JNP GROUP

CONSULTING ENGINEERS

Flood Risk Assessment and Drainage Strategy

Project: Wensley Road, Reading

Client: Reading Borough Council

Reference: M43794-JNP-66-XX-RP-C-1002 P01

Date: January 2022

DOCUMENT CONTROL SHEET

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FOR AND ON BEHALF OF JNP GROUP
Date: February 2022

Document Issue Record

Rev	Date	Description	Prepared	Checked	Approved
P01	28/01/2021	First Issue	SLL	ZS	CC
P02	09/02/22	Second Issue – Updated Appendices	ZS	BID	BID

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Contents

1 INTRODUCTION 3

1.1 Terms of Reference 3
1.2 Policy Framework and Key Stakeholders 3
1.3 Sources of Information 4

2 DEVELOPMENT SITE 6

2.1 Location 6
2.2 Topography 7
2.3 Geology 7
2.4 Hydrology 7

3 PROPOSED DEVELOPMENT 8

4 FLOOD RISK ASSESSMENT 9

4.1 Overview 9
4.2 Climate Change 9
4.3 Surface Water Flood Risk 9
4.4 Sewer Flood Risk 10

5 FLOOD RISK MANAGEMENT 12

5.1 Sequential and Exception Tests 12
5.2 Surface Water Flood Risk 13
5.3 Sewer Flood Risk 13

6 SURFACE WATER DRAINAGE STRATEGY 14

6.1 Existing Drainage (Greenfield Runoff) 14
6.2 Proposed Drainage Strategy 14
6.3 Sustainable Drainage Systems (SuDS) 15
6.4 Exceedance Events 17
6.5 Water Quality Management 17
6.6 Operation and Maintenance 18
6.7 Drainage During Construction 19

7 FOUL WATER DRAINAGE STRATEGY 21

8 CONCLUSIONS AND RECOMMENDATIONS 22

9 LIMITATIONS 24

APPENDIX A: TOPOGRPAHICAL SURVEY 25

APPENDIX B: PROPOSED DEVELOPMENT 26

APPENDIX C: ENGINEERING LAYOUT 27

APPENDIX D: MICRO-DRAINAGE OUTPUTS 28

APPENDIX E: THAMES WATER SEWER RECORDS & CORRESPONDENCE 29

1 INTRODUCTION

1.1 Terms of Reference

1.1.1 JNP Group have been commissioned by Reading Borough Council to prepare a flood risk assessment for the proposed residential development at Wensley Road, Reading.

1.1.2 This report assesses flood risk at the development site from all potential sources and describes the measures adopted in the master planning process to manage such risks. It has been prepared in compliance with current policies and best practices

1.1.3 This report also reviews the surface water drainage hierarchy and proposes a site drainage strategy. It describes the surface water drainage system and identifies management and maintenance tasks for the system. It also outlines a Surface Water Construction Management Plan.

1.2 Policy Framework and Key Stakeholders

1.2.1 The *National Planning Policy Framework* (NPPF) (February 2019) sets strict tests to protect people and property from flooding which all local planning authorities are expected to follow. Where these tests are not met, national policy is clear that new development should not be allowed.

1.2.2 In areas at risk of flooding or for sites of one hectare (ha) or more, developers must undertake a site-specific flood risk assessment to accompany applications for planning permission (or prior approval for certain types of permitted development).

1.2.3 In decision-taking, local planning authorities must ensure a sequential approach to site selection and master planning is followed so that development is, as far as reasonably possible, located where the risk of flooding (from all sources) is lowest, taking account of climate change and the vulnerability of future uses to flood risk.

1.2.4 Where development needs to be in locations where there is a risk of flooding, local planning authorities and developers must ensure development is appropriately flood resilient and resistant, safe for its users for the development's lifetime, and will not increase flood risk elsewhere.

1.2.5 The Environment Agency (EA) is a statutory consultee on applications where there is a risk of flooding from the sea or main rivers.

1.2.6 Lead local flood authorities (unitary authorities or county councils) are responsible for managing local flood risk from ordinary watercourses, surface water or groundwater, and for preparing local flood risk management strategies. Local planning authorities work with lead local flood authorities to ensure local planning policies are compatible with the local flood risk management strategy.

1.2.7 Reading Borough Council (RBC) is the lead local flood authority (LLFA) and its strategy for managing local flood risk is set out in LOCAL FLOOD RISK MANAGEMENT STRATEGY (October 2015).

1.2.8 Reading Borough Council (RBC) is the local planning authority (LPA) and its policies on flood risk management are set out in Reading Borough Local Plan (November 2019) and Sustainable Design and Construction Supplementary Planning Document (December 2019).

1.2.9 Where relevant, local planning authorities and developers must also take advice from:

- Internal drainage boards; to identify the scope of their interests.
- Sewerage undertakers; to ensure they can assess the impact of new development on their assets and plan any required improvements. Thames Water(TW) is the local sewerage undertaker.
- Reservoir undertakers; to avoid an intensification of development within areas at risk from reservoir failure and ensure they can assess the cost implications of any reservoir safety improvements required due to change in land use downstream of their assets.
- Navigation authorities; in relation to developments adjacent to, or which discharge into, canals (especially where these are impounded above natural ground level).

1.3 Sources of Information

1.3.1 This flood risk assessment has been based on the following sources of information:

- DEFRA / EA's LiDAR topographic data (1 m resolution);

  (https://environment.data.gov.uk/DefraDataDownload/?Mode=survey)
- Bespoke topographic survey undertaken by Survey Solutions in July 2019.;
- British Geological Survey's *Geoindex Tool*;

  (http://mapapps2.bgs.ac.uk/geoindex/home.html)
- DEFRA / EA's aquifer and source protection data

  (https://magic.defra.gov.uk/MagicMap.aspx)
- Ground Appraisal Report, Geo-Environmental Ref. GE18760-GARv2.0-MAR21, dated March 2021;
- Bespoke ground investigation undertaken by Geo-Environmental in May 2021;
- EA's Flood Map for Planning;

  (https://flood-map-for-planning.service.gov.uk/)
- EA's Long Term Flood Risk Information;

  (https://flood-warning-information.service.gov.uk/long-term-flood-risk/map)
- RBC Level 2 Strategic Flood Risk Assessment (December 2017);
- EA's detailed flood risk information (Products 4, 5, 6, 7 and 8);
- Bespoke hydraulic model undertaken by JNP Group in January 2022;
- Thames Water Asset Location Plan (ALS/ALS Standard/2019_4124071).

- Flood Risk Assessment, SuDS Strategy and Drainage Strategy, WFBA ref 19195-WFB-YY-XX-RP-C-0001 C01 daed May 2021.

2 DEVELOPMENT SITE

2.1 Location

2.1.1 The site is located off Wensley Road, approximately 1.5 km south west of Reading town centre (Figure 2.1, Table 2.1).

