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Engineering Services Report

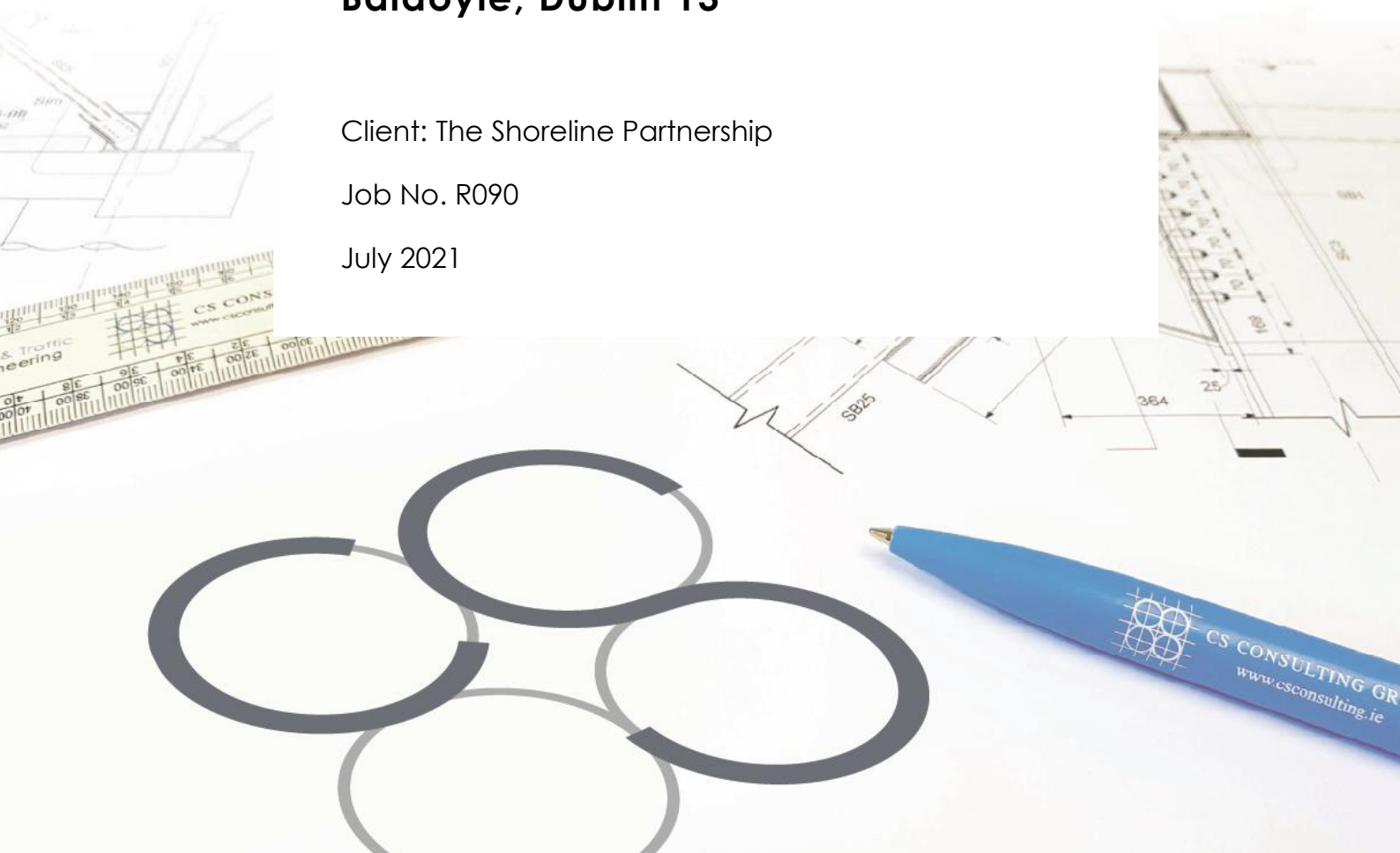
Strategic Housing Development

Baldoyle-Stapolin Growth Area 3, Baldoyle, Dublin 13

Client: The Shoreline Partnership

Job No. R090

July 2021



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ENGINEERING SERVICES REPORT

STRATEGIC HOUSING DEVELOPMENT

BALDOYLE-STAPOLIN GROWTH AREA 3, BALDOYLE, DUBLIN 13

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1.0 INTRODUCTION

Cronin & Sutton Consulting Engineers (CS Consulting) have been commissioned by Shoreline Partnership to prepare an Engineering Services Report to accompany a planning application for a proposed Strategic Housing Development at Baldoyle-Stapolin Growth Area 3, Baldoyle, Dublin 13.

In preparing this report, CS Consulting has referred to the following:

- Fingal County Council Development Plan 2017–2023;
- Greater Dublin regional Code of Practice for Works;
- Local Authority Drainage Records.
- Irish Water Code of Practice for Potable Water;
- Irish Water Code of Practice for Wastewater.

The Engineering Services Report is to be read in conjunction with the engineering drawings and documents submitted by CS Consulting and with the various additional information submitted by the other members of the design team, which forms part of the planning submission.

2.0 SITE LOCATION AND PROPOSED DEVELOPMENT

2.1 Site Location

The proposed development site is located at Baldoyle-Stapolin, Dublin 13. It is a site of c. 6.89 hectares, and comprises lands referred to as Growth Area 3 (GA3) within the Baldoyle-Stapolin Local Area Plan. The lands are bound by the Dublin-Belfast / DART train line to the west, existing and proposed residential areas to the south and east, and future Racecouse Park to the north.

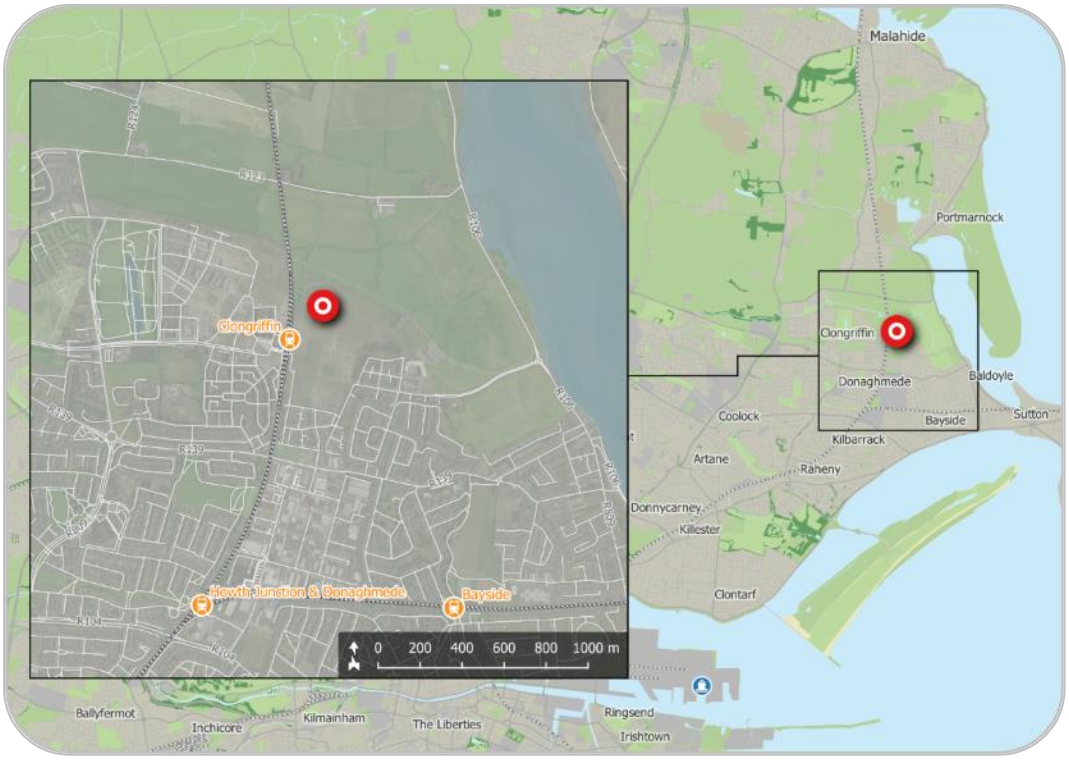


Figure 1 – Location of proposed development site
(*map data & imagery: EPA, OSM Contributors, Google*)

The location of the proposed development site is shown in Figure 1 above; The site is bounded generally to the west by The Dublin-Belfast rail line, to the north High Amenity Lands and to the east and south zoned lands . There is currently no vehicular access to the subject site from the public road

network. Longfield Road connects to Grange Road (R139) approx. 650m to the south of the subject site; Red Arches Avenue connects to Red Arches Road, which in turn connects to Coast Road (R106) approx. 950m to the east of the subject site.

Figure 2 – Site extents and environs
(*map data & imagery: NTA, OSM Contributors, Google*)

2.2 Existing Land Use

The subject site is currently undeveloped.

2.3 Description of Proposed Development

The proposed development will consist of the development of 1,221 no. residential apartment/duplex dwellings in 11 no. blocks ranging in height from 2 to 15 storeys and including for residential tenant amenity, restaurant/cafe, crèche, car and bicycle parking and public realm. Residential Tenant Amenity Facilities are located in Blocks E3, E4, G3, G4 &

G5 and external communal amenity space is provided at ground, podium and terrace levels throughout the scheme. Car Parking is provided in a mix of undercroft for Blocks E1-E2, F1 and F2 and at basement level for Blocks G1-G3 and G4-G5. Cycle parking spaces are provided for residents, visitors and commercial uses, in secure locations and within the public realm throughout the scheme. A new central public space between Blocks E1-E2 and E3 and E4 and a new linear space between Blocks G2-G3 and G4-G5 provides pedestrian and cycle connectivity from Longfield Road to the proposed future Racecourse Park to the north. A proposed new bus, cycle, pedestrian and taxi ramp to the south of the site and north of Stapolin Square provides access from Longfield Road to Clongriffin Train Station. For a full description of the development please see the Statutory Notices.

3.0 STORM WATER INFRASTRUCTURE

3.1 Existing Storm Water Infrastructure

At present there is an existing 1350mm stormwater culvert traversing the subject site along the line of Longfield Road, flowing south to north. This culvert is a diversion of a culvert which previously ran along the western boundary of the development lands.

In addition, there is an existing 1050mm stormwater pipe running from south to north along the line of Stapolin Avenue, which discharges into the Mayne River. Based on the previous planning applications in the vicinity of the site this pipe has been constructed by previous developers at a low level so that it can pass below the North Fringe Sewer. The depth of this pipe and associated outfall is approximately 2m below the existing ground level as it passes through to the flood plain further north. The pipe serves the existing developments constructed to date and discharges directly to the Mayne River.

It is noted that there is an existing stormwater drainage network located in the vicinity of the subject site, however due to its condition and levels it is not intended to make use of the existing network and therefore it is proposed to be removed and a new network constructed in its place.

3.2 Proposed Storm Water Arrangements

In accordance with *Section 4.3 of Appendix 1 of the Baldoyle-Stapolin Local Area Plan*, the site is located adjacent to the tidal estuary at Baldoyle and as there is no downstream development before out falling to the Irish Sea, the development site is *not required to provide full attenuation for the 100 year return storm* as per the requirements in Section 6.6, Volume 2, of the GDSDS. In addition the lands discharge into salt wetlands which are the flood estuary of the Mayne River and extend over approximately 40

hectares (100 year flood plain). Therefore, the principal issue, is the quality of water discharging from the LAP lands and not the quantity of water being discharged to the estuary.

It is the requirement of the LAP that a wetland is installed within the flood plain, just beyond the line of the existing North Fringe foul sewer to provide the required water quality treatment for this and future developments within the LAP. This wetland and its corresponding upstream surface water network were granted based on the planning permission Reg. Ref. F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046) and are under construction.

All water from the proposed development will discharge to this wetland before discharging to the Mayne River floodplain over a spillway/weir. The wetland will serve as the final water quality treatment for the proposed development of Growth Area 3 (Plus GA1 and GA2). It has been sized to cater for a treatment volume based on 15mm rainfall over 100% of the impermeable site areas and this will be retained in a permanent pool area of the wetland at all times.

The wetland will incorporate a sediment forebay to serve as a 'first flush' collector of the majority of silt not removed by SuDS features upstream. The construction of an independent sediment for-bay ensures the remainder of the wetland is not disturbed during maintenance when silt build-up is removed from the fore-bay.

The shape and orientation of the permitted wetland has been designed to maximise the quantity of treatment provided, with a length to width ratio in excess of 3:1, allowing sediments to settle along its length. A varying width has been chosen to encourage diversity of plants and wildlife, while ensuring there are no stagnant areas and that the total volume is available to provide water quality treatment. Details of the planting/landscaping of the wetland are as outlined in the landscape documents that formed the

grant of permission Reg. Ref. F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046). In summary, the original topsoil with seed-bank of calcareous grassland and wetland species will be replaced to allow self-seeding and natural establishment of the wetland. These works will be carried out under direction and supervision of ecologist/landscape architect who will identify the source material area and oversee the works.

The permitted wetland has commenced construction and by excavating the existing ground level to provide the storage volume required. The permanent pool level will be set to approximate the existing ground level. The wetland will be surrounded by a small 300mm high embankment to cater for fluctuations in water level and to ensure flows are directed over the control weir/spillway.

The GDSDS requires that a "treatment volume" (Vt) be provided in order to prevent any pollutants or sediments discharging into river systems, additionally a 'treatment train' stormwater runoff management system is required. According to CIRIA document C753 the following treatment train approach is necessary:

The treatment volume was calculated as 1860m^3 and is based on treatment 15mm of rainfall depth from the runoff from impermeable areas. This will be provided by the constructed wetland. The Wetland has been calculated as follows:

The catchment area served by proposed wetlands comprising of growth areas 1, 2 and 3 = 22.3 hectares approximately.

The treatment volume (vt) required for Growth Area 3

= 4.28 ha (impermeable runoff) x 15mm rainfall = 642 m^3 volume.

Treatment ratio for Growth Area 3 = 642/6.89 has = 93.2m3/ha.

- Growth Areas 2 and Growth Area 1 = 4.33 + 11.47 = 15.8 ha (approximately).
- estimated treatment volume for Growth Areas 2 and 1 =

  15.8 ha x 69.5m3 = 1098.0m^3 volume.

Therefore, the total treatment volume:

Growth Areas 1, 2 and 3 = 1098m^3 + 642m^3 = ***1740m^3***

Wetland (under construction) volume to be approximately = ***1860m^3***

(as granted under planning permission Reg. Ref. F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046), for the adjacent GA1 development to the south)

All run-off areas will pass through the required number of interception stages prior to discharging to the downstream outfall. Interception methods are listed in the section on SuDS with final treatment provided by the wetland.

As previously mentioned, it is not proposed to connect any surface water generated by the development to the existing culverts referred to earlier as they pass under the existing North Fringe Sewer. It is proposed to connect the proposed development to the new surface water network granted under F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046) that shall cross above the North Fringe Sewer under approval with Irish Water to ensure all surface water generated by the proposed development will pass through the wetland and overspill a weir/spillway into the Mayne River Floodplain.

As informed based on the planning permission Reg. Ref. F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046), for the adjacent GA1 development to the south, the permitted wetland has been

sized to serve Growth Areas 1 and 2 of the Local Area Plan in addition to Growth Area 3 as proposed.

The proposed new storm water drainage arrangements will be designed and carried out in accordance with:

i) The Greater Dublin Strategic Drainage Study Volume 2,
ii) The Greater Dublin Regional Code of Practice for Drainage Works,
iii) BS EN – 752:2008, Drains & Sewer Systems Outside Buildings,
iv) Part H, Building Drainage of The Building Regulation.

Please refer to CS Consulting drawing nos. BD-CSC-ZZ-G3-DR-C-0103 and BD-CSC-ZZ-G3-DR-C-0104 for the proposed drainage network layout. The storm drainage network for the development will be in accordance with the requirements and specifications of Fingal County Council. The network has been designed and modelled for the 100 year storm event using Windes Microdrainage programme and the network calculations and modelling results are shown in **Appendix A.**

The hardstanding areas within the Windes design have been subject to a co-efficient runoff factor for the various surface types and are as follows:-

- Roof 0.95
- Concrete (Footpath) 0.90
- Asphalt (Road) 0.90

In addition an overflow flood route is provided within the road network designed to cater for storms higher than that of a 100year event or if a blockage occurs in the network due to poor maintenance. The road network has been designed to guide excess stormwater away from building structures and flow towards green/landscaped areas where it can pond and dissipate to ground once the storm event ceases.

3.3 Proposed SuDS Measures

The second aspect of the storm water drainage network is to improve the quality of the storm water leaving the site. There are a number of water saving systems and SuDS measures that will be put in place to achieve this aim.

The proposed SuDS features shall consist of:

a) Constructed Wetland - Shallow ponds and marshy areas with a high concentration of aquatic vegetation. The wetland will detain flows for an extended period allowing sediments to settle and to remove contaminants by facilitating adhesion to vegetation and aerobic decomposition. Located within existing Mayne River floodplain, prior to discharge to the floodplain

b) Bio-retention Areas: Shallow landscaped depressions which are under-drained with engineered soils and enhanced vegetation and planting on the surface which manage and treat runoff, at source, and promote biodiversity development. Located generally at suitable low points along roads in lieu of gullies throughout the applicant lands.

c) Green Roofs: Green roofs provide ecological, aesthetic and amenity benefits and intercept and retain rainfall, at source, reducing the volume of runoff and attenuation peak flows. Green roofs absorb most of the rainfall that they receive during ordinary events and they will only contribute to attenuation of flows for larger events.

   All green roof systems across the development shall be ultimately designed by a specialist post planning. It will be responsibility of the green roof specialist to design the system in accordance with all relevant building regulations including liaising with the architect to

provide sufficient gullies, downpipes and overflow pipe systems to the proposed roof of the apartment block. It is envisaged, that rainwater gullies or outlets shall be provided at roof level at sub-surface level to the green roof system. These gullies/outlets shall channel excess runoff to the drainage network of the apartment block, where it shall eventually discharge to the external surface water network of the development. Overflow pipes and associated downpipes shall be provided along the parapet of the roof to cater for extreme storm events, when the green roof system is saturated as well as catering for potential blockages to the normal drainage outlets. This is standard practice to any roof design.

100mm deep Sedum green roof systems are proposed to the apartment buildings located to the west of Longfield Road in the north west of the applicant lands. Please see drawings BD-CSC-ZZ-G3-DR-C-0106 that indicates the locations of the green roof systems on the apartment blocks across the development site. Please refer to **Appendix F** for the Bauder Sedum Green Roof System.

As indicated on the drawings, the total roof area to the apartment blocks is approximately 16,698sqm. The total green roof area being provided across the apartment blocks is 4,945 sqm, which equates to 30% of the total roof area.

Future maintenance of the green roof areas shall be the responsibility of the respective management company to the apartment blocks. It is recommended that the management company engage with the green roof supplier and agree an inspection and maintenance schedule upon commissioning of the green roof system.

Generally, all green roofs require a minimum of two inspections a year to ensure that the system is maintained and in full working order. Maintenance procedures shall include the following tasks:

a. Removal of leaves, debris and litter to the green roof

b. Removal of plants etc encroaching on drainage outlets

c. Weeding and the removal of unwanted species

d. Repairing of any bare/damaged patches etc to the green roof

e. Examination and testing of the drainage system, through irrigation, to ensure the system is in full working order.

In addition, a general maintenance document by Bauder Ltd is provided in **Appendix F.**

d) Permeable Paving: These systems are used 'source control' method in managing surface water runoff. Water is managed and dealt with on-site without piping off to storage tanks or surface water treatment systems. Surface water discharge is managed to ensure that risk of contamination or pollution are mitigated. Permeable Paving systems filter contaminants by microbial action. There is no requirement for additional filtering/polishing with Permeable Paving in normal use. It is proposed to construct all on street parking spaces to the development with permeable paving systems.

e) Integrated tree pits.

The combination of the above noted elements shall allow the proposed development to adhere to the principles of sustainable drainage practices while enhancing overall storm water quality.

3.4 SUDS/Green Infrastructure Selection Checklist

As part of any planning application within the Fingal County Council area a Suds/Green infrastructure checklist is to be submitted. To be in

accordance with these requirements the completed checklist is located in **Appendix B**.

3.5 SuDS Metrics

Fingal County Council requires that all developments adhere to their policy of implementing sustainable urban drainage systems, SuDs. Suds not only requires that storm water generated on site is restricted for extreme storm events but that the overall quality of the storm water is enhanced, and the water re-used, where feasible on site.

The use of Suds features as part of this development will include bio-rention areas, permeable paving, green roofs that will provide infiltration and evaporation as much as physical possible and optimize retention time. Relatively small volumes of rainwater collected on the respective SuDS devices will enter the public sewer network during typical low intensity storms. This is because the proposed SuDS measures will retain rainwater until it is either used via evapotranspiration in the green areas or reused within the development via the rainwater harvesting system. The SuDS processes decrease the impact of the development on the receiving environment by providing amenity and biodiversity in many cases.

The Suds devices and techniques are based on the three key design principles: Water Quantity, Water Quality and Water Amenity. The proposed SuDs devices have considered the following.

- Source Control
- Site Control
- Regional control

The above is based on the GDSDS and in the Suds Manual.

The GDSDS & the local authorities Regional Code of Practice for Drainage Works require that four main criteria to be provided by the developer.

Criterion 1: River Water Quality Protection – satisfied by providing interception storage and treatment of run-off within SUDS features e.g., bio-retention areas. Please see below for further details.

Criterion 2: River Regime Protection - satisfied by attenuating run-off from the site.

We confirm the site is located adjacent to the tidal estuary at Baldoyle and as there is no downstream development before outfalling to the Irish Sea, the *development site is not required to provide full attenuation for the 100-year return storm as stipulated in Section 4.3 of Appendix 1 of the Baldoyle-Stapolin LAP*.

Criterion 3: The GDSDS requires that no flooding should occur on site for storms up to and including the 1 in 30-year event. The pipe network and the attenuation storage volumes should, therefore, be checked for such storms to ensure that no site flooding occurs although partial surcharging of the system is allowed as long as it does not threaten to flood.

For the 1 in 100 year event, the pipe network can fully surcharge and cause site flooding, but the top water level due to any such flooding must be at least 500mm below any vulnerable internal floor levels, and the flood waters should be contained within the site. In addition, the top water level in any attenuation device during the 100 year storm must be at least 500mm below any vulnerable internal floor levels.

Refer to **Appendix A** for a copy of the Micro Drainage simulation, which demonstrates a level of service as described above and ensures no surface water flooding to any part of the site for storms up

to and including the 1 in 100 year plus 20% extra for climate change. Therefore, GDSDS Criterion 3 is complied with.

We refer to the JBA consultants Flood Risk Assessment as part of the planning submission for the analysis of flood risk at the subject site.

Criterion 4: River Flood Protection – attenuation and/or long-term storage provided within the Suds features. Criterion 4 is intended to prevent flooding of the receiving system / watercourse by either limiting the volume of runoff to the pre-development greenfield volume using 'long-term storage' (Option 1) or by limiting the rate of runoff for the 1 in 100 year storm to QBAR or 2.0l/s/ha without applying growth factors using 'extended attenuation storage' (Option 2).

We confirm the site is located adjacent to the tidal estuary at Baldoyle and as there is no downstream development before outfalling to the Irish Sea, the development site is not required to provide full attenuation for the 100 year return storm as stipulated in Section 4.3 of Appendix 1 of the Baldoyle-Stapolin LAP.

Criterion 1: Interception and Treatment Storage Calculation

The interception storage volume is calculated based on:

1. Entirety of the paved / roof area (5.35 ha)
2. 5mm rainfall depth
3. 80% runoff factor (5.35x 0.8)= 4.28 ha

The treatment storage volume is calculated based on:

1. Entirety of the paved / roof area (5.35 ha)
2. 15mm rainfall depth
3. 80% runoff factor (5.35 x 0.8)= 4.28 ha

Interception storage is to be provided within the green roofs of the apartment block areas, swales, permeable paving, bio-retention areas, etc (see **Section 3.3**), and landscape zones at ground level. The volumes to be provided are outlined in the Table 2.0 below, and the required volume for each area is provided in Table 3.0.

Required Volume of Interception		
Total Impermeable Area (m^2)	Rainfall Depth (m)	Required Volume of Interception (m^3)
42,800	0.005	**214**

Table 1: Interception Storage Area Requirement

Required Volume of Interception		
Total Impermeable Area (m^2)	Rainfall Depth (m)	Required Volume of Interception (m^3)
42,800	0.015	**642**

Table 2: Treatment Storage Area Requirement

Therefore, the total volume required for the development is 856m^3

Volume of Interception and Treatment Provided			
Storage Structure	Area (m^2)	Storage	Volume of Interception Provided (m^3)
Green Roof	4945	10 litres / m^2	49.45
Permeable Pavement	537	100 mm / m^2	53.7
Grass Crete	1400	100 mm / m^2	140
Resin Paving	953	100 mm / m^2	95.3
Wetlands (GA3 only)			642
		Total Provided	**980.45**

Table 3: Interception Storage Provision Calculation

Based on the above calculations and tables, the development is in accordance with Criterion 1.

4.0 FOUL WATER INFRASTRUCTURE

4.1 Existing Foul Infrastructure

There is an existing 375mm diameter foul sewer that runs in a northern direction to the south east of the site (along Stapolin Avenue). This infrastructure was installed by previous developers to serve the entire LAP lands.

Downstream, this existing 375mm foul sewer discharges to an existing foul pump station located on the north side of Stapolin Haggard. The foul pumping station discharges via a 300mm rising main to the North Fringe Foul Sewer, that runs around the north / north eastern boundary of the site approximately 150m away from the pump station. The pump station currently serves the existing Myrtle and Red Arches Developments and serves the developments contained within planning permission Reg. Ref. F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046).

In addition to the 375mm foul sewer referred to above, there is already an existing foul drainage network located within the development lands, however due to its poor condition it is not intended to make use of the existing network (not in use within the application lands) and therefore it is proposed to remove the existing foul sewers within the development site.

4.2 Proposed Foul Drainage Arrangements

The proposed development will require a new separate drainage network to collect and convey the effluent generated by the proposed development. The drainage network for the proposed development has been designed in accordance with:

- The Regional Code of Practice Drainage Works,

- The Greater Dublin Strategic Drainage Study,
- Irish Water Code of Practice for Wastewater Infrastructure.

The drainage network for the development will be in accordance with Part H of the Building Regulations and to the requirements and specifications set out in the Irish Water Code of Practice for Wastewater.

4.3 Proposed Effluent Generation

The proposed development shall comprise 1,221 no. residential units. Based on Irish Water guidelines, the foul effluent generated shall be:

- For the residential units:
  - ⇒ 446l/day per residential unit (based on 2.7 persons per unit x 150l/person/day, + a 10% increase factor).
  - ⇒ 446l/day/unit x 1,221 units = 544,566 l/day = 544.57 m^3/day;
  - ⇒ 6.30 l/sec Average flow (1 DWF);
  - ⇒ 18.91 l/sec Peak Flow (3 DWF – Population between 1000 and 5000).

A Pre-Connection Enquiry was submitted to Irish Water based on the foul flows for the proposed development and we received a favourable response. See **Appendix C.**

All foul effluent generated from the proposed development shall be collected in separate foul pipes and flow under gravity, to the existing 375mm diameter foul sewer in the north east corner of the development via a new connection. The foul drainage network has been modelled using Windes Microdrainage and the network calculations can be found in **Appendix E.**

The proposed foul water drainage infrastructure and routing plan is shown on drawings BD-CSC-ZZ-G3-DR-C-0103 and BD-CSC-ZZ-G3-DR-C-0104 included with this submission and the proposed connection to the Irish Water Network can be accommodated.

A "Statement of Design Acceptance" has also been received from Irish Water based foul drainage layout as shown on the above referenced drawings, see **Appendix D**.

In relation to the existing north fringe drain to the north of the site. The proposed development will be in excess of 10m from the edge of the existing pipe, allowing a min 20m wide easement over the pipe. We note the 450 diameter main is further north of the development and the watermain is in excess of 15m from the proposed development. CS have engaged with IW on this issue, and they have noted to CS that once we are within the COP from IW they have no comment. With regards to the buffer and landscaping above the pipe no alterations of levels are being proposed.

5.0 POTABLE WATER SUPPLY

5.1 Existing Potable Water Infrastructure

There is an existing 300mm watermain running along the eastern (Stapolin Avenue) and to the south along (Myrtle Avenue) side of the development. This infrastructure was installed to serve the future developments within the LAP. In addition, there is already existing watermain infrastructure located within the development application lands, however due to the condition and system layout it is not intended to make use of the existing network, and these shall be removed and replaced to current Irish Water Specifications. There is an existing 450 diameter watermain running along the northern edge of the site.

5.2 Proposed Potable Water Infrastructure

The proposed development will require a new network. The network will be designed and installed to the requirements and specifications set out in the Irish Water Code of Practice for Water. The proposed development will connect to the existing 300mm watermains on Myrtle and Stapolin Avenues and to the existing 450mm watermain to the north of the site.

The proposed development shall comprise 1,221no. residential units. Based on Irish Water guidelines, the water demand shall be:

- For the residential units:
  - ⇒ 405l/day per residential unit (based on 2.7 persons per unit x 150l/person/day);
  - ⇒ 405l/day/unit x 1,221 units = 494,505 l/day = 495 m^3/day;
  - ⇒ 5.72 l/sec Average water demand;

⇒ 17.156 l/sec Peak water demand (3 times average water demand – Population between 1000 and 5000).

A Pre-Connection Enquiry was submitted to Irish Water based on the potable water demand for the proposed development and we received a favourable response. See **Appendix C.**

The proposed potable water infrastructure and routing plan is shown on drawings BD-CSC-ZZ-G3-DR-C-0107 and BD-CSC-ZZ-G3-DR-C-0108 included with this submission and the proposed connection to the Irish Water Network can be accommodated.

A "Statement of Design Acceptance" has also been received from Irish Water based on the watermain design layout as shown on the above referenced drawings, see **Appendix D.**

In relation to the existing watermain to the north of the site. We note the 450 diameter main is further north of the development and the watermain is in excess of 15m from the proposed development. We have engaged with IW on this issue and they have noted to CS that once we are within the COP from IW they have no comment.

6.0 SURFACE & GROUNDWATER IMPACTS

6.1 Construction Phase

Water pollution will be minimised by the implementation of good construction practices. Such practices will include adequate bunding for oil containers, wheel washers and dust suppression on site roads, and regular plant maintenance. The Construction Industry Research and Information Association provides guidance on the control and management of water pollution from construction sites in their publication Control of Water Pollution from Construction Sites, Guidance for Consultants and Contractors, which provides information on these issues. Pollutants can commonly include suspended solids, oil, chemicals, cement, cleaning materials and paints. These can enter controlled waters in various ways:

- ⇒ directly into a watercourse
- ⇒ via drains or public sewers
- ⇒ via otherwise dry ditches
- ⇒ in old field drains
- ⇒ by seepage into groundwater systems
- ⇒ through excavations into underlying aquifers
- ⇒ by disturbance of an already contaminated site

The proximity of the site to the River Mayne and the Irish coastline, and the historical uses of the site and nearby areas should be examined early in project planning and design, to ensure that suitable redesign and mitigation measures are undertaken as necessary.

During construction, careful management and planning will help minimise water pollution. This may include adequate bunding of all oil tanks, wheel washers and dust suppression on haul roads (particular care to be taken with the nearby River Mayne and Irish coastline), and regular plant maintenance.

A contingency plan for pollution emergencies should also be developed and regularly updated, which would identify the actions to be taken in the event of a pollution incident.

It is recommended the potential contractor draws up a contingency plan for pollution emergencies that should address the following:

- ⇒ containment measures
- ⇒ emergency discharge routes
- ⇒ list of appropriate equipment and clean-up materials
- ⇒ maintenance schedule for equipment
- ⇒ details of trained staff, location, and provision for 24-hour cover
- ⇒ details of staff responsibilities
- ⇒ notification procedures to inform the relevant environmental protection authority
- ⇒ audit and review schedule
- ⇒ telephone numbers of statutory water undertakers
- ⇒ list of specialist pollution clean-up companies and their contact details

6.2 Operational Phase

The sources of pollution that could potentially have an effect on surface or groundwater during the operational phase of the development will be oil and fuel leaks from parked cars, service vehicles, HGV delivery's etc. Hydrocarbon interceptors such as the wetlands, swales etc will be provided in storm water drainage network and Petrol interceptors will be installed within car parks areas under the apartment buildings to cater for these oil/fuel leaks as required.

It is not anticipated that flooding of the site will occur, due to the fact that there is no historical data which refers to any past flooding on this site and that the site is located in Flood Zone C, please refer to the Flood Risk Assessment under separate cover included with this planning application.

6.3 Mitigation Measures

The construction management of the building project will incorporate protection measures to minimise as far as possible the risk of spillage that could lead to surface and groundwater contamination.

All appropriate methods will be utilised to ensure that surface water arising during the course of construction activities will contain minimum sediment, prior to the ultimate discharge to the wetlands to the north.

Hydrocarbon interceptors will be provided on storm water drainage network and grease traps will be installed on foul sewers where necessary.

Best practice in design and construction will be employed for the installation of surface water and sanitary drainage.

6.4 Pollution Control Preliminary Method Statement

Prior to earthworks commencing, all watercourses and drains should be temporarily culverted to avoid movement of vehicles across watercourses. There will be no tracking of machinery within live channels.

Run-off from the working site or any areas of exposed soil should be channelled and intercepted at regular intervals for discharge to silt traps or lagoons with over-flows directed to land rather than to a watercourse. To avoid siltation of watercourses from crossing point locations, silt traps should be placed beside temporary crossing points with an associated buffer strip. Silt traps should be maintained and cleaned regularly during the course of site works.

A maintenance schedule and operational schedule should be established by the contractor for silt and pollution control measures during the construction period. This should be undertaken in consultation with the relevant statutory authorities.

Pouring of concrete should be carried out in the dry and allowed to cure. Pumped concrete should be monitored carefully to ensure no accidental discharge to a watercourse. Mixer washings and excess concrete should not be discharged to surface water. Implementation of comprehensive and strict site housekeeping measures to isolate concrete from local surface waters is essential.

Oil storage tank(s) and the associated filling area and distribution pipe work should be at least 10m distant from a surface watercourses (rivers, streams, field drains etc.) and 50m from boreholes.

Storage tanks should have secondary containment provided by means of an above ground bund to capture any oil leakage irrespective of whether it rises from leakage of the tank itself or from associated equipment such as

filling and off-take points, sighting gauges etc., all of which should be located within the bund. Bund specification should conform to the current best practice for oil storage (Enterprise Ireland BPGC5005).

Oil booms and soakage pads should be maintained on-site to enable a rapid and effective response to any accidental spillage or discharge.

Abstraction of water from watercourses for dust control should be from dedicated watering points. These should preferably be from silt lagoons located on-site or from an excavated site, replenished by ground infiltration and not by stream infiltration. No abstraction should occur on small watercourses.

There can be no direct pumping of contaminated water from the works to a watercourse at any time. Any dewatering must be treated by either infiltration over land, discharge to a Local Authority sewer or to a suitably sized and sited settlement pond.

