to widely spaced, undulating to planar, rough, clay smearing, orange oxidation staining. 7.27m - 7.36m BGL: Non intact zone.
	(2.00)	
8.60	8.50	Complete at 8.50m

Remarks
Cable percussion to 2.30m BGL. Rotary core follow on from 2.30m to 8.50m BGL.
Borehole complete at 8.50m BGL.
Plain pipe with bentonite seal from GL to 1.00m BGL, slotted pipe with pea gravel surround from 1.00m BGL to 8.50m BGL. Finished with a flush cover.
Chiselling from 2.30m to 2.30m for 1 hour.

Scale (approx)	Logged By
1:50	EB & JMD

Figure No.
10069-10-20.BH02

Ground Investigations Ireland Ltd
www.gii.ie

Site	St. Teresa's Lands, Temple Hill, Blackrock			**Borehole Number** BH03
Machine : Dando 2000 & Beretta T44 **Method :** Cable Percussion & Rotary Coring	**Casing Diameter** 200mm to 2.10m 100mm to 6.50m	**Ground Level (mOD)** 17.54	**Client**	**Job Number** 10069-10-20
	Location 721850.1 E 729033.6 N	**Dates** 03/11/2020- 11/11/2020	**Engineer** JJ Campbell & Associates	**Sheet** 1/1

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					17.44	0.10	Brown slightly sandy TOPSOIL		
						(0.60)	MADE GROUND: Brown slightly sandy slightly gravelly Clay with red brick fragments		
0.40	B								
					16.84	0.70 (0.30)	Light brown slightly sandy slightly gravelly CLAY		
0.80	B								
1.00-1.45	SPT(C) N=48			4,6/6,11,14,17	16.54	1.00 (0.60)	Stiff brown slightly sandy gravelly CLAY with occasional subrounded cobbles		
					15.94	1.60 (0.50)	Stiff brown sandy slightly gravelly CLAY with occasional subrounded cobbles		
1.80	B								
2.00-2.41	SPT(C) 50/260			11,15/15,15,15,5 25/50	15.44	2.10 (2.55)	Medium strong light brownish grey coarsely crystalline GRANITE. Partially to distinctly weathered. 2.50m - 5.50m BGL: 3 Fracture sets. F1: 5 - 10 degrees, closely to medium spaced, undulating, roguh, clay smearing, orange oxidation staining. F2: 40 - 50 degrees, medium to widely spaced, undulating, rough, clay smearing, orange oxidation staining. F3: 65 - 80 degrees, medium to widely spaced, undulating to planar, rough, clay smearing, orange oxidation staining.		
2.30	B								
2.50-2.51				SPT(C) 25*/10 50/0					
					12.89	4.65 (1.85)	Strong light brownish grey coarsely crystalline GRANITE. Partially weathered. 5.50m - 6.50m BGL: 1 Fracture set at 65 - 80 degrees, medium to widely spaced, planar to undulating, rough, slight clasy smearing, orange oxidation staining.		
6.50					11.04	6.50	Complete at 6.50m		

Depth (m)	TCR	SCR	RQD	FI
2.50	100	46	26	4
3.00				NI
3.34				4
3.50	100	25	7	
3.79				NI
4.24				7
5.00	93	74	74	
5.50				3
6.50				

Remarks
Cable percussion to 2.10m BGL. Rotary core follow on from 2.10m to 6.50m BGL.
Borehole complete at 6.50m BGL.
Borehole backfilled on completion.
Chiselling from 2.50m to 2.50m for 1 hour.

Scale (approx)	Logged By
1:50	EB & JMD

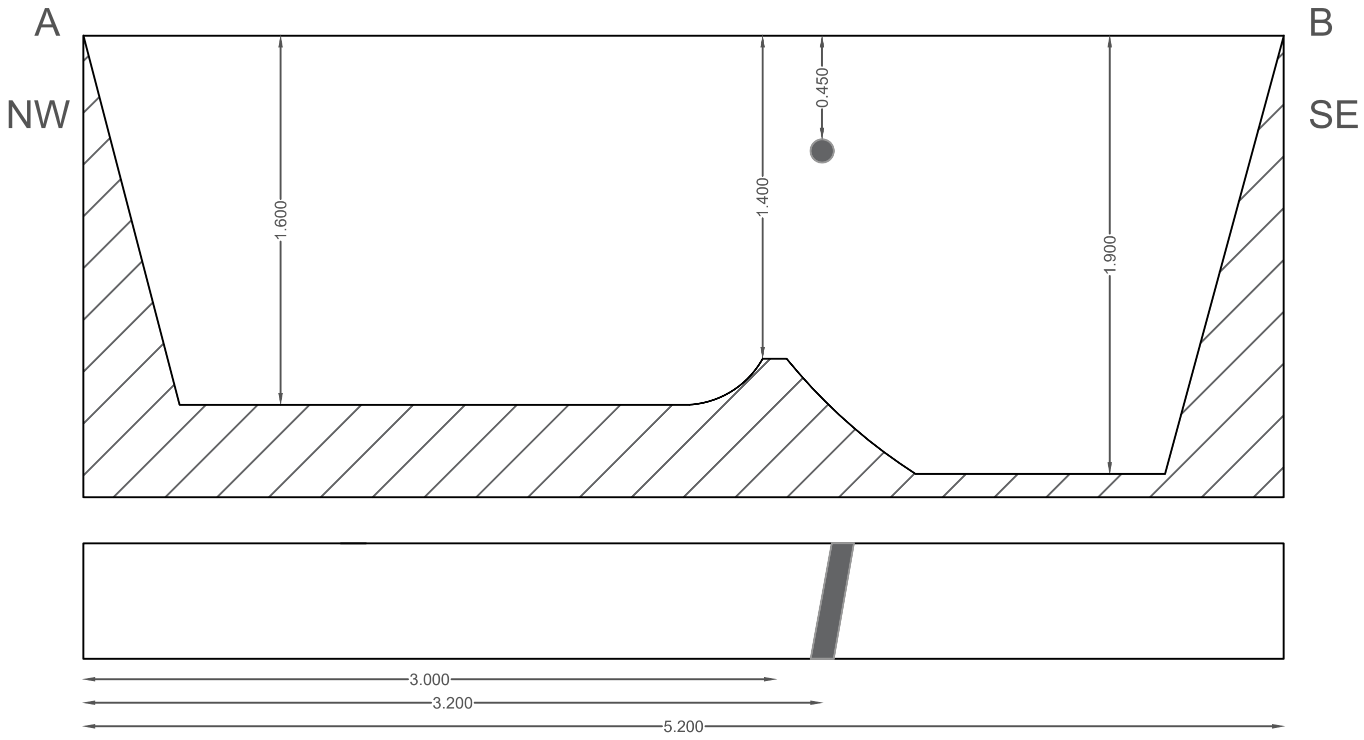
Figure No. 10069-10-20.BH03

APPENDIX 4 – Slit Trench Records

E 721738.177
N 729125.185
Z 12.47

ST01

E 721743.748
N 729121.626
Z 12.655



From (m)	To (m)	Description
0.00	0.20	Grey angular fine to coarse crushed rock FILL
0.20	0.90	MADE GROUND: Brown slightly sandy gravelly Clay with ceramic fragments
0.90	1.40	POSSIBLE MADE GROUND: Brown slightly sandy slightly gravelly Clay
1.40	1.70	Firm brown slightly sandy gravelly CLAY with subrounded occasional cobbles and boulders
1.70	1.90	Brown very clayey very sandy fine to coarse angular GRAVEL with some cobbles and boulders

Service No	ø (m)	Colour- Material	Utility	Angle to trench	Co-ordinates	Elevation
S1	0.100	Yellow Plastic	Old Foul	80	721740.651 729123.572	12.21