Figure 2.1: Site Location

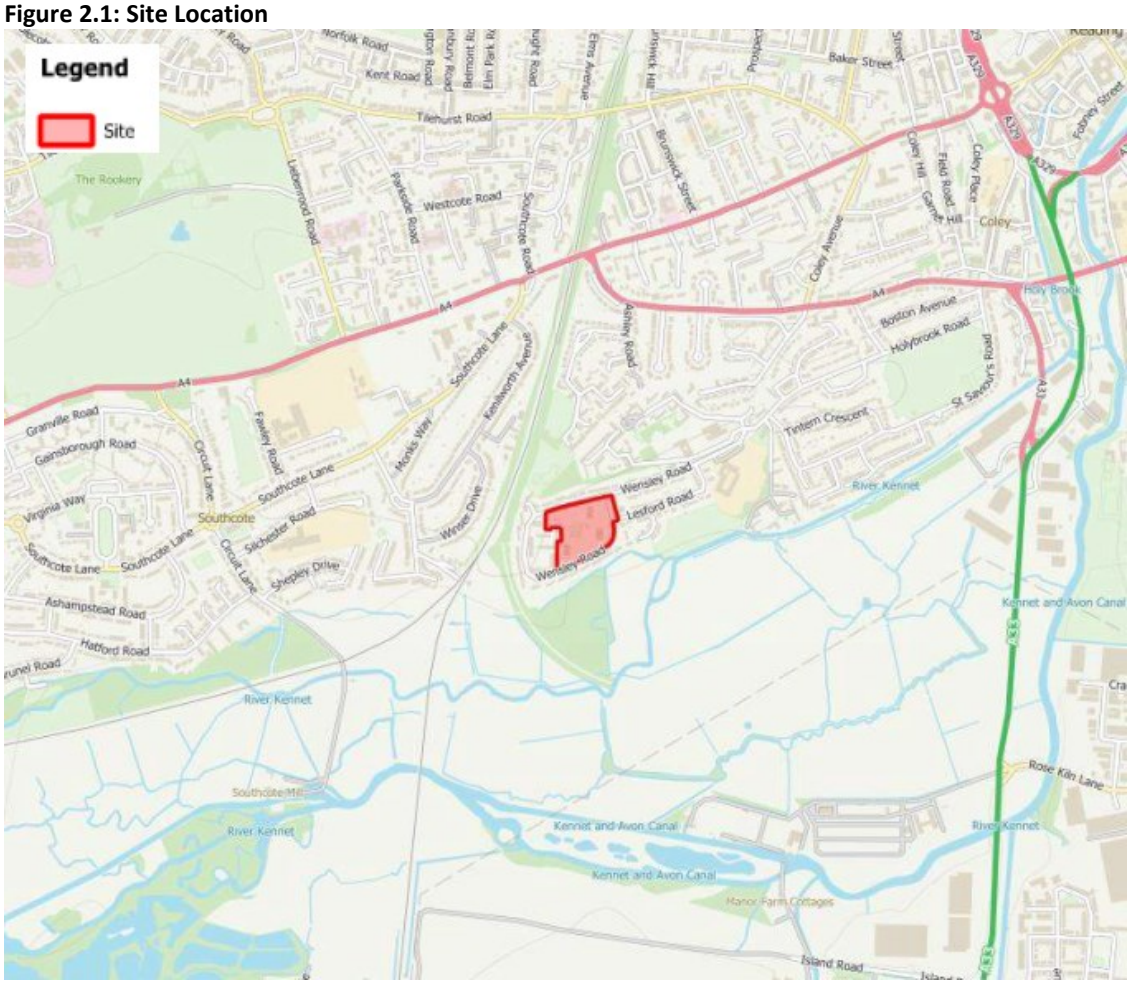


Table 2.1: Site Location

OS X	OS Y	Site Area (ha)	Nearest Postcode
470075	171952	2.37	RG1 6EA

2.1.2 According to the Ground Appraisal Report, the site comprises of an irregularly shaped parcel of land with undulating topography. At the time of the investigation, the site was occupied by three multi-storey apartment blocks, located in the north, southwest and south of the site. Each block had an associated car park with a fourth car park in the northwest. A playground, sports court and cycling track were located in the central western part of the site. The remainder of the site comprised soft landscaping.

2.1.3 A compound was located in the east of the site associating with building and renovation works.

2.1.4 The surrounding land uses are summarised in the following table.

Table 2.2: Surrounding Land Use

Direction	Land Use
North	Wensley Road, residential
East	Residential
South	Residential, fields beyond
West	Residential

2.2 Topography

2.2.1 The available topographic information (Appendix A) shows that ground levels within the development site range between c. 49.5m above Ordnance Datum (aOD) in the north west to 43.0 in the south west.

2.3 Geology

2.3.1 The geology of the site has been determined by reference to the 1:50,000 scale British Geological Survey (BGS) online Geo index Tool and the Ground Appraisal Report.

2.3.2 Made ground was found to be present across the site, ranging from 0.3m to 1.3m thick. The investigation did not identify significant concentrations or volumes of mobile contamination. Never-the-less, the report noted that soakaways should not be constructed through contaminated soils where those contaminants could then be leached or mobilised and impact other soils or groundwater.

2.3.3 Superficial deposits are not present on the site, but the Lynch Hill Gravel Member is present to the north. The bedrock geology is indicated to be the Lambeth Group overlying the Seaford and Newhaven Chalk Formation.

2.3.4 Groundwater was not encountered in any of the monitoring boreholes on-site which extended up to 5.0m bgl.

2.3.5 Considering the presence of made ground across the site, infiltration drainage is not considered to be feasible.

2.4 Hydrology

2.4.1 The nearest surface water feature is the Holy Brook located 39 m to the southeast of the site. This is a main river, which flows to the south and ultimately discharges into the River Kennet. The river is located to the rear of houses to the south of the site.

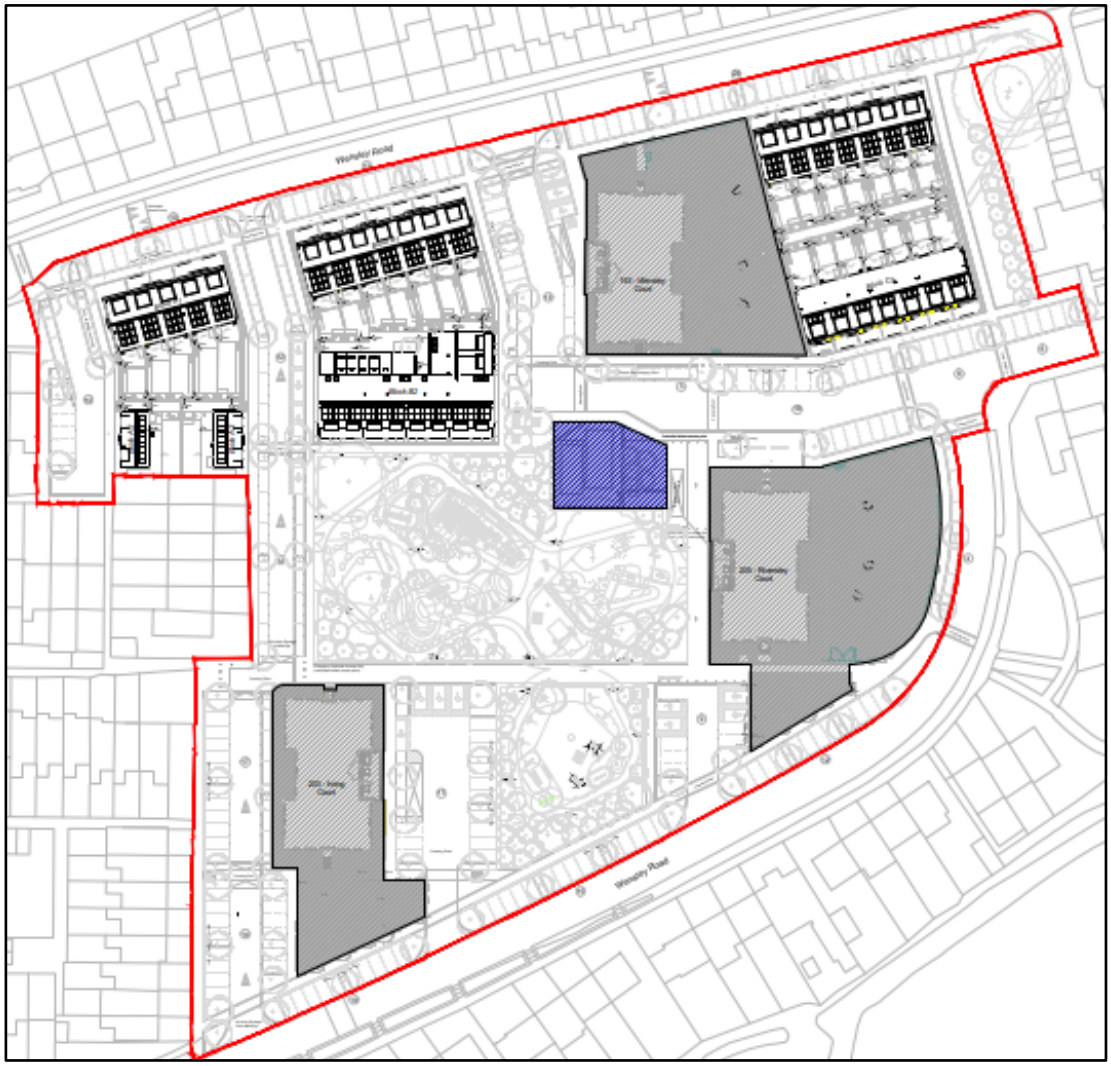
2.4.2 Considering the location of the nearest surface watercourse and the presence of properties in the intervening area, it is not considered to be feasible to discharge surface water run-off to a watercourse.

3 PROPOSED DEVELOPMENT

3.1.1 The proposed development (Figure 3.1 and Appendix B) comprises the demolition of garages and construction of 46 affordable dwellings, which will be a mix of houses and flats. These will be located between the existing apartment blocks. The proposed development comprises 2.37 ha of residential development, including 1.50 ha of hard paved / impermeable surfaces (e.g. roofs, roads, driveways, parking areas, etc.) and 0.87 ha of soft paved / permeable surfaces (e.g. gardens, green corridors, public open spaces, etc.).

3.1.2 Under Table 2 of the *Flood Risk and Coastal Change Guidance* (March 2014), the proposed residential development is classified as more vulnerable.