The short-term storage and removal / disposal of excavated material must be considered and planned such that risk of pollution from these activities is minimised.

Appropriate environmental protection measures are the responsibility of the contractor and all works are subject to the provisions of the Local Government (Water Pollution) Act 1977 (as amended), the Fisheries (Consolidation) Act 1959 (as amended) & Guidelines on Protection of Fisheries During Construction Works in and Adjacent to Waters 2016 (attached).

7.0 LOCAL AUTHORITY ENGAGMENT AND COMMENTS.

Both An Bord Pleanála and Fingal County Council have reviewed the planning documentation submitted in respect of the proposed development during the pre-application consultation phase of the SHD process. A tripartite pre-application consultation meeting has also been held with An Bord Pleanála and Fingal County Council.

The relevant opinions of An Bord Pleanála that pertain to flooding and water services as communicated to the applicant (item 13 below), are produced below; also examined in this section are the recommendations of Fingal County Council's Water Services Planning Department, which were issued to An Bord Pleanála. In each case, we describe measures taken by the design team in response to these opinions and recommendations.

> *13. A report addressing the issues raised in the planning authority's Water Services Department report dated 8th December 2020.*

CS Consulting along with JBA Consulting (flooding consultants) meet with the Fingal County Council's Water Services Planning Department in January 2021 to discuss the items raised in the report dated the 8th of December 2020.

Flooding;

The items raised in relation to flooding were recognised by the flooding specialist JBA Consulting.

- Infilling of the flood plain
- Haul road implications on the flood plain
- Flood modelling to include the Haul Road and Infill area
- Tidal Lock
- Floor levels of the development.

Response

Infilling of the flood plain

The final scheme as lodged will not impact on the existing flood plain. The scheme lodged at stage 2 had indicated a section of the flood plain being infilled to accommodate the level change from GA3 lands to the park lands. The lodged developable area of the scheme will not enter into the flood plain and the previously allowed for compensatory storage at stage 2 lodgement is not required.

Haul road implications on the flood plain

The previously permitted haul road has been accounted for in hydraulic modelling in the JBA flood report accompanying this application.

Tidal Lock

Tidal lock with JBA that the tidal lock in the flooding analysis is in the order of 5 hours. Tidal locking has been accounted for in hydraulic modelling in the JBA flood report accompanying this application.

Floor levels of the development.

All development is located in Flood Zone C. All habitable development finished floor levels are at a level or +6.0m or above. All finished external levels on the site will be a minimum of +4.5m.

Foul Drainage

Response - The report from the council had raised no issues relating to foul drainage. As noted in this report a confirmation of feasibility and statement of design acceptance has been issued by Irish Water.

Water Supply

Response - As noted in this report a confirmation of feasibility and statement of design acceptance has been issued by Irish Water. A connection is to be made to the existing watermain to the north of the site. This connection has been allowed for in the proposed development. The development has now been set back from the location of the watermain along the northern edge of the applicant boundary. As part of the revised design, it is not proposed to alter the ground levels over the existing watermain.

Surface Water

The items raised in relation to surface raised where the following.

- Water level in the wetland ponds (as permitted)
- Suds Measures
- Culvert to wetlands

Response – Water level in the wetland ponds (as permitted). At the time of inspection, the wetlands / ponds were under construction and not fully functionally as the design intended. Once the ponds are constructed in accordance with the design these ponds will hold water in the permanent case until such a time the attenuated water level breeches the weir / spillway to the open space of the parkland.

Response – additional suds measures have been introduced. CS in consultation with landscape consultant have provided integrated tree pits. Permeable paving at the on street car spaces to the main roads. In the soft open space's infiltration trenches will be provided to the pavement run off. A 30% green roof coverage to the development is proposed taking into consideration locations of plant and solar panels required as part of the mechanical and electrical design. Green roof details (Bauder OSA) as part of this stage 3 submission which will detail the maintenance of such an

installation. Use of porous asphalt is noted in the FCC report however the issue of the taking in charge of such a product would be cause concern from a council taking in charge / roads / operations perspective.

Response – Culvert to wetlands. The culvert connecting the permitted scheme (Reg. Ref. F16A/0412 ABP Ref. 248970 (and as amended under F20A/0258 and F21A/0046) has to pass over the existing foul and watermain to the north of the site. This culvert is required and will be installed and connected to the wetlands as permitted. The culvert depth of the storm pipe passing over the drain and watermain to the north of the development is to be installed at 600mm deep hence minimising impact on levels in the parklands. If it noted that the plan alignment of this culvert has been informed by Irish Water and the cross over details that Irish Water require.

Appendix A

Storm Drainage Network Windes Calculations

CS CONSULTING
GROUP

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	Add Flow / Climate Change (%)	0
M5-60 (mm)	15.900	Minimum Backdrop Height (m)	0.000
Ratio R	0.300	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500
PIMP (%)	80		

Designed with Level Inverts

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
10.000	66.571	0.333	199.9	0.096	4.00	0.0	0.600	o	225
11.000	32.314	0.207	156.1	0.064	4.00	0.0	0.600	o	225
10.001	59.459	0.197	301.8	0.064	0.00	0.0	0.600	o	300
10.002	33.638	0.113	297.7	0.144	0.00	0.0	0.600	o	375
10.003	78.604	0.262	300.0	0.160	0.00	0.0	0.600	o	375
10.004	10.641	0.036	295.6	0.000	0.00	0.0	0.600	o	450
10.005	19.697	0.028	703.5	0.042	0.00	0.0	0.600	o	1050
12.000	70.076	0.375	186.9	0.000	4.00	0.0	0.600	o	225
12.001	70.774	0.354	199.9	0.120	0.00	0.0	0.600	o	225
12.002	34.303	0.172	199.4	0.125	0.00	0.0	0.600	o	225
12.003	28.176	0.132	213.5	0.102	0.00	0.0	0.600	o	300
10.006	6.090	0.012	507.5	0.000	0.00	0.0	0.600	o	1200
13.000	38.230	0.255	149.9	0.074	4.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
10.000	50.00	5.20	5.181	0.096	0.0	0.0	0.0	0.92	36.6	13.0
11.000	50.00	4.52	5.055	0.064	0.0	0.0	0.0	1.04	41.5	8.7
10.001	50.00	6.31	4.848	0.224	0.0	0.0	0.0	0.90	63.6	30.3
10.002	50.00	6.84	4.651	0.368	0.0	0.0	0.0	1.04	115.4	49.8
10.003	50.00	8.10	4.538	0.528	0.0	0.0	0.0	1.04	115.0	71.5
10.004	50.00	8.25	4.276	0.528	0.0	0.0	0.0	1.18	187.2	71.5
10.005	49.71	8.51	4.240	0.570	0.0	0.0	0.0	1.29	1118.4	76.7
12.000	50.00	5.23	5.245	0.000	0.0	0.0	0.0	0.95	37.9	0.0
12.001	50.00	6.51	4.870	0.120	0.0	0.0	0.0	0.92	36.6	16.2
12.002	50.00	7.13	4.516	0.245	0.0	0.0	0.0	0.92	36.7	33.1
12.003	50.00	7.56	4.344	0.347	0.0	0.0	0.0	1.07	75.8	47.0
10.006	49.54	8.57	4.212	0.917	0.0	0.0	0.0	1.65	1870.4	123.0
13.000	50.00	4.60	7.339	0.074	0.0	0.0	0.0	1.07	42.4	10.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
13.001	46.177	0.307	150.4	0.128	0.00	0.0	0.600	o	225
13.002	14.988	0.076	197.2	0.054	0.00	0.0	0.600	o	300
13.003	62.800	0.314	200.0	0.047	0.00	0.0	0.600	o	375
14.000	88.431	0.590	149.9	0.120	4.00	0.0	0.600	o	225
14.001	6.360	0.042	151.4	0.136	0.00	0.0	0.600	o	225
13.004	17.267	0.086	200.8	0.120	0.00	0.0	0.600	o	375
15.000	47.398	0.316	150.0	0.122	4.00	0.0	0.600	o	225
15.001	47.816	0.239	200.1	0.113	0.00	0.0	0.600	o	300
13.005	67.619	0.151	447.8	0.144	0.00	0.0	0.600	o	525
16.000	55.753	0.587	95.0	0.128	4.00	0.0	0.600	o	225
16.001	44.391	0.654	67.9	0.088	0.00	0.0	0.600	o	225
16.002	45.851	0.116	395.3	0.120	0.00	0.0	0.600	o	375
17.000	34.409	0.227	151.6	0.000	4.00	0.0	0.600	o	225
16.003	48.174	0.107	450.2	0.224	0.00	0.0	0.600	o	525
16.004	48.121	0.107	449.7	0.320	0.00	0.0	0.600	o	525
16.005	10.363	0.022	471.0	0.320	0.00	0.0	0.600	o	525
13.006	27.487	0.062	443.3	0.000	0.00	0.0	0.600	o	600
18.000	54.575	0.270	202.1	0.080	4.00	0.0	0.600	o	225
18.001	35.261	0.190	185.6	0.073	0.00	0.0	0.600	o	225

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
13.001	50.00	5.32	7.084	0.202	0.0	0.0	0.0	1.06	42.3	27.3
13.002	50.00	5.55	6.777	0.256	0.0	0.0	0.0	1.12	78.9	34.7
13.003	50.00	6.36	6.701	0.303	0.0	0.0	0.0	1.28	141.1	41.1
14.000	50.00	5.38	7.018	0.120	0.0	0.0	0.0	1.07	42.4	16.2
14.001	50.00	5.48	6.428	0.256	0.0	0.0	0.0	1.06	42.2	34.7
13.004	50.00	6.59	6.386	0.679	0.0	0.0	0.0	1.28	140.8	92.0
15.000	50.00	4.74	6.857	0.122	0.0	0.0	0.0	1.07	42.4	16.5
15.001	50.00	5.46	6.541	0.234	0.0	0.0	0.0	1.11	78.3	31.7
13.005	50.00	7.66	5.564	1.058	0.0	0.0	0.0	1.05	227.7	143.2
16.000	50.00	4.69	7.400	0.128	0.0	0.0	0.0	1.34	53.4	17.3
16.001	50.00	5.16	6.813	0.216	0.0	0.0	0.0	1.59	63.2	29.2
16.002	50.00	6.00	5.766	0.336	0.0	0.0	0.0	0.91	100.0	45.5
17.000	50.00	4.54	5.879	0.000	0.0	0.0	0.0	1.06	42.1	0.0
16.003	50.00	6.77	5.650	0.560	0.0	0.0	0.0	1.05	227.1	75.8
16.004	50.00	7.53	5.543	0.880	0.0	0.0	0.0	1.05	227.2	119.2
16.005	50.00	7.70	5.436	1.200	0.0	0.0	0.0	1.03	222.0	162.5
13.006	50.00	8.10	5.413	2.258	0.0	0.0	0.0	1.15	325.2	305.7
18.000	50.00	4.99	6.893	0.080	0.0	0.0	0.0	0.92	36.4	10.8
18.001	50.00	5.61	6.623	0.153	0.0	0.0	0.0	0.96	38.0	20.7

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
18.002	79.950	1.176	68.0	0.080	0.00	0.0	0.600	o	225
19.000	83.096	0.602	138.0	0.080	4.00	0.0	0.600	o	300
19.001	30.301	0.152	199.3	0.080	0.00	0.0	0.600	o	375
18.003	20.094	0.058	346.4	0.028	0.00	0.0	0.600	o	375
20.000	50.005	0.420	119.1	0.080	4.00	0.0	0.600	o	225
20.001	30.868	0.155	199.1	0.080	0.00	0.0	0.600	o	375
20.002	16.777	0.084	199.7	0.027	0.00	0.0	0.600	o	375
18.004	68.008	0.135	503.8	0.051	0.00	0.0	0.600	o	600
18.005	65.409	0.131	499.3	0.120	0.00	0.0	0.600	o	750
18.006	65.435	0.130	503.3	0.160	0.00	0.0	0.600	o	750
13.007	7.091	0.009	787.9	0.400	0.00	0.0	0.600	o	825
13.008	19.637	0.026	755.3	0.090	0.00	0.0	0.600	o	1050
13.009	72.854	0.072	1011.9	0.000	0.00	0.0	0.600	o	1050
21.000	58.974	0.295	199.9	0.000	4.00	0.0	0.600	o	300
21.001	6.357	0.032	198.7	0.126	0.00	0.0	0.600	o	300
21.002	73.923	0.370	199.8	0.106	0.00	0.0	0.600	o	375
21.003	92.949	0.299	310.9	0.320	0.00	0.0	0.600	o	450
13.010	22.230	0.061	364.4	0.320	0.00	0.0	0.600	o	1050
13.011	6.976	0.007	996.6	0.062	0.00	0.0	0.600	o	1200
22.000	63.004	0.210	300.0	0.320	4.00	0.0	0.600	o	375

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
18.002	50.00	6.45	6.433	0.233	0.0	0.0	0.0	1.59	63.2	31.5
19.000	50.00	5.04	6.010	0.080	0.0	0.0	0.0	1.34	94.5	10.8
19.001	50.00	5.43	5.408	0.160	0.0	0.0	0.0	1.28	141.3	21.7
18.003	50.00	6.79	4.935	0.421	0.0	0.0	0.0	0.97	106.9	57.0
20.000	50.00	4.70	5.733	0.080	0.0	0.0	0.0	1.20	47.6	10.8
20.001	50.00	5.10	5.313	0.160	0.0	0.0	0.0	1.28	141.4	21.7
20.002	50.00	5.32	5.158	0.187	0.0	0.0	0.0	1.28	141.2	25.3
18.004	50.00	7.84	4.877	0.659	0.0	0.0	0.0	1.08	304.8	89.3
18.005	49.14	8.72	4.742	0.779	0.0	0.0	0.0	1.25	550.3	103.7
18.006	46.95	9.60	4.611	0.939	0.0	0.0	0.0	1.24	548.0	119.4
13.007	46.68	9.71	4.481	3.597	0.0	0.0	0.0	1.05	561.2	454.8
13.008	46.08	9.97	4.472	3.687	0.0	0.0	0.0	1.25	1079.0	460.2
13.009	43.70	11.10	4.446	3.687	0.0	0.0	0.0	1.07	930.7	460.2
21.000	50.00	4.89	5.264	0.000	0.0	0.0	0.0	1.11	78.3	0.0
21.001	50.00	4.98	4.969	0.126	0.0	0.0	0.0	1.11	78.6	17.1
21.002	50.00	5.95	4.937	0.232	0.0	0.0	0.0	1.28	141.2	31.4
21.003	50.00	7.30	4.567	0.552	0.0	0.0	0.0	1.15	182.5	74.7
13.010	43.30	11.31	4.268	4.559	0.0	0.0	0.0	1.80	1558.0	534.7
13.011	43.11	11.41	4.207	4.622	0.0	0.0	0.0	1.18	1330.7	539.6
22.000	50.00	5.01	5.300	0.320	0.0	0.0	0.0	1.04	115.0	43.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
23.000	85.414	0.323	264.4	0.000	4.00	0.0	0.600	o	300
24.000	61.291	0.199	308.0	0.000	4.00	0.0	0.600	o	375
23.001	44.973	0.450	99.9	0.000	0.00	0.0	0.600	o	450
10.007	68.661	0.088	780.2	0.000	0.00	0.0	0.600	o	1200
25.000	90.280	4.514	20.0	0.201	4.00	0.0	0.600	o	300
25.001	15.517	0.825	18.8	0.128	0.00	0.0	0.600	o	300
25.002	74.749	2.738	27.3	0.176	0.00	0.0	0.600	o	375
25.003	57.836	1.231	47.0	0.161	0.00	0.0	0.600	o	375
10.008	9.460	0.023	411.3	3.200	0.00	0.0	0.600	o	1350
10.009	46.751	0.061	766.4	0.320	0.00	0.0	0.600	o	1350
10.010	72.531	0.094	771.6	0.700	0.00	0.0	0.600	o	1350
26.000	45.048	0.150	300.3	1.500	4.00	0.0	0.600	o	675
26.001	10.138	0.034	298.2	0.000	0.00	0.0	0.600	o	675
26.002	43.971	0.150	293.1	0.600	0.00	0.0	0.600	o	675
27.000	39.958	0.133	300.4	1.500	4.00	0.0	0.600	o	750
27.001	41.283	0.134	308.1	0.000	0.00	0.0	0.600	o	750
10.011	61.140	0.079	773.9	0.000	0.00	0.0	0.600	o	1500
10.012	47.459	0.062	765.5	0.495	0.00	0.0	0.600	o	1500

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
23.000	50.00	5.48	5.410	0.000	0.0	0.0	0.0	0.96	68.0	0.0
24.000	50.00	4.99	5.595	0.000	0.0	0.0	0.0	1.03	113.4	0.0
23.001	50.00	5.85	5.087	0.000	0.0	0.0	0.0	2.03	323.5	0.0
10.007	41.54	12.27	4.200	5.858	0.0	0.0	0.0	1.33	1505.7	659.1
25.000	50.00	4.43	13.442	0.201	0.0	0.0	0.0	3.53	249.6	27.2
25.001	50.00	4.50	8.928	0.329	0.0	0.0	0.0	3.64	257.4	44.5
25.002	50.00	4.86	8.103	0.505	0.0	0.0	0.0	3.48	384.3	68.4
25.003	50.00	5.22	5.365	0.666	0.0	0.0	0.0	2.65	292.6	90.1
10.008	41.40	12.35	4.112	9.724	0.0	0.0	0.0	1.98	2829.4	1090.4
10.009	40.50	12.89	4.089	10.044	0.0	0.0	0.0	1.44	2067.9	1101.6
10.010	39.18	13.73	4.028	10.744	0.0	0.0	0.0	1.44	2060.9	1140.0
26.000	50.00	4.50	4.283	1.500	0.0	0.0	0.0	1.51	539.3	203.1
26.001	50.00	4.61	4.133	1.500	0.0	0.0	0.0	1.51	541.3	203.1
26.002	50.00	5.09	4.099	2.100	0.0	0.0	0.0	1.53	545.9	284.4
27.000	50.00	4.41	4.216	1.500	0.0	0.0	0.0	1.61	711.0	203.1
27.001	50.00	4.85	4.083	1.500	0.0	0.0	0.0	1.59	702.0	203.1
10.011	38.21	14.39	3.934	14.344	0.0	0.0	0.0	1.53	2710.6	1484.3
10.012	37.50	14.90	3.855	14.839	0.0	0.0	0.0	1.54	2725.7	1506.9

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
28.000	59.843	0.120	498.7	0.800	4.00	0.0	0.600	o	600
28.001	27.849	0.032	870.3	0.400	0.00	0.0	0.600	o	600
28.002	4.723	0.032	147.6	0.000	0.00	0.0	0.600	o	600
10.013	33.033	0.043	768.2	0.000	0.00	0.0	0.600	[]	-12
10.014	56.194	0.281	200.0	0.000	0.00	0.0	0.600	[]	-12
10.015	19.264	0.096	200.7	0.000	0.00	0.0	0.600	[]	-12

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
28.000	50.00	4.92	4.000	0.800	0.0	0.0	0.0	1.08	306.4	108.3
28.001	50.00	5.49	3.880	1.200	0.0	0.0	0.0	0.82	231.1	162.5
28.002	50.00	5.53	3.848	1.200	0.0	0.0	0.0	2.00	566.2	162.5
10.013	36.97	15.30	3.793	16.039	0.0	0.0	0.0	1.40	2520.4	1606.1
10.014	36.54	15.64	3.750	16.039	0.0	0.0	0.0	2.76	4961.8	1606.1
10.015	36.39	15.75	3.469	16.039	0.0	0.0	0.0	2.75	4953.2	1606.1

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S11-5	6.992	1.811	Open Manhole	1200	10.000	5.181	225				
11-4-1	6.919	1.864	Open Manhole	1200	11.000	5.055	225				
S11-4	6.916	2.068	Open Manhole	1200	10.001	4.848	300	10.000	4.848	225	
								11.000	4.848	225	
S11-3	6.378	1.727	Open Manhole	1350	10.002	4.651	375	10.001	4.651	300	
S11-2	6.707	2.169	Open Manhole	1350	10.003	4.538	375	10.002	4.538	375	
S11-1	6.652	2.376	Open Manhole	1350	10.004	4.276	450	10.003	4.276	375	
S11	6.753	2.513	Open Manhole	1800	10.005	4.240	1050	10.004	4.240	450	
S10-4	6.733	1.488	Open Manhole	1050	12.000	5.245	225				
S10-3	7.020	2.150	Open Manhole	1200	12.001	4.870	225	12.000	4.870	225	
S10-2	7.066	2.550	Open Manhole	1200	12.002	4.516	225	12.001	4.516	225	
S10-1	7.007	2.663	Open Manhole	1200	12.003	4.344	300	12.002	4.344	225	
S10	7.011	2.799	Open Manhole	1800	10.006	4.212	1200	10.005	4.212	1050	
								12.003	4.212	300	
S21	9.158	1.819	Open Manhole	1200	13.000	7.339	225				
S20	9.073	1.989	Open Manhole	1200	13.001	7.084	225	13.000	7.084	225	
S19	8.970	2.193	Open Manhole	1200	13.002	6.777	300	13.001	6.777	225	
S18	8.864	2.163	Open Manhole	1350	13.003	6.701	375	13.002	6.701	300	
S17-2	8.730	1.712	Open Manhole	1050	14.000	7.018	225				
S17-1	8.277	1.849	Open Manhole	1200	14.001	6.428	225	14.000	6.428	225	
S17	8.146	1.760	Open Manhole	1350	13.004	6.386	375	13.003	6.387	375	1
								14.001	6.386	225	
S16-2	8.480	1.623	Open Manhole	1050	15.000	6.857	225				
S16-1	8.418	1.877	Open Manhole	1200	15.001	6.541	300	15.000	6.541	225	
S16	7.985	2.421	Open Manhole	1500	13.005	5.564	525	13.004	6.300	375	586
								15.001	6.302	300	513
S15-6	9.170	1.770	Open Manhole	1200	16.000	7.400	225				
S15-5	8.556	1.743	Open Manhole	1200	16.001	6.813	225	16.000	6.813	225	
S15-4	8.068	2.302	Open Manhole	1350	16.002	5.766	375	16.001	6.159	225	243
S15-3-1	7.556	1.677	Open Manhole	1050	17.000	5.879	225				
S15-3	7.934	2.284	Open Manhole	1500	16.003	5.650	525	16.002	5.650	375	
								17.000	5.652	225	
S15-2	7.670	2.127	Open Manhole	1500	16.004	5.543	525	16.003	5.543	525	
S15-1	7.196	1.760	Open Manhole	1500	16.005	5.436	525	16.004	5.436	525	
S15	7.128	1.715	Open Manhole	1500	13.006	5.413	600	13.005	5.413	525	
								16.005	5.414	525	
S18-1	9.177	2.284	Open Manhole	1200	18.000	6.893	225				
S18-2	8.678	2.055	Open Manhole	1200	18.001	6.623	225	18.000	6.623	225	
S14-5	8.081	1.648	Open Manhole	1050	18.002	6.433	225	18.001	6.433	225	
S14-4-2	7.870	1.860	Open Manhole	1200	19.000	6.010	300				
S14-4-1	7.031	1.623	Open Manhole	1350	19.001	5.408	375	19.000	5.408	300	
S14-4	6.735	1.800	Open Manhole	1350	18.003	4.935	375	18.002	5.257	225	172
								19.001	5.256	375	321
S14-3-3	7.488	1.755	Open Manhole	1200	20.000	5.733	225				
S14-3-2	6.800	1.487	Open Manhole	1350	20.001	5.313	375	20.000	5.313	225	
S14-3-1	6.550	1.392	Open Manhole	1350	20.002	5.158	375	20.001	5.158	375	
S14-3	6.540	1.663	Open Manhole	1500	18.004	4.877	600	18.003	4.877	375	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
								20.002	5.074	375	
S14-2	6.217	1.475	Open Manhole	1800	18.005	4.742	750	18.004	4.742	600	
S14-1	6.934	2.323	Open Manhole	1800	18.006	4.611	750	18.005	4.611	750	
S14	6.872	2.391	Open Manhole	1800	13.007	4.481	825	13.006	5.351	600	645
								18.006	4.481	750	
S13	6.641	2.169	Open Manhole	1800	13.008	4.472	1050	13.007	4.472	825	
S9C	7.090	2.644	Open Manhole	1800	13.009	4.446	1050	13.008	4.446	1050	
S12-4	6.446	1.182	Open Manhole	1050	21.000	5.264	300				
S12-3	6.886	1.917	Open Manhole	1200	21.001	4.969	300	21.000	4.969	300	
S12-2	6.777	1.840	Open Manhole	1350	21.002	4.937	375	21.001	4.937	300	
S12-1	6.556	1.989	Open Manhole	1350	21.003	4.567	450	21.002	4.567	375	
S9B	6.397	2.129	Open Manhole	1800	13.010	4.268	1050	13.009	4.374	1050	106
								21.003	4.268	450	
S9A	6.951	2.744	Open Manhole	1800	13.011	4.207	1200	13.010	4.207	1050	
S9A-1	6.951	1.651	Open Manhole	1350	22.000	5.300	375				
S9-1-1	6.897	1.487	Open Manhole	1050	23.000	5.410	300				
S9-2	6.811	1.216	Open Manhole	1350	24.000	5.595	375				
S9-1	7.280	2.193	Open Manhole	1350	23.001	5.087	450	23.000	5.087	300	
								24.000	5.396	375	234
S9	6.947	2.747	Open Manhole	1800	10.007	4.200	1200	10.006	4.200	1200	
								13.011	4.200	1200	
								22.000	5.090	375	65
								23.001	4.637	450	
S8-4	15.676	2.234	Open Manhole	1200	25.000	13.442	300				
S8-3	11.261	2.333	Open Manhole	1200	25.001	8.928	300	25.000	8.928	300	
S8-2	10.514	2.411	Open Manhole	1350	25.002	8.103	375	25.001	8.103	300	
S8-1	7.601	2.236	Open Manhole	1350	25.003	5.365	375	25.002	5.365	375	
S8	6.606	2.494	Open Manhole	1800	10.008	4.112	1350	10.007	4.112	1200	
								25.003	4.134	375	
S8A	6.613	2.524	Open Manhole	1800	10.009	4.089	1350	10.008	4.089	1350	
S6	6.862	2.834	Open Manhole	1800	10.010	4.028	1350	10.009	4.028	1350	
S5-3	6.704	2.421	Open Manhole	1500	26.000	4.283	675				
S5-2	6.962	2.829	Open Manhole	1500	26.001	4.133	675	26.000	4.133	675	
S5-1	6.865	2.766	Open Manhole	1500	26.002	4.099	675	26.001	4.099	675	
S4-2	6.861	2.645	Open Manhole	1800	27.000	4.216	750				
S4-1	6.522	2.439	Open Manhole	1800	27.001	4.083	750	27.000	4.083	750	
S4	6.682	2.748	Open Manhole	1800	10.011	3.934	1500	10.010	3.934	1350	
								26.002	3.949	675	
								27.001	3.949	750	
S3	6.280	2.425	Open Manhole	1800	10.012	3.855	1500	10.011	3.855	1500	
S2-2	6.000	2.000	Open Manhole	1500	28.000	4.000	600				
S14	5.630	1.750	Open Manhole	1500	28.001	3.880	600	28.000	3.880	600	
35	6.000	2.152	Open Manhole	1500	28.002	3.848	600	28.001	3.848	600	
S2	6.302	2.509	Open Manhole	3000	10.013	3.793	-12	10.012	3.793	1500	
								28.002	3.816	600	523
S1A	6.000	2.250	Open Manhole	3000	10.014	3.750	-12	10.013	3.750	-12	
S1	6.166	2.697	Open Manhole	3000	10.015	3.469	-12	10.014	3.469	-12	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
WETLANDS	6.000	2.627	Open Manhole	0		OUTFALL		10.015	3.373	-12	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
10.000	o	225	S11-5	6.992	5.181	1.586	Open Manhole	1200
11.000	o	225	11-4-1	6.919	5.055	1.639	Open Manhole	1200
10.001	o	300	S11-4	6.916	4.848	1.768	Open Manhole	1200
10.002	o	375	S11-3	6.378	4.651	1.352	Open Manhole	1350
10.003	o	375	S11-2	6.707	4.538	1.794	Open Manhole	1350
10.004	o	450	S11-1	6.652	4.276	1.926	Open Manhole	1350
10.005	o	1050	S11	6.753	4.240	1.463	Open Manhole	1800
12.000	o	225	S10-4	6.733	5.245	1.263	Open Manhole	1050
12.001	o	225	S10-3	7.020	4.870	1.925	Open Manhole	1200
12.002	o	225	S10-2	7.066	4.516	2.325	Open Manhole	1200
12.003	o	300	S10-1	7.007	4.344	2.363	Open Manhole	1200
10.006	o	1200	S10	7.011	4.212	1.599	Open Manhole	1800
13.000	o	225	S21	9.158	7.339	1.594	Open Manhole	1200
13.001	o	225	S20	9.073	7.084	1.764	Open Manhole	1200
13.002	o	300	S19	8.970	6.777	1.893	Open Manhole	1200
13.003	o	375	S18	8.864	6.701	1.788	Open Manhole	1350
14.000	o	225	S17-2	8.730	7.018	1.487	Open Manhole	1050
14.001	o	225	S17-1	8.277	6.428	1.624	Open Manhole	1200
13.004	o	375	S17	8.146	6.386	1.385	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
10.000	66.571	199.9	S11-4	6.916	4.848	1.843	Open Manhole	1200
11.000	32.314	156.1	S11-4	6.916	4.848	1.843	Open Manhole	1200
10.001	59.459	301.8	S11-3	6.378	4.651	1.427	Open Manhole	1350
10.002	33.638	297.7	S11-2	6.707	4.538	1.794	Open Manhole	1350
10.003	78.604	300.0	S11-1	6.652	4.276	2.001	Open Manhole	1350
10.004	10.641	295.6	S11	6.753	4.240	2.063	Open Manhole	1800
10.005	19.697	703.5	S10	7.011	4.212	1.749	Open Manhole	1800
12.000	70.076	186.9	S10-3	7.020	4.870	1.925	Open Manhole	1200
12.001	70.774	199.9	S10-2	7.066	4.516	2.325	Open Manhole	1200
12.002	34.303	199.4	S10-1	7.007	4.344	2.438	Open Manhole	1200
12.003	28.176	213.5	S10	7.011	4.212	2.499	Open Manhole	1800
10.006	6.090	507.5	S9	6.947	4.200	1.547	Open Manhole	1800
13.000	38.230	149.9	S20	9.073	7.084	1.764	Open Manhole	1200
13.001	46.177	150.4	S19	8.970	6.777	1.968	Open Manhole	1200
13.002	14.988	197.2	S18	8.864	6.701	1.863	Open Manhole	1350
13.003	62.800	200.0	S17	8.146	6.387	1.384	Open Manhole	1350
14.000	88.431	149.9	S17-1	8.277	6.428	1.624	Open Manhole	1200
14.001	6.360	151.4	S17	8.146	6.386	1.535	Open Manhole	1350
13.004	17.267	200.8	S16	7.985	6.300	1.310	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
15.000	o	225	S16-2	8.480	6.857	1.398	Open Manhole	1050
15.001	o	300	S16-1	8.418	6.541	1.577	Open Manhole	1200
13.005	o	525	S16	7.985	5.564	1.896	Open Manhole	1500
16.000	o	225	S15-6	9.170	7.400	1.545	Open Manhole	1200
16.001	o	225	S15-5	8.556	6.813	1.518	Open Manhole	1200
16.002	o	375	S15-4	8.068	5.766	1.927	Open Manhole	1350
17.000	o	225	S15-3-1	7.556	5.879	1.452	Open Manhole	1050
16.003	o	525	S15-3	7.934	5.650	1.759	Open Manhole	1500
16.004	o	525	S15-2	7.670	5.543	1.602	Open Manhole	1500
16.005	o	525	S15-1	7.196	5.436	1.235	Open Manhole	1500
13.006	o	600	S15	7.128	5.413	1.115	Open Manhole	1500
18.000	o	225	S18-1	9.177	6.893	2.059	Open Manhole	1200
18.001	o	225	S18-2	8.678	6.623	1.830	Open Manhole	1200
18.002	o	225	S14-5	8.081	6.433	1.423	Open Manhole	1050
19.000	o	300	S14-4-2	7.870	6.010	1.560	Open Manhole	1200
19.001	o	375	S14-4-1	7.031	5.408	1.248	Open Manhole	1350
18.003	o	375	S14-4	6.735	4.935	1.425	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
15.000	47.398	150.0	S16-1	8.418	6.541	1.652	Open Manhole	1200
15.001	47.816	200.1	S16	7.985	6.302	1.383	Open Manhole	1500
13.005	67.619	447.8	S15	7.128	5.413	1.190	Open Manhole	1500
16.000	55.753	95.0	S15-5	8.556	6.813	1.518	Open Manhole	1200
16.001	44.391	67.9	S15-4	8.068	6.159	1.684	Open Manhole	1350
16.002	45.851	395.3	S15-3	7.934	5.650	1.909	Open Manhole	1500
17.000	34.409	151.6	S15-3	7.934	5.652	2.057	Open Manhole	1500
16.003	48.174	450.2	S15-2	7.670	5.543	1.602	Open Manhole	1500
16.004	48.121	449.7	S15-1	7.196	5.436	1.235	Open Manhole	1500
16.005	10.363	471.0	S15	7.128	5.414	1.189	Open Manhole	1500
13.006	27.487	443.3	S14	6.872	5.351	0.921	Open Manhole	1800
18.000	54.575	202.1	S18-2	8.678	6.623	1.830	Open Manhole	1200
18.001	35.261	185.6	S14-5	8.081	6.433	1.423	Open Manhole	1050
18.002	79.950	68.0	S14-4	6.735	5.257	1.253	Open Manhole	1350
19.000	83.096	138.0	S14-4-1	7.031	5.408	1.323	Open Manhole	1350
19.001	30.301	199.3	S14-4	6.735	5.256	1.104	Open Manhole	1350
18.003	20.094	346.4	S14-3	6.540	4.877	1.288	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
20.000	o	225	S14-3-3	7.488	5.733	1.530	Open Manhole	1200
20.001	o	375	S14-3-2	6.800	5.313	1.112	Open Manhole	1350
20.002	o	375	S14-3-1	6.550	5.158	1.017	Open Manhole	1350
18.004	o	600	S14-3	6.540	4.877	1.063	Open Manhole	1500
18.005	o	750	S14-2	6.217	4.742	0.725	Open Manhole	1800
18.006	o	750	S14-1	6.934	4.611	1.573	Open Manhole	1800
13.007	o	825	S14	6.872	4.481	1.566	Open Manhole	1800
13.008	o	1050	S13	6.641	4.472	1.119	Open Manhole	1800
13.009	o	1050	S9C	7.090	4.446	1.594	Open Manhole	1800
21.000	o	300	S12-4	6.446	5.264	0.882	Open Manhole	1050
21.001	o	300	S12-3	6.886	4.969	1.617	Open Manhole	1200
21.002	o	375	S12-2	6.777	4.937	1.465	Open Manhole	1350
21.003	o	450	S12-1	6.556	4.567	1.539	Open Manhole	1350
13.010	o	1050	S9B	6.397	4.268	1.079	Open Manhole	1800
13.011	o	1200	S9A	6.951	4.207	1.544	Open Manhole	1800
22.000	o	375	S9A-1	6.951	5.300	1.276	Open Manhole	1350
23.000	o	300	S9-1-1	6.897	5.410	1.187	Open Manhole	1050
24.000	o	375	S9-2	6.811	5.595	0.841	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
20.000	50.005	119.1	S14-3-2	6.800	5.313	1.262	Open Manhole	1350
20.001	30.868	199.1	S14-3-1	6.550	5.158	1.017	Open Manhole	1350
20.002	16.777	199.7	S14-3	6.540	5.074	1.091	Open Manhole	1500
18.004	68.008	503.8	S14-2	6.217	4.742	0.875	Open Manhole	1800
18.005	65.409	499.3	S14-1	6.934	4.611	1.573	Open Manhole	1800
18.006	65.435	503.3	S14	6.872	4.481	1.641	Open Manhole	1800
13.007	7.091	787.9	S13	6.641	4.472	1.344	Open Manhole	1800
13.008	19.637	755.3	S9C	7.090	4.446	1.594	Open Manhole	1800
13.009	72.854	1011.9	S9B	6.397	4.374	0.973	Open Manhole	1800
21.000	58.974	199.9	S12-3	6.886	4.969	1.617	Open Manhole	1200
21.001	6.357	198.7	S12-2	6.777	4.937	1.540	Open Manhole	1350
21.002	73.923	199.8	S12-1	6.556	4.567	1.614	Open Manhole	1350
21.003	92.949	310.9	S9B	6.397	4.268	1.679	Open Manhole	1800
13.010	22.230	364.4	S9A	6.951	4.207	1.694	Open Manhole	1800
13.011	6.976	996.6	S9	6.947	4.200	1.547	Open Manhole	1800
22.000	63.004	300.0	S9	6.947	5.090	1.482	Open Manhole	1800
23.000	85.414	264.4	S9-1	7.280	5.087	1.893	Open Manhole	1350
24.000	61.291	308.0	S9-1	7.280	5.396	1.509	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
23.001	o	450	S9-1	7.280	5.087	1.743	Open Manhole	1350
10.007	o	1200	S9	6.947	4.200	1.547	Open Manhole	1800
25.000	o	300	S8-4	15.676	13.442	1.934	Open Manhole	1200
25.001	o	300	S8-3	11.261	8.928	2.033	Open Manhole	1200
25.002	o	375	S8-2	10.514	8.103	2.036	Open Manhole	1350
25.003	o	375	S8-1	7.601	5.365	1.861	Open Manhole	1350
10.008	o	1350	S8	6.606	4.112	1.144	Open Manhole	1800
10.009	o	1350	S8A	6.613	4.089	1.174	Open Manhole	1800
10.010	o	1350	S6	6.862	4.028	1.484	Open Manhole	1800
26.000	o	675	S5-3	6.704	4.283	1.746	Open Manhole	1500
26.001	o	675	S5-2	6.962	4.133	2.154	Open Manhole	1500
26.002	o	675	S5-1	6.865	4.099	2.091	Open Manhole	1500
27.000	o	750	S4-2	6.861	4.216	1.895	Open Manhole	1800
27.001	o	750	S4-1	6.522	4.083	1.689	Open Manhole	1800
10.011	o	1500	S4	6.682	3.934	1.248	Open Manhole	1800
10.012	o	1500	S3	6.280	3.855	0.925	Open Manhole	1800
28.000	o	600	S2-2	6.000	4.000	1.400	Open Manhole	1500
28.001	o	600	S14	5.630	3.880	1.150	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
23.001	44.973	99.9	S9	6.947	4.637	1.860	Open Manhole	1800
10.007	68.661	780.2	S8	6.606	4.112	1.294	Open Manhole	1800
25.000	90.280	20.0	S8-3	11.261	8.928	2.033	Open Manhole	1200
25.001	15.517	18.8	S8-2	10.514	8.103	2.111	Open Manhole	1350
25.002	74.749	27.3	S8-1	7.601	5.365	1.861	Open Manhole	1350
25.003	57.836	47.0	S8	6.606	4.134	2.097	Open Manhole	1800
10.008	9.460	411.3	S8A	6.613	4.089	1.174	Open Manhole	1800
10.009	46.751	766.4	S6	6.862	4.028	1.484	Open Manhole	1800
10.010	72.531	771.6	S4	6.682	3.934	1.398	Open Manhole	1800
26.000	45.048	300.3	S5-2	6.962	4.133	2.154	Open Manhole	1500
26.001	10.138	298.2	S5-1	6.865	4.099	2.091	Open Manhole	1500
26.002	43.971	293.1	S4	6.682	3.949	2.058	Open Manhole	1800
27.000	39.958	300.4	S4-1	6.522	4.083	1.689	Open Manhole	1800
27.001	41.283	308.1	S4	6.682	3.949	1.983	Open Manhole	1800
10.011	61.140	773.9	S3	6.280	3.855	0.925	Open Manhole	1800
10.012	47.459	765.5	S2	6.302	3.793	1.009	Open Manhole	3000
28.000	59.843	498.7	S14	5.630	3.880	1.150	Open Manhole	1500
28.001	27.849	870.3	35	6.000	3.848	1.552	Open Manhole	1500