Sample Type	Sample Depth
Bag	0.50
Bag	1.00

	Y/N	Depth
Groundwater	N	

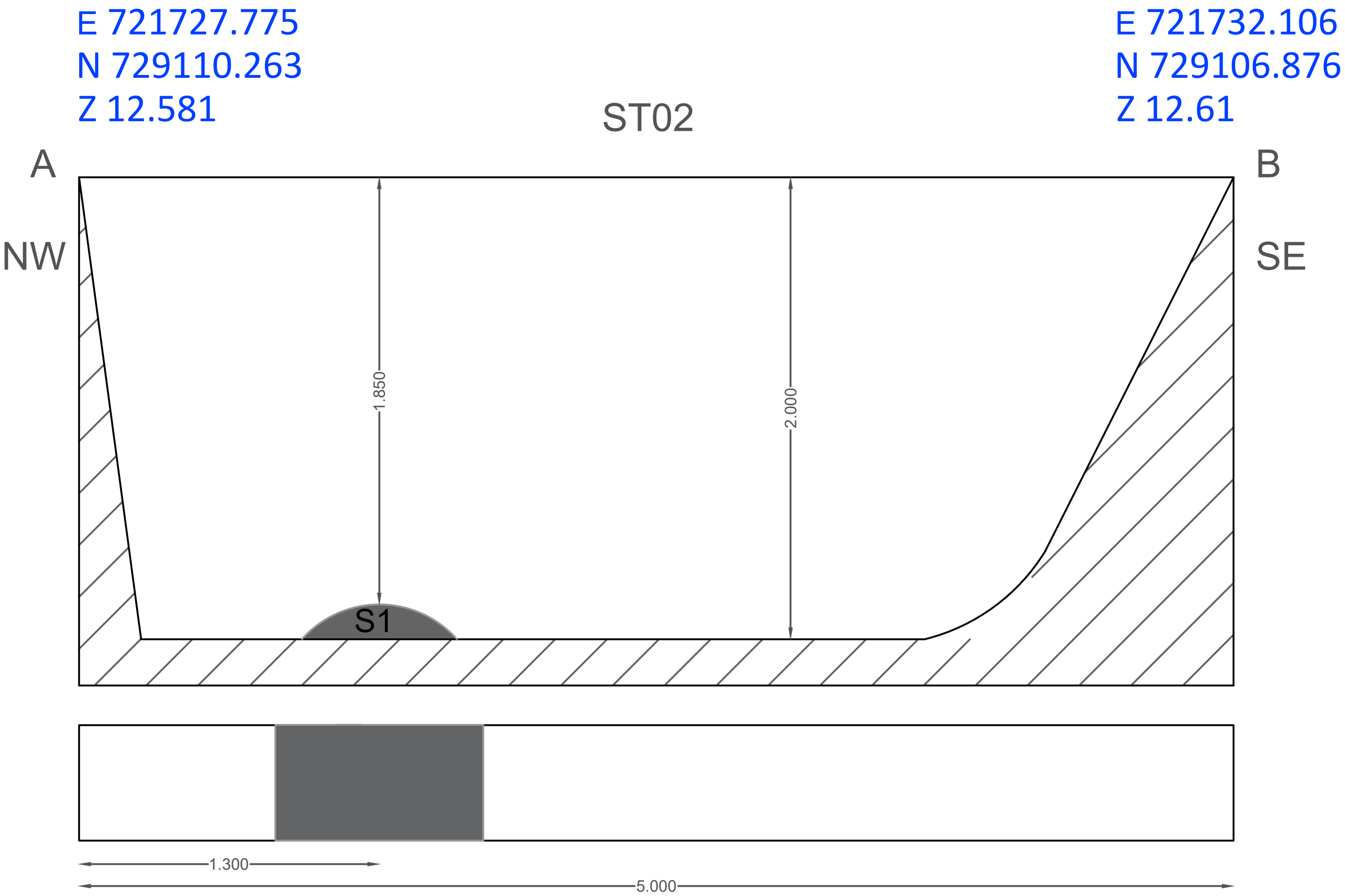
Surface from/to		Surface type
0.00	5.20	804

DATE OF EXCAVATION : 06/11/2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

PROJECT:	St. Teresa's, Temple Hill
DRAWING No.:	10069-10-20 ST 01
DATE:	November 2020
CLIENT:	JJ Campbell & Associates
SCALE:	NTS @ A4

Version:	Date:	Drawn By:	Checked:
No.	Initials	Initials	Initials
	13/11/2020	EB	SK



From (m)	To (m)	Description
0.00	0.20	Grey angular fine to coarse crushed rock FILL
0.20	1.50	MADE GROUND: Brown slightly sandy gravelly Clay with red brick fragments
1.50	2.00	MADE GROUND: Light brown slightly sandy gravelly Clay with occasional red brick and concrete fragments

Service No	Ø (m)	Colour/ Material	Utility	Angle to trench	Co-ordinates	Elevation
S1	0.900	Concrete	Sewer	90	721726.831 729109.333	10.812

Sample Type	Sample Depth

Groundwater	Y/N	Depth
	N	

Surface from/to		Surface type
0.00	5.00	804

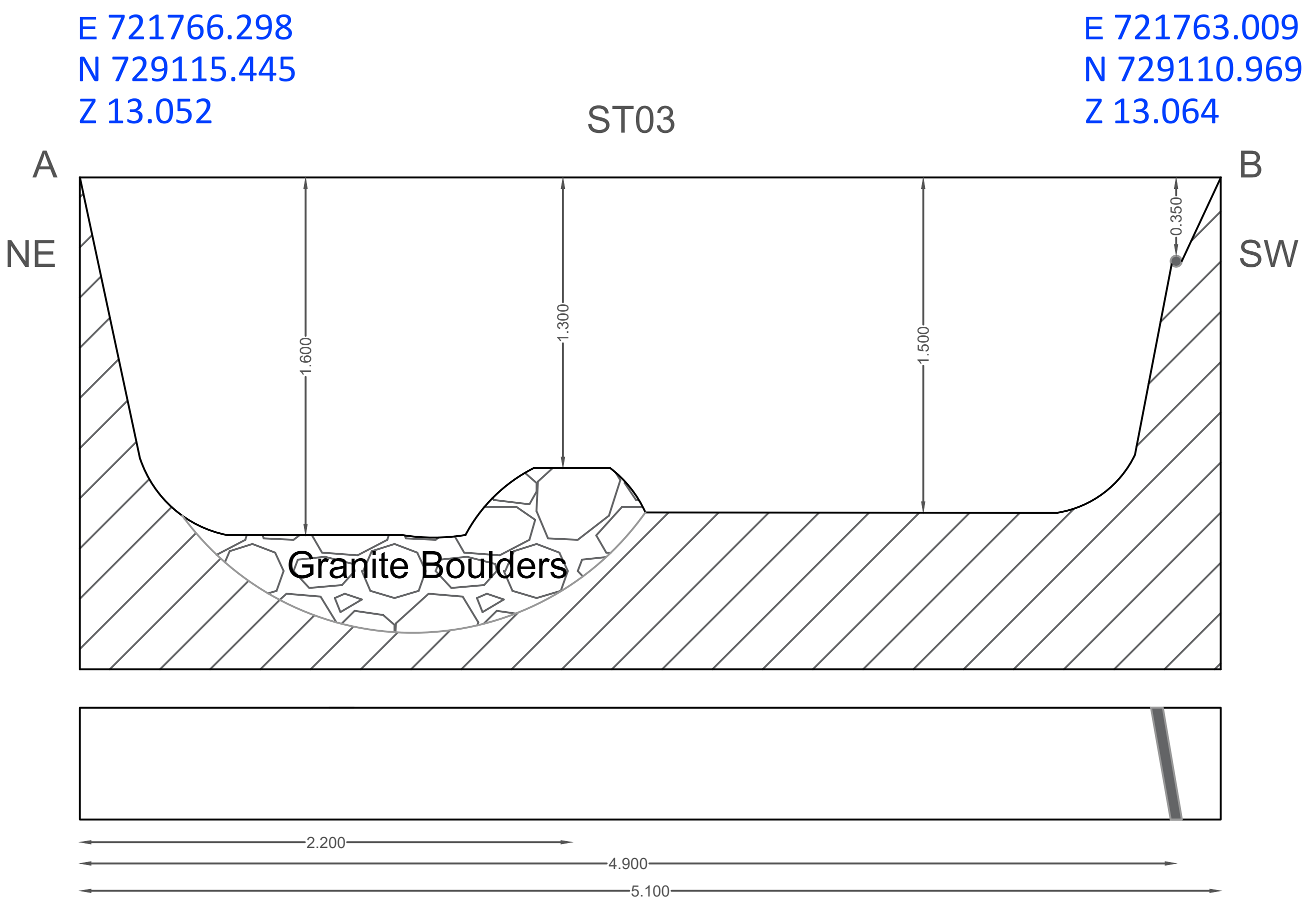
DATE OF EXCAVATION : 06/11/2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

PROJECT:	St. Teresa's, Temple Hill
DRAWING No.:	10069-10-20 ST 02
DATE:	November 2020
CLIENT:	JJ Campbell & Associates
SCALE:	NTS @ A4

Version:	Date:	Drawn By:	Checked:
No.	Initials	Initials	Initials
	13/11/2020	EB	SK

ST03



From (m)	To (m)	Description
0.00	0.25	Grey angular fine to coarse crushed rock FILL
0.25	0.26	Waterproof membrane
0.26	1.30	MADE GROUND Brown slightly sandy gravelly Clay with ceramic fragments
1.00	1.30	Firm brown slightly sandy gravelly CLAY with occasional cobbles and boulders
1.20	1.50	Brown very clayey very sandy fine to coarse angular GRAVEL with some cobbles and boulders

Service No	e (m)	Colour Material	Utility	Angle to trench	Coordinates	Elevation
S1	0.050	Red Plastic	Streetlight	100	721763.234 729111.262	12.563