Figure 3.1: Proposed Development



4 FLOOD RISK ASSESSMENT

4.1 Overview

4.1.1 All potential sources of flood risk at the development site have been assessed based on the information listed in Section 1.3 and are summarised in Table 4.1. The key sources of flood risk to the proposed development are further described in the ensuing sections.

Table 4.1: Potential Sources of Flood Risk

Source	Flood Risk
Coastal	No risk. Site over 40 m aOD.
Fluvial	Site completed classifies as Flood Zone 1. Nearest FZ2 / 3 area c. 30m to south.
Surface Water	Very low risk in general, but low to high risk in some areas.
Groundwater	Low Risk. Recent GI indicates that water table is in excess of 5.0m bgl.
Sewers	Undetermined risk
Infrastructure Failure	No risk.

4.2 Climate Change

4.2.1 The NPPF sets out how the planning system should help minimise vulnerability and provide resilience to the impacts of climate change. This includes demonstrating how flood risk will be managed now and over the development's lifetime, taking climate change into account.

4.2.2 In accordance with the EA's guidance Flood Risk Assessment: Climate Change Allowances (February 2016), the proposed development with anticipated life span into the 2080's (2070 to 2115) must take account of the following allowances:

- Peak River Flows (Kennet and tributaries)
  - Central 21%
- Peak Rainfall Intensity
  - Upper End 40%

4.3 Surface Water Flood Risk

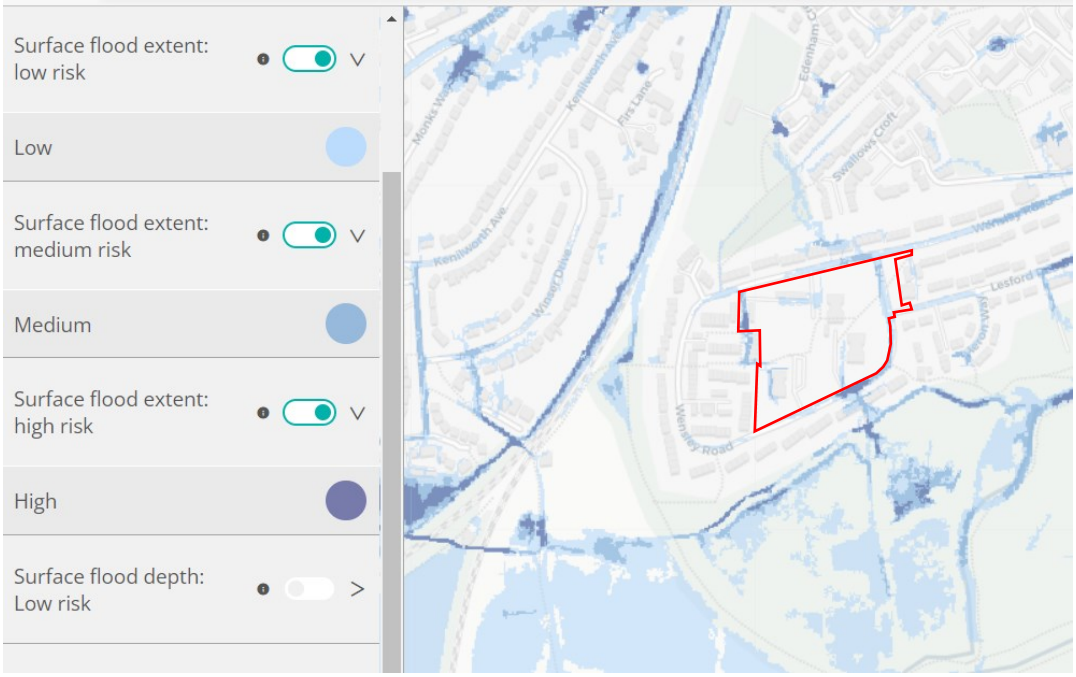
4.3.1 Surface water flooding is a description for excessive overland flows that have yet to enter a natural or manmade receptor (e.g. aquifer, watercourse or sewer). Surface water flooding also occurs when the amount of runoff exceeds the capacity of the collecting system and spills onto overland flow routes.

4.3.2 Surface water flooding is usually the result of very intense, short lived rainfall events, but can also occur during milder, longer lived rainfall events, when collecting systems are at capacity or the ground is saturated. It often results in the inundation of low points in the terrain.

4.3.3 In accordance with the EA's *Long Term Flood Risk Information* (Figure 4.1), the development site is mostly at very low (< 0.1% AEP) risk of surface water flooding. However, small areas

near overland flow paths and topographical lows are at low (0.1% to 1.0% AEP), medium (1.0% to 3.3% AEP) and high (> 3.3% AEP) risk of surface water flooding. In particular, the EA predict overland surface water flow routes along the road close to the western edge and of the site and crossing the site from northern extent of Wensley Road into and along the eastern extent of Wensley Road, close to and along the eastern site boundary. Surface water flooding is also predicted in the centre southern part of the site and centre northern part of the site.

Figure 4.1: Flood Risk from Surface Water



4.3.4 The available information suggests off-site overland flows are expected to reach the development site from the north part of Wensley Road and to the north, before leaving the site towards the Holy Brook. Flood depths generally up to 300mm and occasionally up to 900mm and flood velocities over 0.15m/s are estimated for the overland flows reaching the site.

4.3.5 The management measures proposed to deal with off-site overland flows reaching the site are described in Section 5.

4.3.6 The risk of surface water flooding from runoff generated within the development site will be managed by the drainage strategy described in Section 6.

4.4 Sewer Flood Risk

4.4.1 Sewer flooding occurs when a manmade drainage system receives greater than usual amounts of water and the overwhelmed system starts overflowing at gullies and manholes, thus generating overland flows.

4.4.2 Sewer flooding is usually the result of very intense, short lived rainfall events, but can also occur during milder, longer lived rainfall events, when outfalls become surcharged / locked by high water levels in the receiving feature.

4.4.3 In addition to a flood risk, overflowing combined sewers also pose a significant public health and environmental risk.

4.4.4 RBC's strategic flood risk assessments records the number of sewer flooding in the RG1 6 postcode as between 51 – 100 (AS OF February 2016). It is not known if these affect the site.

4.4.5 The management measures proposed to deal with sewer flood risk at the development site are described in Section 5.3.

5 FLOOD RISK MANAGEMENT

5.1 Sequential and Exception Tests

5.1.1 The sequential, risk-based approach to the location of development is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim is to keep development out of medium and high flood risk areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible.

5.1.2 Application of the sequential approach in the master planning process, in particular application of the *Sequential Test*, helps ensure that development can be safely and sustainably delivered, and developers do not waste resources promoting proposals which are inappropriate on flood risk grounds.

5.1.3 The *Sequential Test* ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The aim is to steer new development to Flood Zone 1 (areas with a low probability of sea or river flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of sea or river flooding), applying the *Exception Test* if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of sea or river flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the *Exception Test* if required.

5.1.4 Table 2 of the *Flood Risk and Coastal Change Guidance* categorises different types of uses and development according to their vulnerability to flood risk. Table 3 of the *Flood Risk and Coastal Change Guidance* (Table 5.1) maps these vulnerability classes against flood zones to indicate where development is appropriate and where it should not be permitted.

Table 5.1: Flood Risk Vulnerability and Flood Zone Compatibility

Flood Zone	Flood Risk Vulnerability				
	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	Exception Test	✓	✓	✓
Zone 3a	Exception Test	×	Exception Test	✓	✓
Zone 3b	Exception Test	×	×	×	✓

Key:
✓ Development is appropriate
× Development should not be permitted

5.1.5 The site is located in Flood Zone 1 and at no significant risk of flooding from any potential source, thus following a sequential approach to steer development away from flood risk. The Exception Test is not required for less vulnerable development in Flood Zone 1.

5.2 Surface Water Flood Risk

5.2.1 The following surface water flood risk management measures have been incorporated in the proposed development's master plan:

- Vulnerable development will be set at least 300 mm above external ground levels, which will be designed to safely route overland flows away from buildings and towards Wensley Road, using less vulnerable parts of the proposed development such as public open spaces, parking areas and roads to convey and attenuate overland flows (Appendix C).
- Off-site runoff reaching the development site from Wensley Road will be intercepted by porous paving and managed within the proposed development's surface water drainage system (Section 5.3.1 and Appendix C) before discharging at various locations into the existing Thames Water sewers

5.3 Sewer Flood Risk

5.3.1 The following sewer flood risk management measures have been incorporated in the proposed development's master plan:

5.3.2 As detailed in Section 6, the proposed surface water drainage strategy has been designed so that flooding does not occur on any part of the site for all events up to 3.3% AEP and flooding does not occur in any part of a building or utility plant susceptible to water for all events up to 1.0% AEP + 40% climate change allowance.