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
28.002	o	600	35	6.000	3.848	1.552	Open Manhole	1500
10.013	[]	-12	S2	6.302	3.793	2.409	Open Manhole	3000
10.014	[]	-12	S1A	6.000	3.750	2.150	Open Manhole	3000
10.015	[]	-12	S1	6.166	3.469	2.597	Open Manhole	3000

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
28.002	4.723	147.6	S2	6.302	3.816	1.886	Open Manhole	3000
10.013	33.033	768.2	S1A	6.000	3.750	2.150	Open Manhole	3000
10.014	56.194	200.0	S1	6.166	3.469	2.597	Open Manhole	3000
10.015	19.264	200.7	WETLANDS	6.000	3.373	2.527	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
10.000	-	-	80	0.120	0.096	0.096
11.000	-	-	80	0.080	0.064	0.064
10.001	-	-	80	0.080	0.064	0.064
10.002	-	-	80	0.180	0.144	0.144
10.003	-	-	80	0.200	0.160	0.160
10.004	-	-	80	0.000	0.000	0.000
10.005	-	-	80	0.052	0.042	0.042
12.000	-	-	80	0.000	0.000	0.000
12.001	-	-	80	0.150	0.120	0.120
12.002	-	-	80	0.156	0.125	0.125
12.003	-	-	80	0.128	0.102	0.102
10.006	-	-	80	0.000	0.000	0.000
13.000	-	-	80	0.092	0.074	0.074
13.001	-	-	80	0.160	0.128	0.128
13.002	-	-	80	0.068	0.054	0.054
13.003	-	-	80	0.059	0.047	0.047
14.000	-	-	80	0.150	0.120	0.120
14.001	-	-	80	0.170	0.136	0.136
13.004	-	-	80	0.150	0.120	0.120
15.000	-	-	80	0.152	0.122	0.122
15.001	-	-	80	0.141	0.113	0.113
13.005	-	-	80	0.180	0.144	0.144
16.000	-	-	80	0.160	0.128	0.128
16.001	-	-	80	0.110	0.088	0.088
16.002	-	-	80	0.150	0.120	0.120
17.000	-	-	80	0.000	0.000	0.000
16.003	-	-	80	0.280	0.224	0.224
16.004	-	-	80	0.400	0.320	0.320
16.005	-	-	80	0.400	0.320	0.320
13.006	-	-	80	0.000	0.000	0.000
18.000	-	-	80	0.100	0.080	0.080
18.001	-	-	80	0.091	0.073	0.073
18.002	-	-	80	0.100	0.080	0.080
19.000	-	-	80	0.100	0.080	0.080
19.001	-	-	80	0.100	0.080	0.080
18.003	-	-	80	0.035	0.028	0.028
20.000	-	-	80	0.100	0.080	0.080
20.001	-	-	80	0.100	0.080	0.080
20.002	-	-	80	0.034	0.027	0.027
18.004	-	-	80	0.064	0.051	0.051
18.005	-	-	80	0.150	0.120	0.120
18.006	-	-	80	0.200	0.160	0.160
13.007	-	-	80	0.500	0.400	0.400
13.008	-	-	80	0.113	0.090	0.090
13.009	-	-	80	0.000	0.000	0.000
21.000	-	-	80	0.000	0.000	0.000
21.001	-	-	80	0.158	0.126	0.126
21.002	-	-	80	0.132	0.106	0.106
21.003	-	-	80	0.400	0.320	0.320
13.010	-	-	80	0.400	0.320	0.320
13.011	-	-	80	0.078	0.062	0.062
22.000	-	-	80	0.400	0.320	0.320
23.000	-	-	80	0.000	0.000	0.000
24.000	-	-	80	0.000	0.000	0.000
23.001	-	-	80	0.000	0.000	0.000
10.007	-	-	80	0.000	0.000	0.000
25.000	-	-	80	0.251	0.201	0.201
25.001	-	-	80	0.160	0.128	0.128
25.002	-	-	80	0.220	0.176	0.176
25.003	-	-	80	0.201	0.161	0.161
10.008	-	-	80	4.000	3.200	3.200
10.009	-	-	80	0.400	0.320	0.320

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
10.010	-	-	100	0.700	0.700	0.700
26.000	-	-	100	1.500	1.500	1.500
26.001	-	-	100	0.000	0.000	0.000
26.002	-	-	100	0.600	0.600	0.600
27.000	-	-	100	1.500	1.500	1.500
27.001	-	-	100	0.000	0.000	0.000
10.011	-	-	100	0.000	0.000	0.000
10.012	-	-	100	0.495	0.495	0.495
28.000	-	-	100	0.800	0.800	0.800
28.001	-	-	100	0.400	0.400	0.400
28.002	-	-	100	0.000	0.000	0.000
10.013	-	-	100	0.000	0.000	0.000
10.014	-	-	100	0.000	0.000	0.000
10.015	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				18.550	16.039	16.039

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
10.015	WETLANDS	6.000	3.373	2.542	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	20.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	1.000
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	5760
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	24

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 0 Number of Storage Structures 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Winter
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	15.900	Storm Duration (mins)	2880
Ratio R	0.300		

Summary of Results for 15 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	6.246	0.840	0.000	0.75	0.0	26.6	SURCHARGED
11.000	11-4-1	6.158	0.878	0.000	0.46	0.0	18.1	SURCHARGED
10.001	S11-4	6.122	0.974	0.000	0.84	0.0	51.0	SURCHARGED
10.002	S11-3	6.027	1.001	0.000	0.80	0.0	82.6	SURCHARGED
10.003	S11-2	5.975	1.062	0.000	1.04	0.0	114.1	SURCHARGED
10.004	S11-1	5.795	1.069	0.000	0.84	0.0	110.7	SURCHARGED
10.005	S11	5.769	0.479	0.000	0.21	0.0	110.2	SURCHARGED
12.000	S10-4	6.337	0.867	0.000	-0.13	0.0	-4.8	SURCHARGED
12.001	S10-3	6.342	1.247	0.000	0.71	0.0	25.2	SURCHARGED
12.002	S10-2	6.157	1.416	0.000	1.60	0.0	55.4	SURCHARGED
12.003	S10-1	5.845	1.201	0.000	1.20	0.0	82.0	SURCHARGED
10.006	S10	5.764	0.352	0.000	0.20	0.0	181.8	SURCHARGED
13.000	S21	8.041	0.477	0.000	0.59	0.0	23.5	SURCHARGED
13.001	S20	7.955	0.646	0.000	1.56	0.0	63.1	SURCHARGED
13.002	S19	7.176	0.099	0.000	1.18	0.0	78.0	SURCHARGED
13.003	S18	7.072	-0.004	0.000	0.67	0.0	89.0	OK
14.000	S17-2	7.745	0.502	0.000	0.93	0.0	38.5	SURCHARGED
14.001	S17-1	7.197	0.544	0.000	2.49	0.0	80.8	SURCHARGED
13.004	S17	6.926	0.165	0.000	1.74	0.0	200.9	SURCHARGED
15.000	S16-2	7.294	0.212	0.000	1.09	0.0	44.0	SURCHARGED
15.001	S16-1	6.896	0.055	0.000	1.10	0.0	81.1	SURCHARGED
13.005	S16	6.618	0.529	0.000	1.45	0.0	302.2	SURCHARGED
16.000	S15-6	7.847	0.222	0.000	0.87	0.0	44.7	SURCHARGED
16.001	S15-5	7.500	0.462	0.000	1.07	0.0	64.4	SURCHARGED
16.002	S15-4	6.791	0.650	0.000	1.05	0.0	96.9	SURCHARGED
17.000	S15-3-1	6.658	0.554	0.000	-0.10	0.0	-3.8	SURCHARGED
16.003	S15-3	6.663	0.488	0.000	0.78	0.0	158.0	SURCHARGED
16.004	S15-2	6.593	0.525	0.000	1.23	0.0	248.7	SURCHARGED
16.005	S15-1	6.416	0.455	0.000	2.90	0.0	343.5	SURCHARGED
13.006	S15	6.283	0.270	0.000	2.37	0.0	618.1	SURCHARGED
18.000	S18-1	7.340	0.222	0.000	0.79	0.0	27.5	SURCHARGED
18.001	S18-2	7.258	0.410	0.000	1.22	0.0	43.9	SURCHARGED
18.002	S14-5	7.032	0.374	0.000	1.01	0.0	62.0	SURCHARGED
19.000	S14-4-2	6.135	-0.175	0.000	0.33	0.0	29.7	OK
19.001	S14-4-1	6.119	0.336	0.000	0.47	0.0	58.7	SURCHARGED
18.003	S14-4	6.108	0.798	0.000	1.19	0.0	107.2	SURCHARGED
20.000	S14-3-3	6.116	0.158	0.000	0.68	0.0	31.0	SURCHARGED
20.001	S14-3-2	6.088	0.400	0.000	0.48	0.0	60.5	SURCHARGED
20.002	S14-3-1	6.077	0.544	0.000	0.48	0.0	55.2	SURCHARGED
18.004	S14-3	6.066	0.589	0.000	0.53	0.0	147.0	SURCHARGED
18.005	S14-2	6.036	0.544	0.000	0.26	0.0	125.8	FLOOD RISK
18.006	S14-1	6.018	0.657	0.000	0.30	0.0	146.1	SURCHARGED
13.007	S14	5.996	0.690	0.000	2.05	0.0	770.3	SURCHARGED
13.008	S13	5.935	0.413	0.000	1.61	0.0	784.9	SURCHARGED
13.009	S9C	5.896	0.400	0.000	0.94	0.0	741.9	SURCHARGED
21.000	S12-4	5.905	0.341	0.000	-0.04	0.0	-2.8	SURCHARGED
21.001	S12-3	5.908	0.639	0.000	0.64	0.0	35.3	SURCHARGED
21.002	S12-2	5.899	0.587	0.000	0.47	0.0	63.3	SURCHARGED
21.003	S12-1	5.872	0.855	0.000	0.76	0.0	132.1	SURCHARGED
13.010	S9B	5.828	0.510	0.000	0.84	0.0	853.4	SURCHARGED
13.011	S9A	5.781	0.374	0.000	1.02	0.0	860.1	SURCHARGED
22.000	S9A-1	5.789	0.114	0.000	1.13	0.0	122.1	SURCHARGED
23.000	S9-1-1	5.738	0.028	0.000	-0.02	0.0	-1.5	SURCHARGED
24.000	S9-2	5.738	-0.232	0.000	-0.01	0.0	-1.4	OK
23.001	S9-1	5.738	0.201	0.000	-0.28	0.0	-81.9	SURCHARGED
10.007	S9	5.760	0.360	0.000	0.83	0.0	1018.2	SURCHARGED
25.000	S8-4	13.561	-0.181	0.000	0.33	0.0	79.6	OK

Summary of Results for 15 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.096	-0.132	0.000	0.60	0.0	130.3	OK
25.002	S8-2	8.302	-0.176	0.000	0.54	0.0	198.1	OK
25.003	S8-1	6.268	0.528	0.000	0.86	0.0	236.0	SURCHARGED
10.008	S8	5.697	0.235	0.000	1.61	0.0	1674.6	SURCHARGED
10.009	S8A	5.651	0.212	0.000	1.12	0.0	1680.1	SURCHARGED
10.010	S6	5.572	0.194	0.000	1.07	0.0	1752.4	SURCHARGED
26.000	S5-3	5.695	0.737	0.000	1.10	0.0	502.1	SURCHARGED
26.001	S5-2	5.616	0.808	0.000	1.53	0.0	499.4	SURCHARGED
26.002	S5-1	5.574	0.800	0.000	1.43	0.0	658.7	SURCHARGED
27.000	S4-2	5.506	0.540	0.000	0.91	0.0	529.6	SURCHARGED
27.001	S4-1	5.480	0.647	0.000	0.88	0.0	506.5	SURCHARGED
10.011	S4	5.455	0.021	0.000	1.11	0.0	2262.9	SURCHARGED
10.012	S3	5.355	0.000	0.000	1.17	0.0	2257.8	OK
28.000	S2-2	4.805	0.205	0.000	1.07	0.0	291.7	SURCHARGED
28.001	S14	4.649	0.169	0.000	2.88	0.0	429.4	SURCHARGED
28.002	35	4.464	0.016	0.000	1.56	0.0	427.7	SURCHARGED
10.013	S2	4.406	0.013	0.000	1.51	0.0	2389.0	SURCHARGED
10.014	S1A	4.111	-0.239	0.000	0.62	0.0	2379.8	OK
10.015	S1	3.944	-0.125	0.000	0.85	0.0	2361.2	OK

Summary of Results for 30 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	6.404	0.998	0.000	0.60	0.0	21.2	SURCHARGED
11.000	11-4-1	6.346	1.066	0.000	0.36	0.0	13.9	SURCHARGED
10.001	S11-4	6.315	1.167	0.000	0.76	0.0	45.7	SURCHARGED
10.002	S11-3	6.213	1.187	0.000	0.74	0.0	76.4	FLOOD RISK
10.003	S11-2	6.159	1.246	0.000	0.99	0.0	107.7	SURCHARGED
10.004	S11-1	5.927	1.201	0.000	0.80	0.0	105.8	SURCHARGED
10.005	S11	5.900	0.610	0.000	0.21	0.0	111.6	SURCHARGED
12.000	S10-4	6.485	1.015	0.000	-0.10	0.0	-3.5	FLOOD RISK
12.001	S10-3	6.486	1.391	0.000	0.66	0.0	23.4	SURCHARGED
12.002	S10-2	6.344	1.603	0.000	1.48	0.0	51.2	SURCHARGED
12.003	S10-1	6.022	1.378	0.000	1.09	0.0	74.7	SURCHARGED
10.006	S10	5.894	0.482	0.000	0.20	0.0	178.5	SURCHARGED
13.000	S21	7.749	0.185	0.000	0.51	0.0	20.6	SURCHARGED
13.001	S20	7.682	0.373	0.000	1.39	0.0	56.1	SURCHARGED
13.002	S19	7.084	0.007	0.000	1.06	0.0	70.1	SURCHARGED
13.003	S18	6.995	-0.081	0.000	0.61	0.0	81.0	OK
14.000	S17-2	7.498	0.255	0.000	0.82	0.0	33.8	SURCHARGED
14.001	S17-1	7.078	0.425	0.000	2.21	0.0	71.6	SURCHARGED
13.004	S17	6.873	0.112	0.000	1.58	0.0	182.3	SURCHARGED
15.000	S16-2	7.059	-0.023	0.000	0.93	0.0	37.6	OK
15.001	S16-1	6.779	-0.062	0.000	0.97	0.0	71.6	OK
13.005	S16	6.634	0.545	0.000	1.30	0.0	271.2	SURCHARGED
16.000	S15-6	7.572	-0.053	0.000	0.78	0.0	39.9	OK
16.001	S15-5	7.298	0.260	0.000	0.97	0.0	58.4	SURCHARGED
16.002	S15-4	6.708	0.567	0.000	0.95	0.0	87.7	SURCHARGED
17.000	S15-3-1	6.621	0.517	0.000	-0.06	0.0	-2.4	SURCHARGED
16.003	S15-3	6.622	0.447	0.000	0.73	0.0	146.8	SURCHARGED
16.004	S15-2	6.576	0.508	0.000	1.15	0.0	232.2	SURCHARGED
16.005	S15-1	6.476	0.515	0.000	2.71	0.0	319.9	SURCHARGED
13.006	S15	6.404	0.391	0.000	2.21	0.0	578.1	SURCHARGED
18.000	S18-1	7.194	0.076	0.000	0.69	0.0	24.2	SURCHARGED
18.001	S18-2	7.137	0.289	0.000	1.13	0.0	40.4	SURCHARGED
18.002	S14-5	6.989	0.331	0.000	0.95	0.0	58.2	SURCHARGED
19.000	S14-4-2	6.319	0.009	0.000	0.27	0.0	24.7	SURCHARGED
19.001	S14-4-1	6.292	0.509	0.000	0.35	0.0	43.2	SURCHARGED
18.003	S14-4	6.272	0.962	0.000	0.99	0.0	88.9	SURCHARGED
20.000	S14-3-3	6.308	0.350	0.000	0.54	0.0	24.6	SURCHARGED
20.001	S14-3-2	6.263	0.575	0.000	0.35	0.0	44.4	SURCHARGED
20.002	S14-3-1	6.243	0.710	0.000	0.36	0.0	41.7	SURCHARGED
18.004	S14-3	6.225	0.748	0.000	0.43	0.0	119.3	SURCHARGED
18.005	S14-2	6.191	0.699	0.000	0.28	0.0	135.3	FLOOD RISK
18.006	S14-1	6.170	0.809	0.000	0.32	0.0	154.3	SURCHARGED
13.007	S14	6.145	0.839	0.000	2.10	0.0	789.1	SURCHARGED
13.008	S13	6.076	0.554	0.000	1.63	0.0	793.3	SURCHARGED
13.009	S9C	6.034	0.538	0.000	0.97	0.0	763.8	SURCHARGED
21.000	S12-4	6.118	0.554	0.000	-0.04	0.0	-2.9	SURCHARGED
21.001	S12-3	6.120	0.851	0.000	0.49	0.0	27.3	SURCHARGED
21.002	S12-2	6.110	0.798	0.000	0.36	0.0	48.0	SURCHARGED
21.003	S12-1	6.068	1.051	0.000	0.68	0.0	116.8	SURCHARGED
13.010	S9B	5.963	0.645	0.000	0.91	0.0	921.2	SURCHARGED
13.011	S9A	5.913	0.506	0.000	1.10	0.0	930.2	SURCHARGED
22.000	S9A-1	5.952	0.277	0.000	0.90	0.0	97.0	SURCHARGED
23.000	S9-1-1	5.886	0.176	0.000	-0.03	0.0	-1.9	SURCHARGED
24.000	S9-2	5.886	-0.084	0.000	-0.03	0.0	-2.8	OK
23.001	S9-1	5.886	0.349	0.000	-0.27	0.0	-79.4	SURCHARGED
10.007	S9	5.890	0.490	0.000	0.93	0.0	1135.3	SURCHARGED
25.000	S8-4	13.547	-0.195	0.000	0.26	0.0	63.0	OK

Summary of Results for 30 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.075	-0.153	0.000	0.48	0.0	103.1	OK
25.002	S8-2	8.277	-0.201	0.000	0.44	0.0	158.6	OK
25.003	S8-1	6.215	0.475	0.000	0.70	0.0	191.4	SURCHARGED
10.008	S8	5.812	0.350	0.000	1.83	0.0	1904.6	SURCHARGED
10.009	S8A	5.754	0.315	0.000	1.28	0.0	1935.7	SURCHARGED
10.010	S6	5.650	0.272	0.000	1.24	0.0	2039.3	SURCHARGED
26.000	S5-3	5.804	0.846	0.000	0.93	0.0	426.3	SURCHARGED
26.001	S5-2	5.718	0.910	0.000	1.29	0.0	421.7	SURCHARGED
26.002	S5-1	5.678	0.904	0.000	1.22	0.0	565.2	SURCHARGED
27.000	S4-2	5.587	0.621	0.000	0.75	0.0	434.2	SURCHARGED
27.001	S4-1	5.540	0.707	0.000	0.74	0.0	426.1	SURCHARGED
10.011	S4	5.497	0.063	0.000	1.33	0.0	2704.2	SURCHARGED
10.012	S3	5.355	0.000	0.000	1.42	0.0	2735.4	OK
28.000	S2-2	4.680	0.080	0.000	0.89	0.0	242.9	SURCHARGED
28.001	S14	4.584	0.104	0.000	2.41	0.0	359.3	SURCHARGED
28.002	35	4.479	0.031	0.000	1.31	0.0	359.9	SURCHARGED
10.013	S2	4.458	0.065	0.000	1.86	0.0	2939.0	SURCHARGED
10.014	S1A	4.227	-0.123	0.000	0.75	0.0	2876.8	OK
10.015	S1	4.072	0.003	0.000	1.03	0.0	2847.1	SURCHARGED

Summary of Results for 45 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	6.319	0.913	0.000	0.51	0.0	18.2	SURCHARGED
11.000	11-4-1	6.265	0.985	0.000	0.30	0.0	11.6	SURCHARGED
10.001	S11-4	6.235	1.087	0.000	0.68	0.0	41.1	SURCHARGED
10.002	S11-3	6.144	1.118	0.000	0.65	0.0	67.5	FLOOD RISK
10.003	S11-2	6.094	1.181	0.000	0.90	0.0	98.1	SURCHARGED
10.004	S11-1	5.884	1.158	0.000	0.73	0.0	97.1	SURCHARGED
10.005	S11	5.858	0.568	0.000	0.20	0.0	104.0	SURCHARGED
12.000	S10-4	6.391	0.921	0.000	-0.07	0.0	-2.5	SURCHARGED
12.001	S10-3	6.399	1.304	0.000	0.60	0.0	21.4	SURCHARGED
12.002	S10-2	6.269	1.528	0.000	1.32	0.0	45.6	SURCHARGED
12.003	S10-1	5.967	1.323	0.000	0.96	0.0	65.5	SURCHARGED
10.006	S10	5.853	0.441	0.000	0.18	0.0	167.1	SURCHARGED
13.000	S21	7.510	-0.054	0.000	0.45	0.0	18.1	OK
13.001	S20	7.458	0.149	0.000	1.19	0.0	48.3	SURCHARGED
13.002	S19	7.006	-0.071	0.000	0.92	0.0	60.7	OK
13.003	S18	6.921	-0.155	0.000	0.54	0.0	72.0	OK
14.000	S17-2	7.281	0.038	0.000	0.70	0.0	28.9	SURCHARGED
14.001	S17-1	6.980	0.327	0.000	1.88	0.0	60.9	SURCHARGED
13.004	S17	6.826	0.065	0.000	1.39	0.0	160.2	SURCHARGED
15.000	S16-2	7.007	-0.075	0.000	0.76	0.0	30.8	OK
15.001	S16-1	6.748	-0.093	0.000	0.81	0.0	59.5	OK
13.005	S16	6.482	0.393	0.000	1.17	0.0	243.6	SURCHARGED
16.000	S15-6	7.532	-0.093	0.000	0.63	0.0	32.4	OK
16.001	S15-5	7.021	-0.017	0.000	0.89	0.0	53.4	OK
16.002	S15-4	6.569	0.428	0.000	0.87	0.0	79.8	SURCHARGED
17.000	S15-3-1	6.496	0.392	0.000	-0.03	0.0	-1.3	SURCHARGED
16.003	S15-3	6.498	0.323	0.000	0.65	0.0	130.6	SURCHARGED
16.004	S15-2	6.455	0.387	0.000	1.01	0.0	203.2	SURCHARGED
16.005	S15-1	6.362	0.401	0.000	2.37	0.0	279.9	SURCHARGED
13.006	S15	6.296	0.283	0.000	1.97	0.0	515.3	SURCHARGED
18.000	S18-1	7.017	-0.101	0.000	0.58	0.0	20.2	OK
18.001	S18-2	6.917	0.069	0.000	1.00	0.0	36.0	SURCHARGED
18.002	S14-5	6.803	0.145	0.000	0.85	0.0	52.3	SURCHARGED
19.000	S14-4-2	6.245	-0.065	0.000	0.22	0.0	20.2	OK
19.001	S14-4-1	6.219	0.436	0.000	0.27	0.0	33.5	SURCHARGED
18.003	S14-4	6.199	0.889	0.000	0.90	0.0	80.9	SURCHARGED
20.000	S14-3-3	6.237	0.279	0.000	0.44	0.0	19.9	SURCHARGED
20.001	S14-3-2	6.191	0.503	0.000	0.27	0.0	34.2	SURCHARGED
20.002	S14-3-1	6.172	0.639	0.000	0.28	0.0	32.5	SURCHARGED
18.004	S14-3	6.154	0.677	0.000	0.42	0.0	117.1	SURCHARGED
18.005	S14-2	6.119	0.627	0.000	0.28	0.0	134.4	FLOOD RISK
18.006	S14-1	6.098	0.737	0.000	0.32	0.0	155.4	SURCHARGED
13.007	S14	6.074	0.768	0.000	1.91	0.0	719.3	SURCHARGED
13.008	S13	6.014	0.492	0.000	1.48	0.0	721.3	SURCHARGED
13.009	S9C	5.976	0.480	0.000	0.91	0.0	716.4	SURCHARGED
21.000	S12-4	6.073	0.509	0.000	-0.03	0.0	-2.0	SURCHARGED
21.001	S12-3	6.076	0.807	0.000	0.42	0.0	23.6	SURCHARGED
21.002	S12-2	6.065	0.753	0.000	0.31	0.0	41.1	SURCHARGED
21.003	S12-1	6.021	1.004	0.000	0.60	0.0	103.8	SURCHARGED
13.010	S9B	5.917	0.599	0.000	0.86	0.0	871.6	SURCHARGED
13.011	S9A	5.870	0.463	0.000	1.05	0.0	881.6	SURCHARGED
22.000	S9A-1	5.915	0.240	0.000	0.73	0.0	78.4	SURCHARGED
23.000	S9-1-1	5.847	0.137	0.000	-0.02	0.0	-1.6	SURCHARGED
24.000	S9-2	5.847	-0.123	0.000	-0.01	0.0	-1.5	OK
23.001	S9-1	5.847	0.310	0.000	-0.17	0.0	-50.5	SURCHARGED
10.007	S9	5.849	0.449	0.000	0.89	0.0	1090.3	SURCHARGED
25.000	S8-4	13.536	-0.206	0.000	0.21	0.0	50.9	OK

Summary of Results for 45 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.058	-0.170	0.000	0.38	0.0	83.1	OK
25.002	S8-2	8.258	-0.220	0.000	0.35	0.0	127.7	OK
25.003	S8-1	6.095	0.355	0.000	0.58	0.0	158.9	SURCHARGED
10.008	S8	5.778	0.316	0.000	1.75	0.0	1822.1	SURCHARGED
10.009	S8A	5.725	0.286	0.000	1.24	0.0	1862.3	SURCHARGED
10.010	S6	5.629	0.251	0.000	1.20	0.0	1970.2	SURCHARGED
26.000	S5-3	5.735	0.777	0.000	0.76	0.0	346.2	SURCHARGED
26.001	S5-2	5.663	0.855	0.000	1.06	0.0	345.0	SURCHARGED
26.002	S5-1	5.630	0.856	0.000	1.04	0.0	478.7	SURCHARGED
27.000	S4-2	5.575	0.609	0.000	0.61	0.0	351.8	SURCHARGED
27.001	S4-1	5.531	0.698	0.000	0.60	0.0	346.1	SURCHARGED
10.011	S4	5.487	0.053	0.000	1.27	0.0	2598.5	SURCHARGED
10.012	S3	5.355	0.000	0.000	1.39	0.0	2682.9	OK
28.000	S2-2	4.600	0.000	0.000	0.73	0.0	199.9	OK
28.001	S14	4.531	0.051	0.000	1.99	0.0	296.7	SURCHARGED
28.002	35	4.472	0.024	0.000	1.07	0.0	293.4	SURCHARGED
10.013	S2	4.453	0.060	0.000	1.82	0.0	2885.8	SURCHARGED
10.014	S1A	4.211	-0.139	0.000	0.75	0.0	2840.7	OK
10.015	S1	4.055	-0.014	0.000	1.02	0.0	2825.7	OK

Summary of Results for 60 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	6.171	0.765	0.000	0.47	0.0	16.6	SURCHARGED
11.000	11-4-1	6.130	0.850	0.000	0.28	0.0	11.1	SURCHARGED
10.001	S11-4	6.101	0.953	0.000	0.62	0.0	37.6	SURCHARGED
10.002	S11-3	6.026	1.000	0.000	0.61	0.0	62.9	SURCHARGED
10.003	S11-2	5.980	1.067	0.000	0.82	0.0	89.5	SURCHARGED
10.004	S11-1	5.807	1.081	0.000	0.67	0.0	88.9	SURCHARGED
10.005	S11	5.783	0.493	0.000	0.18	0.0	95.5	SURCHARGED
12.000	S10-4	6.227	0.757	0.000	-0.05	0.0	-1.9	SURCHARGED
12.001	S10-3	6.232	1.137	0.000	0.56	0.0	19.7	SURCHARGED
12.002	S10-2	6.123	1.382	0.000	1.22	0.0	42.0	SURCHARGED
12.003	S10-1	5.872	1.228	0.000	0.89	0.0	60.8	SURCHARGED
10.006	S10	5.778	0.366	0.000	0.17	0.0	153.6	SURCHARGED
13.000	S21	7.438	-0.126	0.000	0.40	0.0	16.0	OK
13.001	S20	7.337	0.028	0.000	1.05	0.0	42.5	SURCHARGED
13.002	S19	6.984	-0.093	0.000	0.81	0.0	53.8	OK
13.003	S18	6.885	-0.191	0.000	0.48	0.0	63.3	OK
14.000	S17-2	7.149	-0.094	0.000	0.62	0.0	25.8	OK
14.001	S17-1	6.906	0.253	0.000	1.67	0.0	54.2	SURCHARGED
13.004	S17	6.788	0.027	0.000	1.22	0.0	141.4	SURCHARGED
15.000	S16-2	6.991	-0.091	0.000	0.65	0.0	26.3	OK
15.001	S16-1	6.727	-0.114	0.000	0.69	0.0	50.9	OK
13.005	S16	6.308	0.219	0.000	1.05	0.0	219.2	SURCHARGED
16.000	S15-6	7.519	-0.106	0.000	0.54	0.0	27.7	OK
16.001	S15-5	6.964	-0.074	0.000	0.77	0.0	46.7	OK
16.002	S15-4	6.388	0.247	0.000	0.77	0.0	71.1	SURCHARGED
17.000	S15-3-1	6.322	0.218	0.000	-0.02	0.0	-0.9	SURCHARGED
16.003	S15-3	6.323	0.148	0.000	0.58	0.0	116.7	SURCHARGED
16.004	S15-2	6.285	0.217	0.000	0.90	0.0	181.9	SURCHARGED
16.005	S15-1	6.209	0.248	0.000	2.10	0.0	248.5	SURCHARGED
13.006	S15	6.155	0.142	0.000	1.77	0.0	463.1	SURCHARGED
18.000	S18-1	7.006	-0.112	0.000	0.49	0.0	17.2	OK
18.001	S18-2	6.794	-0.054	0.000	0.92	0.0	33.1	OK
18.002	S14-5	6.654	-0.004	0.000	0.81	0.0	49.5	OK
19.000	S14-4-2	6.137	-0.173	0.000	0.19	0.0	17.2	OK
19.001	S14-4-1	6.113	0.330	0.000	0.25	0.0	30.8	SURCHARGED
18.003	S14-4	6.094	0.784	0.000	0.84	0.0	75.3	SURCHARGED
20.000	S14-3-3	6.127	0.169	0.000	0.38	0.0	17.3	SURCHARGED
20.001	S14-3-2	6.086	0.398	0.000	0.23	0.0	29.1	SURCHARGED
20.002	S14-3-1	6.067	0.534	0.000	0.26	0.0	30.4	SURCHARGED
18.004	S14-3	6.050	0.573	0.000	0.40	0.0	111.2	SURCHARGED
18.005	S14-2	6.017	0.525	0.000	0.27	0.0	127.9	FLOOD RISK
18.006	S14-1	5.996	0.635	0.000	0.31	0.0	149.5	SURCHARGED
13.007	S14	5.973	0.667	0.000	1.74	0.0	653.9	SURCHARGED
13.008	S13	5.923	0.401	0.000	1.37	0.0	665.0	SURCHARGED
13.009	S9C	5.888	0.392	0.000	0.84	0.0	661.5	SURCHARGED
21.000	S12-4	5.972	0.408	0.000	-0.02	0.0	-1.7	SURCHARGED
21.001	S12-3	5.974	0.705	0.000	0.41	0.0	22.6	SURCHARGED
21.002	S12-2	5.963	0.651	0.000	0.29	0.0	38.7	SURCHARGED
21.003	S12-1	5.923	0.906	0.000	0.54	0.0	94.1	SURCHARGED
13.010	S9B	5.838	0.520	0.000	0.80	0.0	805.3	SURCHARGED
13.011	S9A	5.794	0.387	0.000	0.97	0.0	814.6	SURCHARGED
22.000	S9A-1	5.828	0.153	0.000	0.63	0.0	67.8	SURCHARGED
23.000	S9-1-1	5.772	0.062	0.000	-0.02	0.0	-1.2	SURCHARGED
24.000	S9-2	5.772	-0.198	0.000	-0.01	0.0	-1.0	OK
23.001	S9-1	5.773	0.236	0.000	-0.14	0.0	-39.4	SURCHARGED
10.007	S9	5.775	0.375	0.000	0.83	0.0	1010.9	SURCHARGED
25.000	S8-4	13.528	-0.214	0.000	0.18	0.0	43.9	OK