Sample Type	Sample Depth

Groundwater	Y/N	Depth
	N	

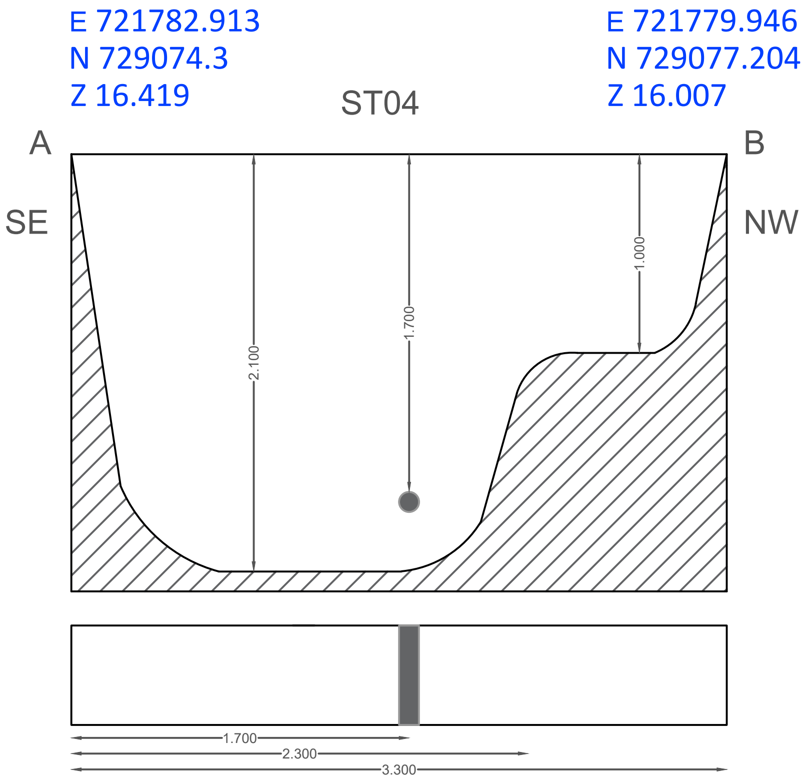
Surface from/to		Surface type
0.00	5.10	504

DATE OF EXCAVATION : 09/11/2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

PROJECT:	St. Teresa's, Temple Hill
DRAWING No.:	10069-10-20 ST 03
DATE:	November 2020
CLIENT:	JJ Campbell & Associates
SCALE:	NTS @ A4

Version:	Date:	Drawn By:	Checked:
No.	Initials	Initials	Initials
	13/11/2020	EB	SK



From (m)	To (m)	Description
0.00	0.10	Brown slightly sandy slightly gravelly TOPSOIL with some grass rootlets
0.10	0.70	MADE GROUND: Dark brown slightly sandy slightly gravelly Clay with occasional red brick fragments
0.70	1.10	MADE GROUND: Brown slightly sandy gravelly Clay with wavin pipe
1.10	2.00	Soft sandy slightly gravelly CLAY

Service No	ø (m)	Colour- Material	Utility	Angle to trench	Co-ordinates	Elevation
S1	0.100	Yellow Wavin	Water	90	721781.641 729075.419	14.521

Sample Type	Sample Depth

Groundwater	Y/N	Depth
	N	

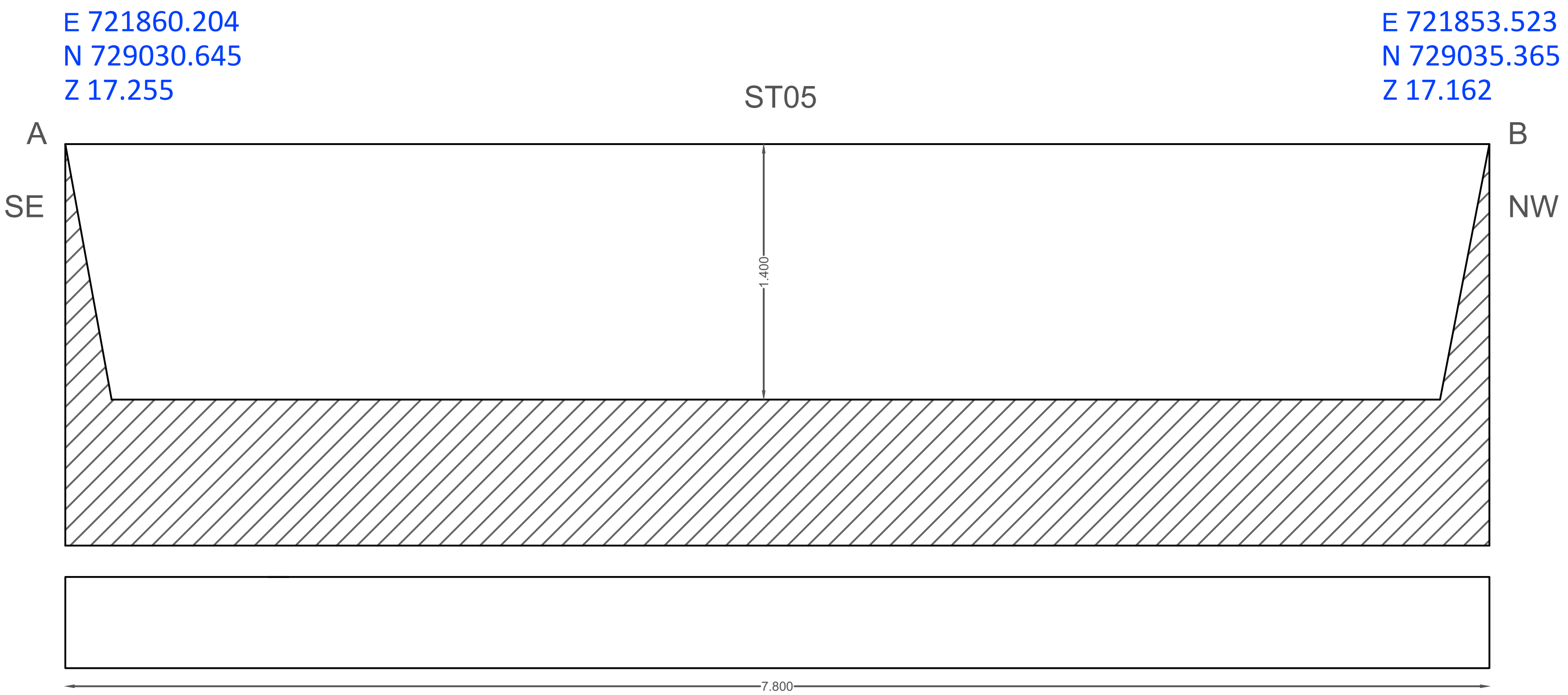
Surface from/to		Surface type
0.00	3.30	Grass

DATE OF EXCAVATION : 06/11/2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

PROJECT:	St. Teresa's, Temple Hill
DRAWING No.:	10069-10-20 ST 04
DATE:	November 2020
CLIENT:	JJ Campbell & Associates
SCALE:	NTS @ A4

Version:	Date:	Drawn By:	Checked:
No.	Initials	Initials	Initials
	13/11/2020	EB	SK



From (m)	To (m)	Description
0.00	0.30	Brown slightly sandy slightly gravelly TOPSOIL with some grass rootlets
0 30	0 70	MADE GROUND· Grey/brown slightly sandy gravelly Clay with occasional rebar
0 70	1 40	Stiff reddish brown slightly sandy gravelly CLAY with occasional subangular to subrounded cobbles

Service No	ø (m) Colour- Material	Utility	Angle to trench	Co-ordinates	Elevation

Sample Type	Sample Depth

Groundwater	Y/N	Depth
	N	

Surface from/to		Surface type
0.00	7.80	Grass

DATE OF EXCAVATION : 09/11/2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

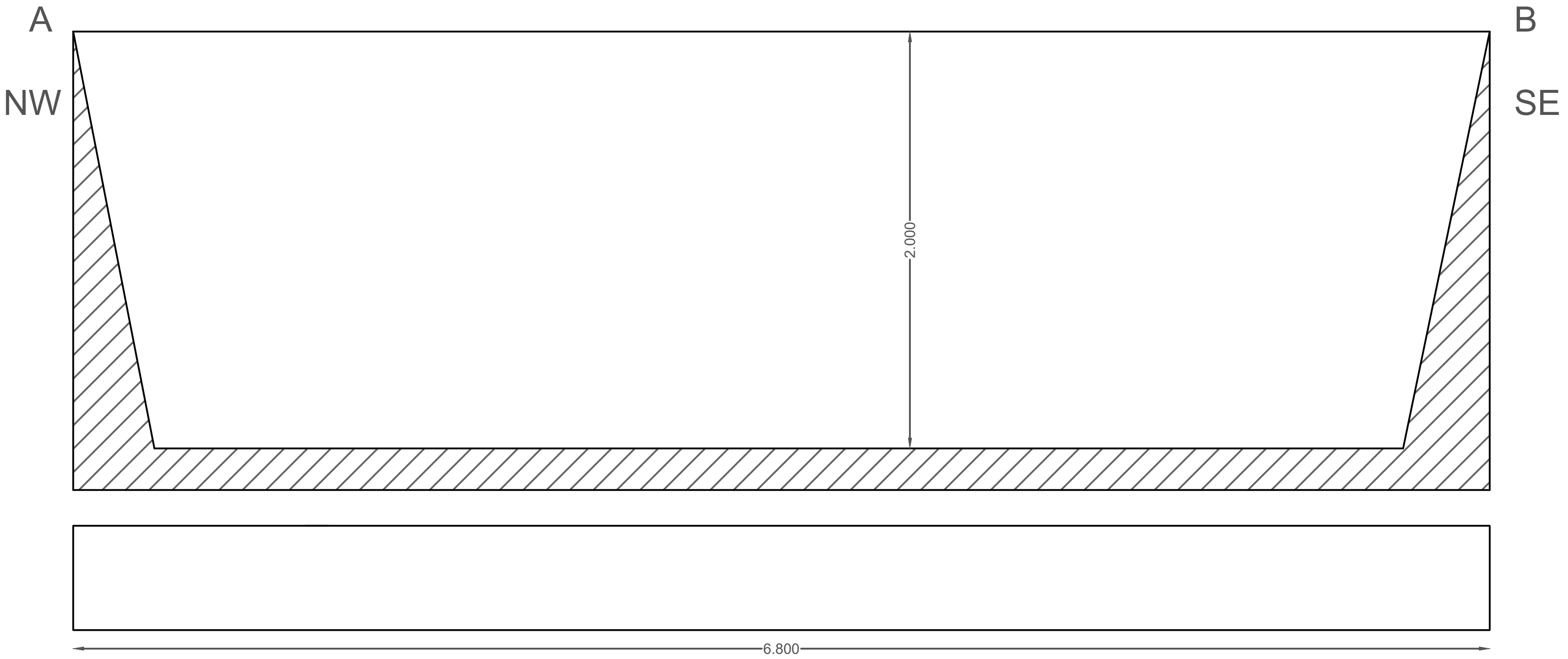
PROJECT:	St. Teresa's, Temple Hill
DRAWING No.:	10069-10-20 ST 05
DATE:	November 2020
CLIENT:	JJ Campbell & Associates
SCALE:	NTS @ A4