6 SURFACE WATER DRAINAGE STRATEGY

6.1 Existing Drainage (Greenfield Runoff)

6.1.1 Runoff generated within the existing residential (brownfield) development is intercepted by road gullies and drainage channels spread across the area and conveyed towards either soakaways or the Thames Water surface water sewer in the southern part of Wensley Road. It is understood that this sewer then discharges into the Holy Brook.

6.1.2 Existing runoff rates have been calculated for the two main existing outfall routes, with the two other outfall routes anticipated to discharge into existing soakaways. Outfall 3 discharges into Thames Water MH 0853 located south of the site at an existing rate of 24.4 l/s. Outfall 4 discharges into Thames Water MH 1851 at an existing rate of 17.3 l/s.

6.1.3 All existing discharge dates for the development has been established using a rainfall event of 1in1 year 15-minute winter and the rational method (Appendix E).

6.1.4 The National Standards for Sustainable Drainage Systems (Defra, 2011) state that the following options must be considered in accordance with the hierarchy for surface water disposal:

<u>Discharge to Ground (Infiltration)</u>

6.1.5 Based on the available geologic and hydrogeological information (Sections 3.3 to 3.6 of this report), infiltration drainage is deemed unfeasible at the development site.

<u>Discharge to Surface Water Body</u>

6.1.6 There are no appropriate surface water bodies close to the site.

<u>Discharge to Sewer</u>

6.1.7 A discharge to the surface water sewer is proposed, this then discharges to the Holy Brook to the south of the site

6.1.8

6.2 Proposed Drainage Strategy

6.2.1 The proposed surface water drainage strategy has been designed in accordance *Sewers for* Adoption and / or *Building Regulations Part H* and in compliance with the *NPPF*, local requirements and current best practices[1], to collect, convey and attenuate runoff from all impermeable areas (1.50 ha) before discharging into existing Thames Water sewers.

6.2.2 As the volume of runoff leaving the proposed development cannot be reduced to existing values through infiltration, the proposed drainage strategy has been designed to limit off-site discharges to approximately 50% or more betterment in comparison to the existing runoff rates. This proposed surface water will discharge into three outfalls: two existing outfalls and one new outfall connection into the Thames Water sewer network. (rates of 5.3

[1] e.g. *Non-Statutory Technical Standards for Sustainable Drainage Systems* (March 2015) and *The SuDS Manual* (2015).

l/s (Outfall 3), 8.6 l/s (Outfall 4) and 4.7l/s (new outfall connection - Outfall 5). This provides betterment of over 50%.

6.2.3 The proposed drainage strategy (Appendix C) has been designed so that:

- flooding does not occur on any part of the site for all events up to 3.3% AEP (1 in 30 years);
- flooding does not occur in any part of a building or utility plant susceptible to water for all events up to 1.0% AEP (1 in 100 years) + 40% climate change allowance.

6.2.4 The performance of the proposed surface water drainage strategy has been tested for storm events with 100.0% AEP, 3.3% AEP and 1.0% AEP + 40% climate change and durations of 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640 and 10080 minutes.

6.2.5 The results of the simulations are included in Appendix D and demonstrate how the proposed surface water drainage strategy can manage surface water flood risk at the development site without increasing flood risk elsewhere for storm events up to the 1.0% AEP + 40% climate change allowance.

6.3 Sustainable Drainage Systems (SuDS)

6.3.1 In accordance with the *NPPF*, (major) developments should incorporate sustainable drainage systems (SuDS) unless there is clear evidence that this would be inappropriate. In addition to water quantity control, SuDS should consider opportunities to provide water quality and amenity / biodiversity benefits (i.e. multifunctionality approach).

6.3.2 While the proposed drainage strategy is largely reliant on suds features such as pervious pavements, attenuation tank and three hydro-brakes to manage runoff quantity, Table 6.1 shortlists other SuDS deemed compatible with the site's characteristics and which inclusion in the proposed development must be continuously assessed as the design progresses.

6.3.3 It is important to note the need to remove silt from runoff prior to discharge into SuDS features. SuDS such as filter drains, swales, bioretention systems and pervious pavements are sustainable alternatives to proprietary treatment systems otherwise required to manage silt.

Table 6.1: Sustainable Drainage Systems (SuDS)

SuDS Component	Description and Opportunities
Green / Blue Roofs	Green roofs are areas of living vegetation installed on the top of buildings for a range of reasons including visual benefit, ecological value, enhanced building performance and reduction of surface water runoff. A blue roof is a roof designed explicitly to store water for use within the building (rainwater harvesting) or controlled discharge. Green roofs that include reservoir storage zones beneath the growing medium could also be considered blue roofs. Green roofs can improve the thermal performance of buildings, help combat the urban heat island effect and contribute to improved air quality. Through evapotranspiration, green roofs can reduce peak flow rates to a site drainage system (principally for small and medium-sized events) but are unlikely to a have a significant impact on downstream attenuation storage requirements. Blue roofs can be designed to provide significant attenuation (and evapotranspiration). The higher density zones of the proposed development may offer opportunities to implement green / blue roofs on the top of buildings.
Filter Drains/Strips	Filter drains are trenches filled with stone/gravel that create temporary subsurface storage for the filtration, attenuation and conveyance of surface water runoff. Ideally, filter drains receive lateral inflow from adjacent impermeable surfaces pre-treated over a filter strip. Filter drains can help manage peak flows by naturally limiting rates of conveyance through the filter medium and by providing attenuation storage when the rate of flow at the outlet is controlled. Filter drains can be effectively incorporated into the landscape and public open spaces and can have minimal land-take requirements. The use of filter drains is typically restricted to flat sites (unless placed parallel to contours). Filter drains are best located adjacent to (small) impermeable surfaces such as car parks and roads / highways.
Swales	Swales are shallow, flat bottomed, vegetated open channels designed to treat, convey and often attenuate surface water runoff. Swales can also provide aesthetic and biodiversity benefits. Swales can help reduce flow rates by facilitating infiltration and / or providing attenuation storage when flow at the outlet is controlled. Coarse to medium sediments and associated pollutants can be removed by filtration through surface vegetation and ground cover. Swales are well suited for managing runoff from linear features such as main roads / highways. Swales are generally difficult to incorporate into dense urban developments, where space is limited.
Bioretention Systems	Bioretention systems (including rain gardens) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution. They also provide attractive landscape features and biodiversity. Bioretention systems can help reduce flow rates from a site by promoting infiltration / evapotranspiration and providing some attenuation storage. Bioretention systems can also provide very effective treatment functionality. Bioretention systems are a very flexible surface water management component that can be integrated into a wide variety of developments / densities using different shapes, materials, planting and dimensions.

SuDS Component	Description and Opportunities
Pervious Pavements	Pervious pavements provide a pavement suitable for pedestrian and / or vehicular traffic, while allowing rainwater to infiltrate through the surface and into the underlying structural layers. The water is temporarily stored beneath the overlying surface before use, infiltration to the ground or controlled discharge downstream. Pervious pavements help reduce flow rates from a site by providing attenuation storage. A flow control structure is required to constrain the rate of water discharged from the sub-base via an outlet pipe. Pervious pavement drainage has been shown to have decreased concentrations of a range of surface water pollutants, including heavy metals, oil and grease, sediment and some nutrients. Pervious pavements are typically built as an alternative to impermeable surfaces and therefore require no extra development space for their construction. Pervious pavements are included in the scheme.
Attenuation Storage Tanks	Attenuation storage tanks are used to create a below-ground void space for the temporary storage of surface water before use, infiltration or controlled release. Attenuation storage tanks can help reduce flow rates from a site by providing significant attenuation storage. Storage tanks do not provide any form of treatment of surface water runoff and therefore need to be combined in a "management train" with other methods that do provide suitable treatment of all relevant pollutants (coarse sediment must always be removed upstream of a storage tank). The inherent flexibility in size and shape of the typical attenuation storage tank systems means that they can be tailored to suit the specific characteristics and requirements of any site. However, the lack of amenity and biodiversity benefits means that storage tanks should be a last resource in any surface water drainage strategy for a major development. An attenuation tank is included in the scheme.

6.4 Exceedance Events

6.4.1 Plot levels are set at least 300 mm above external ground levels and external ground levels have been designed to safely route overland flows away from buildings and towards the existing Thames Water sewer, using the less vulnerable parts of the proposed development such as public open spaces, parking areas and roads to convey and store overland flows.

6.4.2 Overland flows resulting from exceedance events are expected to leave the developed site The proposed overland flood routing shown on the engineering layout, which is included in Appendix C.

6.5 Water Quality Management

6.5.1 The suitability of the proposed drainage strategy to manage the development's pollution risk has been assessed using the simple index approach in *The SuDS Manual* (2015), as summarized in 6.2.