Summary of Results for 60 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.047	-0.181	0.000	0.33	0.0	71.9	OK
25.002	S8-2	8.244	-0.234	0.000	0.30	0.0	109.9	OK
25.003	S8-1	5.963	0.223	0.000	0.51	0.0	138.9	SURCHARGED
10.008	S8	5.714	0.252	0.000	1.61	0.0	1675.8	SURCHARGED
10.009	S8A	5.669	0.230	0.000	1.14	0.0	1717.4	SURCHARGED
10.010	S6	5.588	0.210	0.000	1.11	0.0	1825.6	SURCHARGED
26.000	S5-3	5.662	0.704	0.000	0.67	0.0	305.0	SURCHARGED
26.001	S5-2	5.606	0.798	0.000	0.92	0.0	301.5	SURCHARGED
26.002	S5-1	5.577	0.803	0.000	0.91	0.0	417.8	SURCHARGED
27.000	S4-2	5.546	0.580	0.000	0.53	0.0	309.2	SURCHARGED
27.001	S4-1	5.507	0.674	0.000	0.53	0.0	302.8	SURCHARGED
10.011	S4	5.468	0.034	0.000	1.18	0.0	2414.8	SURCHARGED
10.012	S3	5.355	0.000	0.000	1.29	0.0	2492.3	OK
28.000	S2-2	4.555	-0.045	0.000	0.63	0.0	172.0	OK
28.001	S14	4.498	0.018	0.000	1.73	0.0	257.8	SURCHARGED
28.002	35	4.444	-0.004	0.000	0.94	0.0	257.9	OK
10.013	S2	4.427	0.034	0.000	1.69	0.0	2682.6	SURCHARGED
10.014	S1A	4.147	-0.203	0.000	0.70	0.0	2666.8	OK
10.015	S1	4.001	-0.068	0.000	0.97	0.0	2665.8	OK

Summary of Results for 90 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.884	0.478	0.000	0.39	0.0	14.0	SURCHARGED
11.000	11-4-1	5.860	0.580	0.000	0.24	0.0	9.2	SURCHARGED
10.001	S11-4	5.838	0.690	0.000	0.54	0.0	32.7	SURCHARGED
10.002	S11-3	5.790	0.764	0.000	0.52	0.0	53.3	SURCHARGED
10.003	S11-2	5.754	0.841	0.000	0.70	0.0	77.0	SURCHARGED
10.004	S11-1	5.641	0.915	0.000	0.58	0.0	76.7	SURCHARGED
10.005	S11	5.622	0.332	0.000	0.16	0.0	81.7	SURCHARGED
12.000	S10-4	5.905	0.435	0.000	-0.03	0.0	-1.1	SURCHARGED
12.001	S10-3	5.908	0.813	0.000	0.49	0.0	17.4	SURCHARGED
12.002	S10-2	5.839	1.098	0.000	1.03	0.0	35.6	SURCHARGED
12.003	S10-1	5.680	1.036	0.000	0.75	0.0	51.0	SURCHARGED
10.006	S10	5.617	0.205	0.000	0.14	0.0	131.1	SURCHARGED
13.000	S21	7.425	-0.139	0.000	0.31	0.0	12.5	OK
13.001	S20	7.244	-0.065	0.000	0.85	0.0	34.2	OK
13.002	S19	6.956	-0.121	0.000	0.65	0.0	43.3	OK
13.003	S18	6.863	-0.213	0.000	0.38	0.0	50.9	OK
14.000	S17-2	7.130	-0.113	0.000	0.49	0.0	20.3	OK
14.001	S17-1	6.761	0.108	0.000	1.32	0.0	42.6	SURCHARGED
13.004	S17	6.685	-0.076	0.000	0.99	0.0	113.8	OK
15.000	S16-2	6.971	-0.111	0.000	0.51	0.0	20.7	OK
15.001	S16-1	6.699	-0.142	0.000	0.54	0.0	39.7	OK
13.005	S16	6.162	0.073	0.000	0.85	0.0	177.0	SURCHARGED
16.000	S15-6	7.502	-0.123	0.000	0.42	0.0	21.8	OK
16.001	S15-5	6.940	-0.098	0.000	0.61	0.0	36.7	OK
16.002	S15-4	6.230	0.089	0.000	0.61	0.0	56.1	SURCHARGED
17.000	S15-3-1	6.183	0.079	0.000	-0.01	0.0	-0.5	SURCHARGED
16.003	S15-3	6.183	0.008	0.000	0.46	0.0	93.0	SURCHARGED
16.004	S15-2	6.149	0.081	0.000	0.72	0.0	145.7	SURCHARGED
16.005	S15-1	6.091	0.130	0.000	1.67	0.0	197.9	SURCHARGED
13.006	S15	6.051	0.038	0.000	1.44	0.0	375.5	SURCHARGED
18.000	S18-1	6.990	-0.128	0.000	0.39	0.0	13.6	OK
18.001	S18-2	6.766	-0.082	0.000	0.72	0.0	25.8	OK
18.002	S14-5	6.565	-0.093	0.000	0.64	0.0	39.1	OK
19.000	S14-4-2	6.087	-0.223	0.000	0.15	0.0	13.6	OK
19.001	S14-4-1	5.875	0.092	0.000	0.20	0.0	25.1	SURCHARGED
18.003	S14-4	5.863	0.553	0.000	0.67	0.0	59.7	SURCHARGED
20.000	S14-3-3	5.891	-0.067	0.000	0.30	0.0	13.6	OK
20.001	S14-3-2	5.858	0.170	0.000	0.19	0.0	23.6	SURCHARGED
20.002	S14-3-1	5.844	0.311	0.000	0.22	0.0	25.8	SURCHARGED
18.004	S14-3	5.832	0.355	0.000	0.34	0.0	94.4	SURCHARGED
18.005	S14-2	5.807	0.315	0.000	0.23	0.0	110.0	SURCHARGED
18.006	S14-1	5.791	0.430	0.000	0.27	0.0	129.4	SURCHARGED
13.007	S14	5.769	0.463	0.000	1.45	0.0	544.1	SURCHARGED
13.008	S13	5.736	0.214	0.000	1.14	0.0	554.3	SURCHARGED
13.009	S9C	5.708	0.212	0.000	0.71	0.0	556.5	SURCHARGED
21.000	S12-4	5.756	0.192	0.000	-0.01	0.0	-0.9	SURCHARGED
21.001	S12-3	5.758	0.489	0.000	0.33	0.0	18.3	SURCHARGED
21.002	S12-2	5.750	0.438	0.000	0.25	0.0	32.9	SURCHARGED
21.003	S12-1	5.720	0.703	0.000	0.46	0.0	80.0	SURCHARGED
13.010	S9B	5.667	0.349	0.000	0.67	0.0	676.1	SURCHARGED
13.011	S9A	5.631	0.224	0.000	0.81	0.0	685.0	SURCHARGED
22.000	S9A-1	5.655	-0.020	0.000	0.50	0.0	54.0	OK
23.000	S9-1-1	5.597	-0.113	0.000	-0.01	0.0	-0.4	OK
24.000	S9-2	5.601	-0.369	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.599	0.062	0.000	-0.05	0.0	-14.4	SURCHARGED
10.007	S9	5.615	0.215	0.000	0.69	0.0	846.0	SURCHARGED
25.000	S8-4	13.517	-0.225	0.000	0.14	0.0	34.3	OK

Summary of Results for 90 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.031	-0.197	0.000	0.26	0.0	56.0	OK
25.002	S8-2	8.226	-0.252	0.000	0.24	0.0	86.0	OK
25.003	S8-1	5.709	-0.031	0.000	0.41	0.0	111.3	OK
10.008	S8	5.570	0.108	0.000	1.35	0.0	1405.1	SURCHARGED
10.009	S8A	5.540	0.101	0.000	0.97	0.0	1455.2	SURCHARGED
10.010	S6	5.485	0.107	0.000	0.93	0.0	1532.8	SURCHARGED
26.000	S5-3	5.523	0.565	0.000	0.54	0.0	245.3	SURCHARGED
26.001	S5-2	5.484	0.676	0.000	0.74	0.0	243.3	SURCHARGED
26.002	S5-1	5.463	0.689	0.000	0.73	0.0	338.2	SURCHARGED
27.000	S4-2	5.462	0.496	0.000	0.43	0.0	246.6	SURCHARGED
27.001	S4-1	5.433	0.600	0.000	0.42	0.0	244.0	SURCHARGED
10.011	S4	5.405	-0.029	0.000	0.97	0.0	1982.9	OK
10.012	S3	5.232	-0.123	0.000	1.06	0.0	2038.1	OK
28.000	S2-2	4.519	-0.081	0.000	0.50	0.0	135.9	OK
28.001	S14	4.480	0.000	0.000	1.37	0.0	203.3	OK
28.002	35	4.411	-0.037	0.000	0.73	0.0	199.3	OK
10.013	S2	4.393	0.000	0.000	1.39	0.0	2193.9	OK
10.014	S1A	4.086	-0.264	0.000	0.57	0.0	2188.5	OK
10.015	S1	3.912	-0.157	0.000	0.79	0.0	2185.3	OK

Summary of Results for 120 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.700	0.294	0.000	0.34	0.0	12.2	SURCHARGED
11.000	11-4-1	5.677	0.397	0.000	0.20	0.0	8.0	SURCHARGED
10.001	S11-4	5.657	0.509	0.000	0.47	0.0	28.2	SURCHARGED
10.002	S11-3	5.612	0.586	0.000	0.45	0.0	46.4	SURCHARGED
10.003	S11-2	5.579	0.666	0.000	0.61	0.0	67.0	SURCHARGED
10.004	S11-1	5.486	0.760	0.000	0.50	0.0	66.7	SURCHARGED
10.005	S11	5.468	0.178	0.000	0.14	0.0	71.4	SURCHARGED
12.000	S10-4	5.706	0.236	0.000	-0.02	0.0	-0.7	SURCHARGED
12.001	S10-3	5.709	0.614	0.000	0.42	0.0	15.0	SURCHARGED
12.002	S10-2	5.649	0.908	0.000	0.90	0.0	31.0	SURCHARGED
12.003	S10-1	5.517	0.873	0.000	0.64	0.0	44.0	SURCHARGED
10.006	S10	5.465	0.053	0.000	0.13	0.0	114.2	SURCHARGED
13.000	S21	7.417	-0.147	0.000	0.26	0.0	10.5	OK
13.001	S20	7.224	-0.085	0.000	0.71	0.0	28.7	OK
13.002	S19	6.936	-0.141	0.000	0.55	0.0	36.4	OK
13.003	S18	6.848	-0.228	0.000	0.33	0.0	43.1	OK
14.000	S17-2	7.118	-0.125	0.000	0.41	0.0	17.0	OK
14.001	S17-1	6.702	0.049	0.000	1.12	0.0	36.3	SURCHARGED
13.004	S17	6.649	-0.112	0.000	0.83	0.0	96.1	OK
15.000	S16-2	6.959	-0.123	0.000	0.43	0.0	17.3	OK
15.001	S16-1	6.682	-0.159	0.000	0.45	0.0	33.3	OK
13.005	S16	6.092	0.003	0.000	0.71	0.0	148.8	SURCHARGED
16.000	S15-6	7.492	-0.133	0.000	0.35	0.0	18.2	OK
16.001	S15-5	6.927	-0.111	0.000	0.51	0.0	30.7	OK
16.002	S15-4	6.159	0.018	0.000	0.52	0.0	47.5	SURCHARGED
17.000	S15-3-1	6.120	0.016	0.000	-0.01	0.0	-0.4	SURCHARGED
16.003	S15-3	6.120	-0.055	0.000	0.39	0.0	78.6	OK
16.004	S15-2	6.091	0.023	0.000	0.60	0.0	121.9	SURCHARGED
16.005	S15-1	6.046	0.085	0.000	1.41	0.0	166.9	SURCHARGED
13.006	S15	6.014	0.001	0.000	1.20	0.0	312.9	SURCHARGED
18.000	S18-1	6.981	-0.137	0.000	0.32	0.0	11.4	OK
18.001	S18-2	6.749	-0.099	0.000	0.61	0.0	21.7	OK
18.002	S14-5	6.551	-0.107	0.000	0.54	0.0	33.1	OK
19.000	S14-4-2	6.080	-0.230	0.000	0.12	0.0	11.4	OK
19.001	S14-4-1	5.692	-0.091	0.000	0.18	0.0	22.0	OK
18.003	S14-4	5.680	0.370	0.000	0.59	0.0	52.8	SURCHARGED
20.000	S14-3-3	5.809	-0.149	0.000	0.25	0.0	11.4	OK
20.001	S14-3-2	5.676	-0.012	0.000	0.17	0.0	21.2	OK
20.002	S14-3-1	5.663	0.130	0.000	0.21	0.0	24.0	SURCHARGED
18.004	S14-3	5.651	0.174	0.000	0.29	0.0	81.2	SURCHARGED
18.005	S14-2	5.629	0.137	0.000	0.20	0.0	95.1	SURCHARGED
18.006	S14-1	5.613	0.252	0.000	0.24	0.0	114.6	SURCHARGED
13.007	S14	5.594	0.288	0.000	1.24	0.0	468.3	SURCHARGED
13.008	S13	5.569	0.047	0.000	0.99	0.0	480.4	SURCHARGED
13.009	S9C	5.543	0.047	0.000	0.60	0.0	474.9	SURCHARGED
21.000	S12-4	5.590	0.026	0.000	-0.01	0.0	-0.5	SURCHARGED
21.001	S12-3	5.591	0.322	0.000	0.27	0.0	15.2	SURCHARGED
21.002	S12-2	5.583	0.271	0.000	0.21	0.0	28.1	SURCHARGED
21.003	S12-1	5.555	0.538	0.000	0.40	0.0	68.4	SURCHARGED
13.010	S9B	5.507	0.189	0.000	0.57	0.0	575.1	SURCHARGED
13.011	S9A	5.476	0.069	0.000	0.69	0.0	583.0	SURCHARGED
22.000	S9A-1	5.503	-0.172	0.000	0.42	0.0	45.5	OK
23.000	S9-1-1	5.437	-0.273	0.000	0.00	0.0	0.1	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.453	-0.084	0.000	-0.03	0.0	-8.3	OK
10.007	S9	5.462	0.062	0.000	0.60	0.0	736.5	SURCHARGED
25.000	S8-4	13.510	-0.232	0.000	0.12	0.0	28.6	OK

Summary of Results for 120 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.022	-0.206	0.000	0.22	0.0	46.8	OK
25.002	S8-2	8.216	-0.262	0.000	0.20	0.0	71.8	OK
25.003	S8-1	5.543	-0.197	0.000	0.35	0.0	94.6	OK
10.008	S8	5.423	-0.039	0.000	1.16	0.0	1208.2	OK
10.009	S8A	5.370	-0.069	0.000	0.83	0.0	1249.1	OK
10.010	S6	5.267	-0.111	0.000	0.81	0.0	1334.8	OK
26.000	S5-3	5.247	0.289	0.000	0.45	0.0	207.6	SURCHARGED
26.001	S5-2	5.211	0.403	0.000	0.63	0.0	207.0	SURCHARGED
26.002	S5-1	5.191	0.417	0.000	0.63	0.0	289.2	SURCHARGED
27.000	S4-2	5.193	0.227	0.000	0.36	0.0	208.1	SURCHARGED
27.001	S4-1	5.166	0.333	0.000	0.36	0.0	207.0	SURCHARGED
10.011	S4	5.139	-0.295	0.000	0.87	0.0	1768.8	OK
10.012	S3	5.002	-0.353	0.000	0.94	0.0	1823.1	OK
28.000	S2-2	4.512	-0.088	0.000	0.41	0.0	112.2	OK
28.001	S14	4.480	0.000	0.000	1.11	0.0	165.4	OK
28.002	35	4.407	-0.041	0.000	0.59	0.0	162.1	OK
10.013	S2	4.393	0.000	0.000	1.24	0.0	1967.1	OK
10.014	S1A	4.057	-0.293	0.000	0.52	0.0	1964.1	OK
10.015	S1	3.869	-0.200	0.000	0.71	0.0	1958.6	OK

Summary of Results for 180 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.392	-0.014	0.000	0.28	0.0	10.0	OK
11.000	11-4-1	5.374	0.094	0.000	0.17	0.0	6.6	SURCHARGED
10.001	S11-4	5.357	0.209	0.000	0.38	0.0	22.7	SURCHARGED
10.002	S11-3	5.319	0.293	0.000	0.36	0.0	37.4	SURCHARGED
10.003	S11-2	5.292	0.379	0.000	0.49	0.0	53.9	SURCHARGED
10.004	S11-1	5.229	0.503	0.000	0.41	0.0	53.8	SURCHARGED
10.005	S11	5.214	-0.076	0.000	0.11	0.0	57.9	OK
12.000	S10-4	5.385	-0.085	0.000	-0.01	0.0	-0.3	OK
12.001	S10-3	5.385	0.290	0.000	0.34	0.0	11.9	SURCHARGED
12.002	S10-2	5.340	0.599	0.000	0.71	0.0	24.5	SURCHARGED
12.003	S10-1	5.253	0.609	0.000	0.51	0.0	35.0	SURCHARGED
10.006	S10	5.211	-0.201	0.000	0.10	0.0	92.0	OK
13.000	S21	7.407	-0.157	0.000	0.20	0.0	8.1	OK
13.001	S20	7.203	-0.106	0.000	0.55	0.0	22.1	OK
13.002	S19	6.913	-0.164	0.000	0.42	0.0	28.1	OK
13.003	S18	6.828	-0.248	0.000	0.25	0.0	33.1	OK
14.000	S17-2	7.105	-0.138	0.000	0.32	0.0	13.1	OK
14.001	S17-1	6.637	-0.016	0.000	0.86	0.0	27.9	OK
13.004	S17	6.605	-0.156	0.000	0.64	0.0	74.2	OK
15.000	S16-2	6.946	-0.136	0.000	0.33	0.0	13.4	OK
15.001	S16-1	6.663	-0.178	0.000	0.35	0.0	25.7	OK
13.005	S16	5.923	-0.166	0.000	0.55	0.0	115.5	OK
16.000	S15-6	7.480	-0.145	0.000	0.27	0.0	14.1	OK
16.001	S15-5	6.911	-0.127	0.000	0.39	0.0	23.7	OK
16.002	S15-4	6.014	-0.127	0.000	0.40	0.0	36.6	OK
17.000	S15-3-1	5.984	-0.120	0.000	0.00	0.0	0.1	OK
16.003	S15-3	5.984	-0.191	0.000	0.29	0.0	59.2	OK
16.004	S15-2	5.963	-0.105	0.000	0.46	0.0	92.1	OK
16.005	S15-1	5.930	-0.031	0.000	1.06	0.0	125.3	OK
13.006	S15	5.864	-0.149	0.000	0.92	0.0	239.6	OK
18.000	S18-1	6.969	-0.149	0.000	0.25	0.0	8.8	OK
18.001	S18-2	6.731	-0.117	0.000	0.47	0.0	16.7	OK
18.002	S14-5	6.534	-0.124	0.000	0.41	0.0	25.4	OK
19.000	S14-4-2	6.072	-0.238	0.000	0.10	0.0	8.8	OK
19.001	S14-4-1	5.501	-0.282	0.000	0.14	0.0	17.6	OK
18.003	S14-4	5.410	0.100	0.000	0.50	0.0	44.7	SURCHARGED
20.000	S14-3-3	5.800	-0.158	0.000	0.19	0.0	8.8	OK
20.001	S14-3-2	5.427	-0.261	0.000	0.14	0.0	17.5	OK
20.002	S14-3-1	5.395	-0.138	0.000	0.16	0.0	18.9	OK
18.004	S14-3	5.385	-0.092	0.000	0.24	0.0	67.0	OK
18.005	S14-2	5.365	-0.127	0.000	0.16	0.0	78.4	OK
18.006	S14-1	5.352	-0.009	0.000	0.20	0.0	97.2	OK
13.007	S14	5.330	0.024	0.000	0.98	0.0	369.0	SURCHARGED
13.008	S13	5.310	-0.212	0.000	0.78	0.0	377.7	OK
13.009	S9C	5.285	-0.211	0.000	0.48	0.0	377.1	OK
21.000	S12-4	5.313	-0.251	0.000	0.00	0.0	-0.1	OK
21.001	S12-3	5.313	0.044	0.000	0.23	0.0	12.8	SURCHARGED
21.002	S12-2	5.307	-0.005	0.000	0.17	0.0	22.7	OK
21.003	S12-1	5.284	0.267	0.000	0.32	0.0	54.9	SURCHARGED
13.010	S9B	5.246	-0.072	0.000	0.46	0.0	463.5	OK
13.011	S9A	5.221	-0.186	0.000	0.56	0.0	470.4	OK
22.000	S9A-1	5.447	-0.228	0.000	0.33	0.0	35.1	OK
23.000	S9-1-1	5.410	-0.300	0.000	0.00	0.0	0.0	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.209	-0.328	0.000	0.00	0.0	-1.1	OK
10.007	S9	5.209	-0.191	0.000	0.49	0.0	594.1	OK
25.000	S8-4	13.503	-0.239	0.000	0.09	0.0	22.1	OK

Summary of Results for 180 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.010	-0.218	0.000	0.17	0.0	36.1	OK
25.002	S8-2	8.200	-0.278	0.000	0.15	0.0	55.4	OK
25.003	S8-1	5.496	-0.244	0.000	0.27	0.0	73.1	OK
10.008	S8	5.166	-0.296	0.000	0.94	0.0	977.4	OK
10.009	S8A	5.144	-0.295	0.000	0.67	0.0	1009.0	OK
10.010	S6	5.069	-0.309	0.000	0.66	0.0	1077.9	OK
26.000	S5-3	5.063	0.105	0.000	0.35	0.0	161.3	SURCHARGED
26.001	S5-2	5.033	0.225	0.000	0.49	0.0	160.8	SURCHARGED
26.002	S5-1	5.017	0.243	0.000	0.49	0.0	224.6	SURCHARGED
27.000	S4-2	5.020	0.054	0.000	0.28	0.0	161.6	SURCHARGED
27.001	S4-1	4.998	0.165	0.000	0.28	0.0	160.1	SURCHARGED
10.011	S4	4.976	-0.458	0.000	0.71	0.0	1439.8	OK
10.012	S3	4.846	-0.509	0.000	0.77	0.0	1486.3	OK
28.000	S2-2	4.406	-0.194	0.000	0.32	0.0	86.7	OK
28.001	S14	4.383	-0.097	0.000	0.85	0.0	126.2	OK
28.002	35	4.322	-0.126	0.000	0.45	0.0	124.6	OK
10.013	S2	4.312	-0.081	0.000	1.01	0.0	1604.1	OK
10.014	S1A	4.011	-0.339	0.000	0.42	0.0	1605.6	OK
10.015	S1	3.802	-0.267	0.000	0.58	0.0	1606.7	OK

Summary of Results for 240 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.260	-0.146	0.000	0.24	0.0	8.7	OK
11.000	11-4-1	5.224	-0.056	0.000	0.14	0.0	5.5	OK
10.001	S11-4	5.210	0.062	0.000	0.31	0.0	19.0	SURCHARGED
10.002	S11-3	5.178	0.152	0.000	0.30	0.0	31.4	SURCHARGED
10.003	S11-2	5.155	0.242	0.000	0.41	0.0	45.2	SURCHARGED
10.004	S11-1	5.109	0.383	0.000	0.34	0.0	45.2	SURCHARGED
10.005	S11	5.097	-0.193	0.000	0.09	0.0	48.6	OK
12.000	S10-4	5.245	-0.225	0.000	0.00	0.0	0.0	OK
12.001	S10-3	5.229	0.134	0.000	0.29	0.0	10.1	SURCHARGED
12.002	S10-2	5.191	0.450	0.000	0.60	0.0	20.7	SURCHARGED
12.003	S10-1	5.129	0.485	0.000	0.43	0.0	29.6	SURCHARGED
10.006	S10	5.094	-0.318	0.000	0.09	0.0	77.8	OK
13.000	S21	7.400	-0.164	0.000	0.17	0.0	6.6	OK
13.001	S20	7.190	-0.119	0.000	0.45	0.0	18.2	OK
13.002	S19	6.899	-0.178	0.000	0.35	0.0	23.1	OK
13.003	S18	6.816	-0.260	0.000	0.21	0.0	27.4	OK
14.000	S17-2	7.096	-0.147	0.000	0.26	0.0	10.8	OK
14.001	S17-1	6.602	-0.051	0.000	0.71	0.0	23.1	OK
13.004	S17	6.580	-0.181	0.000	0.53	0.0	61.2	OK
15.000	S16-2	6.936	-0.146	0.000	0.27	0.0	11.0	OK
15.001	S16-1	6.650	-0.191	0.000	0.29	0.0	21.2	OK
13.005	S16	5.874	-0.215	0.000	0.46	0.0	95.2	OK
16.000	S15-6	7.472	-0.153	0.000	0.22	0.0	11.6	OK
16.001	S15-5	6.901	-0.137	0.000	0.32	0.0	19.5	OK
16.002	S15-4	5.948	-0.193	0.000	0.33	0.0	30.3	OK
17.000	S15-3-1	5.907	-0.197	0.000	0.00	0.0	0.0	OK
16.003	S15-3	5.907	-0.268	0.000	0.25	0.0	50.0	OK
16.004	S15-2	5.876	-0.192	0.000	0.39	0.0	78.4	OK
16.005	S15-1	5.842	-0.119	0.000	0.90	0.0	106.7	OK
13.006	S15	5.811	-0.202	0.000	0.77	0.0	201.8	OK
18.000	S18-1	6.962	-0.156	0.000	0.21	0.0	7.2	OK
18.001	S18-2	6.719	-0.129	0.000	0.38	0.0	13.8	OK
18.002	S14-5	6.524	-0.134	0.000	0.34	0.0	21.0	OK
19.000	S14-4-2	6.066	-0.244	0.000	0.08	0.0	7.2	OK
19.001	S14-4-1	5.492	-0.291	0.000	0.12	0.0	14.4	OK
18.003	S14-4	5.276	-0.034	0.000	0.42	0.0	37.7	OK
20.000	S14-3-3	5.792	-0.166	0.000	0.16	0.0	7.2	OK
20.001	S14-3-2	5.397	-0.291	0.000	0.12	0.0	14.4	OK
20.002	S14-3-1	5.277	-0.256	0.000	0.14	0.0	16.6	OK
18.004	S14-3	5.254	-0.223	0.000	0.21	0.0	57.6	OK
18.005	S14-2	5.238	-0.254	0.000	0.14	0.0	66.7	OK
18.006	S14-1	5.226	-0.135	0.000	0.17	0.0	81.3	OK
13.007	S14	5.213	-0.093	0.000	0.83	0.0	312.0	OK
13.008	S13	5.196	-0.326	0.000	0.66	0.0	319.8	OK
13.009	S9C	5.166	-0.330	0.000	0.41	0.0	319.6	OK
21.000	S12-4	5.264	-0.300	0.000	0.00	0.0	0.0	OK
21.001	S12-3	5.181	-0.088	0.000	0.19	0.0	10.6	OK
21.002	S12-2	5.176	-0.136	0.000	0.15	0.0	19.5	OK
21.003	S12-1	5.156	0.139	0.000	0.27	0.0	46.6	SURCHARGED
13.010	S9B	5.123	-0.195	0.000	0.39	0.0	392.5	OK
13.011	S9A	5.102	-0.305	0.000	0.47	0.0	398.1	OK
22.000	S9A-1	5.431	-0.244	0.000	0.27	0.0	28.9	OK
23.000	S9-1-1	5.410	-0.300	0.000	0.00	0.0	0.0	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.090	-0.447	0.000	0.00	0.0	0.0	OK
10.007	S9	5.092	-0.308	0.000	0.41	0.0	503.1	OK
25.000	S8-4	13.496	-0.246	0.000	0.08	0.0	18.1	OK

Summary of Results for 240 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	9.001	-0.227	0.000	0.14	0.0	29.7	OK
25.002	S8-2	8.191	-0.287	0.000	0.13	0.0	45.6	OK
25.003	S8-1	5.484	-0.256	0.000	0.22	0.0	60.1	OK
10.008	S8	5.054	-0.408	0.000	0.80	0.0	830.9	OK
10.009	S8A	5.032	-0.407	0.000	0.57	0.0	857.6	OK
10.010	S6	4.959	-0.419	0.000	0.56	0.0	916.2	OK
26.000	S5-3	4.940	-0.018	0.000	0.29	0.0	133.7	OK
26.001	S5-2	4.916	0.108	0.000	0.41	0.0	132.9	SURCHARGED
26.002	S5-1	4.902	0.128	0.000	0.40	0.0	186.1	SURCHARGED
27.000	S4-2	4.905	-0.061	0.000	0.23	0.0	133.8	OK
27.001	S4-1	4.887	0.054	0.000	0.23	0.0	132.0	SURCHARGED
10.011	S4	4.869	-0.565	0.000	0.60	0.0	1222.3	OK
10.012	S3	4.740	-0.615	0.000	0.65	0.0	1262.0	OK
28.000	S2-2	4.335	-0.265	0.000	0.26	0.0	71.7	OK
28.001	S14	4.310	-0.170	0.000	0.71	0.0	105.7	OK
28.002	35	4.250	-0.198	0.000	0.38	0.0	104.6	OK
10.013	S2	4.242	-0.151	0.000	0.86	0.0	1363.2	OK
10.014	S1A	3.980	-0.370	0.000	0.36	0.0	1363.6	OK
10.015	S1	3.758	-0.311	0.000	0.49	0.0	1364.3	OK

Summary of Results for 360 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.246	-0.160	0.000	0.18	0.0	6.5	OK
11.000	11-4-1	5.105	-0.175	0.000	0.11	0.0	4.3	OK
10.001	S11-4	5.035	-0.113	0.000	0.24	0.0	14.7	OK
10.002	S11-3	5.011	-0.015	0.000	0.23	0.0	24.0	OK
10.003	S11-2	4.993	0.080	0.000	0.32	0.0	34.5	SURCHARGED
10.004	S11-1	4.957	0.231	0.000	0.26	0.0	34.4	SURCHARGED
10.005	S11	4.948	-0.342	0.000	0.07	0.0	37.1	OK
12.000	S10-4	5.245	-0.225	0.000	0.00	0.0	0.0	OK
12.001	S10-3	5.045	-0.050	0.000	0.22	0.0	7.8	OK
12.002	S10-2	5.016	0.275	0.000	0.46	0.0	16.0	SURCHARGED
12.003	S10-1	4.973	0.329	0.000	0.33	0.0	22.7	SURCHARGED
10.006	S10	4.946	-0.466	0.000	0.07	0.0	59.6	OK
13.000	S21	7.391	-0.173	0.000	0.12	0.0	5.0	OK
13.001	S20	7.174	-0.135	0.000	0.34	0.0	13.6	OK
13.002	S19	6.881	-0.196	0.000	0.26	0.0	17.3	OK
13.003	S18	6.799	-0.277	0.000	0.15	0.0	20.5	OK
14.000	S17-2	7.085	-0.158	0.000	0.20	0.0	8.1	OK
14.001	S17-1	6.566	-0.087	0.000	0.53	0.0	17.3	OK
13.004	S17	6.550	-0.211	0.000	0.40	0.0	45.9	OK
15.000	S16-2	6.925	-0.157	0.000	0.20	0.0	8.2	OK
15.001	S16-1	6.635	-0.206	0.000	0.22	0.0	15.8	OK
13.005	S16	5.813	-0.276	0.000	0.34	0.0	71.4	OK
16.000	S15-6	7.462	-0.163	0.000	0.17	0.0	8.6	OK
16.001	S15-5	6.888	-0.150	0.000	0.24	0.0	14.6	OK
16.002	S15-4	5.907	-0.234	0.000	0.25	0.0	22.7	OK
17.000	S15-3-1	5.879	-0.225	0.000	0.00	0.0	0.0	OK
16.003	S15-3	5.851	-0.324	0.000	0.19	0.0	37.7	OK
16.004	S15-2	5.810	-0.258	0.000	0.29	0.0	59.2	OK
16.005	S15-1	5.772	-0.189	0.000	0.68	0.0	80.6	OK
13.006	S15	5.742	-0.271	0.000	0.58	0.0	151.7	OK
18.000	S18-1	6.952	-0.166	0.000	0.15	0.0	5.4	OK
18.001	S18-2	6.705	-0.143	0.000	0.29	0.0	10.3	OK
18.002	S14-5	6.510	-0.148	0.000	0.26	0.0	15.7	OK
19.000	S14-4-2	6.057	-0.253	0.000	0.06	0.0	5.4	OK
19.001	S14-4-1	5.482	-0.301	0.000	0.09	0.0	10.8	OK
18.003	S14-4	5.140	-0.170	0.000	0.32	0.0	28.4	OK
20.000	S14-3-3	5.784	-0.174	0.000	0.12	0.0	5.4	OK
20.001	S14-3-2	5.387	-0.301	0.000	0.09	0.0	10.8	OK
20.002	S14-3-1	5.240	-0.293	0.000	0.11	0.0	12.6	OK
18.004	S14-3	5.121	-0.356	0.000	0.16	0.0	44.2	OK
18.005	S14-2	5.091	-0.401	0.000	0.11	0.0	51.4	OK
18.006	S14-1	5.082	-0.279	0.000	0.13	0.0	61.9	OK
13.007	S14	5.071	-0.235	0.000	0.63	0.0	238.5	OK
13.008	S13	5.059	-0.463	0.000	0.50	0.0	244.4	OK
13.009	S9C	5.018	-0.478	0.000	0.31	0.0	243.9	OK
21.000	S12-4	5.264	-0.300	0.000	0.00	0.0	0.0	OK
21.001	S12-3	5.055	-0.214	0.000	0.15	0.0	8.5	OK
21.002	S12-2	5.040	-0.272	0.000	0.12	0.0	15.6	OK
21.003	S12-1	4.994	-0.023	0.000	0.21	0.0	36.1	OK
13.010	S9B	4.968	-0.350	0.000	0.30	0.0	300.1	OK
13.011	S9A	4.952	-0.455	0.000	0.36	0.0	304.6	OK
22.000	S9A-1	5.413	-0.262	0.000	0.20	0.0	21.6	OK
23.000	S9-1-1	5.410	-0.300	0.000	0.00	0.0	0.0	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.087	-0.450	0.000	0.00	0.0	0.0	OK
10.007	S9	4.945	-0.455	0.000	0.32	0.0	385.4	OK
25.000	S8-4	13.488	-0.254	0.000	0.06	0.0	13.6	OK