Version:	Date:	Drawn By:	Checked:
No.	Initials	Initials	Initials
	13/11/2020	EB	SK

E 721801.544
N 729060.889
Z 16.986

ST06

E 721807.304
N 729056.665
Z 17.022



From (m)	To (m)	Description
0.00	0.30	Brown slightly sandy slightly gravelly TOPSOIL with some grass rootlets
0.30	0.90	MADE GROUND: Brown slightly sandy slightly gravelly Clay with occasional plastic fragments
0.90	1.40	Firm brown slightly sany gravelly CLAY
1.40	2.00	grey/brown clayey very sandy fine to coarse angular to subrounded GRAVEL

Service No	ø (m)	Colour- Material	Utility	Angle to trench	Co-ordinates	Elevation
n/a						

Sample Type	Sample Depth

Groundwater	Y/N	Depth
	N	

Surface from/to		Surface type
0.00	6.80	Grass

DATE OF EXCAVATION : 09/11/2020

GROUND INVESTIGATIONS IRELAND
Geotechnical & Environmental

PROJECT: St. Teresa's, Temple Hill
DRAWING No.: 10069-10-20 ST 06
DATE: November 2020
CLIENT: JJ Campbell & Associates
SCALE: NTS @ A4

Version:	Date:	Drawn By:	Checked:
No.	Initials	Initials	Initials
	13/11/2020	EB	SK

APPENDIX 5 – Laboratory Testing

National Materials Testing Laboratory Ltd.

SUMMARY OF TEST RESULTS

				Particle			Index Properties		Bulk	Cell	Undrained Triaxial Tests		Lab	
BH/TP	Depth	Sample	Moisture	Density	<425um	LL	PL	PI	Density	Presssure	Compressive	Strain at	Vane	Remarks
No	m	No.	%	Mg/m3	%	%	%	%	Mg/m3	kPa	Stress kPa	Failure %	kPa	
TP01	2.00	B	9.9		9.7	37	26	11						
TP04	2.00	B	9.9		35.9	34	19	15						

NMTL

Notes :

1. All BS tests carried out using preferred (definitive) method unless otherwise stated.

Job ref No. NMTL 3328

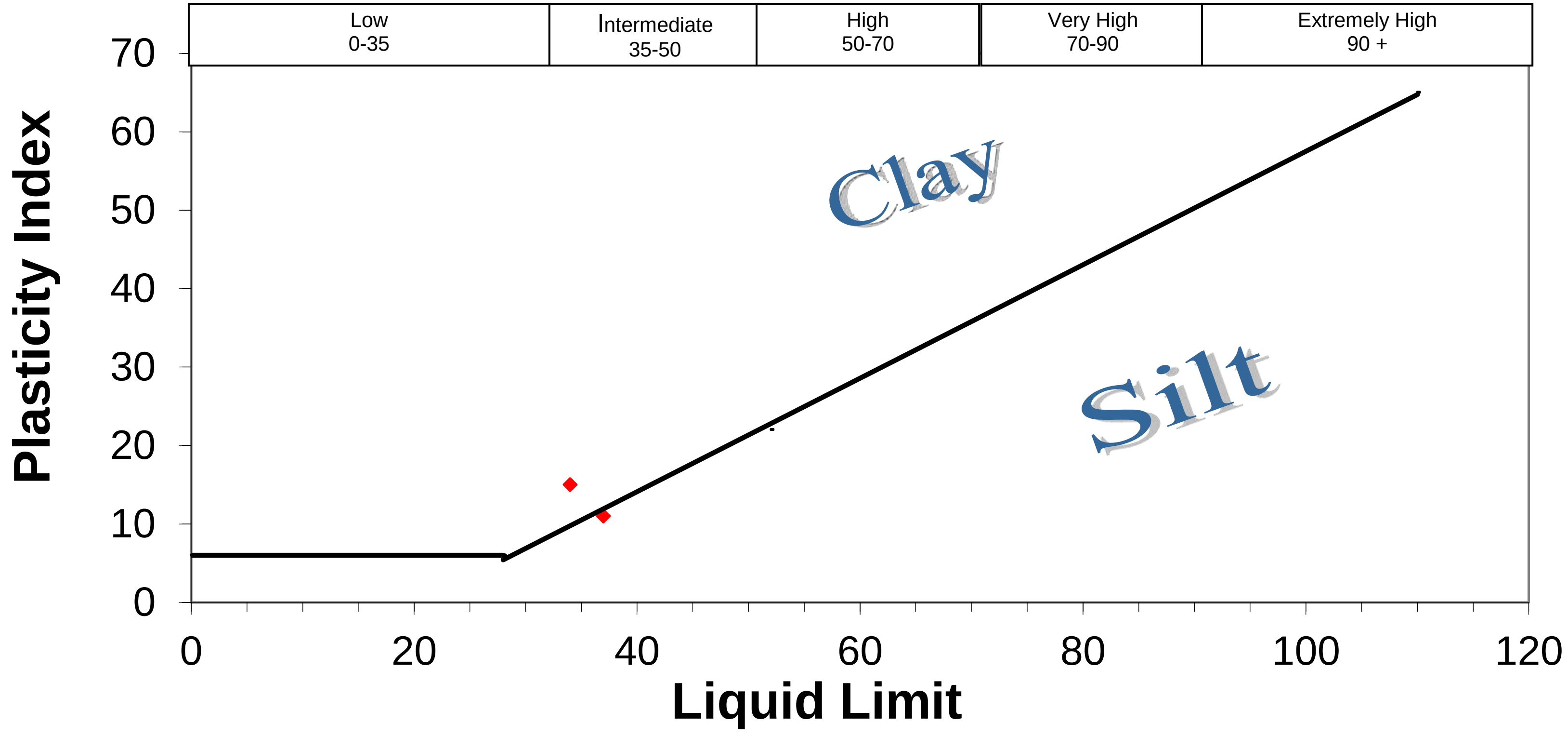
GII Project ID: 10069-10-20

Location St Teresa's

Revision-02

NMTL LTD
Unit 18c, Tullow Industrial Estate
Tullow
County Carlow
Tel: 00353 59 9180822
Mob: 00353 872575508
billa@nmtl.ie

Contract:	**St Teresa's**
Client:	**Ground Investigations Ireland Ltd**
Engineer:	**Eoin Byrne**
GII Project ID	**10069-10-20**
Date:	**04/12/2020**
Tested By:	**Sb/Tch/Ms** **Checked:** **Bc**
Job ref No.	**NMTL 3328**



NMTL Ltd

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Sieve Size mm	% Passing
125.000	100.0
75.000	100.0
63.000	97.8
50.000	93.1
37.500	87.6
28.000	78.0
20.000	67.6
14.000	56.7
10.000	48.0
6.300	38.8
5.000	35.5
3.350	30.9
2.000	23.9
1.180	18.1
0.600	11.8
0.425	9.7
0.300	8.4
0.212	7.6
0.150	7.0
0.063	5.5

Percentage Particle Size

Clay	Fine Medium Coarse	Fine Medium Coarse	Fine Medium Coarse	Cobbles	Boulder
	Silt	Sand	Gravel		
	5.5	18.4	73.9	2.2	0.0

Sample Description Dark brown silty sandy GRAVEL, with occsaional cobbles.