Table 6.2: Surface Water Quality Management (Simple Index Approach)

Runoff Route / Treatment Train 1				
Land Use / SuDS	Hazard Level	TSS	Metals	Hydrocarbons
Pollution Hazard Indices				
Residential Roofs	Very Low	0.20	0.20	0.05
Driveways, residential car parks and low traffic roads	Low	0.50	0.40	0.40
SuDS Mitigation Indices				
Pervious Pavement	-	0.70	0.60	0.70
Total SuDS Mitigation Index ≥ Pollution Hazard Index (for each contaminant type)				

6.6 Operation and Maintenance

6.6.1 The function of the surface water drainage system must be understood by those responsible for maintenance, regardless of whether individual components are below ground or on the surface. In any system properly designed, monitored and maintained, performance deterioration can usually be minimised.

6.6.2 The long-term operation and maintenance of the proposed surface water drainage strategy will be the responsibility of Reading Borough Council and Thames Water, as detailed in Table 6.3. Appropriate legal agreements defining maintenance responsibilities and access rights over the lifetime of the proposed development must be established prior to construction.

Table 6.3: Entities Responsible for SuDS Maintenance

SuDS Component	Location	Function	Responsible Entity
Pervious pavement	Private & public parking areas	Store & treat runoff	Owner or private management company
Attenuation storage tank	Public open spaces	Store runoff	Private management company
Hydro-Brake	Public open spaces	Control discharge rate	Private management company

6.6.3 Where the user / benefiter of a system is not responsible for maintenance, then it is important to ensure that they know when the SuDS is not functioning correctly and who to contact if any issue arises.

6.6.4 Maintenance plans are often required to clearly identify who is responsible for maintaining proposed SuDS as well as the maintenance regime to be applied. Maintenance plans can also form a useful tool for public engagement with SuDS and understanding their wider benefits. The maintenance requirements of the proposed surface water drainage strategy are summarised in Table 6.4.

Table 6.4: Typical Operation and Maintenance Requirements

Operation and Maintenance Activity	SuDS Component	
	Pervious Pavement	Attenuation Storage Tank
Regular Maintenance		
Inspection	■	■
Litter and debris removal	■	□
Grass cutting	□	□
Weed and invasive plant control	□	
Shrub management (including pruning)	□	
Occasional Maintenance		
Sediment management	■	■
Vacuum sweeping and brushing	■	
Remedial Maintenance		
Structure rehabilitation/repair	□	□
Infiltration surface reconditioning	□	
Key: ■ Will be required □ May be required		

6.7 Drainage During Construction

6.7.1 Drainage is typically an early activity in the construction of a development, taking form during the earthworks phase. However, the connection of piped drainage system to SuDS components should not take place until the end of construction works, unless a robust strategy for silt removal prior to occupation of the site is implemented.

6.7.2 Silt-laden runoff from construction sites represents a common form of waterborne pollution and cannot enter SuDS components not specifically designed to manage this, as it can overwhelm the system and pollute receiving water features. Any gullies and piped systems should be capped off during construction and fully jetted and cleaned prior to connection to SuDS components.

6.7.3 The three principal aspects of drainage during construction are conveying runoff, controlling runoff and trapping sediments:

- Conveyance of runoff can be achieved through small ditches / swales, channels and drains. Runoff control measures should be implemented to ensure that runoff does not overwhelm the temporary drainage system causing flooding on site or elsewhere.
- Control of runoff can be achieved through perimeter ditches or appropriate grading to ensure that any runoff from the construction site stays on site. Runoff rates leaving the site should be managed so they do not exceed pre-development conditions.

- Construction runoff should be directed to dedicated infiltration basins with adequate upstream sediment and pollution control such as sediment basins, silt fences and straw bales prior to infiltration or off-site discharge.

6.7.4 Additional conveyance, control and treatment measures should be installed as needed during grading. Slope stability needs to be considered when using open water features to convey, control and treat runoff across the site. Any necessary surface stabilisation measures should be applied immediately on all disturbed areas where construction work is either delayed or incomplete.

6.7.5 Maintenance inspections should be performed weekly, and maintenance repairs should be made immediately after periods of rainfall.

6.7.6 All drainage infrastructure (namely underground features) must be protected from damage by construction traffic and heavy machinery through the implementation of measures such as protective barriers and storing construction materials away from the drainage infrastructure.

7 FOUL WATER DRAINAGE STRATEGY

7.1.1 Sewerage undertakers have a legal obligation under the Water Industries Act 1991 to provide developers with the right to connect to public (foul) networks. The Water Industries Act 1991 also contains safeguards to ensure that flows resulting from new developments do not cause detriment to the existing public sewerage networks by imposing a duty on sewerage undertakers to carry out works required to accommodate additional flows into their networks.

7.1.2 The existing development site benefits from an existing Thames Water foul water drainage sewer located along the east of the site and runs from north to south, in accordance with records obtained from the Thames Water Asset Plan (Appendix E**Error! Reference source not found.**).

7.1.3 In accordance with records obtained from Thames Water (Appendix E**Error! Reference source not found.**), foul sewage from the existing Wensley Road development is conveyed through a network of underground sewers towards FW MH 1906 (Pipe inlet and outlet size - 225mm), which is across the road from the development on Wensley Road, south east of the site, and then flows west along Wensley Road.

7.1.4 In response to a Developer Enquiry, Thames Water confirmed acceptance of the proposed connection to the existing public foul sewer (Appendix E**Error! Reference source not found.**).

7.1.5 A S185 sewer diversion application is required to abandon/divert the existing Thames Water foul sewer from MH 0901 to MH1902. The new route for the foul drainage diversion is shown on the drainage plans (Appendix D).

8 CONCLUSIONS AND RECOMMENDATIONS

8.1.1 JNP Group has been commissioned by Reading Borough Council to prepare a Flood Risk Assessment and Drainage Strategy (including Maintenance Plan) for the proposed residential development at Wensley Road, Reading.

8.1.2 The site is brownfield and is approximately 2.37 ha and is located approximately 1.5 km south west of Reading town centre. The proposed development comprises the demolition of garages and construction of 46 affordable dwellings, which will be a mix of houses and flats. These will be located between the existing apartment blocks. This includes 1.50 ha of hard paved / impermeable surfaces and 0.87 ha of soft paved / permeable surfaces.

8.1.3 0.3m to 1.3m of made ground was found to be present across the site. This is underlain by the Lambeth Group. Groundwater levels were in excess of 5m bgl. The GI noted that soakaways should not be constructed through contaminated soils.

8.1.4 Based on the available geologic and hydrogeologic information, and the previous use of the site, infiltration drainage is deemed unfeasible.

8.1.5 The nearest natural watercourse is the Holy Brook located 39 m to the southeast of the site to the rear of houses to the south of the site. Direct discharge to this is not feasible due to the presence of the properties.

8.1.6 The Flood Risk Assessment section of this report demonstrates that the risk of flooding from most sources (fluvial, tidal, groundwater, sewer and reservoir) is low.

8.1.7 The risk of surface water flooding was generally very low but there were areas of the site at higher risk. This will be managed by the surface water drainage strategy.

8.1.8 Runoff generated within the existing residential (brownfield) development is intercepted by road gullies and drainage channels spread across the area and conveyed towards either soakaways or the Thames Water surface water sewer in the southern part of Wensley Road. It is understood that this sewer then discharges into the Holy Brook. Existing runoff rates have been calculated as 24.4 l/s into MH 0853 located south of the site and 17.3 l/s into MH 1851 (total 41.7 l/s).

8.1.9 The proposed drainage strategy intends to collect, convey and attenuate runoff from all impermeable areas (1.50 ha) before discharging into existing Thames Water sewers. The discharge will be into three outfalls: two existing outfalls and one new outfall connection (rates of 5.3 l/s, 8.6 l/s and 4.7l/s, a total rate of 18.6 l/s. This provides betterment of over 50%.

8.1.10 Attenuation storage is to be provided in the form of the pervious pavement sub-base and a below ground tank.

8.1.11 The proposed surface water drainage strategy can manage surface water flood risk at the development site without increasing flood risk elsewhere for storm events up to the 3.3% AEP (1 in 30 years) storm event. . Flooding does not occur in any part of a building or utility plant susceptible to water for all events up to 1.0% AEP (1 in 100 years) + 40% climate change allowance.

8.1.12 Plot levels are set at least 300 mm above external ground levels and external ground levels have been designed to safely route overland flows away from buildings and towards the

existing Thames Water sewer, using the less vulnerable parts of the proposed development such as public open spaces, parking areas and roads.

8.1.13 Water quality management is to be achieved through the treatment potential of the pervious pavement.

8.1.14 An operation and maintenance plan has been provided as part of this report in accordance with the SuDS Manual, which includes a review of all drainage elements, including SuDS features.