Summary of Results for 360 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	8.992	-0.236	0.000	0.10	0.0	22.2	OK
25.002	S8-2	8.180	-0.298	0.000	0.09	0.0	34.1	OK
25.003	S8-1	5.466	-0.274	0.000	0.16	0.0	44.9	OK
10.008	S8	4.907	-0.555	0.000	0.61	0.0	636.9	OK
10.009	S8A	4.887	-0.552	0.000	0.44	0.0	657.0	OK
10.010	S6	4.817	-0.561	0.000	0.43	0.0	701.4	OK
26.000	S5-3	4.786	-0.172	0.000	0.22	0.0	100.6	OK
26.001	S5-2	4.767	-0.041	0.000	0.31	0.0	99.7	OK
26.002	S5-1	4.757	-0.017	0.000	0.30	0.0	139.7	OK
27.000	S4-2	4.759	-0.207	0.000	0.17	0.0	100.6	OK
27.001	S4-1	4.745	-0.088	0.000	0.17	0.0	99.6	OK
10.011	S4	4.731	-0.703	0.000	0.46	0.0	936.0	OK
10.012	S3	4.607	-0.748	0.000	0.50	0.0	967.7	OK
28.000	S2-2	4.258	-0.342	0.000	0.20	0.0	53.9	OK
28.001	S14	4.223	-0.257	0.000	0.54	0.0	80.1	OK
28.002	35	4.156	-0.292	0.000	0.29	0.0	79.7	OK
10.013	S2	4.149	-0.244	0.000	0.66	0.0	1046.4	OK
10.014	S1A	3.937	-0.413	0.000	0.27	0.0	1046.6	OK
10.015	S1	3.698	-0.371	0.000	0.38	0.0	1047.4	OK

Summary of Results for 720 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.231	-0.175	0.000	0.11	0.0	3.9	OK
11.000	11-4-1	5.093	-0.187	0.000	0.07	0.0	2.6	OK
10.001	S11-4	4.925	-0.223	0.000	0.15	0.0	9.1	OK
10.002	S11-3	4.799	-0.227	0.000	0.14	0.0	14.9	OK
10.003	S11-2	4.784	-0.129	0.000	0.20	0.0	21.5	OK
10.004	S11-1	4.761	0.035	0.000	0.17	0.0	22.1	SURCHARGED
10.005	S11	4.755	-0.535	0.000	0.04	0.0	23.1	OK
12.000	S10-4	5.245	-0.225	0.000	0.00	0.0	0.0	OK
12.001	S10-3	4.925	-0.170	0.000	0.14	0.0	4.9	OK
12.002	S10-2	4.798	0.057	0.000	0.29	0.0	10.0	SURCHARGED
12.003	S10-1	4.771	0.127	0.000	0.21	0.0	14.3	SURCHARGED
10.006	S10	4.754	-0.658	0.000	0.04	0.0	38.7	OK
13.000	S21	7.379	-0.185	0.000	0.07	0.0	3.0	OK
13.001	S20	7.153	-0.156	0.000	0.20	0.0	8.2	OK
13.002	S19	6.856	-0.221	0.000	0.16	0.0	10.4	OK
13.003	S18	6.778	-0.298	0.000	0.09	0.0	12.4	OK
14.000	S17-2	7.069	-0.174	0.000	0.12	0.0	4.9	OK
14.001	S17-1	6.525	-0.128	0.000	0.32	0.0	10.4	OK
13.004	S17	6.510	-0.251	0.000	0.24	0.0	27.7	OK
15.000	S16-2	6.909	-0.173	0.000	0.12	0.0	5.0	OK
15.001	S16-1	6.612	-0.229	0.000	0.13	0.0	9.6	OK
13.005	S16	5.743	-0.346	0.000	0.21	0.0	43.1	OK
16.000	S15-6	7.448	-0.177	0.000	0.10	0.0	5.2	OK
16.001	S15-5	6.870	-0.168	0.000	0.15	0.0	8.8	OK
16.002	S15-4	5.865	-0.276	0.000	0.15	0.0	13.7	OK
17.000	S15-3-1	5.879	-0.225	0.000	0.00	0.0	0.0	OK
16.003	S15-3	5.790	-0.385	0.000	0.11	0.0	22.8	OK
16.004	S15-2	5.732	-0.336	0.000	0.18	0.0	35.9	OK
16.005	S15-1	5.686	-0.275	0.000	0.41	0.0	48.9	OK
13.006	S15	5.658	-0.355	0.000	0.35	0.0	92.0	OK
18.000	S18-1	6.939	-0.179	0.000	0.09	0.0	3.3	OK
18.001	S18-2	6.686	-0.162	0.000	0.17	0.0	6.2	OK
18.002	S14-5	6.492	-0.166	0.000	0.15	0.0	9.5	OK
19.000	S14-4-2	6.047	-0.263	0.000	0.04	0.0	3.3	OK
19.001	S14-4-1	5.463	-0.320	0.000	0.05	0.0	6.5	OK
18.003	S14-4	5.061	-0.249	0.000	0.19	0.0	17.2	OK
20.000	S14-3-3	5.772	-0.186	0.000	0.07	0.0	3.3	OK
20.001	S14-3-2	5.368	-0.320	0.000	0.05	0.0	6.5	OK
20.002	S14-3-1	5.221	-0.312	0.000	0.07	0.0	7.6	OK
18.004	S14-3	5.021	-0.456	0.000	0.10	0.0	26.9	OK
18.005	S14-2	4.943	-0.549	0.000	0.07	0.0	31.6	OK
18.006	S14-1	4.915	-0.446	0.000	0.08	0.0	38.2	OK
13.007	S14	4.906	-0.400	0.000	0.39	0.0	147.5	OK
13.008	S13	4.893	-0.629	0.000	0.31	0.0	148.8	OK
13.009	S9C	4.839	-0.657	0.000	0.19	0.0	149.5	OK
21.000	S12-4	5.264	-0.300	0.000	0.00	0.0	0.0	OK
21.001	S12-3	5.030	-0.239	0.000	0.09	0.0	5.2	OK
21.002	S12-2	5.002	-0.310	0.000	0.07	0.0	9.5	OK
21.003	S12-1	4.786	-0.231	0.000	0.13	0.0	22.5	OK
13.010	S9B	4.770	-0.548	0.000	0.18	0.0	185.6	OK
13.011	S9A	4.759	-0.648	0.000	0.22	0.0	187.8	OK
22.000	S9A-1	5.386	-0.289	0.000	0.12	0.0	13.0	OK
23.000	S9-1-1	5.410	-0.300	0.000	0.00	0.0	0.0	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.087	-0.450	0.000	0.00	0.0	0.0	OK
10.007	S9	4.753	-0.647	0.000	0.20	0.0	239.8	OK
25.000	S8-4	13.478	-0.264	0.000	0.03	0.0	8.2	OK

Summary of Results for 720 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	8.976	-0.252	0.000	0.06	0.0	13.4	OK
25.002	S8-2	8.160	-0.318	0.000	0.06	0.0	20.6	OK
25.003	S8-1	5.444	-0.296	0.000	0.10	0.0	27.1	OK
10.008	S8	4.715	-0.747	0.000	0.38	0.0	398.0	OK
10.009	S8A	4.695	-0.744	0.000	0.27	0.0	410.3	OK
10.010	S6	4.628	-0.750	0.000	0.27	0.0	437.3	OK
26.000	S5-3	4.584	-0.374	0.000	0.13	0.0	61.0	OK
26.001	S5-2	4.569	-0.239	0.000	0.19	0.0	60.7	OK
26.002	S5-1	4.563	-0.211	0.000	0.18	0.0	85.0	OK
27.000	S4-2	4.564	-0.402	0.000	0.11	0.0	61.0	OK
27.001	S4-1	4.555	-0.278	0.000	0.11	0.0	60.7	OK
10.011	S4	4.547	-0.887	0.000	0.29	0.0	581.1	OK
10.012	S3	4.428	-0.927	0.000	0.31	0.0	600.5	OK
28.000	S2-2	4.177	-0.423	0.000	0.12	0.0	32.6	OK
28.001	S14	4.124	-0.356	0.000	0.33	0.0	48.8	OK
28.002	35	4.042	-0.406	0.000	0.18	0.0	48.8	OK
10.013	S2	4.032	-0.361	0.000	0.41	0.0	649.1	OK
10.014	S1A	3.882	-0.468	0.000	0.17	0.0	649.2	OK
10.015	S1	3.623	-0.446	0.000	0.24	0.0	649.7	OK

Summary of Results for 1440 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.219	-0.187	0.000	0.07	0.0	2.3	OK
11.000	11-4-1	5.084	-0.196	0.000	0.04	0.0	1.6	OK
10.001	S11-4	4.909	-0.239	0.000	0.09	0.0	5.5	OK
10.002	S11-3	4.727	-0.299	0.000	0.09	0.0	9.0	OK
10.003	S11-2	4.652	-0.261	0.000	0.12	0.0	12.9	OK
10.004	S11-1	4.616	-0.110	0.000	0.10	0.0	13.9	OK
10.005	S11	4.613	-0.677	0.000	0.03	0.0	13.6	OK
12.000	S10-4	5.245	-0.225	0.000	0.00	0.0	0.0	OK
12.001	S10-3	4.913	-0.182	0.000	0.08	0.0	2.9	OK
12.002	S10-2	4.637	-0.104	0.000	0.17	0.0	6.0	OK
12.003	S10-1	4.622	-0.022	0.000	0.12	0.0	8.5	OK
10.006	S10	4.612	-0.800	0.000	0.03	0.0	24.0	OK
13.000	S21	7.369	-0.195	0.000	0.04	0.0	1.8	OK
13.001	S20	7.136	-0.173	0.000	0.12	0.0	4.9	OK
13.002	S19	6.839	-0.238	0.000	0.09	0.0	6.3	OK
13.003	S18	6.758	-0.318	0.000	0.06	0.0	7.4	OK
14.000	S17-2	7.057	-0.186	0.000	0.07	0.0	2.9	OK
14.001	S17-1	6.498	-0.155	0.000	0.19	0.0	6.3	OK
13.004	S17	6.480	-0.281	0.000	0.14	0.0	16.6	OK
15.000	S16-2	6.897	-0.185	0.000	0.07	0.0	3.0	OK
15.001	S16-1	6.596	-0.245	0.000	0.08	0.0	5.7	OK
13.005	S16	5.695	-0.394	0.000	0.12	0.0	25.9	OK
16.000	S15-6	7.436	-0.189	0.000	0.06	0.0	3.1	OK
16.001	S15-5	6.858	-0.180	0.000	0.09	0.0	5.3	OK
16.002	S15-4	5.841	-0.300	0.000	0.09	0.0	8.2	OK
17.000	S15-3-1	5.879	-0.225	0.000	0.00	0.0	0.0	OK
16.003	S15-3	5.753	-0.422	0.000	0.07	0.0	13.7	OK
16.004	S15-2	5.680	-0.388	0.000	0.11	0.0	21.5	OK
16.005	S15-1	5.626	-0.335	0.000	0.25	0.0	29.4	OK
13.006	S15	5.599	-0.414	0.000	0.21	0.0	55.2	OK
18.000	S18-1	6.927	-0.191	0.000	0.06	0.0	2.0	OK
18.001	S18-2	6.671	-0.177	0.000	0.10	0.0	3.7	OK
18.002	S14-5	6.479	-0.179	0.000	0.09	0.0	5.7	OK
19.000	S14-4-2	6.040	-0.270	0.000	0.02	0.0	2.0	OK
19.001	S14-4-1	5.451	-0.332	0.000	0.03	0.0	3.9	OK
18.003	S14-4	5.026	-0.284	0.000	0.11	0.0	10.3	OK
20.000	S14-3-3	5.763	-0.195	0.000	0.04	0.0	2.0	OK
20.001	S14-3-2	5.356	-0.332	0.000	0.03	0.0	3.9	OK
20.002	S14-3-1	5.206	-0.327	0.000	0.04	0.0	4.6	OK
18.004	S14-3	4.978	-0.499	0.000	0.06	0.0	16.1	OK
18.005	S14-2	4.869	-0.623	0.000	0.04	0.0	19.1	OK
18.006	S14-1	4.812	-0.549	0.000	0.05	0.0	22.9	OK
13.007	S14	4.797	-0.509	0.000	0.23	0.0	87.9	OK
13.008	S13	4.783	-0.739	0.000	0.18	0.0	90.1	OK
13.009	S9C	4.725	-0.771	0.000	0.11	0.0	90.1	OK
21.000	S12-4	5.264	-0.300	0.000	0.00	0.0	0.0	OK
21.001	S12-3	5.014	-0.255	0.000	0.06	0.0	3.1	OK
21.002	S12-2	4.986	-0.326	0.000	0.04	0.0	5.7	OK
21.003	S12-1	4.678	-0.339	0.000	0.08	0.0	13.5	OK
13.010	S9B	4.635	-0.683	0.000	0.11	0.0	113.6	OK
13.011	S9A	4.625	-0.782	0.000	0.13	0.0	110.9	OK
22.000	S9A-1	5.366	-0.309	0.000	0.07	0.0	7.8	OK
23.000	S9-1-1	5.410	-0.300	0.000	0.00	0.0	0.0	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.087	-0.450	0.000	0.00	0.0	0.0	OK
10.007	S9	4.625	-0.775	0.000	0.13	0.0	156.7	OK
25.000	S8-4	13.471	-0.271	0.000	0.02	0.0	4.9	OK

Summary of Results for 1440 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	8.965	-0.263	0.000	0.04	0.0	8.0	OK
25.002	S8-2	8.148	-0.330	0.000	0.03	0.0	12.3	OK
25.003	S8-1	5.424	-0.316	0.000	0.06	0.0	16.3	OK
10.008	S8	4.573	-0.889	0.000	0.24	0.0	247.9	OK
10.009	S8A	4.547	-0.892	0.000	0.17	0.0	253.6	OK
10.010	S6	4.484	-0.894	0.000	0.16	0.0	270.8	OK
26.000	S5-3	4.458	-0.500	0.000	0.08	0.0	36.7	OK
26.001	S5-2	4.419	-0.389	0.000	0.11	0.0	36.7	OK
26.002	S5-1	4.415	-0.359	0.000	0.11	0.0	51.3	OK
27.000	S4-2	4.427	-0.539	0.000	0.06	0.0	36.7	OK
27.001	S4-1	4.410	-0.423	0.000	0.06	0.0	36.6	OK
10.011	S4	4.405	-1.029	0.000	0.18	0.0	357.0	OK
10.012	S3	4.292	-1.063	0.000	0.19	0.0	369.0	OK
28.000	S2-2	4.129	-0.471	0.000	0.07	0.0	19.6	OK
28.001	S14	4.064	-0.416	0.000	0.20	0.0	29.4	OK
28.002	35	3.978	-0.470	0.000	0.11	0.0	29.4	OK
10.013	S2	3.952	-0.441	0.000	0.25	0.0	397.7	OK
10.014	S1A	3.842	-0.508	0.000	0.10	0.0	397.8	OK
10.015	S1	3.572	-0.497	0.000	0.14	0.0	397.9	OK

Summary of Results for 2880 minute 100 year Winter (Storm)

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
10.000	S11-5	5.210	-0.196	0.000	0.04	0.0	1.4	OK
11.000	11-4-1	5.078	-0.202	0.000	0.02	0.0	0.9	OK
10.001	S11-4	4.893	-0.255	0.000	0.05	0.0	3.3	OK
10.002	S11-3	4.706	-0.320	0.000	0.05	0.0	5.4	OK
10.003	S11-2	4.605	-0.308	0.000	0.07	0.0	7.7	OK
10.004	S11-1	4.509	-0.217	0.000	0.06	0.0	8.0	OK
10.005	S11	4.507	-0.783	0.000	0.02	0.0	8.7	OK
12.000	S10-4	5.245	-0.225	0.000	0.00	0.0	0.0	OK
12.001	S10-3	4.902	-0.193	0.000	0.05	0.0	1.8	OK
12.002	S10-2	4.564	-0.177	0.000	0.10	0.0	3.6	OK
12.003	S10-1	4.512	-0.132	0.000	0.08	0.0	5.2	OK
10.006	S10	4.506	-0.906	0.000	0.02	0.0	14.5	OK
13.000	S21	7.363	-0.201	0.000	0.03	0.0	1.1	OK
13.001	S20	7.124	-0.185	0.000	0.07	0.0	3.0	OK
13.002	S19	6.823	-0.254	0.000	0.06	0.0	3.7	OK
13.003	S18	6.745	-0.331	0.000	0.03	0.0	4.4	OK
14.000	S17-2	7.048	-0.195	0.000	0.04	0.0	1.8	OK
14.001	S17-1	6.479	-0.174	0.000	0.12	0.0	3.7	OK
13.004	S17	6.460	-0.301	0.000	0.09	0.0	9.9	OK
15.000	S16-2	6.887	-0.195	0.000	0.04	0.0	1.8	OK
15.001	S16-1	6.582	-0.259	0.000	0.05	0.0	3.4	OK
13.005	S16	5.663	-0.426	0.000	0.07	0.0	15.5	OK
16.000	S15-6	7.428	-0.197	0.000	0.04	0.0	1.9	OK
16.001	S15-5	6.846	-0.192	0.000	0.05	0.0	3.2	OK
16.002	S15-4	5.822	-0.319	0.000	0.05	0.0	4.9	OK
17.000	S15-3-1	5.879	-0.225	0.000	0.00	0.0	0.0	OK
16.003	S15-3	5.725	-0.450	0.000	0.04	0.0	8.2	OK
16.004	S15-2	5.646	-0.422	0.000	0.06	0.0	12.9	OK
16.005	S15-1	5.580	-0.381	0.000	0.15	0.0	17.6	OK
13.006	S15	5.554	-0.459	0.000	0.13	0.0	33.1	OK
18.000	S18-1	6.920	-0.198	0.000	0.03	0.0	1.2	OK
18.001	S18-2	6.659	-0.189	0.000	0.06	0.0	2.2	OK
18.002	S14-5	6.467	-0.191	0.000	0.06	0.0	3.4	OK
19.000	S14-4-2	6.028	-0.282	0.000	0.01	0.0	1.2	OK
19.001	S14-4-1	5.441	-0.342	0.000	0.02	0.0	2.3	OK
18.003	S14-4	5.004	-0.306	0.000	0.07	0.0	6.2	OK
20.000	S14-3-3	5.757	-0.201	0.000	0.03	0.0	1.2	OK
20.001	S14-3-2	5.346	-0.342	0.000	0.02	0.0	2.3	OK
20.002	S14-3-1	5.197	-0.336	0.000	0.02	0.0	2.7	OK
18.004	S14-3	4.952	-0.525	0.000	0.04	0.0	9.7	OK
18.005	S14-2	4.831	-0.661	0.000	0.02	0.0	11.4	OK
18.006	S14-1	4.746	-0.615	0.000	0.03	0.0	13.8	OK
13.007	S14	4.721	-0.585	0.000	0.14	0.0	52.7	OK
13.008	S13	4.708	-0.814	0.000	0.11	0.0	54.0	OK
13.009	S9C	4.648	-0.848	0.000	0.07	0.0	54.0	OK
21.000	S12-4	5.264	-0.300	0.000	0.00	0.0	0.0	OK
21.001	S12-3	5.004	-0.265	0.000	0.03	0.0	1.9	OK
21.002	S12-2	4.977	-0.335	0.000	0.03	0.0	3.4	OK
21.003	S12-1	4.633	-0.384	0.000	0.05	0.0	8.1	OK
13.010	S9B	4.531	-0.787	0.000	0.07	0.0	67.5	OK
13.011	S9A	4.513	-0.894	0.000	0.08	0.0	68.3	OK
22.000	S9A-1	5.350	-0.325	0.000	0.04	0.0	4.7	OK
23.000	S9-1-1	5.410	-0.300	0.000	0.00	0.0	0.0	OK
24.000	S9-2	5.595	-0.375	0.000	0.00	0.0	0.0	OK
23.001	S9-1	5.087	-0.450	0.000	0.00	0.0	0.0	OK
10.007	S9	4.509	-0.891	0.000	0.07	0.0	89.3	OK
25.000	S8-4	13.459	-0.283	0.000	0.01	0.0	2.9	OK

Summary of Results for 2880 minute 100 year Winter (Storm)

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
25.001	S8-3	8.958	-0.270	0.000	0.02	0.0	4.8	OK
25.002	S8-2	8.139	-0.339	0.000	0.02	0.0	7.4	OK
25.003	S8-1	5.411	-0.329	0.000	0.04	0.0	9.7	OK
10.008	S8	4.464	-0.998	0.000	0.14	0.0	145.1	OK
10.009	S8A	4.439	-1.000	0.000	0.10	0.0	148.9	OK
10.010	S6	4.375	-1.003	0.000	0.10	0.0	159.1	OK
26.000	S5-3	4.395	-0.563	0.000	0.05	0.0	22.0	OK
26.001	S5-2	4.316	-0.492	0.000	0.07	0.0	22.0	OK
26.002	S5-1	4.310	-0.464	0.000	0.07	0.0	30.8	OK
27.000	S4-2	4.343	-0.623	0.000	0.04	0.0	22.0	OK
27.001	S4-1	4.302	-0.531	0.000	0.04	0.0	22.0	OK
10.011	S4	4.296	-1.138	0.000	0.10	0.0	211.3	OK
10.012	S3	4.189	-1.166	0.000	0.11	0.0	218.3	OK
28.000	S2-2	4.094	-0.506	0.000	0.04	0.0	11.7	OK
28.001	S14	4.023	-0.457	0.000	0.12	0.0	17.6	OK
28.002	35	3.946	-0.502	0.000	0.06	0.0	17.6	OK
10.013	S2	3.908	-0.485	0.000	0.15	0.0	235.8	OK
10.014	S1A	3.815	-0.535	0.000	0.06	0.0	235.6	OK
10.015	S1	3.539	-0.530	0.000	0.09	0.0	235.5	OK

Appendix B

SuDS/Green Infrastructure Checklist

CS CONSULTING
GROUP

SUDS/Green Infrastructure selection checklist –To be submitted in planning submission - Rev 1

Suds Measures	Measures to be used on this site	Rationale for selecting/not selecting measure	Checklist submitted? See no. 8 below
Source Control			
Swales	No.	None provided given the density of the site with apartment. Road network will have development each side.	
Tree Pits	No	Some Tree pits are proposed in green areas adjacent to road network.	
Rainwater Butts	No	Apartments form the type of the development.	
Rainwater harvesting	No	None proposed	
Soakaways	No	Poor permeability. BRE digest 365 test failed.	
Infiltration trenches	No	Poor permeability.	
Permeable pavement (Grasscrete, Block paving, Portous Asphalt etc.)	No	Poor permeability. Permeable paving proposed in locations for filtration of road run off	
Green Roofs	Yes	Low level roofs in apartment development will have green roofs. High level roofs will not have green roofs. Percentage of green roof area to be confirmed upon final design. Podium slabs to apartment blocks to incorporate limited green roof systems.	
Filter strips	No		
Bio-retention systems/Raingardens	Yes	Some Bio retention areas proposed in green areas adjacent to road network.	
Blue Roofs	No	None proposed.	
Filter Drain	No	None proposed.	
Site Control			
Detention Basins	No	Refer to regional control below	
Retentions basins	No	Refer to regional control below	
Regional Control			
Ponds	Yes	Forebay to be constructed prior to attenuation discharge to the wetlands.	
Wetlands	Yes	Wetlands to be constructed to serve the GA1, 2 and 3 of the development as approved under the 2016 permission on the site and currently under construction.	
Other			

Petrol/Oil interceptor	yes	Petrol inceptors to be placed on the parking under the apartment development and in addition Forebay sediment control prior to entering the wetlands.	
Attenuation tank – only as a last resort where other measures are not feasible	No	None proposed	
Oversized pipes– only as a last resort where other measures are not feasible	No	None proposed.	

Note:

1. Fingal has a preference for above ground Green Infrastructure rather than tanks or over sized pipes . Above ground flows through swales, basins etc are encouraged.
2. Demonstrate SUDS system will have sufficient Pollutant removal efficiency in accordance with Ciria Suds Manual C753
3. Basins sides should be no steeper than 1:4 and no deeper than 1.2m in the 1%AEP
4. Culverting shall be avoided where possible
5. De-culverting is encouraged.
6. Please submit evidence of infiltration rates
7. To account for climate change in the design of the drainage system rainfall intensities should be factored up by 20%
8. The Applicant must provide Suds checklists in accordance with the Appendix B of the Ciria Suds manual C753

Appendix	Name
B3	Full planning
B4	Scheme design
B5	Health and safety
B6	Infiltration assessment
B7	Proprietary treatment
B9	filter strip
B11	filter drain
B13	swale
B15	bioretention
B16	pervious pavement
B17	attenuation tank
B19	basin
B21	pond wetland

Flood risk to be assessed

Flood risk	Applicable to subject site	Measures to reduce risk	Residual risk
Fluvial	No		
Pluvial	No		
Coastal	No		
Groundwater	No		
Dam/Embankment/Canal bank breach	No		
Network drainage	Yes	Network modelled for 100 year event plus climate change, and no flooding occurs. In the event of blockage failure, the road network is designed to direct floodwater to green areas	No
Snow melt	No		
Watermain burst	Yes	the road network is designed to direct floodwater to green areas	No

Note:

Models should consider the risk when outlets are surcharged

Climate Change scenarios to be considered both MRFS and HEFS

Appendix C

Irish Water Pre-Connection Enquiry Response

CS CONSULTING
GROUP

Owen Sullivan
CS Consulting
19-22 Dame Street
Dublin 2
D02E267

16 November 2020

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

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

www.water.ie

Dear Owen Sullivan,

Re: Connection Reference No CDS20001785 pre-connection enquiry -

Subject to contract | Contract denied

Connection for Housing Development of 1,200 unit(s) at The Coast, Baldoyle, Dublin 13

Irish Water has reviewed your pre-connection enquiry in relation to a water and wastewater connection at The Coast, Baldoyle, Dublin 13.

Based upon the details that you have provided with your pre-connection enquiry and on the capacity currently available in the network(s), as assessed by Irish Water, we wish to advise you that, subject to a valid connection agreement being put in place, your proposed connection to the Irish Water network(s) can be facilitated.

Water:

In order to accommodate the proposed connection to Irish Water network at the Premises, upgrade works are required as follows:

- Connection main - (Approx.) 150m of new 200mm ID pipe main to be laid to connect the site development to the existing 300mm main. Bulk meter to be installed on the connection main to be linked with telemetry online. See red dashed-line below in the figure.
- Secondary connection main – (Approx.) 30m of new 200mm ID pipe main to be laid to connect site boundary to 450mm DI main. Valve to be installed on connection main, valve to be closed in normal operations. See green line in the figure below.

Irish Water currently does not have any plans to extend its network in this area. Should you wish to progress with the connection you will be required to fund this network extension.

This Confirmation of Feasibility to connect to the Irish Water infrastructure also does not extend to your fire flow requirements. Please note that Irish Water cannot guarantee a flow rate to meet fire flow requirements and in order to guarantee a flow to meet the Fire Authority requirements, you may need to provide adequate fire storage capacity within your development.

In order to determine the potential flow that could be delivered during normal operational conditions, an onsite assessment of the existing network is required.

Wastewater:

New connection to the existing network is feasible without upgrade.

All connections to the North Fringe Sewer should be sufficiently sized to cater for all new flows and to be separate foul only connections.

Connection detail to the 1600mm sewer has to be submitted and agreed at Connection Application stage. The sewer can surcharge at this location and connection detail will need to withstand any surcharging effect to the internal network.

Strategic Housing Development:

Irish Water notes that the scale of this development dictates that it is subject to the Strategic Housing Development planning process. In advance of submitting your full application to An Bord Pleanála for assessment, you must have reviewed this development with Irish Water and received a Statement of Design Acceptance in relation to the layout of water and wastewater services.

All infrastructure should be designed and installed in accordance with the Irish Water Codes of Practice and Standard Details. A design proposal for the water and/or wastewater infrastructure should be submitted to Irish Water for assessment. Prior to submitting your planning application, you are required to submit these detailed design proposals to Irish Water for review.

You are advised that this correspondence does not constitute an offer in whole or in part to provide a connection to any Irish Water infrastructure and is provided subject to a connection agreement being signed at a later date.

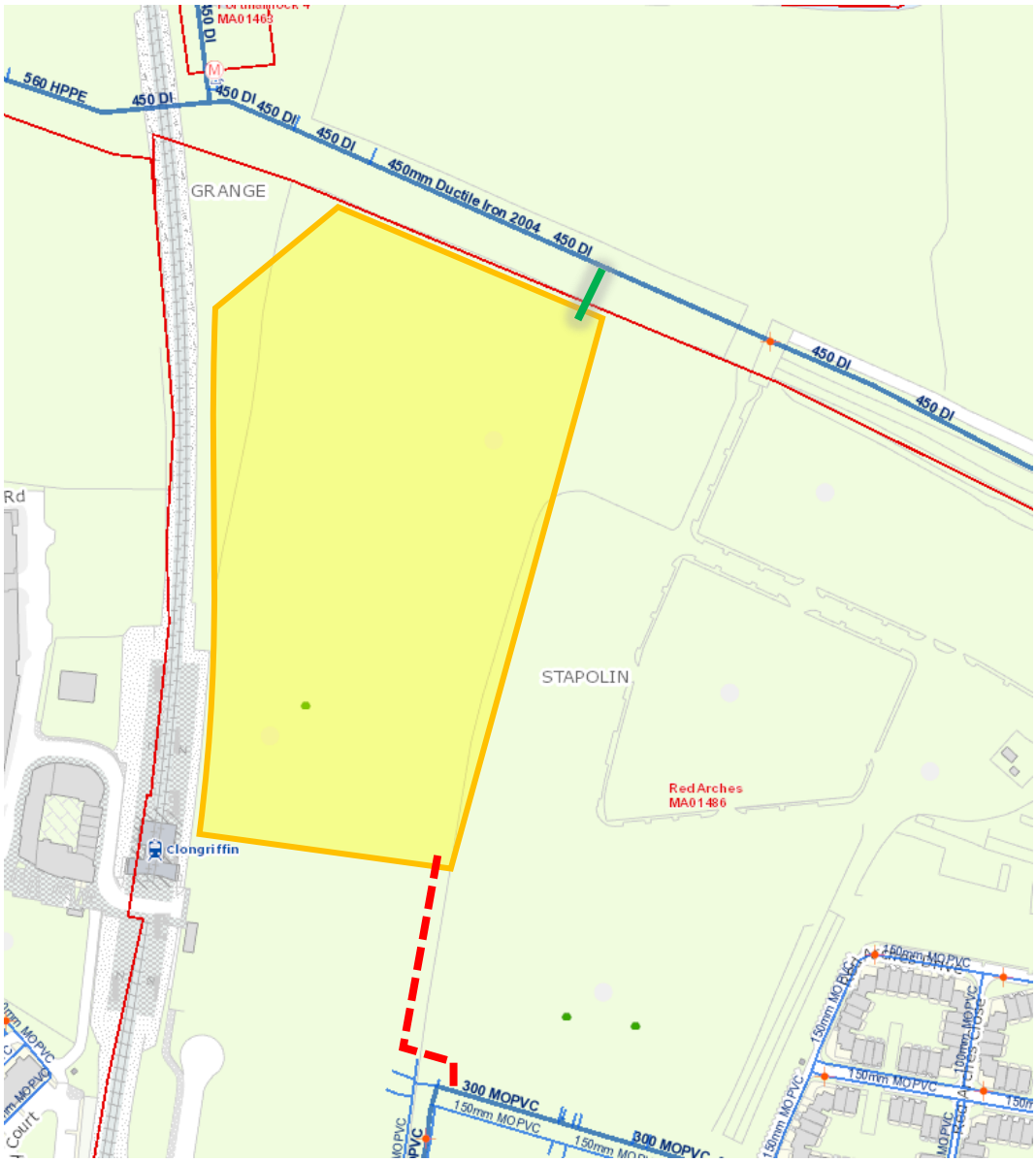
A connection agreement can be applied for by completing the connection application form available at **www.water.ie/connections**. Irish Water's current charges for water and wastewater connections are set out in the Water Charges Plan as approved by the Commission for Regulation of Utilities.

If you have any further questions, please contact Marina Byrne from the design team via email mzbyrne@water.ie. For further information, visit **www.water.ie/connections.**

Yours sincerely,

Maria O'Dwyer

Connections and Developer Services


MA01463
450 DI
560 HPPE
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450 DI 450 DI
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450mm Ductile Iron 2004
450 DI
450 DI
450 DI
GRANGE
Rd
STAPOLIN
Red Arches
MA01486
Clongriffin
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150mm MOPVC
150mm MOPVC
100mm MOPVC
150mm MOPVC
150mm MOPVC
150mm MOPVC
150mm MOPVC
Court

Appendix D

Irish Water Statement of Design Acceptance

CS CONSULTING
GROUP

Sean McCallion
Embassy house
Ballsbridge, Dublin 4
Dublin
D04H6Y0

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

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

www.water.ie

18 June 2021

Re: Design Submission for The Coast, Baldoyle, Dublin, Co. Dublin (the "Development") (the "Design Submission") / Connection Reference No: CDS20001785

Dear Sean McCallion,

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, Irish Water has no objection to your proposals.