Project St Terea's GII PROJECT ID:10069-10-20

Project No.	NMTL 3328		
BH/TP No.	TP01		
Sample No.	B		
Depth	2.0m		

Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	02/12/2020

NM
TL
Ltd

NMTL Ltd

Sieve Size mm	% Passing
125.000	100.0
75.000	91.0
63.000	80.4
50.000	76.2
37.500	70.3
28.000	66.4
20.000	62.6
14.000	59.1
10.000	55.8
6.300	52.1
5.000	50.9
3.350	49.4
2.000	46.0
1.180	42.3
0.600	37.9
0.425	35.9
0.300	33.9
0.212	32.0
0.150	30.1
0.063	25.8

Determination of Particle Size Distribution

BS 1377 : 1990 : Part 2 : Clauses 9.2 & 9.5

Percentage Particle Size

Clay	Fine Medium Coarse	Fine Medium Coarse	Fine Medium Coarse	Cobbles	Boulder
	Silt	Sand	Gravel		
	25.8	20.2	34.4	19.6	0.0

Sample Description	Dark brown slightly sandy gravelly silty CLAY	Project No.	NMTL 3328
		BH/TP No.	TP04
Project	St Terea's GII PROJECT ID:10069-10-20	Sample No.	B

NM TL Ltd	Operator	Tzr	Checked	Nc	Approved	Bc	Date sample tested	02/12/2020	Depth 2.0m

Element Materials Technology
Unit 3 Deeside Point
Zone 3
Deeside Industrial Park
Deeside
CH5 2UA

P: +44 (0) 1244 833780
F: +44 (0) 1244 833781

W: www.element.com

Ground Investigations Ireland
Catherinestown House
Hazelhatch Road
Newcastle
Co. Dublin
Ireland

Attention :	Conor Finnerty
Date :	26th November, 2020
Your reference :	10069-10-20
Our reference :	Test Report 20/15944 Batch 1
Location :	St Teresas, Temple Hill, Blackrock
Date samples received :	13th November, 2020
Status :	Final report
Issue :	1

One sample was received for analysis on 13th November, 2020 of which one was scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Ground Investigations Ireland
Reference: 10069-10-20
Location: St Teresas, Temple Hill, Blackrock
Contact: Conor Finnerty
EMT Job No: 20/15944

Report : **Solid**

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

Please see attached notes for all abbreviations and acronyms

EMT Sample No.	1											
Sample ID	TP01											
Depth	2.00											
COC No / misc												
Containers	T											
Sample Date	09/11/2020											
Sample Type	Soil											
Batch Number	1											
Date of Receipt	13/11/2020										LOD/LOR	Units	Method No.
Sulphate as SO4 (2:1 Ext) #	0.0081										<0.0015	g/l	TM38/PM20
pH #	8.51										<0.01	pH units	TM73/PM11

Please include all sections of this report if it is reproduced
All solid results are expressed on a dry weight basis unless stated otherwise.

Client Name: Ground Investigations Ireland
Reference: 10069-10-20
Location: St Teresas, Temple Hill, Blackrock
Contact: Conor Finnerty

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 20/15944						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 20/15944

SOILS

Please note we are only MCERTS accredited (UK soils only) for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.

Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher, this result is not accredited.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

EMT Job No: 20/15944

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993 (comparabl	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

James Fisher Testing Services
Materials Laboratory, Unit D
Zone 5, Clonminam Business Park
Portlaoise, Co. Laois

Laboratory Test Report
Point Load Strength Index

Project : St. Teresa's Lands, Temple Hill
Client : Ground Investigations Ireland
Catherinestown House, Hazelhatch Road
Newcastle, Co. Dublin
Originator Conor Finnerty

Job Number 10069-10-20
Lab Ref No ST 98624
Date Received 08/12/2020
Date Tested 09/12/2020
Date Reported 10/12/2020

Point Load Strength Index

Sample No:-	Depth (m)	Description	Type	Orientation	W (mm)	D (mm)	P (kN)	De^2 (mm^2)	De (mm)	I_s	F	$I_{s(50)}MN/m^2$
BH03	2.59-2.68	1	D	⊥	100.0	63.5	7.00	4032	63.5	1.736	1.11	1.93
BH03	2.79-2.86	1	D	⊥	135.0	63.5	6.00	4032	63.5	1.488	1.11	1.66

Description 1 : Brown Rock
Description 2 :
Description 3 :

$I_{s(50)}MN/m^2$ for	Description 1	Description 2	Description 3
Min	1.66		
Mean	1.80		
Max	1.93		

Test
A = axial
D = diametrical

Relationship to planes of weakness
IL = irregular lump
II = parallel
⊥ = perpendicular

	$I_{s(50)}MN/m^2$	U.C.S. MN/m^2
Extremely Weak	<0.05	0.6-1.0
Very Weak	0.05-0.20	1.0-5.0
Weak	0.20-0.50	5.0-25.0
Medium Strong	0.50-2.00	25-50
Strong	2.00-4.50	50-100
Very Strong	4.50-9.00	100-250
Extremely Strong	9.00 +	>250

The stated result only relates to the item/location tested, this report shall not be reproduced except in full.

Approved Signature
James Fisher Testing Services Ireland

☐ **James Ward, Operations Manager**

Appendix M – Civil Infrastructure Report

JJ Campbell and associates | Consulting Engineers

JJ Campbell & Associates
Consulting Civil & Structural Engineers
t +353 (1) 298 0538
e info@jjc.ie
F1 Nutgrove Office Park,
Rathfarnham, Dublin 14, Ireland,
D14A895.
www.jjc.ie

CIVIL INFRASTRCUTURE REPORT

DOCUMENT CONTROL SHEET

<table>
<tr><td>Client</td><td colspan="6">Oval Target Ltd.</td></tr>
<tr><td>Project Title</td><td colspan="6">St Teres’a Lands Temple Hill, Monkstown, Blackrock, County Dublin.</td></tr>
<tr><td>Document Title</td><td colspan="6">Infrastructure Report</td></tr>
<tr><td>Document No.</td><td colspan="6">2511-01 - Infrastructure Report</td></tr>
<tr><td rowspan="2">This Document Comprises</td><td>DCS</td><td>TOC</td><td>Text</td><td>List of Tables</td><td>List of Figures</td><td>No. of Appendices</td></tr>
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Rev.	**Status**	**Author(s)**	**Reviewed By**	**Approved By**	**Office of Origin**	**Issue Date**
P1	Planning	MW	JJC	JJC	Dublin	July 2025

Contents

1 INTRODUCTION

J.J. Campbell & Associates were instructed by Oval Target Ltd. to design the necessary drainage systems, water distribution, road build-up and surface carparking for a planning application for a proposed residential Development at St. Teresa's Lands Temple Hill, Monkstown, Blackrock, County Dublin.

2 CIVIL WORKS.

2.1 GENERAL

This section covers the Civil works associated with the following areas: drainage systems, water Distribution, footpaths, and all underground work associated with the distribution of site services.

Details of existing utilities were obtained from Irish Water record drawings. A topographical survey and survey of underground utilities was carried out by Murphy Surveys ltd. The exact position of all sewers and culverts is subject to verification at construction stages.

2.2 STORMWATER

Site stormwater drains have been designed using the modified rational method and taking account of the Greater Dublin Strategic Drainage Study, the Greater Dublin Regional Code of Practice for Drainage Works, Irish Water publication "Code of Practice for Wastewater Infrastructure, Connections and Developer Services, Design and Construction requirements for self-lay Developments" and CIRIA C753, The SUDS Manual. Causeway Storm Water Analysis software has been used to design the storm network.

Pipes will be precast concrete, flexibly jointed, or unplasticised polyvinyl chloride (uPVC), flexibly jointed, and laid in granular bed and surround. For design purposes, a Colebrook-White friction factor K=0.6mm will be used. Manholes shall be cast insitu or precast concrete. Gully chambers shall be precast concrete. Manhole covers and gully gratings shall be cast-iron, designed for heavy traffic use. The principles of Sustainable Urban Drainage Systems, local authority and Irish Water requirements will be incorporated into the drainage design. Stormwater drainage attenuation calculations have been provided in annex D in the main drainage planning report.

A petrol interceptor will be provided for underground carparks.

Storm-water attenuation calculations have been carried out in accordance with the Greater Dublin Strategic Drainage Policy. The calculated volume of attenuation is 2350 m^3, including a 20% allowance for climate change and 10% allowance for urban creep. The maximum allowable discharge from the site is 6.8 litres/sec.

Surface water drainage calculations are included in Annex E and Annex F in the main drainage planning report.

The site drainage will connect to the existing public sewer in Temple Road.

A Flood Risk Assessment has been carried out by JBA Consulting Engineers; the report is included in Annex H in the main drainage planning report.

2.3 FOUL DRAINAGE

Domestic effluent will discharge to the existing foul drainage system in Temple Road. Pipelines will be designed to provide self cleansing velocities. Pipe will be pre-cast concrete, flexibly jointed, or unplasticised polyvinyl chloride (uPVC), flexibly jointed, and laid in granular bed and surround. For design purposes, a Colebrook-White friction factor K=1.5mm will be used. Manholes shall be cast insitu or pre-cast concrete. Manhole covers shall be cast-iron, designed for heavy traffic use.