8.1.15 It is proposed to discharge existing and new foul drainage to MH1902, which will require abandonment of the existing connection to MH 0901. Thames Water have confirmed acceptance of the proposed connection to the public foul sewer. A S185 sewer diversion application is required to abandon/divert the existing foul sewer.

8.1.16 In conclusion, the proposed development is not at risk of flooding and does not increase flood risk off-site. Surface water runoff from the proposed development will be collected and managed on-site before discharging to the sewer network at a maximum discharge rate of 18.6 l/s. The foul water drainage will discharge unrestricted to the sewer network.

8.1.17 Any connection to the public sewer is subject to a Section 106 application.

8.1.18 This report is intended for the use of the developer of the site in support of their planning application for the site only.

9 LIMITATIONS

9.1.1 The information, conclusions and recommendations presented within this report are deemed to be current at the time of issue. No guarantee can be given to the status of this information other than at the time of issuing. Where necessary, the user shall confirm the status of any applicable assessments and consents.

9.1.2 This report has been commissioned by Reading Borough Council. No third party may receive a copy of this report without first obtaining our permission in writing.

9.1.3 This report is confidential and has been prepared solely for the benefit of Reading Borough Council and those parties with whom a warranty agreement has been executed or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of this report, written approval must be sought from JNP Group and a charge may be levied against such approval. JNP Group accepts no responsibility or liability for the consequences of this document being used for any purpose or project other than for which it was commissioned, or this document being used by any third party with whom an agreement has not been executed.

9.1.4 The copyright of this report remains with JNP Group at all times.

APPENDIX A: TOPOGRPAHICAL SURVEY

TOPOGRAPHICAL & MEASURED BUILDING SURVEYS

ABBREVIATIONS & SYMBOLS

AH	Arch Head Height	FH	Fire Hydrant	RSJ	Rolled Steel Joist
AR	Assumed Route	FBD	Floor Board Direction	SI	Sign Post
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FB	Flower Bed	RS	Road Sign		
FBD	Floor Board Direction	RSD	Roller Shutter Door		Survey Control Station

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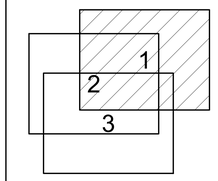

CONTROL CO-ORDINATES

STATIONS	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
JG01	470100.161	171883.976	41.678	PK Nail
JG02	470149.925	171925.270	43.162	PK Nail
JG03	470084.259	171924.348	44.503	PK Nail
JG04	470047.594	171859.888	43.683	Hlth Nail
JG05	470031.833	171918.081	47.004	PK Nail
JG06	470023.765	171879.784	46.941	PK Nail
JG07	469967.507	171847.846	46.331	PK Nail
JG08	469968.259	171920.831	48.030	PK Nail
NW01	470161.413	172046.158	48.379	PK Nail
NW02	470134.104	172034.108	48.530	PK Nail
NW03	470163.471	172053.790	48.018	Hlth Nail
NW04	470152.491	171985.434	45.799	Hlth Nail
NW05	470186.524	171992.921	45.505	Hlth Nail
NW06	470116.832	171982.829	46.340	Hlth Nail
NW07	470127.878	171923.537	43.674	Peg & Nail
NW08	470096.090	171922.461	44.514	Hlth Nail
NW09	470065.607	171927.202	45.361	Hlth Nail
NW10	470044.541	171932.976	46.360	Hlth Nail
TG01	470111.852	172046.505	48.502	PK Nail
TG02	470069.423	172035.967	49.212	PK Nail
TG03	470002.865	172019.314	49.627	PK Nail
TG04	470069.901	172000.621	47.540	Hlth Nail
TG05	470069.733	171983.276	47.618	Hlth Nail
TG07	470008.367	171960.230	48.993	Hlth Nail
TG08	469965.383	172011.897	49.782	Hlth Nail
TG09	469967.445	171992.908	49.615	Hlth Nail
TG10	470007.065	171958.019	46.187	Hlth Nail
TG11	470007.718	171920.848	47.858	Hlth Nail
TG12	470039.044	171963.703	46.897	Hlth Nail
TG13	470024.680	171946.866	47.468	Hlth Nail
TG14	470034.810	171932.411	46.809	PK Nail
TG15	470034.211	171898.494	46.938	PK Nail
TG16	470034.418	171883.911	46.668	PK Nail

REV	DESCRIPTION	DRAWN	APPR	DATE

SURVEY SOLUTIONS
Ipswich Coventry Yeovil Norwich Perth Nottingham Brentwood
Tel No: 0845 0405 969 Fax No: 0845 0405 970
www.survey-solutions.co.uk enquiries@survey-solutions.co.uk
LAND SURVEYING BUILDING SURVEYING UNDERGROUND SURVEYING

PROJECT TITLE: WENSLEY ROAD READING			
DRAWING DETAIL: TOPOGRAPHICAL SURVEY Sheet 1 of 3			
CLIENT: GLEEDS			SCALE: 1:200
SURVEYOR: TG/NW/JG	SURVEY DATE: 17/7/19	CHECKED BY: GWP	APPROVED BY: PDS	DWG STATUS: FINAL
DRAWING NUMBER: 24762ov-01	REVISION:	ISSUE DATE: 19/7/19	

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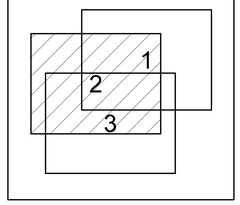

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www.survey-solutions.co.uk enquiries@survey-solutions.co.uk
LAND SURVEYING BUILDING SURVEYING UNDERGROUND SURVEYING

PROJECT TITLE WENSLEY ROAD READING				
DRAWING DETAIL TOPOGRAPHICAL SURVEY Sheet 2 of 3				
CLIENT GLEEDS				SCALE 1:200
SURVEYOR TG/NW/JG	SURVEY DATE 17/7/19	CHECKED BY GWP	APPROVED BY PDS	DWG STATUS FINAL
DRAWING NUMBER 24762cv-02			REVISION	ISSUE DATE 19/7/19

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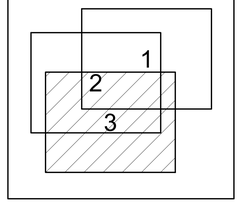
To avoid discrepancies any coordinated data used in conjunction with this survey must be derived directly from this control data.

Sheet Layout



CONTROL CO-ORDINATES

STATIONS	EASTINGS	NORTHINGS	LEVEL	DESCRIPTION
JG01	470100.161	171883.976	41.878	PK Nail
JG02	470149.925	171925.270	43.162	PK Nail
JG03	470084.258	171924.348	44.503	PK Nail
JG04	470047.584	171859.888	43.683	Hith Nail
JG05	470031.833	171918.081	47.004	PK Nail
JG06	470023.765	171879.784	46.941	PK Nail
JG07	469997.507	171847.846	46.331	PK Nail
JG08	469968.259	171920.831	48.030	PK Nail
N/W01	470161.413	172046.158	48.379	PK Nail
N/W02	470134.104	172034.108	48.530	PK Nail
N/W03	470163.471	172035.790	48.018	Hith Nail
N/W04	470152.491	171985.434	45.799	Hith Nail
N/W05	470186.524	171992.921	45.505	Hith Nail
N/W06	470116.832	171982.829	46.340	Hith Nail
N/W07	470127.878	171923.537	43.674	Peg & Nail
N/W08	470096.090	171922.461	44.514	Hith Nail
N/W09	470065.607	171927.202	45.361	Hith Nail
N/W10	470044.541	171932.976	46.360	Hith Nail
TG01	470111.852	172046.505	48.502	PK Nail
TG02	470069.423	172035.967	49.212	PK Nail
TG03	470002.865	172019.314	49.627	PK Nail
TG04	470069.901	172000.621	47.540	Hith Nail
TG05	470069.733	171983.276	47.618	Hith Nail
TG07	470008.367	171980.230	48.993	Hith Nail
TG08	469993.383	172011.897	49.782	Hith Nail
TG09	469967.445	171992.908	49.615	Hith Nail
TG10	470007.065	171958.019	46.187	Hith Nail
TG11	470007.718	171920.849	47.858	Hith Nail
TG12	470039.044	171963.703	46.897	Hith Nail
TG13	470024.680	171946.866	47.468	Hith Nail
TG14	470034.810	171932.471	46.809	PK Nail
TG15	470034.211	171898.494	46.938	PK Nail
TG16	470034.418	171883.911	46.668	PK Nail

REV	DESCRIPTION	DRAWN	APPR	DATE

SURVEY SOLUTIONS
Ipswich Coventry Yeovil Norwich Perth Nottingham Brentwood
Tel No: 0845 0405 969 Fax No: 0845 0405 970
www.survey-solutions.co.uk enquiries@survey-solutions.co.uk
LAND SURVEYING BUILDING SURVEYING UNDERGROUND SURVEYING