This letter does not constitute an offer, in whole or in part, to provide a connection to any Irish Water infrastructure. Before you can connect to our network you must sign a connection agreement with Irish Water. This can be applied for by completing the connection application form at www.water.ie/connections. Irish Water'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 Irish Water's network(s) (the "**Self-Lay Works**"), as reflected in your Design Submission. Acceptance of the Design Submission by Irish Water does not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.

If you have any further questions, please contact your Irish Water representative:
Name: Alvaro Garcia
Email: agarcia@water.ie

Yours sincerely,

Yvonne Harris

Yvonne Harris
Head of Customer Operations

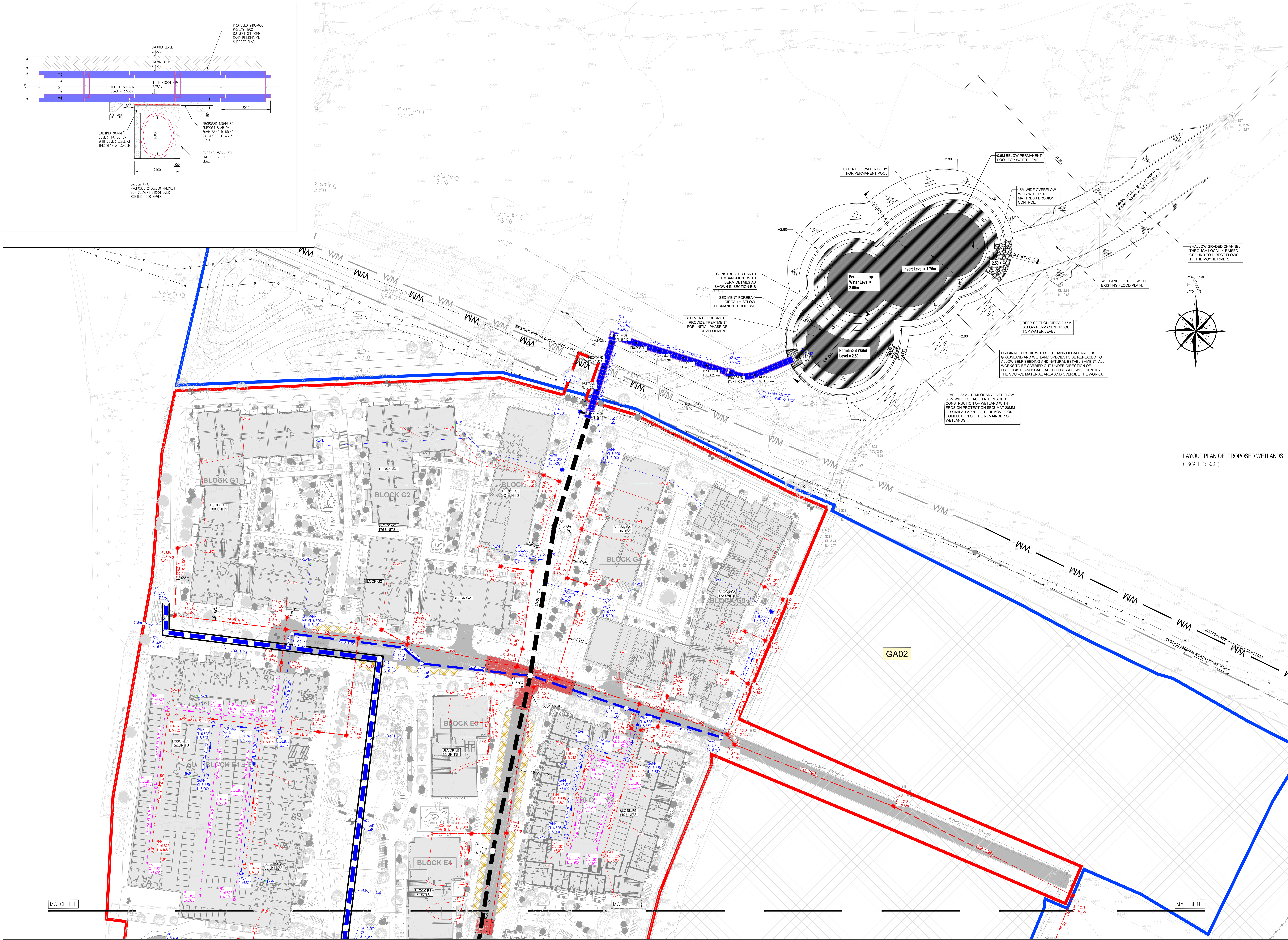
Appendix A

Document Title & Revision

BD-CSC-ZZ-G3-DR-C-0103_Proposed Drainage Layout-Sheet 1
BD-CSC-ZZ-G3-DR-C-104_Proposed Drainage Layout-Sheet 2
BD-CSC-ZZ-G3-DR-C-0105_Proposed Basement Drainage
BD-CSC-ZZ-G3-DR-C-107_Proposed Watermain Layout-Sheet 1
BD-CSC-ZZ-G3-DR-C-108_Proposed Watermain Layout-Sheet 2
BD-CSC-ZZ-G3-DR-C-0115_Foul Sewer Profiles

*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 Irish Water will not, in any way, render Irish Water liable for any elements of the design and/or construction of the Self-Lay Works.



LEGEND:

SITE BOUNDARY

LEGEND

- EXISTING FOUL SEWER
- EXISTING SURFACE WATER SEWER
- PROPOSED STORM SEWER
- PROPOSED FOUL SEWER
- PROPOSED SURFACE WATER SEWER DIVERSION
- UNDERCROFT PARKING LEVEL DRAINAGE
- PROPOSED FOUL INSPECTION CHAMBER
- PROPOSED SW INSPECTION CHAMBER
- PIPE DIAMETER AND GRADIENT — 225mmØ 1:150
- PROPOSED MANHOLE NUMBER, COVER AND INVERT LEVELS — S1 CL 100.00 IL 99.40
- BACKDROP INVERT LEVEL — DL 3.57
- PROPOSED SWALE
- PROPOSED BIO RETENTION
- KERB GULLY
- ROAD GULLY
- PROPOSED GREEN ROOF
- PROPOSED PERMEABLE PAVING
- PROPOSED TREE PIT
- SITE BOUNDARY EXTENTS

NOTE: LOCATIONS AND LEVELS OF ALL EXISTING SERVICES ON SITE TO BE SURVEYED AND VERIFIED PRIOR TO COMMENCMENT OF CONSTRUCTION WORKS.

NOTES:

1. ALL LEVELS ARE TO MALIN HEAD ORDNANCE DATUM.
2. REFER TO DRAWING BD-CSC-ZZ-G3-DR-C-0109 FOR MANHOLE DETAILS.
3. REFER TO DRAWING BD-CSC-ZZ-G3-DR-C-0110 FOR PIPE BEDDING DETAILS
4. ALL WORKS IN CONFINED SPACES SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE PROVISIONS ON "SAFE WORK" "IN CONFINED SPACES" CODE OF PRACTICE FOR WORKING IN CONFINED SPACES, PUBLISHED BY THE HEALTH & SAFETY AUTHORITY.
5. ALL SITE DEVELOPMENT WORKS SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE CONSTRUCTION DRAWINGS.
6. ALL DRAINAGE WORKS SHALL BE CARRIED OUT IN STRICT ACCORDANCE WITH THE REQUIREMENTS OF THE LOCAL AUTHORITY, TII PUBLICATIONS SERIES 500, THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS AND THE IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS.
7. THIS DRAWING SHOULD BE READ IN CONJUNCTION WITH ALL OTHER CONTRACT DOCUMENTATION, INCLUDING DRAWINGS AND SPECIFICATIONS.
8. THE CONTRACTOR IS SOLELY RESPONSIBLE FOR LOCATING, PROTECTING AND MAINTAINING ALL EXISTING SERVICES WITHIN THE SITE BOUNDARY AND IN THE AREAS AFFECTED BY THE WORKS. THE ENGINEER HAS PROVIDED INFORMATION ON KNOWN SERVICES BUT GIVES NO GUARANTEE THAT THIS INFORMATION PROVIDED BY THE THIRD PARTIES, IS CORRECT OR THAT THESE ARE THE ONLY SERVICES ON THE SITE.
9. SUITABLE SHORT LENGTHS OF PIPE OR ROCKER PIPES SHALL BE INSTALLED TO PROVIDE A FLEXIBLE JOINT WITHIN 1000MM OF THE OUTER FACE OF THE MANHOLE ON ALL SEWERS AND BRANCHES.
10. WHERE ROCK IS MET IN TRENCHES IT SHALL BE EXCAVATED AND TRIMMED TO 300MM BELOW THE UNDERSIDE OF PIPELINE.
11. GRANULAR MATERIAL 5MM – 20MM NOMINAL SIZE GRADED AGGREGATE (TO COMPLY WITH TABLE 1 OF B5) TO BE USED FOR BEDDING, HAUNCHING AND SURROUND TO PIPES WHERE SPECIFIED.
12. CONCRETE MIX C16/20 TO BE USED FOR BEDDING, HAUNCHING AND SURROUND WHERE SPECIFIED.
13. WHERE RIGID PIPES WITH FLEXIBLE JOINTS ARE USED WITH CONCRETE BEDS FOR DRAINS AND WATERMAINS, VERTICAL MOVEMENT JOINTS SHALL BE PROVIDED IN THE BEDS AT MAX INTERVALS OF 5.0M AND ALIGNED WITH FACE OF PIPE SOCKET. JOINTS TO BE MINIMUM 12M WIDE AND FILLED WITH FLEXCELL OR SIMILAR APPROVED MATERIAL.
14. SURFACE WATER AND FOUL DRAINS SHALL BE SURROUNDED BY 150 THICKNESS OF C16/20 CONCRETE IF COVER TO PIPE IS LESS THAN:–
   - –1.2M IN ROADS AND DRIVEWAYS
   - –0.9M IN OPEN SPACES AND PATHS NOT NEAR CARRIAGEWAYS.
15. ALL PIPE RUNS SHALL BE LAID IN STRAIGHT LINES BOTH VERTICALLY AND HORIZONTALLY TO THE SPECIFIED GRADIENTS BETWEEN MANHOLES. NO DEVIATIONS OR BENDS SHALL BE PERMITTED.
16. REFER TO "THE GREATER DUBLIN REGIONAL CODE OF PRACTICE FOR DRAINAGE WORKS" FOR DETAILS OF SURFACE WATER MANHOLE STANDARDS AND IRISH WATER CODE OF PRACTICE AND STANDARD DETAILS FOR DETAILS OF FOUL MANHOLE STANDARDS..
17. THE CONTRACTOR SHALL CARRY OUT A CCTV SURVEY REPORT OF THE COMPLETED STORM & FOUL NETWORK TO THE SATISFACTION OF THE LOCAL AUTHORITY AND REPORT TO BE ISSUED ON PRACTICAL COMPLETION.
18. THE LOCAL AUTHORITY MUST BE NOTIFIED AT LEAST 10 WORKING DAYS IN ADVANCE OF COMMENCEMENT OF WORKS.
19. PRIOR TO COMMENCEMENT OF CONSTRUCTION OUTFALL LEVELS FOR THE FOUL AND SURFACE WATER MANHOLES SHALL BE VERIFIED ON SITE.
20. PROPOSED FOUL SEWERS WILL BE EITHER CONCRETE, THERMOSTATIC STRUCTURED WALLED PIPES OR UNPLASTICISED PVC IN ACCORDANCE WITH SECTION 3.13 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE. PROPOSED STORM DRAINS TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF FINGAL CO. CO.
21. TYPICAL SERVICE LAYOUT DISTANCES (HORIZONTAL AND VERTICAL) AS PER IRISH WATER DETAIL STD-WW-05
22. THE EXTERNAL FACE OF PROPOSED MANHOLE CHAMBERS IN PUBLIC ROADS WILL BE A MINIMUM OF 0.5M FROM THE PROPOSED PUBLIC ROAD KERB LINE IN ACCORDANCE WITH SECTION 1.23 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE
23. INSPECTION CHAMBERS TO EACH HOUSE/UNIT TO BE IN ACCORDANCE WITH IRISH WATER DETAIL STD-WW-02 AND STD-WW-03.
24. APPROPRIATE MEASURES ADHERING TO SECTION 3.21 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE WILL BE PROVIDED TO DRAINAGE INFRASTRUCTURE IN CLOSE PROXIMITY TO PLANTING TO PREVENT ANY DAMAGE TO INFRASTRUCTURE VIA ROOT INGRESS OR NEGATIVE IMPACTS TO PLANTING SUCH AS DAMAGE OF TREE ROOTS

PIPE MATERIALS

ALL FOUL SEWER PIPE MATERIALS SHALL BE PVC SN8 OR IN COMPLIANCE WITH SECTION 3.13 OF THE IRISH WATER CODE OF PRACTICE FOR WASTEWATER.

PROPOSED SW SEWERS 450mmØ IN DIAMETER OR LARGER TO BE CONCRETE ISEN1916(2002), THERMOSTATIC STRUCTURED WALLED PIPES (TWIN WALL) TO PIPE DIAMETERS 225mmØ OR 375mØ OR SIMILAR APPROVED.

R090

DRAFT

PLANNING DRAWING.
NOT FOR CONSTRUCTION.
ALL LEVELS GIVEN ARE RELATIVE TO ORDNANCE DATUM.
THIS DRAWING HAS BEEN ISSUED FOR INFORMATION PURPOSES ONLY AND MUST NOT BE USED FOR CONSTRUCTION UNDER ANY CIRCUMSTANCES

NOTES
1. For setting out refer to Architect's drawings.
2. This drawing to be read in conjunction with all other Architectural and Engineering drawings and all other relevant drawings and Specifications.
3. DO NOT SCALE THIS DRAWING. Use figured dimensions only.
4. No part of this document may be reproduced or transmitted in any form or stored in any retrieval system of any nature without the written permission as copyright holder except as agreed for use on the project for which the document was originally issued.
5. Ordnance Survey Ireland Licence Number EN 0074021

Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	01.03.2021	Site Layout Revised	JS	OS
P2	17.06.2021	RED LINE AMENDED	DD	OS

Architect	Henry J. Lyons
Project	GA03 Project Shoreline, Baldoyle.
Title	PROPOSED DRAINAGE LAYOUT SHEET 1 OF 2
Dwg. No.	BD-CSC-ZZ-G3-DR-C-0103

Date	Drn by	Chkd by	Aprvd by	Scale	Revision
13.10.2020	DD	NB	OS	1:500 @A0	P2

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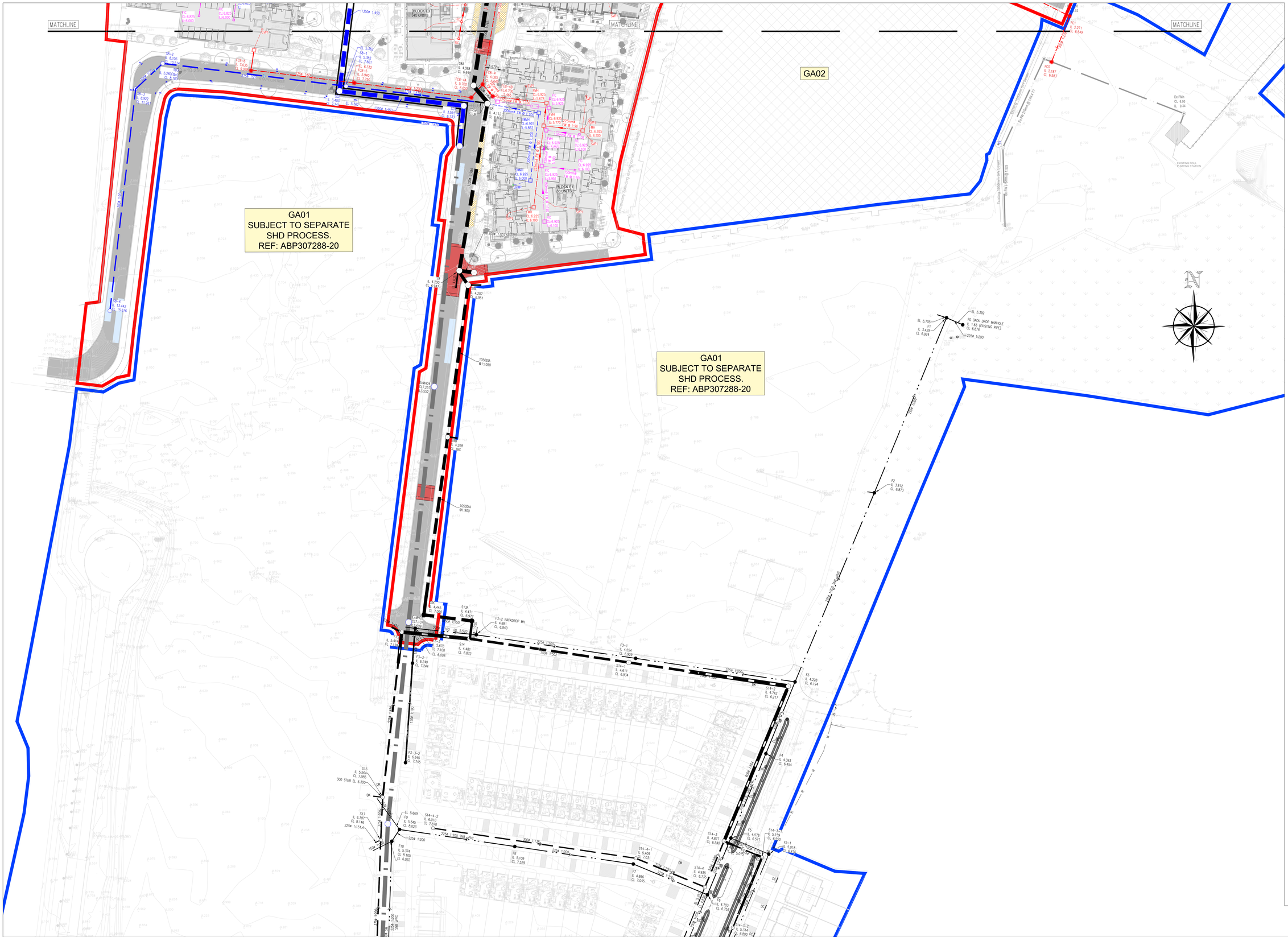

LEGEND:

SITE BOUNDARY

LEGEND

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- PROPOSED STORM SEWER
- PROPOSED FOUL SEWER
- PROPOSED SURFACE WATER SEWER DIVERSION
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- PROPOSED SW INSPECTION CHAMBER — FMH*0.5 IL 6.450
- PIPE DIAMETER AND GRADIENT — 225mm@ 1:150
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- BACKDROP INVERT LEVEL — EL 5.157
- PROPOSED SWALE
- PROPOSED BIO RETENTION — BIO
- KERB GULLY — KG
- ROAD GULLY — RG
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- PROPOSED PERMEABLE PAVING
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17. THE CONTRACTOR SHALL CARRY OUT A CCTV SURVEY REPORT OF THE COMPLETED STORM & FOUL NETWORK TO THE SATISFACTION OF THE LOCAL AUTHORITY AND REPORT TO BE ISSUED ON PRACTICAL COMPLETION.
18. THE LOCAL AUTHORITY MUST BE NOTIFIED AT LEAST 10 WORKING DAYS IN ADVANCE OF COMMENCEMENT OF WORKS.
19. PRIOR TO COMMENCEMENT OF CONSTRUCTION OUTFALL LEVELS FOR THE FOUL AND SURFACE WATER MANHOLES SHALL BE VERIFIED ON SITE.
20. PROPOSED FOUL SEWERS WILL BE EITHER CONCRETE, THERMOSTATIC STRUCTURED WALLED PIPES OR UNPLASTICISED PVC IN ACCORDANCE WITH SECTION 3.13 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE. PROPOSED STORM DRAINS TO BE IN ACCORDANCE WITH THE REQUIREMENTS OF FINGAL CO. CO.
21. TYPICAL SERVICE LAYOUT DISTANCES (HORIZONTAL AND VERTICAL) AS PER IRISH WATER DETAIL STD-WW-05
22. THE EXTERNAL FACE OF PROPOSED MANHOLE CHAMBERS IN PUBLIC ROADS WILL BE A MINIMUM OF 0.5M FROM THE PROPOSED PUBLIC ROAD KERB LINE IN ACCORDANCE WITH SECTION 1.23 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE
23. INSPECTION CHAMBERS TO EACH HOUSE/UNIT TO BE IN ACCORDANCE WITH IRISH WATER DETAIL STD-WW-02 AND STD-WW-03.
24. APPROPRIATE MEASURES ADHERING TO SECTION 3.21 OF THE IRISH WATER WASTEWATER CODE OF PRACTICE WILL BE PROVIDED TO DRAINAGE INFRASTRUCTURE IN CLOSE PROXIMITY TO PLANTING TO PREVENT ANY DAMAGE TO INFRASTRUCTURE VIA ROOT INGRESS OR NEGATIVE IMPACTS TO PLANTING SUCH AS DAMAGE OF TREE ROOTS

PIPE MATERIALS

ALL FOUL SEWER PIPE MATERIALS SHALL BE PVC SN8 OR IN COMPLIANCE WITH SECTION 3.13 OF THE IRISH WATER CODE OF PRACTICE FOR WASTEWATER.

PROPOSED SW SEWERS 450mmø IN DIAMETER OR LARGER TO BE CONCRETE (GEN1916/2002), THERMOSTATIC STRUCTURED WALLED PIPES (TWIN WALL) TO PIPE DIAMETERS 225mmø OR 375mmø OR SIMILAR APPROVED.

R090

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	01.03.2021	Site Layout Revised	JS	OS
P2	17.06.2021	RED LINE AMENDED	DD	OS

Architect	Henry J. Lyons
Project	GA03 Project Shoreline, Baldoyle.
Title	PROPOSED DRAINAGE LAYOUT SHEET 2 OF 2
Dwg. No.	BD-CSC-ZZ-G3-DR-C-0104
Date	13.10.2020
Drn by	DD
Chkd by	NB
Apprvd by	OS
Scale	1:500 @A0
Revision	P2

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	01.03.2021	Site Layout Revised	JS	OS
P2	17.06.2021	RED LINE AMENDED	DD	OS

Architect	Henry J. Lyons
Project	GA03 Project Shoreline, Baldoyle.
Title	PROPOSED BASEMENT DRAINAGE
Dwg. No.	BD-CSC-ZZ-G3-DR-C-0105

Date	Drn by	Chkd by	Aprvd by	Scale	Revision
13.10.2020	DD	NB	OS	1:250 @A0	P2

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Energy I.S. EN ISO 50001:2011
Health & Safety OHSAS 18001:2007

LEGEND:

SITE BOUNDARY

LEGEND

1. EXISTING PUBLIC WATERMAINS
2. WATERMAINS TO BE GRUBBED UP AND ABANDONED
3. PROPOSED WATERMAINS
4. SLUICE VALVE TO IRISH WATER STANDARD DETAIL STD-W-15 — S.V.
5. AIR VALVE TO IRISH WATER STANDARD DETAIL STD-W-22 — A.V.
6. HYDRANT TO IRISH WATER STANDARD DETAIL STD-W-19
7. SCOUR VALVE TO IRISH WATER STANDARD DETAIL STD-W-30 — Sc.V
8. BULK METER TO IRISH WATER STANDARD DETAIL STD-W-26 — BWM
9. PROPOSED BOUNDARY BOX
10. THRUST BLOCK — TB
11. DWELLING UNIT NUMBER

NOTES

1. All pipe work, valves, chambers, network arrangements and all associated watermain works to be in accordance with Irish Water Codes of Practice and Standard Details.
2. All new watermain material shall be PE80 SD17 Fusion Welded in accordance with Section 3.9 of the Irish Water Code of Practice.
3. All manholes in grassed areas to have 200mm wide x 100mm deep concrete plinth/kerb cast to their perimeter to ensure they are not overgrown. Concrete to be grade C20/25.
4. Meters for apartments and similar properties shall be installed internally within the premises in accordance with the Building Control Authority's requirements and subject to review by Irish Water as per section 3.15.2 of the Code of Practice.
5. Proposed watermains to be located a minimum of 300mm from the wastewater infrastructure in accordance with section 3.5.18 of the 3.15.18 of the Irish Water Wastewater Code of Practice.
6. The location of the bulk meter, valves and hydrants shall be designed in accordance with section 3.15.4 of the Irish Water Code of practice.
7. Note the Fire Safety Certificate has not been comleted yet, but as part of this development, it is confirmed that hydrants shall not be located any more than 46m from any part of the development.
8. All watermain works to be taken in charge to be tested in accordance with Irish Water Code of Practice Section 4.10.
9. Contractor to review Irish Water Specifications and Requirements prior to commencement of any works
10. Contractor to review Irish Water QA Field Inspection Requirements Manual prior to commencement of any works

BLOCK G1 — BLOCK C1 169 UNITS
BLOCK G2 — BLOCK G2 175 UNITS
BLOCK G3 — BLOCK G3 124 UNITS
BLOCK G4 — BLOCK G4 60 UNITS
BLOCK G5 — BLOCK G5 172 UNITS
BLOCK E1 + E2 — BLOCK E1 457 UNITS; BLOCK E2 96 UNITS
BLOCK E3 — BLOCK E3 42 UNITS
BLOCK E4 — BLOCK E4 36 UNITS
BLOCK F2 — BLOCK F2 140 UNITS

150mmØ WATERMAIN SPUR CONNECTED TO DEVELOPMENT INTERNAL WATERMAIN LAYOUT BY M&E DESIGNER

150 Ø PE80 SDR-17 WATERMAIN

300 Ø PE80 SDR-17 WATERMAIN

300mm DIAMETER WATERMAIN SPUR TO FUTURE GROWTH AREA 2 - PIPE SIZE TO BE IN ACCORDANCE WITH SECTION 3.7 OF THE IRISH WATER CODE OF PRACTICE

GA02

MATCHLINE

R090

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	01.03.2021	Site Layout Revised	JS	OS
P2	17.06.2021	RED LINE AMENDED	DD	OS

Architect	Henry J. Lyons
Project	GA03 Project Shoreline, Baldoyle.
Title	PROPOSED WATERMAIN LAYOUT SHEET 1 OF 2
Dwg. No.	BD-CSC-ZZ-G3-DR-C-0107
Date	13.10.2020
Drn by	DD
Chkd by	NB
Apprd by	OS
Scale	1:500 @A0
Revision	P2

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MATCHLINE

MATCHLINE

GA02

GA01
SUBJECT TO SEPARATE
SHD PROCESS.
REF: ABP307288-20

GA01
SUBJECT TO SEPARATE
SHD PROCESS.
REF: ABP307288-20

BLOCK E3
45 UNITS

BLOCK F1
83 UNITS

STAPOLIN RISE

4.38

+10.250

+7.175

+6.800

150mmØ WATERMAIN SPUR CONNECTED TO DEVELOPMENT INTERNAL WATERMAIN LAYOUT BY M&E DESIGNER

CAP WITH SV

NEW 300mm TAIL FOR FUTURE

300mm WATERMAIN GOES SOUTH AND NORTH

"T" CONNECTION HERE OF THE 300mm LINE

300mm DIVERTS TO ROADWAY

EXISTING 200mmØ MDPVC 2006 WATERMAIN TO BE RETAINED AND USED AS PART OF THE NEW MAIN

SV BEFORE SCOUR VALVE CHAMBER AS DETAIL STD-W-30. SCOUR CHAMBER TO BE 1200MM RING WITH SUMP ALLOWANCE OF 450MM AND THEN A PIPE TO BRING OVERFLOW FROM SCOUR CHAMBER TO SW MANHOLE S22 TO NORTH WEST

INSTALL BULK WATER METER TO STD-W-36 IW CODE OF PRACTICE. THIS WILL BE 1500X1500 EXTERNAL

A WASH OUT HYDRANT AS PER DETAIL STD-W-30A IS ALTERNATIVE TO SCOUR CHAMBER ARRANGEMENT UPON AGREEMENT WITH IRISH WATER IN WRITING.

CONNECT TO EXISTING 300MM DIAMETER WATERMAINS - USE EQUAL 300 T WITH TAPER BEFORE SV, PIPE TO BE 250MM THROUGH BULK METER BOX

EXISTING 300mmØ MDPVC 2006 WATERMAIN

EXISTING 200mmØ MDPVC 2006 WATERMAIN

EXISTING 200mmØ MDPVC 2006 WATERMAIN

Temporary Retaining during Construction Stage

N

LEGEND:

SITE BOUNDARY

LEGEND

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R090

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By
P1	01.03.2021	Site Layout Revised	JS	OS
P2	17.06.2021	RED LINE AMENDED	DD	OS

Architect	Henry J. Lyons
Project	GA03 Project Shoreline, Baldoyle.
Title	PROPOSED WATERMAIN LAYOUT SHEET 2 OF 2
Dwg. No.	BD-CSC-ZZ-G3-DR-C-0108

Date	Drn by	Chkd by	Apvd by	Scale	Revision
13.10.2020	DD	NB	OS	1:500 @A0	P2

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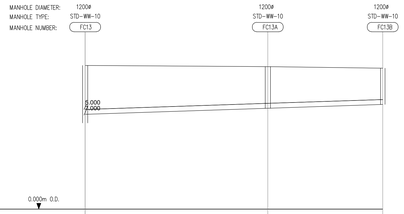
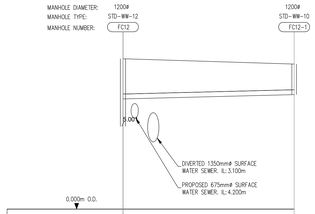


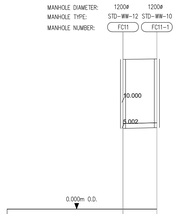
PN	F6.001	F6.000
DIA (mm)	225	225
SLOPE (1:X)	150.0	150.0
COVER LEVEL (m)	6.829	6.575 6.550
INVERT LEVEL (m)	4.373	4.054 4.037
LENGTH (m)	42.152	26.521

FOUL SEWER FROM MANHOLE FC13B TO MANHOLE FC13
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



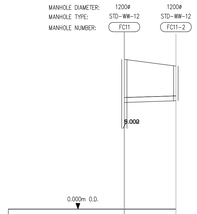
PN	F8.000
DIA (mm)	225
SLOPE (1:X)	200.0
COVER LEVEL (m)	8.936 8.691
INVERT LEVEL (m)	5.085 5.282
LENGTH (m)	39.496

FOUL SEWER FROM MANHOLE FC12-1 TO MANHOLE FC12
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



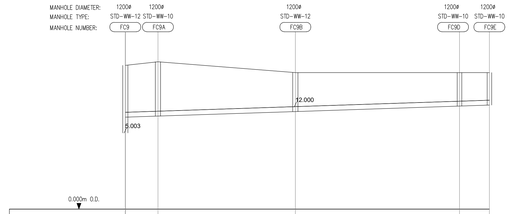
PN	F9.000
DIA (mm)	225
SLOPE (1:X)	200.3
COVER LEVEL (m)	8.909 8.930
INVERT LEVEL (m)	3.725 3.759
LENGTH (m)	7.811

FOUL SEWER FROM MANHOLE FC11-1 TO MANHOLE FC11
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



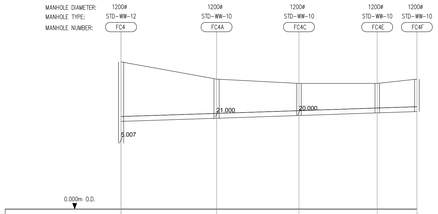
PN	F10.000
DIA (mm)	225
SLOPE (1:X)	150.0
COVER LEVEL (m)	8.909 8.600
INVERT LEVEL (m)	4.921 5.000
LENGTH (m)	11.899

FOUL SEWER FROM MANHOLE FC11-2 TO MANHOLE FC11
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



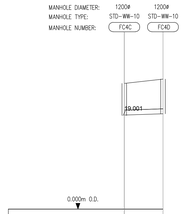
PN	F11.003	F11.002	F11.001	F11.000
DIA (mm)	225	225	225	225
SLOPE (1:X)	150.6	150.3	150.0	150.0
COVER LEVEL (m)	8.653 8.800	8.300	8.300	8.300
INVERT LEVEL (m)	4.340 4.290 4.295	4.241 4.237	4.154 4.154	4.804
LENGTH (m)	7.529	31.708	37.871	6.909

FOUL SEWER FROM MANHOLE FC9B TO MANHOLE FC9
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



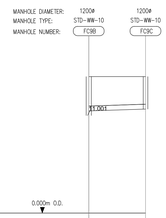
PN	F19.003	F19.002	F19.001	F19.000
DIA (mm)	225	225	225	225
SLOPE (1:X)	150.0	150.0	150.0	150.0
COVER LEVEL (m)	6.793	6.000	5.800 5.800	6.000
INVERT LEVEL (m)	4.045	4.197 4.192	4.319 4.319	4.439 4.439 4.209
LENGTH (m)	22.040	19.020	18.057	9.161

FOUL SEWER FROM FC4F TO FC4
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



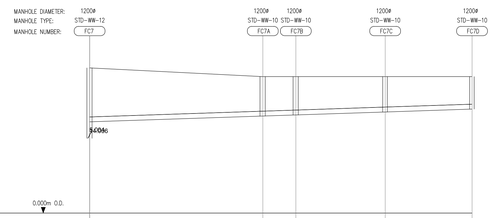
PN	F20.000
DIA (mm)	225
SLOPE (1:X)	150.0
COVER LEVEL (m)	5.800 6.000
INVERT LEVEL (m)	4.340 4.405
LENGTH (m)	8.931

FOUL SEWER FROM FC4D TO FC4C
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



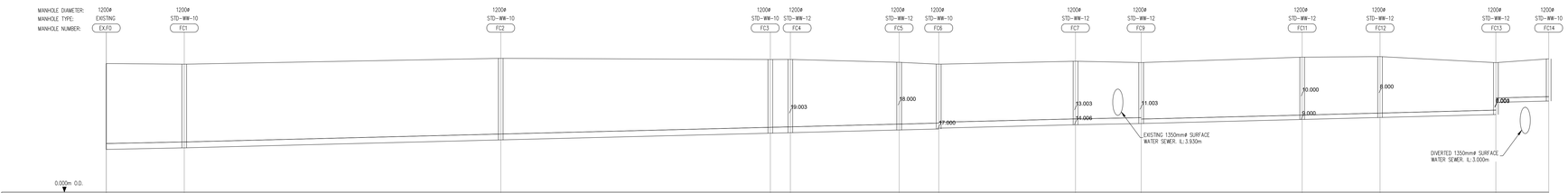
PN	F12.000
DIA (mm)	225
SLOPE (1:X)	150.6
COVER LEVEL (m)	6.300
INVERT LEVEL (m)	4.771 4.800
LENGTH (m)	13.101

FOUL SEWER FROM MANHOLE FC9CTO MANHOLE FC9B
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



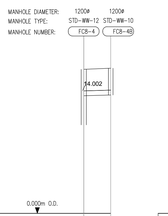
PN	F13.003	F13.002	F13.001	F13.000
DIA (mm)	225	225	225	225
SLOPE (1:X)	150.2	149.5	150.5	150.0
COVER LEVEL (m)	6.707	6.300 6.300	6.300 6.300	6.300
INVERT LEVEL (m)	4.212	4.478 4.478	4.529 4.529	4.666 4.666 4.800
LENGTH (m)	39.954	7.626	20.621	20.050