Foul water drainage calculations have been included in section 3.0 in the main drainage planning report. Calculations are based on a flow rates given in Irish Water Code of Practice for Waste Water, and a peaking factor of 6. Occupancy is based on number of bed units provided. Foul water will be discharge to the existing 1200 mm diameter combined sewer in Temple Road via an existing 300 mm connection. The layout is described in drawings C2-0 to C2-6.

All existing drains will be surveyed prior to construction of the on-site drainage system to confirm the above invert level.

2.4 WATER DISTRIBUTION

A new distribution 200Ø (Inside diameter) watermain is proposed for the development, which will to be connected to the existing IW 400Ø watermain on Temple Hill Road.

The existing watermain supplying the adjacent St. Catherine’s lands will be replaced along the length of the St. Teresa’s avenue as this main was laid in 1943 and is approaching the end of its useful life. All works will comply with Irish Water publication “Water Infrastructure Standard Details, Connections and Developer Services, Construction Requirements for Self-Lay Developments”.

2.5 ROADS, FOOTPATHS AND CARPARKS

All roads within the development shall be designed in accordance with RT 181 – Geometric Design Guidelines for Roads and local authority requirements. Pavement construction will typically be designed to DOE specification for road works standard, based upon California Bearing Ratio tests (BS 1377, Part 4: Section 7), carried out on typical soil samples obtained from the site.

Appendix N – Comparison Between 2019 and 2025 Schemes

Watermain - Comparison between 2019 and 2025 Schemes		
Description	**2019**	**2025**
Average Daily domestic Demand	1.4 ltr / sec	2.4 ltr/sec
Watermain proposed network	Similar to 2025 scheme	Similar to 2019 scheme

Wastewater - Comparison between 2019 and 2025 Schemes		
Description	**2019**	**2025**
Peak Discharge	12.5 ltr/sec for PCE	15.3 ltr/sec
Wastewater proposed network	Similar to 2025 scheme	Similar to 2019 scheme

Stormwater - Comparison between 2019 and 2025 Schemes		
Description	**2019**	**2025**
Attenuation	Stormtech and concrete tank Zone 1: 825m^3; Zone 2: 876m^3	Stormtech and concrete tank Zone 1: 1300m^3; Zone 2: 1050m^3
Climate Change Factor	20%	20%
Urban Creep Factor	-	10%
SAAR Value	900	765
Dry Swales	Located along road, similar to 2025 scheme	Located along road, similar to 2019 scheme
Green Roof	Min 70% On all buildings	Min 70% Extensive on Blocks A1 to B4 and sheds. Min 50% Intensive on Blocks C1 to E2.
Discharge to public sewer	Zone 1 4.1 l/s Zone 2 4.1 l/sec Same as 2025 Scheme	Zone 1 3.4 l/s Zone 2 3.4 l/sec Same as 2019 Scheme
Green and Blue Roof	No	No
Permeable paving	Similar to 2025 scheme	Similar to 2019 scheme
Interception	Similar to 2025 scheme	Similar to 2019 scheme
Stormwater proposed network	Similar to 2025 scheme	Similar to 2019 scheme

Appendix O – Response to Opinion from DLR Drainage Department

2. DRAINAGE PLANNING

Introduction

The applicant has provided sufficient detail for this stage of the planning process, in relation to drainage. It is noted that the SFRA has referenced the use of justification test for the proposed development. However, the area of the site subject to the justification test has no proposed changed from the approved scheme. With changes to the 2022-2028 CDP SFRA requirements and policies, reference to the justification test should be reviewed and removed if not relevant. In particular section 4 and 5 should be reviewed.

Surface Water Drainage

DLR: 1. The applicant is requested to clearly demonstrate what changes are proposed from the approved scheme to the proposed scheme. It is noted that the climate change factor has changed since the original application. The applicant is requested to comment on how this has been dealt with.

JJC: Appendix N of Engineering Services Report clearly indicates the changes in watermain, wastewater and stormwater networks by comparing the 2019 and 2025 schemes. A Climate Change factor of 20% and a Urban Creep factor for 10% have been used for amended application.

DLR: 2. In accordance with Appendix 7.2: Green Roof Policy of the County Development Plan 2022-2028, the applicant should demonstrate which areas of the development will have green roofs and should demonstrate by calculation and by representation on a drawing that the proposed green roof extents are in accordance with the Council's Green Roof Policy such that the minimum coverage requirement is achieved. Note the requirement for green roof rather than blue roof. The applicant should also provide details of maintenance access to the green roofs and should note that, in the absence of a stairwell type access to the roof, provision should be made for alternative maintenance and access arrangements such as external mobile access that will be centrally managed. A detailed cross section of the proposed build-up of the green roof should be provided, including dimensions. The applicant should demonstrate that the green roof is designed in accordance with BS EN 12056-3:2000, BS 6229:2018 and The SUDS Manual (CIRIA C753). Any runoff coefficients applied to the green roof areas should be in accordance with the tabulated runoff factors detailed in Section 3 of Appendix 7.2: Green Roof Policy.

JJC: Drawing C11 demonstrates the areas and calculations for intensive and extensive green roofs. A detailed cross section of the Green Roofs is shown on drawing C8. 70% extensive green roof is proposed on Blocks A1 to B4, on bike sheds and ESB substations and on basement podium roof. 50% intensive green roof is proposed on Blocks C1 to E2.

DLR: 3. The applicant is requested to ensure that all surface water design proposals are in accordance with the requirements of Appendix 7: Sustainable Drainage System Measures of the County Development Plan 2022-2028.

JJC: The surface water design is in accordance with all requirements outlined in Section 7.1 of Appendix 7.

DLR: 4. The applicant is requested to ensure that the proposed surface water design is in accordance with County Development Plan 2022-2028 Section 10.2.2.6 Policy Objective EI4: Sustainable Drainage Systems, such that the proposal meets the requirements of the Greater Dublin Strategic Drainage Study (GDSDS) policies in relation to Sustainable Drainage Systems (SuDS). The design must incorporate SuDS measures appropriate to the scale of the proposed development such as green roofs, bioretention areas, permeable paving, rainwater harvesting, swales, etc. that minimise flows to the public drainage system and maximises local infiltration potential.

JJC: The drainage design incorporates SuDS measures such as intensive and extensive green roofs, dry swales and permeable paving, see drawing C8.

DLR: 5. A nature-based solution to the drainage requirements is encouraged, with limited below ground tanks proposed. The applicant is encouraged to consider bioretention area, detention basin, tree pits, rain gardens, rainwater harvesting, filter drains, swales etc. throughout the development.

JJC: Dry swales/infiltration trenches are considered. See drawing C2 and Section 4.0 of Engineering Services Report.

DLR: 6. Any changes to parking and hardstanding areas shall be constructed in accordance with the recommendations of the Greater Dublin Strategic Drainage Study for sustainable urban drainage systems (SuDS) i.e. permeable surfacing, and in accordance with Section 12.4.8.3 Driveways/Hardstanding Areas of the County Development Plan 2022-2028. Appropriate measures shall be included to prevent runoff from driveways entering onto the public realm as required.

JJC: Design is in accordance with Development Plan.
See drawings C2 and C7.

DLR: 7. If an attenuation system is proposed it should, where possible, not be located under the internal roads but under a communal open area or parking. Attenuation systems should be inline. The preference is for attenuation systems that allow for infiltration and/or treatment within the site. The applicant should note that certain landscaping items, such as trees, may not be compatible with attenuation systems. The applicant should specify whether the proposed development will be taken in charge or privately managed and provide the details of the management company that will maintain the proposed surface water drainage network as required.

JJC: **The development will be privately managed, which will also manage the foul and storm networks. There are two attenuation tanks, one for each zone. In Zone 1, the attenuation tank is under a communal open area.**
The attenuation in Zone 2 is smaller and due to the sloping and restricted nature of the site, the attenuation tank forms part of the basement under Blocks A1 to B3.

DLR: 8. The discharge rate for the site must be limited to QBAR (calculated using site specific data) or 2l/s/ha, whichever is greater, subject to the orifice size of the flow control device not being less than 50mm in diameter. The applicant is requested to apply an appropriate outfall discharge rate for the site and recalculate the attenuation volume using the revised discharge rate. This may lead to an increase in attenuation storage volume required. Note that in the interest of clarity where the calculated QBAR rate for the site is less than 2 l/s/ha then a minimum value of 2 l/s/ha should be applied, not a flat rate of 2 l/s, subject to the orifice size of the flow control device not being less than 50mm in diameter.

JJC: **Discharge rate calculation is outlined in Section 4.2 and Appendix A of Engineering Services Report.**
The attenuation storage systems are connected independently to the local authority collection system, each connection is provided with a flow limiting device (Hydro-brake) set at 3.8 l/s so that the total flow from the site is 6.4 l/s.
The size for the flow control device for Zone 1 and Zone 2 is greater than 100mm, see Appendix G.