PROJECT TITLE: WENSLEY ROAD READING				
DRAWING DETAIL: TOPOGRAPHICAL SURVEY Sheet 3 of 3				
CLIENT: GLEEDS				SCALE: 1:200
SURVEYOR: TG/NW/JG	SURVEY DATE: 17/7/19	CHECKED BY: GWP	APPROVED BY: PDS	DWG STATUS: FINAL
DRAWING NUMBER: 24762cv-03		REVISION:	ISSUE DATE: 19/7/19	

NORTH Indicative

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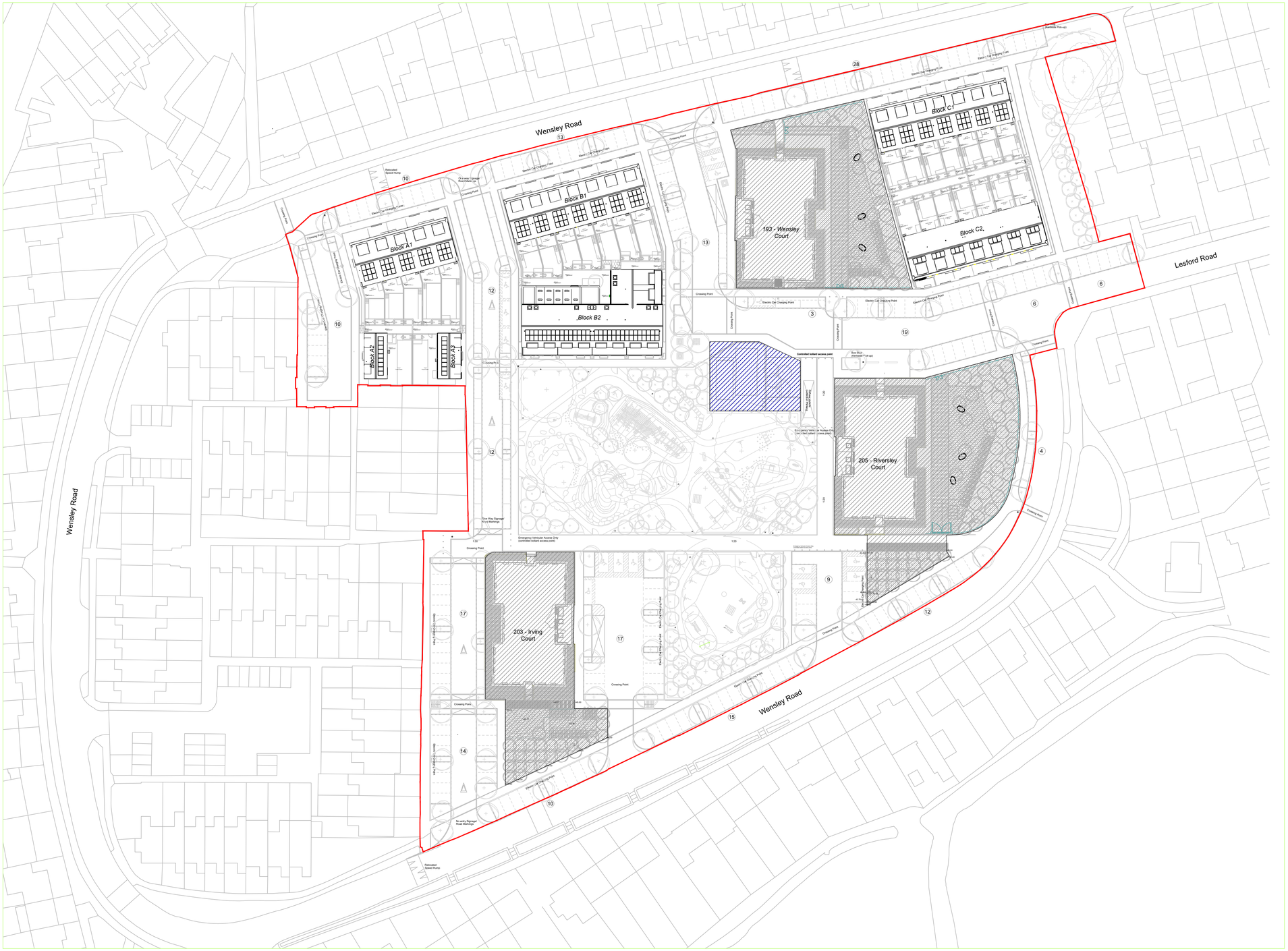
Original Sheet Size A0H

APPENDIX B: PROPOSED DEVELOPMENT



01 **Proposed Site Plan**

1100 Proposed Site

PROPOSED SITE PLAN LEGEND

Site Boundary (Total Site Area - 2.368 ha)

Phase 2 : Coley Rise Refurbishment
(Planning Application Reference: 210549)
These areas are excluded from Construction works.

Community Hub - IN ABEYANCE

All ownership boundary information is based on Reading Borough Council information. All ownership boundaries to be confirmed with Reading Borough Council prior to commencement of any works.

This drawing, together with HTA 's other drawings and Specification, describes HTA Design LLP 's design intent to be achieved by the Design and Build Contractor and any construction proposals shown hereon are indicative only. The detailed design resolution and specification of the construction shall be carried out by the Design and Build Contractor to achieve the design intent and shall comply with the Employer 's Requirements, the CDM Regulations 2015 and any other relevant health and safety legislation, and the requirements of the Building Regulations.

Notes: -
Do not scale from drawings unless by agreement with HTA. Use figured dimensions only. Check all dimensions on site prior to commencing the works. Drawing to be read in conjunction with other relevant consultant information.

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N

FOR COORDINATION

revision	date	drawn	description
H	06/10/21	PPR	Site Drawings - Updated for Co-ordination, Site Plan Amendments following Waste Management comments, Fire & Refuse Tracking. EVC Locations amended.
G	12/04/21	PPR	Dimensions and location of proposed building adjusted, following amendment to external wall thickness. Parallel WCH parking bays amended
F	03/08/20	PPR	Issue for Tender
E	27/07/20	PPR	Issue for Coordination
D	17/07/20	PPR	Issue for Coordination
C	18/06/20	PPR	Issue for Coordination
B	12/06/20	PPR	Issue to Client
A	21/04/20	PPR	Issue for Coordination
	08/04/20	PPR	Initial Issue to Consutant Team

Site Plan

RBC-WLR_HTA-A_XX_00_DR_1100 — number

H — revision

Reading Borough Council
Wensley Rd & Lesford Rd - RG1 6EA

RBC-WLR — job reference

1:1000 @ A3
1:500 @ A1 — scale

PPR — drawn

0m 10m 20m 30m 40m 50m

HTA Design LLP
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APPENDIX C: ENGINEERING LAYOUT

Drainage & Road Layout Standard Drawing Notes

1. The contractor is to check and verify all buildings and site dimensions and levels, including sewer invert levels, before works start on site.

2. The contractor is to comply in all aspects with the current building legislation, British Standards, building regulations etc.

3. The contractor is to check the levels of existing sewers which are to be used as an out-fall prior to commencement of any onsite drainage works. Any discrepancies are to be reported to the Engineer.

4. This drawing is to be read in conjunction with and checked against all other drawings, Engineering Details, specification and any structural, geotechnical or other specialist document provided.

5. Any anomaly or contradiction between any of the above or difference between actual and drawn details is to be reported to the engineer

6. Drainage works to be adopted under Section 104 of the Water Industries Act 1991 shall comply with DCG published by Water UK and the combined addendum.

7. Roads, footpaths and parking areas which form part of the highway to be adopted under Section 38 of the Highways Act 1980 shall comply with the Reading Borough Council Highway Specification.

8. All substrata structures and unconsolidated material within the road construction width to be removed.

9. Formation preparation to be in accordance with Highways Agency Specification for Highway Works (SHW) cl. 616. No prepared formation to be continuously exposed to rain causing degradation below design CBR or to be left uncovered overnight.

10. Any soft, damaged or weak spots including peat contaminated material are to be excavated and replaced with SHW Type 1 in accordance with SHW cl. 803 laid and compacted to cl. 802, Table 8/4.

11. Where ground conditions are deemed to be frost susceptible, refer to Ground Investigation report; track thickness shall be 450mm minimum thickness. All material within 450mm of road construction to be non-frost susceptible.

12. Positions of existing services/statutory undertaker's apparatus adjacent to or crossing proposed sewers are to be checked by the contractor prior to starting work.

Contractor shall refer to the services information available from the Developer to identify all existing services. It is the Contractor's responsibility to liaise with all relevant services companies to ensure that all existing services are accurately located prior to commencemnet of works, and adequately protected during construction.