FOUL SEWER FROM MANHOLE FC7D TO MANHOLE FC7
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



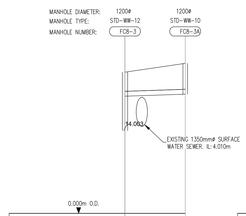
PN	F5.011	F5.010	F5.009	F5.007	F5.006	F5.005	F5.004	F5.003	F5.002	F5.001	F5.000
DIA (mm)	300	300	300	300	300	300	300	225	225	225	225
SLOPE (1:X)	239.0	200.0	200.0	200.0	200.0	200.0	262.1	200.0	200.0	191.0	200.0
COVER LEVEL (m)	6.583	6.549	6.850	6.791	6.793	6.644	6.550	6.791	6.613	6.909	6.936 6.629
INVERT LEVEL (m)	2.187 3.013	2.172 2.270	2.675 2.675	3.091 3.091	3.245 3.245	3.384 3.384	3.329 3.329	3.490 3.490	3.514 3.514	3.721 3.721	3.800 3.800 4.597 4.684
LENGTH (m)	19.913	80.860	68.869	27.792	10.116	34.940	16.773	41.131	19.901	29.596	13.492

FOUL SEWER FROM FC4 TO EXISTING MANHOLE (EXF0)
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



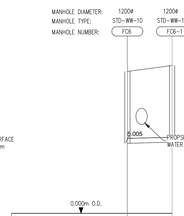
PN	F15.000
DIA (mm)	225
SLOPE (1:X)	185.0
COVER LEVEL (m)	6.649 6.700
INVERT LEVEL (m)	5.421 5.465
LENGTH (m)	6.215

FOUL SEWER FROM FA8-4B TO FC8-4
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



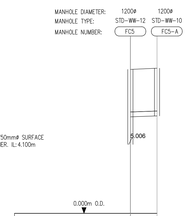
PN	F16.000
DIA (mm)	225
SLOPE (1:X)	149.4
COVER LEVEL (m)	6.579 6.925
INVERT LEVEL (m)	5.407 5.500
LENGTH (m)	13.898

FOUL SEWER FROM FA8-3A TO FC8-3
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



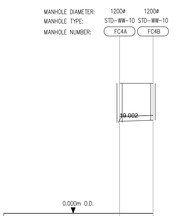
PN	F17.000
DIA (mm)	225
SLOPE (1:X)	200.0
COVER LEVEL (m)	6.550 6.825
INVERT LEVEL (m)	3.274 3.286
LENGTH (m)	10.310

FOUL SEWER FROM FA6-1 TO FC6
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



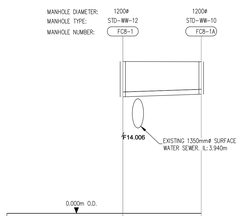
PN	F18.000
DIA (mm)	225
SLOPE (1:X)	136.8
COVER LEVEL (m)	6.644 6.700
INVERT LEVEL (m)	4.565 4.300
LENGTH (m)	6.146

FOUL SEWER FROM FA5-A TO FC5
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



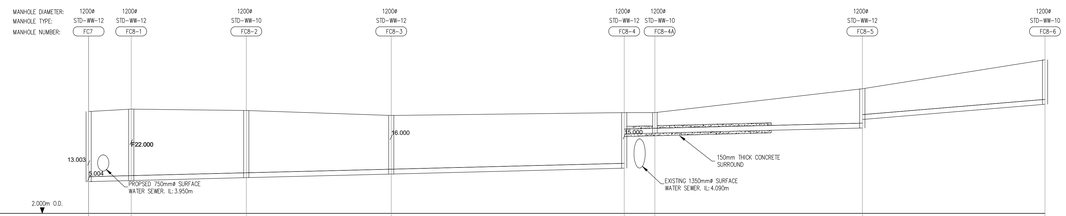
PN	F21.000
DIA (mm)	225
SLOPE (1:X)	150.0
COVER LEVEL (m)	6.000 6.000
INVERT LEVEL (m)	4.749 4.300
LENGTH (m)	7.709

FOUL SEWER FROM FC4B TO FC4A
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



PN	F22.000
DIA (mm)	225
SLOPE (1:X)	150.0
COVER LEVEL (m)	6.800 6.800
INVERT LEVEL (m)	5.379 5.300
LENGTH (m)	18.108

FOUL SEWER FROM FC8-1A TO FC8-1
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100



PN	F14.006	F14.005	F14.004	F14.003	F14.002	F14.001	F14.000
DIA (mm)	225	225	225	225	225	225	225
SLOPE (1:X)	200.0	200.0	200.0	199.9	202.1	200.3	60.0
COVER LEVEL (m)	6.707	6.870 3.536	6.870 6.847	6.870 6.929	6.849	6.652	7.000 7.088
INVERT LEVEL (m)	3.467	3.536 3.536	3.649 3.649	3.898 3.929	4.666 4.666	5.727 5.727	6.332 6.940 7.750
LENGTH (m)	9.831	26.550	33.448	53.762	7.075	47.868	42.157

FOUL SEWER FROM MANHOLE FC8-6 TO MANHOLE FC7
HORIZONTAL SCALE 1:500
VERTICAL SCALE 1:100

R090

DRAFT

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Rev. No.	Date	REVISION NOTE	Drn. By	Chkd. By

Architect: Henry J. Lyons
Project: GA03 Project Shoreline, Baldoyle.
Title: PROPOSED FOUL SEWER LONGITUDINAL SECTIONS
Dwg. No.: BD-CSC-ZZ-G3-DR-C-0115
Date: 13.10.2020 | Drn by: DD | Chkd by: NB | Aprvd by: OS | Scale: AS SHOWN @A1 | Revision:

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Health & Safety OHSAS 18001:2007

Appendix E

Foul Water Drainage Windes Calculations

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FOUL SEWERAGE DESIGN

Design Criteria for Foul - Main

Pipe Sizes STANDARD Manhole Sizes STANDARD

Industrial Flow (l/s/ha)	0.00	Add Flow / Climate Change (%)	0
Industrial Peak Flow Factor	0.00	Minimum Backdrop Height (m)	0.000
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	0.000
Persons per House	3.00	Min Design Depth for Optimisation (m)	0.000
Domestic (l/s/ha)	0.00	Min Vel for Auto Design only (m/s)	0.75
Domestic Peak Flow Factor	6.00	Min Slope for Optimisation (1:X)	500

Designed with Level Inverts

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
F5.000	13.492	0.067	200.0	0.000	0	0.0	1.500	o	225
F6.000	26.521	0.177	150.0	0.000	0	0.0	1.500	o	225
F6.001	42.152	0.281	150.0	0.000	0	0.0	1.500	o	225
F7.000	5.113	0.034	150.0	0.000	0	0.0	1.500	o	225
F5.001	29.596	0.155	191.0	0.000	0	0.0	1.500	o	225
F8.000	39.496	0.197	200.0	0.000	0	0.0	1.500	o	225
F5.002	19.901	0.100	200.0	0.000	0	0.0	1.500	o	225
F9.000	7.811	0.039	200.3	0.000	0	0.0	1.500	o	225
F10.000	11.899	0.079	150.0	0.000	0	0.0	1.500	o	225
F5.003	41.131	0.206	200.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F5.000	4.664	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F6.000	4.831	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F6.001	4.654	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F7.000	4.375	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F5.001	3.975	0.000	0.0	0	0.0	0	0.00	0.83	33.0	0.0
F8.000	5.282	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F5.002	3.820	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F9.000	3.759	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F10.000	5.000	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F5.003	3.720	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
F11.000	6.909	0.046	150.0	0.000	0	0.0	1.500	o	225
F11.001	37.871	0.252	150.0	0.000	0	0.0	1.500	o	225
F12.000	13.101	0.087	150.6	0.000	0	0.0	1.500	o	225
F11.002	31.708	0.211	150.3	0.000	0	0.0	1.500	o	225
F11.003	7.529	0.050	150.6	0.000	0	0.0	1.500	o	225
F5.004	16.773	0.064	262.1	0.000	0	0.0	1.500	o	300
F13.000	20.050	0.134	150.0	0.000	0	0.0	1.500	o	225
F13.001	20.621	0.137	150.5	0.000	0	0.0	1.500	o	225
F13.002	7.626	0.051	149.5	0.000	0	0.0	1.500	o	225
F13.003	39.954	0.266	150.2	0.000	0	0.0	1.500	o	225
F14.000	42.157	0.703	60.0	0.000	0	0.0	1.500	o	225
F14.001	47.868	0.239	200.3	0.000	0	0.0	1.500	o	225
F14.002	7.075	0.035	202.1	0.000	0	0.0	1.500	o	225
F15.000	6.215	0.034	185.0	0.000	0	0.0	1.500	o	225
F14.003	53.762	0.269	199.9	0.000	0	0.0	1.500	o	225
F16.000	13.898	0.093	149.4	0.000	0	0.0	1.500	o	225
F14.004	33.448	0.167	200.0	0.000	0	0.0	1.500	o	225
F14.005	26.550	0.133	200.0	0.000	0	0.0	1.500	o	225
F14.006	9.831	0.049	200.0	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F11.000	4.800	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F11.001	4.754	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F12.000	4.800	0.000	0.0	0	0.0	0	0.00	0.93	37.2	0.0
F11.002	4.501	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F11.003	4.290	0.000	0.0	0	0.0	0	0.00	0.93	37.2	0.0
F5.004	3.514	0.000	0.0	0	0.0	0	0.00	0.85	60.4	0.0
F13.000	4.800	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F13.001	4.666	0.000	0.0	0	0.0	0	0.00	0.93	37.2	0.0
F13.002	4.529	0.000	0.0	0	0.0	0	0.00	0.94	37.3	0.0
F13.003	4.478	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F14.000	7.035	0.000	0.0	0	0.0	0	0.00	1.48	59.0	0.0
F14.001	5.940	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F14.002	5.701	0.000	0.0	0	0.0	0	0.00	0.81	32.0	0.0
F15.000	5.465	0.000	0.0	0	0.0	0	0.00	0.84	33.5	0.0
F14.003	4.085	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F16.000	5.500	0.000	0.0	0	0.0	0	0.00	0.94	37.3	0.0
F14.004	3.816	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F14.005	3.649	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F14.006	3.516	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0

Network Design Table for Foul - Main

PN	Length (m)	Fall (m)	Slope (1:X)	Area (ha)	Houses	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
F5.005	34.940	0.175	200.0	0.000	0	0.0	1.500	o	300
F17.000	10.310	0.052	200.0	0.000	0	0.0	1.500	o	225
F5.006	10.116	0.051	200.0	0.000	0	0.0	1.500	o	300
F18.000	6.146	0.045	136.6	0.000	0	0.0	1.500	o	225
F5.007	27.792	0.139	200.0	0.000	0	0.0	1.500	o	300
F19.000	9.161	0.061	150.0	0.000	0	0.0	1.500	o	225
F19.001	18.057	0.120	150.0	0.000	0	0.0	1.500	o	225
F20.000	8.931	0.060	150.0	0.000	0	0.0	1.500	o	225
F19.002	19.020	0.127	150.0	0.000	0	0.0	1.500	o	225
F21.000	7.709	0.051	150.0	0.000	0	0.0	1.500	o	225
F19.003	22.040	0.147	150.0	0.000	0	0.0	1.500	o	225
F5.008	5.121	0.026	197.0	0.000	0	0.0	1.500	o	300
F5.009	68.869	0.344	200.0	0.000	0	0.0	1.500	o	300
F5.010	80.860	0.404	200.0	0.000	0	0.0	1.500	o	300
F5.011	19.913	0.083	239.0	0.000	0	0.0	1.500	o	300
F22.000	18.108	0.121	149.7	0.000	0	0.0	1.500	o	225

Network Results Table

PN	US/IL (m)	Σ Area (ha)	Σ Base Flow (l/s)	Σ Hse	Add Flow (l/s)	P.Dep (mm)	P.Vel (m/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
F5.005	3.450	0.000	0.0	0	0.0	0	0.00	0.98	69.2	0.0
F17.000	3.286	0.000	0.0	0	0.0	0	0.00	0.81	32.2	0.0
F5.006	3.234	0.000	0.0	0	0.0	0	0.00	0.98	69.2	0.0
F18.000	4.500	0.000	0.0	0	0.0	0	0.00	0.98	39.0	0.0
F5.007	3.184	0.000	0.0	0	0.0	0	0.00	0.98	69.2	0.0
F19.000	4.500	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F19.001	4.439	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F20.000	4.400	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F19.002	4.319	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F21.000	4.300	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F19.003	4.192	0.000	0.0	0	0.0	0	0.00	0.94	37.2	0.0
F5.008	3.045	0.000	0.0	0	0.0	0	0.00	0.99	69.7	0.0
F5.009	3.019	0.000	0.0	0	0.0	0	0.00	0.98	69.2	0.0
F5.010	2.675	0.000	0.0	0	0.0	0	0.00	0.98	69.2	0.0
F5.011	2.270	0.000	0.0	0	0.0	0	0.00	0.90	63.3	0.0
F22.000	5.500	0.000	0.0	0	0.0	0	0.00	0.94	37.3	0.0

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
FFC14	6.825	2.161	Open Manhole	1200	F5.000	4.664	225				
FFC13B	6.500	1.669	Open Manhole	1050	F6.000	4.831	225				
FFC13A	6.575	1.921	Open Manhole	1200	F6.001	4.654	225	F6.000	4.654	225	
FFC13C	6.622	2.247	Open Manhole	1200	F7.000	4.375	225				
FFC13	6.629	2.654	Open Manhole	1200	F5.001	3.975	225	F5.000	4.597	225	622
								F6.001	4.373	225	398
								F7.000	4.341	225	366
FFC12-1	6.691	1.409	Open Manhole	1050	F8.000	5.282	225				
FFC12	6.936	3.116	Open Manhole	1200	F5.002	3.820	225	F5.001	3.820	225	
								F8.000	5.085	225	1264
FFC11-1	6.930	3.171	Open Manhole	1200	F9.000	3.759	225				
FFC11-2	6.600	1.600	Open Manhole	1050	F10.000	5.000	225				
FFC11	6.909	3.189	Open Manhole	1200	F5.003	3.720	225	F5.002	3.721	225	1
								F9.000	3.720	225	
								F10.000	4.921	225	1201
FFC9E	6.300	1.500	Open Manhole	1050	F11.000	4.800	225				
FFC9D	6.300	1.546	Open Manhole	1050	F11.001	4.754	225	F11.000	4.754	225	
FFC9C	6.300	1.500	Open Manhole	1050	F12.000	4.800	225				
FFC9B	6.300	1.799	Open Manhole	1200	F11.002	4.501	225	F11.001	4.501	225	
								F12.000	4.713	225	212
FFC9A	6.800	2.510	Open Manhole	1200	F11.003	4.290	225	F11.002	4.290	225	
FFC9	6.633	3.119	Open Manhole	1200	F5.004	3.514	300	F5.003	3.514	225	
								F11.003	4.240	225	651
FFC7D	6.300	1.500	Open Manhole	1050	F13.000	4.800	225				
FFC7C	6.300	1.634	Open Manhole	1050	F13.001	4.666	225	F13.000	4.666	225	
FFC7B	6.300	1.771	Open Manhole	1200	F13.002	4.529	225	F13.001	4.529	225	
FFC7A	6.300	1.822	Open Manhole	1200	F13.003	4.478	225	F13.002	4.478	225	
FFC8-6	9.088	2.053	Open Manhole	1200	F14.000	7.035	225				
FFC8-5	7.750	1.810	Open Manhole	1200	F14.001	5.940	225	F14.000	6.332	225	392
FFC8-4A	6.652	0.951	Open Manhole	1050	F14.002	5.701	225	F14.001	5.701	225	
FFC8-4B	6.700	1.235	Open Manhole	1050	F15.000	5.465	225				
FFC8-4	6.649	2.564	Open Manhole	1200	F14.003	4.085	225	F14.002	5.666	225	1581
								F15.000	5.431	225	1346
FFC8-3A	6.925	1.425	Open Manhole	1050	F16.000	5.500	225				
FFC8-3	6.519	2.703	Open Manhole	1200	F14.004	3.816	225	F14.003	3.816	225	
								F16.000	5.407	225	1591
FFC8-2	6.747	3.098	Open Manhole	1200	F14.005	3.649	225	F14.004	3.649	225	
FFC8-1	6.810	3.294	Open Manhole	1200	F14.006	3.516	225	F14.005	3.516	225	
FFC7	6.701	3.251	Open Manhole	1200	F5.005	3.450	300	F5.004	3.450	300	
								F13.003	4.212	225	687
								F14.006	3.467	225	
FFC6-1	6.825	3.539	Open Manhole	1200	F17.000	3.286	225				
FFC6	6.550	3.316	Open Manhole	1200	F5.006	3.234	300	F5.005	3.276	300	41
								F17.000	3.234	225	
FFC5A	6.700	2.200	Open Manhole	1200	F18.000	4.500	225				
FFC5	6.644	3.460	Open Manhole	1200	F5.007	3.184	300	F5.006	3.184	300	
								F18.000	4.455	225	1196

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
FFC4F	6.000	1.500	Open Manhole	1050	F19.000	4.500	225				

Manhole Schedules for Foul - Main

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
FFC4E	5.800	1.361	Open Manhole	1050	F19.001	4.439	225	F19.000	4.439	225	
FFC4D	6.000	1.600	Open Manhole	1050	F20.000	4.400	225				
FFC4C	5.800	1.481	Open Manhole	1050	F19.002	4.319	225	F19.001	4.319	225	
								F20.000	4.340	225	22
FFC4B	6.000	1.700	Open Manhole	1050	F21.000	4.300	225				
FFC4A	6.000	1.808	Open Manhole	1200	F19.003	4.192	225	F19.002	4.192	225	
								F21.000	4.249	225	57
FFC4	6.793	3.748	Open Manhole	1200	F5.008	3.045	300	F5.007	3.045	300	
								F19.003	4.045	225	925
FFC3	6.791	3.772	Open Manhole	1200	F5.009	3.019	300	F5.008	3.019	300	
FFC2	6.850	4.175	Open Manhole	1200	F5.010	2.675	300	F5.009	2.675	300	
FFC1	6.549	4.279	Open Manhole	1200	F5.011	2.270	300	F5.010	2.270	300	
FF0	6.583	4.396	Open Manhole	0		OUTFALL		F5.011	2.187	300	
FFC8-1A	6.800	1.300	Open Manhole	1050	F22.000	5.500	225				
FFC8-1	6.810	1.431	Open Manhole	1200		OUTFALL		F22.000	5.379	225	

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.000	o	225	FFC14	6.825	4.664	1.936	Open Manhole	1200
F6.000	o	225	FFC13B	6.500	4.831	1.444	Open Manhole	1050
F6.001	o	225	FFC13A	6.575	4.654	1.696	Open Manhole	1200
F7.000	o	225	FFC13C	6.622	4.375	2.022	Open Manhole	1200
F5.001	o	225	FFC13	6.629	3.975	2.429	Open Manhole	1200
F8.000	o	225	FFC12-1	6.691	5.282	1.184	Open Manhole	1050
F5.002	o	225	FFC12	6.936	3.820	2.891	Open Manhole	1200
F9.000	o	225	FFC11-1	6.930	3.759	2.946	Open Manhole	1200
F10.000	o	225	FFC11-2	6.600	5.000	1.375	Open Manhole	1050
F5.003	o	225	FFC11	6.909	3.720	2.964	Open Manhole	1200
F11.000	o	225	FFC9E	6.300	4.800	1.275	Open Manhole	1050
F11.001	o	225	FFC9D	6.300	4.754	1.321	Open Manhole	1050
F12.000	o	225	FFC9C	6.300	4.800	1.275	Open Manhole	1050
F11.002	o	225	FFC9B	6.300	4.501	1.574	Open Manhole	1200
F11.003	o	225	FFC9A	6.800	4.290	2.285	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.000	13.492	200.0	FFC13	6.629	4.597	1.807	Open Manhole	1200
F6.000	26.521	150.0	FFC13A	6.575	4.654	1.696	Open Manhole	1200
F6.001	42.152	150.0	FFC13	6.629	4.373	2.031	Open Manhole	1200
F7.000	5.113	150.0	FFC13	6.629	4.341	2.063	Open Manhole	1200
F5.001	29.596	191.0	FFC12	6.936	3.820	2.891	Open Manhole	1200
F8.000	39.496	200.0	FFC12	6.936	5.085	1.626	Open Manhole	1200
F5.002	19.901	200.0	FFC11	6.909	3.721	2.963	Open Manhole	1200
F9.000	7.811	200.3	FFC11	6.909	3.720	2.964	Open Manhole	1200
F10.000	11.899	150.0	FFC11	6.909	4.921	1.763	Open Manhole	1200
F5.003	41.131	200.0	FFC9	6.633	3.514	2.894	Open Manhole	1200
F11.000	6.909	150.0	FFC9D	6.300	4.754	1.321	Open Manhole	1050
F11.001	37.871	150.0	FFC9B	6.300	4.501	1.574	Open Manhole	1200
F12.000	13.101	150.6	FFC9B	6.300	4.713	1.362	Open Manhole	1200
F11.002	31.708	150.3	FFC9A	6.800	4.290	2.285	Open Manhole	1200
F11.003	7.529	150.6	FFC9	6.633	4.240	2.168	Open Manhole	1200

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.004	o	300	FFC9	6.633	3.514	2.819	Open Manhole	1200
F13.000	o	225	FFC7D	6.300	4.800	1.275	Open Manhole	1050
F13.001	o	225	FFC7C	6.300	4.666	1.409	Open Manhole	1050
F13.002	o	225	FFC7B	6.300	4.529	1.546	Open Manhole	1200
F13.003	o	225	FFC7A	6.300	4.478	1.597	Open Manhole	1200
F14.000	o	225	FFC8-6	9.088	7.035	1.828	Open Manhole	1200
F14.001	o	225	FFC8-5	7.750	5.940	1.585	Open Manhole	1200
F14.002	o	225	FFC8-4A	6.652	5.701	0.726	Open Manhole	1050
F15.000	o	225	FFC8-4B	6.700	5.465	1.010	Open Manhole	1050
F14.003	o	225	FFC8-4	6.649	4.085	2.339	Open Manhole	1200
F16.000	o	225	FFC8-3A	6.925	5.500	1.200	Open Manhole	1050
F14.004	o	225	FFC8-3	6.519	3.816	2.478	Open Manhole	1200
F14.005	o	225	FFC8-2	6.747	3.649	2.873	Open Manhole	1200
F14.006	o	225	FFC8-1	6.810	3.516	3.069	Open Manhole	1200
F5.005	o	300	FFC7	6.701	3.450	2.951	Open Manhole	1200
F17.000	o	225	FFC6-1	6.825	3.286	3.314	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.004	16.773	262.1	FFC7	6.701	3.450	2.951	Open Manhole	1200
F13.000	20.050	150.0	FFC7C	6.300	4.666	1.409	Open Manhole	1050
F13.001	20.621	150.5	FFC7B	6.300	4.529	1.546	Open Manhole	1200
F13.002	7.626	149.5	FFC7A	6.300	4.478	1.597	Open Manhole	1200
F13.003	39.954	150.2	FFC7	6.701	4.212	2.264	Open Manhole	1200
F14.000	42.157	60.0	FFC8-5	7.750	6.332	1.193	Open Manhole	1200
F14.001	47.868	200.3	FFC8-4A	6.652	5.701	0.726	Open Manhole	1050
F14.002	7.075	202.1	FFC8-4	6.649	5.666	0.758	Open Manhole	1200
F15.000	6.215	185.0	FFC8-4	6.649	5.431	0.993	Open Manhole	1200
F14.003	53.762	199.9	FFC8-3	6.519	3.816	2.478	Open Manhole	1200
F16.000	13.898	149.4	FFC8-3	6.519	5.407	0.887	Open Manhole	1200
F14.004	33.448	200.0	FFC8-2	6.747	3.649	2.873	Open Manhole	1200
F14.005	26.550	200.0	FFC8-1	6.810	3.516	3.069	Open Manhole	1200
F14.006	9.831	200.0	FFC7	6.701	3.467	3.009	Open Manhole	1200
F5.005	34.940	200.0	FFC6	6.550	3.276	2.974	Open Manhole	1200
F17.000	10.310	200.0	FFC6	6.550	3.234	3.091	Open Manhole	1200

PIPELINE SCHEDULES for Foul - Main

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.006	o	300	FFC6	6.550	3.234	3.016	Open Manhole	1200
F18.000	o	225	FFC5A	6.700	4.500	1.975	Open Manhole	1200
F5.007	o	300	FFC5	6.644	3.184	3.160	Open Manhole	1200
F19.000	o	225	FFC4F	6.000	4.500	1.275	Open Manhole	1050
F19.001	o	225	FFC4E	5.800	4.439	1.136	Open Manhole	1050
F20.000	o	225	FFC4D	6.000	4.400	1.375	Open Manhole	1050
F19.002	o	225	FFC4C	5.800	4.319	1.256	Open Manhole	1050
F21.000	o	225	FFC4B	6.000	4.300	1.475	Open Manhole	1050
F19.003	o	225	FFC4A	6.000	4.192	1.583	Open Manhole	1200
F5.008	o	300	FFC4	6.793	3.045	3.448	Open Manhole	1200
F5.009	o	300	FFC3	6.791	3.019	3.472	Open Manhole	1200
F5.010	o	300	FFC2	6.850	2.675	3.875	Open Manhole	1200
F5.011	o	300	FFC1	6.549	2.270	3.979	Open Manhole	1200
F22.000	o	225	FFC8-1A	6.800	5.500	1.075	Open Manhole	1050

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
F5.006	10.116	200.0	FFC5	6.644	3.184	3.160	Open Manhole	1200
F18.000	6.146	136.6	FFC5	6.644	4.455	1.964	Open Manhole	1200
F5.007	27.792	200.0	FFC4	6.793	3.045	3.448	Open Manhole	1200
F19.000	9.161	150.0	FFC4E	5.800	4.439	1.136	Open Manhole	1050
F19.001	18.057	150.0	FFC4C	5.800	4.319	1.256	Open Manhole	1050
F20.000	8.931	150.0	FFC4C	5.800	4.340	1.235	Open Manhole	1050
F19.002	19.020	150.0	FFC4A	6.000	4.192	1.583	Open Manhole	1200
F21.000	7.709	150.0	FFC4A	6.000	4.249	1.526	Open Manhole	1200
F19.003	22.040	150.0	FFC4	6.793	4.045	2.523	Open Manhole	1200
F5.008	5.121	197.0	FFC3	6.791	3.019	3.472	Open Manhole	1200
F5.009	68.869	200.0	FFC2	6.850	2.675	3.875	Open Manhole	1200
F5.010	80.860	200.0	FFC1	6.549	2.270	3.979	Open Manhole	1200
F5.011	19.913	239.0	FF0	6.583	2.187	4.096	Open Manhole	0
F22.000	18.108	149.7	FFC8-1	6.810	5.379	1.206	Open Manhole	1200

Surcharged Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F5.011	FF0	6.583	2.187	2.187	0	0

Input Hydrograph Type: User Defined

No Input Hydrograph data used for analysis due to offset specified.

Surcharged Outfall Details for Foul - Main

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
F22.000	FFC8-1	6.810	5.379	0.000	1200	0

Input Hydrograph Type: User Defined

No Input Hydrograph data used for analysis due to offset specified.

Appendix F

Bauder Ltd Green Roof Information

CS CONSULTING
GROUP

BAUDER

GREEN ROOFS

BIODIVERSE, EXTENSIVE AND INTENSIVE SYSTEMS

OUR COMPANY

Who We Are

Bauder is one of Europe's leading manufacturers of flat roof waterproofing membranes and insulation products that has been owner-operated for over 150 years across 13 countries. We have an enviable reputation and track record for delivering the highest quality materials and service through supplying and project managing the installation of premier flat roof systems.

Our comprehensive portfolio of flat roof waterproofing systems, green roofs and photovoltaic energy delivers an extensive range of solutions to meet individual project needs without compromise.

"Manufacturing the highest quality roofing materials is one thing, but here at Bauder it is our total commitment and passion to work closely together with our clients to successfully deliver every product to the highest possible standard, that sets us above the rest."

Andrew Mackenzie
Managing Director
Bauder Ltd

What We Do

Bauder is fully committed to providing a complete service with an unrivalled level of support on all roofing projects, whether it's for a new build project or the refurbishment of an existing building.

Technical Expertise

Our large team of regionally based technical managers and site technicians will be on hand throughout the process, from specification design through to inspection of the installation and project completion to ensure a defect free finish.

Our technical department is the envy of the industry, providing a comprehensive and superior service with bespoke specifications individual to each project. Our support services ensure that products and materials all arrive on site when required providing an efficiency that all our clients demand.

Assured Quality

To ensure a consistent and proficient service, Bauder approved contractors are the only people fully trained and certified to install our products. We only approve contracting companies that possess the technical expertise and the organisational capacity to maintain an efficient and well-run site.

We have always operated a policy where we train and approve the individual installer and not just the company they work for. By taking installers with proven experience and demonstrating the techniques particular to our system, we can ensure the quality of workmanship that meets our clients' expectations.

Every operative receives an identity badge providing proof of competence, which is available for inspection at all times.

Guaranteed Satisfaction

Bauder is noted throughout the industry for the range of guarantees we offer that can cover design, products and installation. We unreservedly issue our guarantees on all projects because we monitor quality every step of the way from manufacture to finished installation.

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.

ENVIRONMENTAL CREDENTIALS

Aiding Biodiversity and Meeting a Biodiversity Action Plan (BAP)

A green roof can provide a natural habitat specifically designed to support a particular species of plant or wildlife. Created for the local ecology, in which vegetation will establish and provide a home for smaller elements of wildlife as well as insects and invertebrates. The provision of a healthy habitat in a place that could otherwise be empty encourages wildlife to remain in the area, provides support for the natural colonisation of locally arising plants, birds and small animals, boosting a wider spread of species in the area.

Our vegetation options include our XF118 wildflower blanket and Flora Seed Mixes, which are all specifically devised to meet BAP criteria through their inclusion of species within the RHS 'Perfect for Pollinators' and Flora Locale 'native origins criteria'.

Storm Water Management

Green roofs are one method of retaining rainwater by inception storage in the substrate, drainage/reservoir board and plants. This water is then used by the vegetation or evaporates back into the atmosphere.

Improving Air Quality of Local Surroundings

Localised air quality is improved as the vegetation assists in reducing both gaseous pollutants and dust particles by removing a proportion of them from the immediate environment, effectively purifying the air.

Urban Heat Island Effect

The urban heat island effect is reduced because the substrate of a green roof will absorb some of this heat and the natural evaporation of water from both the plants and soil helps to cool and humidify the air, thus lowering the ambient air temperature.

Recycled Content of Green Roof Components

Many recycled or waste materials are used within our green roof build ups to enable us to provide environmental solutions to the industry.

Water Retention and Drainage Layers

Our DSE 20, 40 and 60 boards are manufactured from recycled high density polyethylene.

Protection Layers

Our protection layers FSM600 and FSM1100 for extensive green roofs are made from a mixture of two recycled materials, reground polyester and polypropylene fibre.

Our ProMat for intensive green roofs is made of granulate from recycled shredded tyres.

Our Ecomat product is created from mechanically bonded recycled Polyester clothing and fabric.

Substrates and Growing Mediums

Our substrates are based around recycled crushed brick and composted organic material.

Separation and Slip Layer

Our PE Foil is manufactured from recycled polyethylene granulate.

Recycling and Reusing Green Roof Components

The level of recycled content within our components clearly demonstrates that these products are then easily returned to the conventional recycling processes at the end of their required lifespan.

BREEAM 2014 Accreditation

The BREEAM assessment method evaluates the sustainability of built environments through the different stages of their life cycle. The schemes include:

Our green roofs have the potential to count towards these sections of BREEAM:

Land Use and Ecology

LE 03 Mitigating Ecological Impact.
Criteria 1&2
Potential credit 1

LE 04 Enhancing Site Ecology.
Criteria 1&2
Potential credit 1

LE 05 Long Term Impact on Biodiversity
Criteria 8
Potential credit 1

Our green roofs can be specified with our XF118 native species wildflower blanket or Bauder Flora seed mixes 3,5,7,9,11 which are accredited by the RHS as 'Perfect for Pollinators' and certified by Flora Locale.

Health and Wellbeing

Hea 05 Acoustic performance
Criteria 2
Potential credit 1

Our XF301 sedum system on a metal deck has been tested in accordance with BS EN ISO 140-18: 2006. The sedum plants intercept the impact of rainfall and mitigate the noise so that a figure of 33.5 dB was achieved.

Management

Man 04 Stakeholder Participation
Criteria 12
Potential credits 1

Green roofs for fully accessible recreational use provide facilities that can be shared by the relevant parties.

Energy

Ene 04 Low and Zero Carbon Technologies
Compliance CN10
Potential credits 2

A Bauder BioSOLAR Green Roof PV array creates local energy generation from renewable sources which can supply a compliant

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.

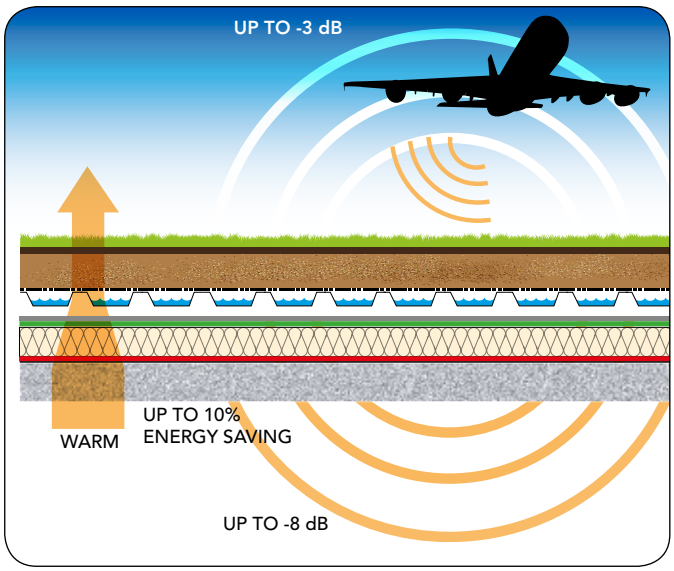
The same system was tested in a sloped orientation to ensure that the fire behaviour is not affected by roof slope and is also classified EXT.S.AA.

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.

RECREATIONAL GREEN ROOFS

Intensive green roofs provide recreational gardens and amenity spaces at roof level, with all the benefits usually associated with ground level landscaping. Typically they will feature landscapes combining shrubs, perennial and herbaceous plants, grassed areas, trees or hard landscaping for foot or vehicular traffic.

When to Specify

Maximising the full potential of a building by utilising all available space to deliver leisure spaces. Typically created on new build roof constructions, over underground car parks and podiums. The landscape variations are practically limitless for both design and use.

Key Features

These features are in addition to those associated with all green roofs.

- Assists in maximising the building's potential.
- Provides valuable recreational space.
- Offers storm water management benefits due to the depths of substrate used, particularly when specified in conjunction with permeable paving.
- Increases the overall value of the property.