DLR: 9. The applicant is requested to submit supporting standard details, including cross sections and long-sections, and commentary that demonstrates that all proposed SuDS measures have been designed in accordance with the recommendations of CIRIA C753 (The SuDS manual).

JJC: **Details are provided in our Stage III Engineering Service Report and Drawings, C2 to C15.**

DLR: 10. As standard, the applicant is requested to provide a penstock in the flow control device chamber and ensure that the flow control device provided does not have a bypass door. The applicant shall also clarify whether a silt trap is being provided in the flow control device chamber and if not to make provision for same.

JJC: **Penstock is supplied in outfall manholes SMH HB21 for Zone 1 and SMH HB22 for Zone 2. By pass door will not be fitted to the Hydro-brakes.**
500mm silt trap to be provided in both hydro-brake manholes, See C2.

DLR: 11.If the applicant proposes SuDS measures that incorporate the use of infiltration, the applicant is requested to provide details of each SuDS measure and confirm whether it will be lined/tanked or not. If lined/tanked systems are to be used, then the applicant will be requested to explain the rationale behind this. If unlined systems are to be used then the applicant is requested to demonstrate on a drawing that all infiltration SuDS proposals, including the attenuation system, have a 5m separation distance from building foundations and 3m separation from site boundaries.

JJC: **No infiltration on site due to presence of rock.**

DLR: 12. As standard, the applicant is requested to show the options being proposed for interception and treatment with contributing areas on a drawing together with an accompanying text and tabular submission showing the calculations, to demonstrate that the entire site is in compliance with GDSDS requirements. The applicant should note that over-provision in one location does not compensate for under provision elsewhere.

JJC: **Interception and treatment storage are shown on drawing C7, interception areas at ground level.**

DLR: 13. The applicant is requested to ensure that a Stage 1 Stormwater Audit is carried out for the development. In accordance with the Stormwater Audit policy, the audit shall be forwarded to DLRCC prior to lodging the planning application. All recommendations shall be complied with, unless agreed in writing otherwise with DLRCC.

JJC: **Stormwater Stage 1 Audit has been carried outby JBA, see Appendix H.**

Site Specific Flood Risk Assessment

DLR: 1. As standard, a Flood Risk Assessment will be required for the site. It is noted that the SSFRA provided has referenced information provided during the original application, however this was carried out under the requirements of the previous development plan, and therefore some updates will be required. The revised SSFRA should focus on the proposed amendments.

JJC: **JBA have updated FRA for the 2019 granted scheme to the 2025 amended scheme.**

DLR: 2. The applicant is requested to comment on the proposed surface water drainage system in the event of blockage or partial blockage of the system, commenting on any surcharging or flood risk that may be identified. The applicant is requested to submit a drawing identifying and showing details of safe overland flow routes both within and without the site. The overland flow route plan should identify drop kerbs or ramps requested for channelling the flow, should address low point areas in the site and should detail how properties, both within the development and on adjacent lands, will be protected in the event of excessive overland flows.

JJC: **See drawings F1-1 and F1-2 and Section 4.6 in our Engineering Service Report.**

DLR: 3. The flood flow-path areas shall not contain any Engineering, Architectural, or Landscaping features, (other than proposals submitted as part of the planning application) that would have the potential for obstruction of flowpaths.

JJC: **Flood path areas do not contain any engineering, architectural or landscaping features that would potentially obstruct flowpaths. See drawing F1-1.**

Foul Water and Water Supply:

DLR: As the foul water and water supply networks are Uisce Eireann owned assets, the proposer should contact Uisce Eireann to discuss any issues regarding the impact of the proposed development on their assets. The pre-connection enquiry response (i.e. Confirmation of Feasibility) should be dated within 6 months of the application date.

JJC: **COF received on the 07/07/25, CDS25004579.**
New PCE received on 12/01/26.

Appendix P – SuDS Operations and Maintenance Plan

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OPERATIONS AND MAINTENANCE PLAN

Sustainable Drainage System (SuDS)

Temple Hill
Blackrock
Co. Dublin

Job No.	2511-01
Date:	December 2025
Prepared by:	Airton Brandini

JJ Campbell & Associates
Consulting Civil & Structural Engineers

Contents

Document Information	
Project No.	2511-01
Document Title	Engineering Service Report
Prepared by	Airton Brandini, BEng MIEI
Checked by	Marcus Wallace, BA MIEI Eng Dip
Date	09th December 2025
File Reference	P:\Current Projects\Projects 2025\ 2511-01

1. SuDS and Landscape Maintenance – Summary

		Frequency
	REGULAR MAINTENANCE	
1	LITTER MANAGEMENT	
1.1	Pick up all litter in SuDS and Landscape areas and remove from site	12 visits monthly
2	GRASS MAINTENANCE – all cuttings to wildlife piles	
2.1	Mow all grass verges, paths and amenity at 35-50mm with 75mm max. Leaving grass in situ	As required or monthly
2.2	Mow all dry swales, dry SuDS basins and margins to low flow channels and other SuDS features at 100mm with 150mm max.	4-8 visits as required Annually
2.3	Wildflower areas trimmed to 50mm in Sept Or Wildflower areas trimmed to 50mm on 3-year rotation 30% each year	1 visit annually 1 visit annually
3	INLETS AND OUTLETS	
3.1	Inspect monthly, remove silt from slab aprons and debris. Trim 1m round for access	12 visits monthly
4	HARD SURFACES	
4.1	Sweep all paving regularly. Sweep and suction brush permeable paving in autumn after leaf fall.	1 visit
	OCCASIONAL TASKS	
5	INSPECTION AND CONTROL CHAMBERS	
5.1	Annual inspection, remove silt and check free flow	1 visit

6	WETLAND AND POND VEGETATION	
6.1	Wetland vegetation to be cut at 100mm on 3 – 5-year rotation. 30% each year. All cuttings to be removed to wildlife piles or from site.	As required
7	SILT MANAGEMENT	
7.1	Inspect swales annually for silt accumulation	1 visit
7.2	Excavate silt, stack and dry within 10m of the SuDS feature, but outside the design profile where water flows, spread, rake and overseed	As required
8	NATIVE PLANTING	
8.1	Remove lower branches where necessary to ensure good ground cover to protect soil profile from erosion.	1 visit annually
	REMEDIAL WORK	
9	Inspect SuDS system regularly to check for damage or failure. Undertake remedial work as required.	As required

2. Sustainable Drainage (SuDS) features checklist

SuDS techniques include landscape features and control structures to manage runoff as it flows to site outfalls. The following lists the features which may be found on a site.

- **Swales** are linear, flat bottomed grassed or vegetated channels that convey water from one place to another. They can also store water and allow it to soak into the ground.

- **Permeable surfaces** as permeable block paving, porous Asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc.

- **Green Roofs** are planted with sedum or other plant material. They clean and absorb water allowing it to evaporate. Excess water is drained from the roof to other SuDS features.

- **Inlets and outlets structures** are often conveyance pipes protected with mesh guards. They must be free from obstruction at all times to allow free flow through the SuDS.

- **SuDS flow control structures** are usually small orifices in control chamber, slots or V notches in weirs. They are usually near the surface, so they are accessible and easy to maintain. They may be in baskets, in small chambers or in the open.

- **Inspection Chambers** and rodding eyes are used on bends or where pipes come together. They allow cleaning of the system if necessary.

- **Overflows** can be below ground through gratings and chambers or over grass weirs in the open They must be kept clear at all times to protect areas from flooding.

- **Flood routes (exceedance routes)** allow water volumes exceeding the capacity of the SUDS system to escape from the site without causing damage to property. This route must be clear of obstructions at all times.

SuDS design usually avoids below ground structures such as gully pots, oil separators and other sumps, which are a wildlife hazard, often ineffective and expensive to maintain. SuDS design also reduces pipework, manholes and interceptors. However, water may be conveyed in surface features like rills and channels with changes in level managed in spouts or cascades. These hard landscape features require standard landscape maintenance.

3. Sustainable Drainage Maintenance Specification

3.1 General Requirements

Maintenance activities comprise • **Regular Maintenance** • **Occasional Tasks** • **Remedial Work**	**Frequency**
General Litter Collect all litter or other debris and remove from site at each site visit.	Monthly

- **Avoid** use of weedkillers and pesticides to prevent chemical pollution

- **Avoid** de-icing agents wherever possible to allow bioremediation of pollutants in permeable surfaces.

- **Protect** all permeable, porous and infiltration surfaces from silt, sand, mulch and other fine particles.

4. Swales

Swales are linear, flat bottomed grassed or vegetated channels that convey water from one place to another which can also store water and allow it to soak into the ground.