The plants used make a heavy demand on the green roof and will require maintenance, irrigation and management throughout the year to ensure the upkeep of the landscape and allow the vegetation to flourish.

It is important to first establish the landscape finish you are looking to achieve. There is little to restrict the scope for design, other than the overall weight of the system dictating the construction of the supporting structure and the height and level of exposure of the roof.

All our green roof systems meet with FLL Guidelines

Specification Support

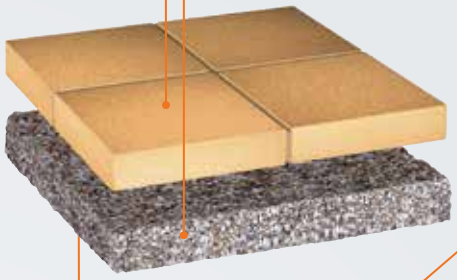
Specification downloads:
www.bauder.co.uk/technical-centre

Telephone helpline:
0845 271 8800

Example System Configuration

Our lightweight substrates combined with specially developed water storage and drainage components all ensure that the modern green roof can replicate a traditional landscape at roof level at only a fraction of the weight and with a substantially shallower build up.

It is crucial that an integrated approach is taken to the design and specification of both the waterproofing and landscaping components, so that the desired outcomes are achieved. We can work with you from the earliest design stage to ensure that your green roof project is successful.



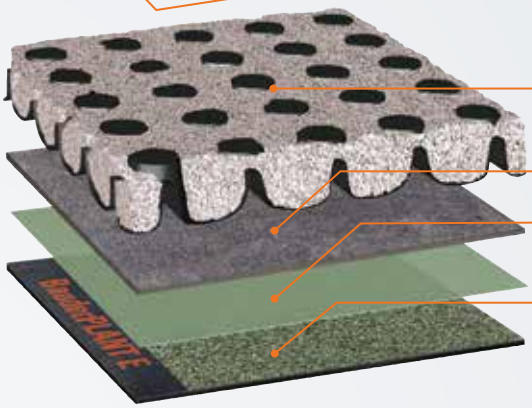
Paving/Pebble Ballast

Granite Chipping Base

Vegetation
specifically selected for each individual roof, from turf to trees.

Bauder Intensive Substrate
lightweight growing medium manufactured to meet FLL guidelines.

Bauder Filter Fleece
filtration layer that prevents substrate fines from washing into the drainage layer.



Bauder DSE60
60mm thick, water storage and drainage layer, infilled with Bauder Mineral Drain for structural stability.

Bauder FSM 1100 Protection Mat
recycled polyester and polythene fibre mix.

Bauder PE Foil
polythene foil separation and slip layer manufactured from recycled granules.

Bauder Plant E or AP2
root resistant, SBS modified bitumen membrane reinforced with 250g/m^2 recycled spunbond polyester.

SUBSTRATE GREEN ROOFS

These extensive green roof systems are primarily used for their ecological benefits or aesthetic appearance rather than for general access or for leisure purposes.

A traditional extensive substrate green roof system provides a depth of growing medium usually around 80-120mm to allow for the specification of a broader range of species and planting schemes. The plants are generally low maintenance, wind, frost and drought resistant and can be installed by different methods, including plug planting, vegetation mat and seeding.

When to Specify

The system is lightweight and offers the advantage of a bespoke vegetation finish with a substrate depth to support the plants, suitable for new build construction and retrofit or refurbishment projects.

Key Features

- Comparatively lightweight.
- Plants chosen to suit the project and location.
- Significant scope for creating a natural habitat to encourage plants and small wildlife to remain, so aiding biodiversity.
- Can be designed specifically to support particular flora and fauna.
- Aid to planning consent as biodiversity roofs help to meet local authority policies towards a sustainable environment.
- Aid to meeting BREEAM requirements of a development through points secured by the use of accredited native species plants.
- Develop another dimension through a unique opportunity to maximise the potential of the building to support the environment.
- Good levels of rainwater attenuation, depending on substrate depth.
- Cost effective on large roof areas.

Creating a Biodiverse Roof

This specific type of green or 'living' roof typically either tries to replicate as closely as is practical the ecological environment of the site where construction has taken place or sets out to create a natural habitat to support a variety of flora and fauna so aiding biodiversity.

When to Specify

Biodiverse roofs can be created on new build construction and refurbishment or retrofit projects. Ideal for meeting biodiversity action plans (BAP) and delivering to BREEAM and planning requirements.

All our green roof systems comply with FLL Guidelines.

Specification Support

Specification downloads:
www.bauder.co.uk/technical-centre

NBS Plus BIM DWG

Telephone helpline:
0845 271 8800

BALI gro ECO PLATFORM EPD EN 15804 VERIFIED

flora LOCALE RHS PERFECT FOR POLLINATORS bre

Example System Configuration

Substrate-based extensive green roofs can incorporate a variety of vegetation finishes.

Vegetation Mats

The installation of a precultivated vegetation mat allows instant coverage of the roof. Native species wildflower blanket XF118 meets the growing demand to satisfy the requirements of BREEAM and to meet a biodiversity action plan for the site.

Sedum Blanket XF300 provides dense sedum foliage featuring up to 11 species of sedum with some mosses and grasses for plant diversity.

Plug Planting

This method gives the client both a much greater choice of plant species and the opportunity to plan the layout. The individual immature plants or 'plugs' are planted out into the substrate by hand, which can then grow on to give good cover over the next two full growing seasons.

Seeding

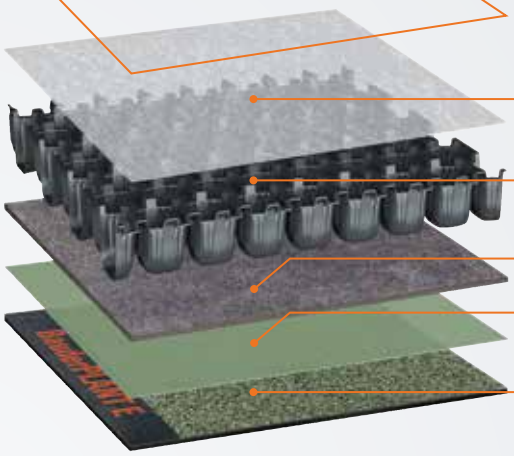
This is an economical and practical method for vegetating larger roof areas. Plant establishment and full coverage will take between 18-24 months, depending upon the time of year sowing takes place and the weather conditions during the period of establishment.

Vegetation Mat

Seeded Roof

Plug Plants

Biodiverse Habitat



Bauder Filter Fleece
filtration layer that prevents substrate fines from washing into the drainage layer.

Bauder DSE40
40mm water storage layer that provides multi directional drainage.

Bauder FSM600 Protection Mat
recycled polyester and polypropylene fibre mix.

Bauder PE Foil
polyethylene foil separation and slip layer manufactured from recycled granules.

Bauder Plant E or AP2
root resistant, SBS modified bitumen membrane reinforced with 250g/m^2 recycled spunbond polyester.

Substrate Pitch Roof Systems - Configurations Over 10°

An extensive substrate system on a pitch greater than 10° requires a water retention and storage board that will hold the substrate firmly in place and be sufficiently rigid to prevent board flexure and manage the imposed sheer load.

The extensive or biodiverse substrate is applied directly to the profiled surface of the board so that the green roof is stabilised whilst retaining sufficient levels of water to support the vegetation.

Sedum Vegetation on Bauder Extensive Substrate
variety of sedum species with some grasses and moss.

Vegetation on Bauder Biodiverse Substrate
generally provided through plug planting, vegetation mat or seeding. Selected species can be chosen to suit the project and location.

Bauder Substrate
applied directly to the profiled surface of the reservoir board.

Bauder Reservoir Board
lightweight rigid expanded polystyrene water storage and drainage layer.

Bauder FSM600 Protection Mat
polyester and polypropylene fibre mix.

Bauder PE Foil
polyethylene foil separation and slip layer manufactured from recycled granules.

Bauder Plant E or AP2
root resistant, SBS modified bitumen membrane reinforced with 250g/m² recycled spunbond polyester.

www.bauder.co.uk/technical-centre

BioSOLAR Green Roof System

Bauder BioSOLAR is a revolutionary solar PV mounting system for biodiverse or extensive green roofs. Well suited to new build applications where environmentally friendly solutions are required to meet planning and BREEAM requirements. Our BioSOLAR system can also be retrofitted on many existing roofs without the need for any structural modification to the building.

A key element is that the front edge of the PV panel is set 300mm above the level of the substrate, which allows liberal growing room for the vegetation without blocking light to the array that would otherwise reduce the efficiency of the panels. This height setting also enables light and moisture to reach beneath the panel to support the plants below.

Vegetation Mats

Native Species Wildflower Blanket XF118 meets the growing demand for a native species vegetation blanket to satisfy the requirements of BREEAM and to meet a biodiversity action plan for the site.

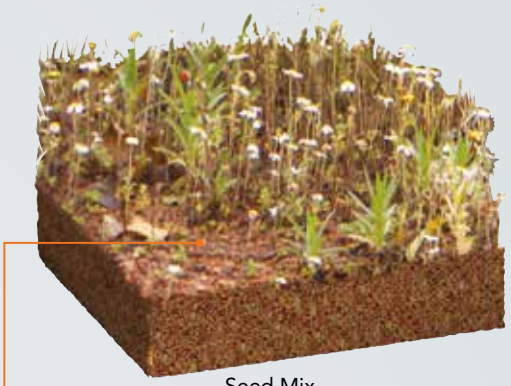
Sedum Blanket XF300 provides dense sedum foliage cover featuring up to 11 species of sedum with some mosses and grasses for plant diversity.

Plug Planting

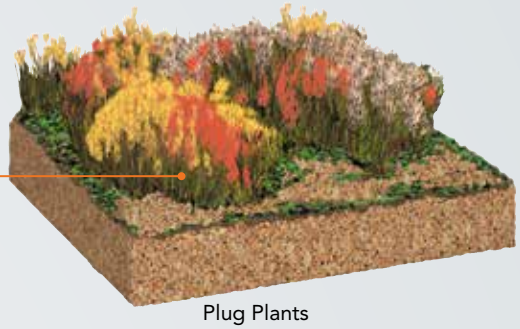
Individual immature plants or 'plugs' are planted out into the substrate by hand to give a variety of species, which can then grow on to give good cover over the next two full growing seasons.

Bauder Flora 3 Seed Mix

Ideal for vegetating large roof areas with species selected for their maximum growing height that meet BREEAM requirements.

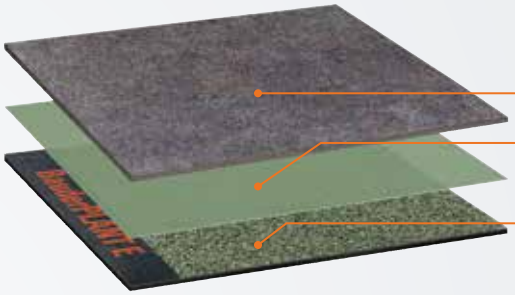


Seed Mix



Plug Plants

Vegetation Mat



Bauder FSM600 Protection Mat
recycled polyester and polypropylene fibre mix.

Bauder PE Foil
polyethylene foil separation and slip layer manufactured from recycled granules.

Bauder Plant E or AP2
root resistant, SBS modified bitumen membrane reinforced with 250g/m^2 recycled spunbond polyester.

www.bauder.co.uk/technical-centre

LIGHTWEIGHT SEDUM SYSTEM

Bauder XF301 extensive sedum blanket system is constructed using low maintenance planting (succulents) that provide excellent cover and increased protection to the waterproofing system.

When to Specify

The Xero Flor sedum blanket is a very versatile green roof system and is suitable for both new build and refurbishment projects. It is ideal for buildings where weight loading is a consideration or planning requirements stipulate the inclusion of a green roof.

Key Features

- The Xero Flor sedum blanket is installed as a complete system
- The most lightweight green roof system available, making it ideal for retrofitting or refurbishment projects
- Delivers instant greening of a roof with sedums and other species able to flourish in our climate
- Ideal solution where a green roof needs to be specified to meet planning requirements
- Cost effective
- Sedum blankets are grown on our farm in the UK and delivered to site within 24 hours of harvesting
- Blanket features up to 11 species of sedums, some mosses and grasses to ensure plant diversity

The plants are grown on a 'blanket' that is harvested like turf and installed by rolling out on top of the waterproofing and any other landscaping components required. The blankets are very lightweight, easy to maintain and provide instant greening to the roof.

All our green roof systems comply with FLL guidelines.

Specification Support

Specification downloads:
www.bauder.co.uk/technical-centre

Telephone helpline:
0845 271 8800

System Configuration

The multi-functional XF301 sedum system combines the vegetation support layer with a moisture retention fleece to provide the perfect base for all roofing scenarios with a labour efficient installation.

Our patented geo-textile carrier fleece with its ultraviolet resistant nylon loops provides a support base for the specially developed substrate growing medium and gives stability to the established vegetation whether on a low pitch flat roof or a 25° slope.

The pre-attached fleece is a unique feature of our XF301 sedum system, retaining moisture after rainfall and thus allowing the plants to take up the water for future use. The sedums are grown to maturity before being harvested, thus ensuring that they acclimatise quickly to their new rooftop location.

We currently cultivate 60,000m^2 of XF301 and are able to harvest the sedum and deliver to site within 24 hours.

Bauder XF301 Sedum System
pre-cultivated vegetation blanket on a patented nylon loop and geo-textile base carrier with special substrate and a pre-attached integral 8mm moisture retention fleece.

Bauder SDF Mat
multifunctional drainage, filtration and protection layer manufactured from ultraviolet resistant nylon woven loops which are thermally bonded to geo-textile filter fleece facings.

System Installation

Long length rolls being craned into position and installed.

Short 2m rolls of XF301 Sedum System installed by hand.

BAUDER PLANTING & VEGETATION

XF118 Native Species Wildflower Blanket

This vegetation blanket meets the growing demand for native species plants to satisfy the requirement of BREEAM. The 24 species of wildflowers and herbs incorporated into the blanket have been selected to provide a viable and vibrant plant that will be present on most of the biodiversity action plan lists that project specific ecology reports now demand.

XF300 Sedum Blanket and XF301 Sedum System

Both of these vegetation blankets provide dense sedum foliage cover featuring up to 11 species of sedum with some mosses and grasses for plant diversity.

The plants provide a lot of colour and are selected to suit our climate, and provide 90% ground coverage at installation.

Plug Planting

The use of small seedling plants have a number of advantages, each individual species can be chosen and the location and density of the planting can be controlled.

We supply a wide range of British provenance plug plant species for a Bauder green roof project.

Seeding

Seeding is a proven way to establish vegetation, however at roof level, the environment makes this a challenge without the correct provisions.

We supply a range of British and Scottish provenance seed mixes which have a unique blend of seed species, adhesive to bind the seed to the substrate, organic fertiliser for nutrients and mycorrhizal fungi to increase the root surface area and establish the plants as they grow.

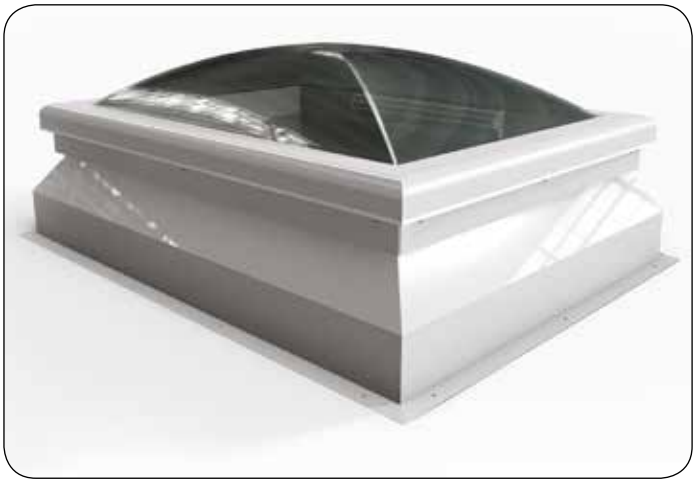
COMPLETING THE PACKAGE

As a responsible manufacturer and specialist, it is important to us to work with other key manufacturers that produce accompanying rooftop products that may affect the integrity of our waterproofing, such as rooflights, outlets and trims.

All these items need securing to the roof, which means finding a solution to roof details and working with the approved roofing contractor to ensure the installation is precise, accurate and robust.

Rooflights

Bauder Euroglaze and BauderDOME are the most advanced rooflight designs available. With high standards of illumination, insulation and ventilation, Bauder offers rooflights for all flat roofed buildings. All these glazing products are fully compatible with our roof waterproofing systems and the standard products all hold BBA certification. They are installed with a comprehensive guarantee to give total confidence and complete peace of mind.

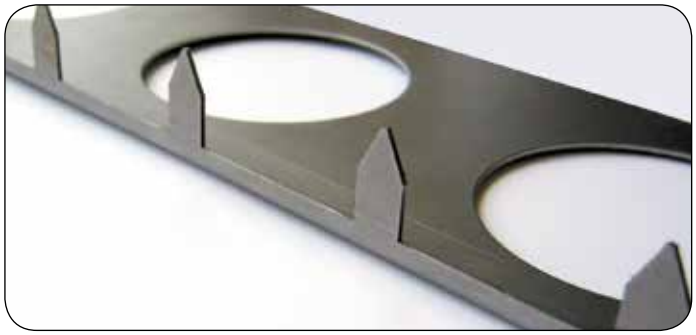


BBA BRITISH BOARD OF AGRÉMENT 05/4297

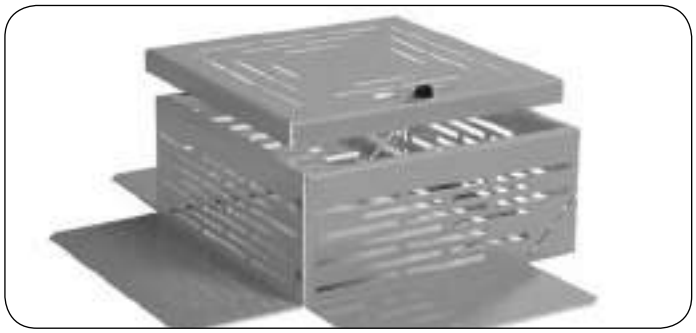
Accessories

Our full range of accessories complement a Bauder green roof and give a single point of contact for all elements required in the design. These are some examples of our range.

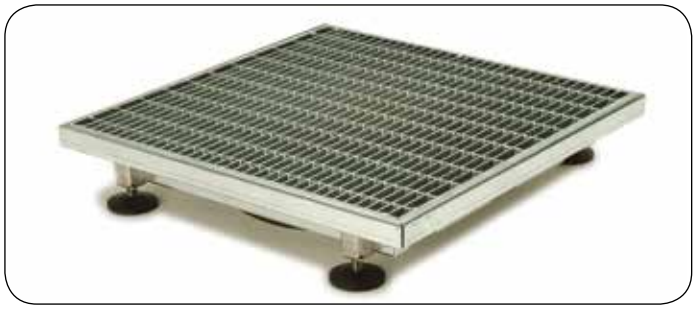
Bauder AL40 Sedum Blanket Edge Trim



Sedum Blanket Retention Strip



Inspection Chamber ALU250



Linear Drain Rainwater Outlet Access Cover

OUR SERVICE

Your project is important to us and our service is dedicated to providing a green roof solution that fully understands all the individual issues of the project, answers the waterproofing requirement and satisfies the needs of the vegetation.

New Build and Refurbishment Projects

Your green roof design can be complex, so we work with you to ensure all the roof detailing is robust and accurate. Our technical managers will meet you and from your plans they will produce, alongside our technical department, a specification package ready for the tendering process.

A typical specification and report package can include the following:

- Building type and usage.
- Recommended system configuration.
- Detailed specification.
- Green roof construction and design.
- Thermal analysis and calculations.
- Falls and drainage design.
- Wind uplift and restraint calculations.
- Detailing on all roof penetrations.
- Roof plans and tapered insulation layouts.
- Recommended approved contractors.

Creating a Biodiverse Landscape

We support the architect in the design and development of the biodiverse roof, ensuring it complies with the ecological requirements for maximum BREEAM credits and fulfils all the planning requirements.

Our technical team can produce comprehensive specifications for the roof and, if required, detailed roof plans and management plans for the design to satisfy both BREEAM inspection and local planning authorities.

Biodiverse Roof Plans

In discussions with architects we can interpret the ecological requirements to show a detail 'layout' drawing for the mounding of substrate and location of planting and surface finishes, ensuring the loading of the roof is compatible with the roof structure.

Biodiverse Green Roof Management Plans

Increasingly, local authorities require 3-5 year site specific management plans to ensure the roof establishes correctly and produces the habitat it was designed to deliver.

We offer a project specific management programme which enables the planning requirements to be discharged with our maintenance and monitoring team carrying out the work.

Vegetation

All BAP's are focused on the enhancement of the local ecosystems, to this end the provenance and suitability of the plant stock is key.

Our vegetation blankets are grown in the UK and all wildflower plugs are of British provenance.

Our Flora Seed Mix range uses seed from sources who are signatures to the Flora Locale code of practice.

Bauder Flora Seed Mix Range

Bauder Flora 3: General Purpose Mix
Bauder Flora 5: Urban Seed Mix
Bauder Flora 7: Chalk Grassland
Bauder Flora 9: Coastal Mix
Bauder Flora 11: Scottish Mix

SIX STEPS

1: Brief and Consultation
You give us your remit and together we discuss the green roof project; site suitability, level of access required, falls and drainage, weight loadings, performance expectations, preferred system application, your budget and how the works can be formulated.

2: Roof Review
Upon determining which green roof and vegetation finish is suitable for your building we will perform a detailed appraisal of all roof areas to fully assess the structural and design considerations, and propose the appropriate green roof components.

3: Report, Design and Specification Service
Designing to protect the building's construction and flat roof waterproofing is vital when delivering a green roof as many forces can affect the structure. Your detailed report and specification package takes into account these factors and will answer your original brief.

4: Contractor Selection
The Bauder approved contractors best placed to deliver your green roof will competitively tender for your project. Our national network of contractors undergo a rigorous selection process and their installers are trained specifically in the application of our systems, so you are ensured an expert installation.

5: Green Roof Installation
Once the Bauder approved contractor has been appointed, a pre-contract meeting will make sure the project delivery is well coordinated. The works are closely monitored by Bauder site technicians to ensure quality and waterproof integrity of the roof and correct installation of the green roof components.

6: Sign Off, Guarantee and Maintenance
A full final inspection is completed on the works by our site technician team following rigorous approval criteria before the guarantee is issued.

BAUDER INSTALLATIONS

Installations

You can be assured that the waterproofing, PV and green roof installation performed on your building's roof will be of the absolute highest quality, as we only allow fully trained and certified Bauder approved contractors to install our roofing solutions.

Approved Contractors

Our national network of approved contractors are given all the training, support and expert advice they need in order to deliver a high quality roof installation that we are proud to put our name to.

We look to build strong working relationships with all of our approved contractors, as we recognise just how essential the quality and experience of the installing operative is to ensuring a successful project.

Badged Operatives

Excellent workmanship is crucial to the guarantee that accompanies Bauder installations and so we have always operated a policy to train and approve the individual installer, and not simply the contracting roofing company. Each individual fixer is required to display their approved operative badge at all times showing photographic identification, name, badged operative number and the systems that they are trained to install.

Bauder Site Technicians

Once your roofing works commence, our experienced team of site technicians will monitor and inspect the workmanship at key stages to ensure that the standards required to meet our guarantee are fulfilled, as well as providing you with easy to understand reports on how the works are progressing.

Our national team is the largest of all the manufacturer-suppliers, ensuring all our sites receive the attention they deserve.

QUALITY GUARANTEED

Guarantees

A full final inspection is undertaken by our site technician team on completion of the waterproofing before the installation of the green roof commences.

Your completed roof package will be backed up by what we can confidently claim to be the most comprehensive guarantee range in today's roofing industry, giving you total reassurance with regards to the future performance of your building's roof.

Unlike others in the market, Bauder offers a full range of guarantees that map to the building's and client's requirements. Our guarantee provides you with complete satisfaction and will be bespoke to your project and its requirements.

We issue our guarantees unreservedly as part of our service because we monitor quality every step of the way from manufacture to installation.

Guarantee Options

- Products supplied by Bauder (exclusions exist).
- Workmanship and installation of Bauder products by our approved contractors.
- Design, advice, formula and specification where Bauder products are concerned.
- Financial loss from building damage due to faulty manufacture or installation of Bauder products.
- Consequential damage through Bauder waterproofing system failure due to faulty manufacture or installation of Bauder products.

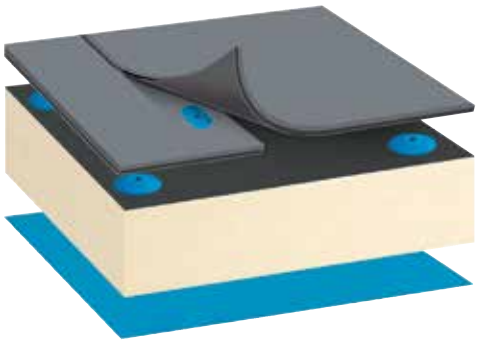
WATERPROOFING OPTIONS

Our portfolio of waterproofing systems ensures we impartially match the right solution for every project whether new build or refurbishment.

Single Ply Systems

Our single roofing systems are ideal for lightweight, fast track and cost effective construction projects. The systems provide solutions that are durable, resistant to the natural elements and are able to support extensive green roofs.

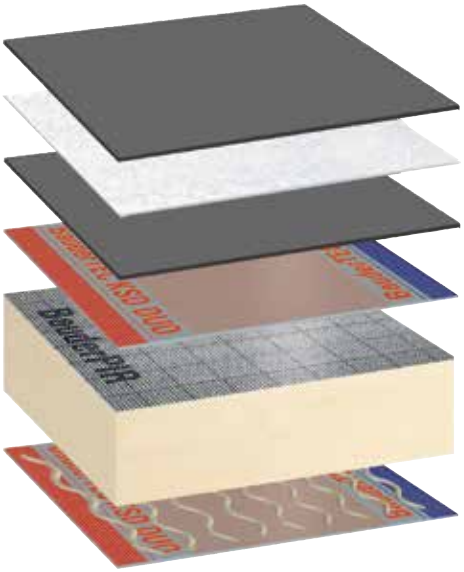
- Projects: New build or refurbishment.
- Construction: Warm, cold and inverted roofs.
- Upgrades: Extensive Green roofs and BauderSOLAR
- Certification: BBA, FM Approval.
- Guarantees: Full range.



Cold Liquid Applied Waterproofing

Our cold liquid applied systems are based on the most advanced PMMA technology. Simple to install, fast curing and long lasting; they are suitable for use in all kinds of flat roof, balcony, walkway, and terrace waterproofing and surfacing applications.

- Projects: New build or refurbishment.
- Construction: Warm, cold and inverted roofs.
- Upgrade: Extensive Green Roofs
- Certification: BBA
- Guarantees: Full range.



Bitumen Membrane Systems

Our long-established and fully integrated roof systems incorporate SBS modified elastomeric bitumen membranes and highly efficient PIR insulation to give a robust waterproofing solution with long-term durability and life-expectancy. These systems are ideal for all types of green roof scenarios and solar PV.

- Projects: New build or refurbishment.
- Construction: Warm, cold and inverted roofs.
- Upgrades: Green roofs and BauderSOLAR flat roof or BioSOLAR photovoltaics.
- Certification: BBA.
- Guarantees: Full range.

Hot Melt Structural Waterproofing

The Bauder Hot Melt Structural Waterproofing System can be installed on decks with zero degree falls.

- Projects: New build.
- Construction: Cold and inverted roofs.
- Upgrades: Green roofs and BioSOLAR photovoltaics.
- Certification: BBA
- Guarantees: Full range to accompany BioSOLAR PV system.

ONLINE TECHNICAL RESOURCES

bauder.co.uk/technical-centre

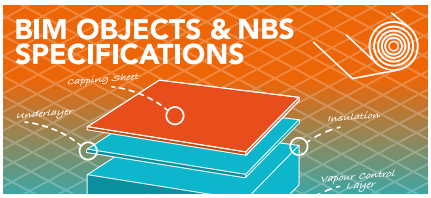
Get your specification right

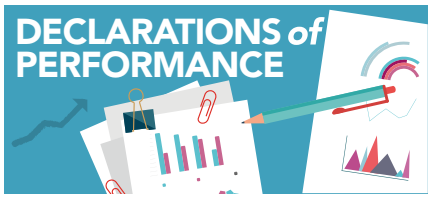
Online technical resources for your flat roof project

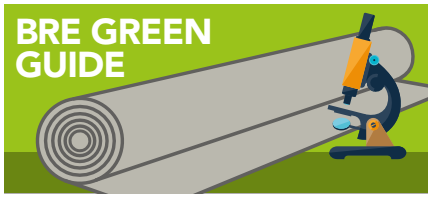
At Bauder our service is free to you and covers all elements for a successful project delivery from initial concept or site survey, through to specification package with bespoke drawings and calculations, on site monitoring and final sign-off and handover.

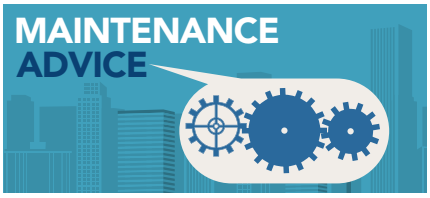
We appreciate that there are times when you need resources to get your project started and the Bauder Online Technical Centre will support you.

Technical Centre
BIM objects and NBS specifications
CAD detail drawings
System summaries
Certification
Declarations of Performance
Products
Design guides
Brochures
BRE Green Guide
Maintenance advice
Technical CPD seminars









Specification Hotline: 0845 271 8800

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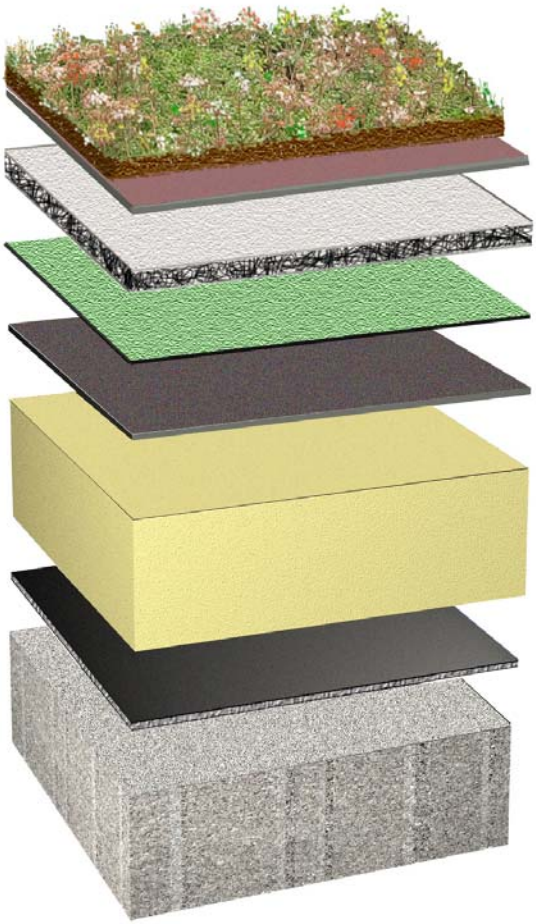
Date: 11-02-2005

TECHNICAL DATA SHEET

Xero Flor sedum blanket system – Construction and Saturated loading
Insulated with roof fall of 1°-2°



Bauder Xeroflor XF301
Sedum combination blanket

Bauder SDF mat

Bauder Plant-E capping sheet

Bauder G4E

Bauder PIR insulation

Bauder DS1 DUO vapour barrier

Specification Build-up	Thickness / mm	Weight kgs / m²
Vapour barrier – DS1 DUO	3.5	4.3
Insulation	140	5.32
G4E Underlayer	4	4.8
Plant-E capping sheet	5	6.0
SDF Mat	20	0.6
XF301 sedum blanket	33	43.8
System build-up	185.5	
Overall saturated weight in kgs / m²		64.06

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BAUDER

SERVICE

GREEN ROOF MAINTENANCE

GREEN ROOF MAINTENANCE

A green roof is a real asset to a building and for it to continue to deliver the environmental and aesthetic benefits for which it was originally designed, it is important to carry out maintenance on a regular basis.

A well maintained green roof will:

- Look at its best and ensure the optimum range of species for maximum coverage and longer flowering periods
- Sustain healthy plant growth to provide a habitat for wildlife
- Improve air quality by reducing airborne dust and help local air cooling
- Offer protection to the waterproofing beneath
- Help conserve and control rainwater runoff
- Maximise the building's asset value

Common Problems

Lack of Nutrients can lead to unhealthy plants and loss of vegetation coverage, resulting in bare patches and a reduction in the variety of species present.

Invasive Weeds, Fallen Leaves and Debris can spoil the aesthetic appearance and function of your green roof, and in some circumstances can even damage the waterproofing. The removal of leaf litter from overhanging trees and other accumulated debris is essential to prevent plants from being suffocated.

Impeded Drainage can be detrimental to plant health and roof performance. For example, when the growing medium is not free-draining it can become wet and lead to root rot or invasive grasses and weeds. Regular maintenance and inspection checks ensure that the outlets and areas surrounding outlet inspection chambers remain clear and perform as intended.

Health & Safety Considerations

Following health and safety best practice is essential to all successful green roof maintenance and should be carried out by fully trained personnel who should be:

- Familiar with working at rooftop levels
- Able to carry out risk assesments
- Inspecting mansafe equipment prior to use
- Competent users of all apparatus
- Wear all necessary personal protective equipment

OUR SERVICE

With over 35 years' experience in the design and supply of green roofs throughout the UK and Ireland, we offer unparalleled knowledge and horticultural expertise for rooftop vegetation and green roof maintenance.

Our national coverage assures you of a prompt reliable service to fully meet your requirements and comprises a full inspection and evaluation of your green roof.

Our experienced maintenance team will fully comply with relevant health and safety legislation throughout the duration of the work to access the roof with suitable edge protection or fall protection systems; carry out pre-use inspections of all maintenance equipment, wear personal protective equipment where necessary; and risk assess all works prior to commencement.

Following each visit you will be provided with a bespoke report that highlights the work carried out, the condition of the roof and any necessary future works to be considered.

Call our team for a no obligation quote.

Green Roof Maintenance Team

Telephone: 0845 271 8802

Email: greenmaintenance@bauder.co.uk

Sedum Roof Maintenance

It is a common misconception that extensive green roofs are maintenance free, but this is not the case and annual maintenance is required. Our sedum maintenance service typically concentrates on:

- Ensuring adequate fertilisation of the sedum blanket
- Evaluating colour and growth rate of vegetation
- Removal of leaves, debris and any unwanted invasive weeds
- Repairing of any bare patches
- Clearance of outlets and testing of irrigation

Biodiverse & Wildflower Maintenance

The level of maintenance of the horticultural element of this type of green roof varies significantly depending on the species of vegetation incorporated, and our biodiverse and wildflower maintenance service typically focuses on:

- Ensuring a suitable balance of species on the roof
- Removal of leaves, debris and any unwanted invasive weeds
- Strimming back of vegetation and sward growth where applicable
- Ensuring adequate fertilisation of the vegetation
- Examining and testing of irrigation

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