SWALES	
Regular Maintenance	**Frequency**
Grass	
Mow amenity grass access paths and verges surrounding swales and filter strips at 35-50mm minimum and 75mm maximum or as specified.	Monthly or as required
Mow filter strips and swales at 100mm with 150mm maximum to filter and control runoff in normal grass swales removing first and last cut in season if grass is longer than 150mm removing cuttings to wildlife piles on site.	Monthly or as required
Where marsh or wetland develops in the swale due to wet conditions then cut annually, or as required, at 100mm removing cuttings to wildlife piles on site	Annual or as required
Occasional Tasks	**Frequency**
Where there is a build-up of silt on the swale or at inlets, i.e. 50mm or more above the design level, then remove and spread on site. Undertake when ground is damp in autumn or early spring and transplant turf and overseed to original design levels. Spread excavated material on site above SuDS design profile, e.g. top of banks, in accordance with E.A. Waste Exemption Guidance.	As required
Remedial Work	**Frequency**
All damage to be made good to design profile unless there is a design flaw.	As required

5. Permeable Surfaces

Permeable surfaces including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	**Frequency**
Cleaning Brush regularly and remove sweepings from all hard surfaces	Monthly
Occasional Tasks	**Frequency**
Permeable Pavements. Brush and vacuum surface once a year to prevent silt blockage and enhance design life.	Annually
Remedial Work	**Frequency**
Monitor effectiveness of permeable pavement and when water does not infiltrate immediately advise Client of possible need for reinstatement of top layers or specialist cleaning. Recent experience suggests jet washing and suction cleaning will substantially reinstate pavement to 90% efficiency.	As required

6. Inlets, Outlets, Controls, and Inspection Chambers

- **Inlets and outlets structures** may be surface structures or conveyance pipes with guards or headwalls. They must be free from obstruction at all times.

- **SuDS flow control structures** can be protected orifices, slots weirs or other controls at or near the surface to be accessible and easy to maintain. They may be in baskets, in small chambers or in the open.

- **Inspection Chambers** and rodding eyes are used on bends or where pipes come together and allow cleaning of the system if necessary. They should be designed out of the system where possible.

INLETS, OUTLETS, CONTROLS AND INSPECTION CHAMBERS	
Regular Maintenance	**Frequency**
Inlets, outlets and surface control structures Inspect surface structures removing obstructions and silt as necessary. Check there is no physical damage. Trim vegetation 1m min. surround to structures and keep hard aprons free from silt and debris	Monthly Monthly
Inspection chambers and below ground control chambers	
Remove cover and inspect ensuring water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn	Annually
Occasional Maintenance	
Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower damage	As necessary
Remedial work	**Frequency**
Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary. Repair physical damage if necessary.	As required As required

7. Overflows and Flood Routes

- **Overflows** are overland across weirs, through gratings or within chambers and must be kept clear at all times to protect areas from flooding. They allow onward flow when part of the SuDS system is blocked.

- **Flood routes (exceedance routes)** allow water volumes that exceed the capacity of the SuDS system to pass through or round the site without causing damage to property. These routes must be clear of obstructions at all times.

OVERFLOWS AND FLOOD ROUTES	
Regular Maintenance	**Frequency**
Overflows. Jet pipes leading from overflow structures annually and check by running water through the overflow. Check free flow at next SUDS feature – inlet to basin or chamber.	Annually
Overflows. Remove any accumulated grass cuttings or other debris on top of grass weirs or stone filled baskets overflows.	Monthly
Flood Routes. Make visual inspection. Check route is not blocked by new fences, walls, soil or other rubbish. Remove as necessary.	Monthly
Remedial	**Frequency**
Overflows. If overflow is not clear then dismantle structure and reassemble to design detail.	As required

8. Ornamental Planting and Existing Vegetation

- **Ornamental Trees -** All ornamental planting to be kept weed free and pruned using secateurs to keep the shrubs to an agreed and reasonable size.
- **Native Trees and Shrubs –** All native planting to be allowed to grow freely removing overhanging branches as required.

PLANTING AND EXISTING VEGETATION - Review	
Regular Maintenance	**Frequency**
Grass maintenance	
Amenity Grass - Mow all grass verges, paths and amenity grass at 35- 50mm with 75mm max. All cuttings to remain in situ	16 visits
Rough grass – Mow at 75-100mm but not to exceed 150mm All cuttings to wildlife piles	4 - 8 visits
Wildflower areas trimmed to 50mm in Sept-Oct or Wildflower areas trimmed to 50mm July and Sept or Wildflower areas trimmed to 50mm on 3-year rotation 30% each year All cuttings to wildlife piles	1 visit 2 visits 1 visit
Ornamental tree & shrub planting. Weed all shrub beds as detailed spec as necessary. Cut back planting from lights, paths and visibility sight lines in late autumn and as necessary. Cut hedges slightly tapered back from base with flat top at specified height. Do not mulch planting adjacent to permeable/ porous paving surfaces.	4 visits

Remove stakes and ties from trees when no longer needed for support and within 3 years of planting. Protect from strimmer damage and remove competitive growth until it is well established.	
Native trees & shrub planting. Prune to shape in year 1. Protect trees from strimmer damage and remove competitive growth until well established. Remove stakes and ties from trees when no longer needed for support and within 3 years from planting.	1 visit
Existing trees Check existing trees for safety.	1 visit
Remedial	**Frequency**
Replace trees and shrubs which fail in the first five years after planting. Carry out tree surgery as necessary.	

9. Spillage – Emergency Action

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage in a slow and controlled manner with time available for natural breakdown in a treatment system. Therefore, small spillages of oil, milk or other known organic substances should be removed where possible using soak mats as recommended by the Environment Agency with residual spillage allowed to bio-remediate in the drainage system.

In the event of a serious spillage, either by volume or of unknown or toxic compounds, then isolate the spillage with soil, turf or fabric and block outlet pipes from chamber(s) downstream of the spillage with a bung(s). (A bung for blocking pipes may be made by wrapping soil or turf in a plastic sheet or close woven fabric.)

Contact the Environment Agency immediately.

Appendix Q – Simple Index Approach

SIMPLE INDEX APPROACH:
SUMMARY TABLE

SUMMARY TABLE		*DESIGN CONDITIONS*			
		1	*2*	*3*	*4*
Land Use Type	Individual driveway				
Pollution Hazard Level	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Pervious pavement (where the pavement is not designed as an infiltration component)	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	Swale	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.95				
Metals	0.9				
Hydrocarbons	>0.95				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.95	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.9				
Hydrocarbons	>0.95				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

SIMPLE INDEX APPROACH:
SUMMARY TABLE

SUMMARY TABLE		*DESIGN CONDITIONS*			
		1	*2*	*3*	*4*
Land Use Type	Residential parking				
Pollution Hazard Level	Low				
Pollution Hazard Indices					
TSS	0.5				
Metals	0.4				
Hydrocarbons	0.4				
SuDS components proposed					
Component 1	Pervious pavement (where the pavement is not designed as an infiltration component)	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.7				
Metals	0.6				
Hydrocarbons	0.7				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.7	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.6				
Hydrocarbons	0.7				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

SIMPLE INDEX APPROACH: SUMMARY TABLE

SUMMARY TABLE		*DESIGN CONDITIONS*			
		1	*2*	*3*	*4*
Land Use Type	Residential roofing				
Pollution Hazard Level	Very low				
Pollution Hazard Indices					
TSS	0.2				
Metals	0.2				
Hydrocarbons	0.05				
SuDS components proposed					
Component 1	Bioretention system (where the system is not designed as an infiltration component)	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	None				
Component 3	None				
SuDS Pollution Mitigation Indices					
TSS	0.8				
Metals	0.8				
Hydrocarbons	0.8				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	0.8	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	0.8				
Hydrocarbons	0.8				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

Appendix R – Table S7.1.5 of DLRCC CDP 2022-2028

Job Title: Temple Hill
Job No.: 2511-01

Table S7.1.5 of DLRCC CDP 2022-2028

Surface Cover Type	Area (m^2)
Wetland or open water (semi-natural; not chlorinated) maintained or established on site.	N/A
Semi-natural vegetation (e.g. hedgerows, trees, woodland, species-rich grassland) maintained or established on site.	1100
Reuse of existing soils and seed source to develop vegetation cover	6930
Standard trees planted in connected tree pits with a minimum soil volume equivalent to at least two thirds of the projected canopy area of the mature tree.	184
Standard trees planted in pits with soil volumes less than two thirds of the projected canopy area of the mature tree.	77
Intensive green roof or vegetation over structure. Substrate minimum settled depth of 150mm.	3258
Non intensive Brown Roof (Biodiversity Roof). Substrate minimum settled depth of 150mm. Design will be site specific and developed by a suitably qualified ecologist.	N/A
Extensive green roof with substrate of minimum settled depth of 80mm (or 60mm beneath vegetation blanket)	3296
Extensive green roof of sedum mat or other lightweight systems	N/A
Green wall –modular system or climbers rooted in soil.	N/A
Rain gardens and other vegetated sustainable drainage elements.	N/A
Flower-rich perennial planting.	3475
Hedges (line of mature shrubs one or two shrubs wide).	355
Hedgerows or double hedgerow of native species (may have an associated ditch and bank)	215
Groundcover planting.	2315
Amenity grassland entire area or sections managed for lesser mowing frequencies for pollinators e.g. six week meadow)	4475
Amenity grassland (species-poor, regularly mown lawn).	1915
Water features (chlorinated) or unplanted detention basins.	N/A
Permeable paving.	1753
Sealed surfaces (e.g. concrete, asphalt, waterproofing, stone)	7235