It is the Contractor's responsibility to liaise with the Developer and all relevant services companies to ensure that all new and diverted services are accurately located and adequately protected during construction.

All adoptable highway works to be installed in accordance with Reading Borough Council construction requirements and specifications.

All adoptable drainage works to be installed in accordance with DCG, including any applicable local water authority addendums.

General Notes

1. Where this drawing has been issued in electronic .dwg format, it has been done so in good faith. JNP Group do not take any responsibility for any inaccuracies in the electronic data, which should be checked against the paper (or .pdf) drawing issue. Any apparent discrepancies should be immediately reported to JNP Group. The electronic .dwg file should not be assumed to be to scale and should not be used for 'overlaying', setting out or checking of any third party information. All dimensions should be taken from the paper (or .pdf) version of the drawing. Electronic drawings may contain third party information. JNP Group take no responsibility for this information, which should be checked against the originators paper drawing(s).

2. All dimensions are millimetres (mm), and levels are in metres (m) unless noted otherwise and should be checked on site prior to construction/fabrication.

3. Do not scale from this drawing. Only figured dimensions are to be relied upon. Don't hesitate to get in touch with JNP Group if additional information is required.

4. Any discrepancies between drawings of different scales and between drawings and specifications, where appropriate, to be reported to JNP Group for decision.

5. Copyright reserved. This drawing may only be used for The Client and location specified in the title block. It may not be copied or disclosed to any third party without the prior written consent of JNP Group.

6. This drawing should only be used for construction if the drawing status is "Construction". JNP Group takes no responsibility for construction works undertaken to drawings that are not marked with this status.

Health & Safety Note

The details on this drawing have been prepared on the assumption that a competent contractor will be carrying out the works. If the contractor(s) considers that there is insufficient Health and Safety information on this drawing, this should immediately be brought to the attention of the designer.

HAZARD IDENTIFICATION BOX

This table is provided to assist the Principal Contractor to fulfil their obligations under the CDM Regulations 2015

Hazard Ref	Hazard Type (Construction/Maintenance/ Cleaning/Demolition/Adjacent)	Hazard Description	Mitigation Measures/ Residual Risk
⚠			

** Construction is subject to the following statutory approvals:
- S38
- S104
- S106
- S185
- Building Regulations

All construction works prior to the above approvals shall be at the Contractor's risk.

Rev.	Date	Description	Drn / Chk'd / App'd
P03	14/02/2022	Amended tank size on south west of site and key. Added information to adoptable SW laterals.	ZS/BID/-
P02	09/02/2022	Amended tank north of the site to be private. SW drainage re-located within the shared pedestrian route behind block A1. SW pipe material changed to HDPE and revised gulley positions in Irvine Court (Car Parking Area 2). Added highway drainage easements, tank dimensions and 450Ø demarcation chambers in required areas. Updated drawing reference.	ZS/BID/BID
P01	28/01/2022	Issued for Information	BID / - / -

Status: S2 - Suitable for Information

JNP GROUP
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www.jnpgroup.co.uk

Client: Reading Borough Council

Job: Wensley Road, Reading

Title: Engineering Layout

Classification: FI_60_20

Scale @ A0: 1:250

Project - Originator - Volume/System - Level/Location - Type - Discipline - Number: M43794 - JNP - 90 - XX - DR - C - 7002

Revision: P03

Document/Drawing Number

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JNP Group Internal Project Number: H4123

CREATED 14/02/2022 BY JNP GLOBAL

APPENDIX D: MICRO-DRAINAGE OUTPUTS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Network 1 - Outfall 3 - Rev C

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.800	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	0.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.000
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm Network 1 - Outfall 3 - Rev C

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	12.628	0.158	79.9	0.007	4.00	0.0	0.600	o	100	Pipe/Conduit	
S1.001	12.695	0.159	79.8	0.009	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.002	12.197	0.414	29.5	0.007	0.00	0.0	0.600	o	100	Pipe/Conduit	
S2.000	15.201	0.190	80.0	0.009	4.00	0.0	0.600	o	100	Pipe/Conduit	
S2.001	12.738	0.701	18.2	0.009	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.003	9.333	0.471	19.8	0.007	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.004	9.867	0.123	80.2	0.011	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.005	12.400	0.683	18.2	0.092	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.006	4.765	0.150	31.8	0.015	0.00	0.0	0.600	o	100	Pipe/Conduit	

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)
S1.000	50.00	4.24	48.500	0.007	0.0	0.0	0.0	0.86	6.8	0.9
S1.001	50.00	4.49	48.342	0.016	0.0	0.0	0.0	0.86	6.8	2.2
S1.002	50.00	4.63	48.183	0.023	0.0	0.0	0.0	1.43	11.2	3.1
S2.000	50.00	4.29	48.660	0.009	0.0	0.0	0.0	0.86	6.8	1.2
S2.001	50.00	4.41	48.470	0.018	0.0	0.0	0.0	1.82	14.3	2.4
S1.003	50.00	4.72	47.769	0.048	0.0	0.0	0.0	1.74	13.7	6.5
S1.004	50.00	4.91	47.298	0.059	0.0	0.0	0.0	0.86	6.8«	8.0
S1.005	50.00	5.03	47.175	0.151	0.0	0.0	0.0	1.82	14.3«	20.4
S1.006	50.00	5.08	46.492	0.166	0.0	0.0	0.0	1.37	10.8«	22.5

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Network Design Table for Storm Network 1 - Outfall 3 - Rev C

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S3.000	12.327	0.550	22.4	0.032	4.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	20.408	0.650	31.4	0.030	4.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	36.728	0.958	38.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.007	13.777	0.188	73.3	0.012	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.008	9.862	0.099	99.6	0.031	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.009	11.602	0.145	80.0	0.014	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.010	9.404	0.118	79.7	0.013	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.011	7.633	0.273	28.0	0.011	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.012	5.700	0.204	27.9	0.013	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.013	8.150	0.290	28.1	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.014	11.323	0.414	27.4	0.017	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.015	11.416	0.114	100.1	0.022	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.016	19.938	0.636	31.3	0.019	0.00	0.0	0.600	o	100	Pipe/Conduit	
S5.000	5.453	0.055	99.1	0.019	4.00	0.0	0.600	o	100	Pipe/Conduit	
S1.017	12.269	1.034	11.9	0.027	0.00	0.0	0.600	o	100	Pipe/Conduit	

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)
S3.000	50.00	4.10	47.850	0.032	0.0	0.0	0.0	2.14	37.8	4.3
S4.000	50.00	4.19	47.950	0.030	0.0	0.0	0.0	1.80	31.9	4.1
S3.001	50.00	4.56	47.300	0.062	0.0	0.0	0.0	1.63	28.8	8.4
S1.007	50.00	5.34	46.342	0.240	0.0	0.0	0.0	0.90	7.1«	32.5
S1.008	49.15	5.55	46.154	0.271	0.0	0.0	0.0	0.77	6.1«	36.1
S1.009	48.26	5.78	46.055	0.285	0.0	0.0	0.0	0.86	6.8«	37.3
S1.010	47.57	5.96	45.910	0.298	0.0	0.0	0.0	0.86	6.8«	38.4
S1.011	47.25	6.05	45.792	0.309	0.0	0.0	0.0	1.46	11.5«	39.5
S1.012	47.01	6.11	45.519	0.322	0.0	0.0	0.0	1.47	11.5«	41.0
S1.013	46.68	6.20	45.315	0.322	0.0	0.0	0.0	1.46	11.5«	41.0
S1.014	46.23	6.33	45.025	0.339	0.0	0.0	0.0	1.48	11.6«	42.4
S1.015	45.38	6.58	44.611	0.361	0.0	0.0	0.0	0.77	6.0«	44.4
S1.016	44.59	6.82	44.497	0.380	0.0	0.0	0.0	1.38	10.9«	45.9
S5.000	50.00	4.12	43.916	0.019	0.0	0.0	0.0	0.77	6.1	2.6
S1.017	44.30	6.91	44.661	0.426	0.0	0.0	0.0	2.26	17.7«	51.1

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Network Design Table for Storm Network 1 - Outfall 3 - Rev C

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.000	31.572	0.210	150.0	0.040	4.00	0.0	0.600	o	225	Pipe/Conduit	
S6.001	11.748	0.078	150.0	0.070	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.000	31.572	0.316	99.9	0.027	4.00	0.0	0.600	o	100	Pipe/Conduit	
S7.001	1.315	1.741	0.8	0.027	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.002	15.896	0.106	150.0	0.020	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.003	12.883	0.085	151.6	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.018	7.510	0.075	100.1	0.020	0.00	0.0	0.600	o	150	Pipe/Conduit	

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)
S6.000	50.00	4.49	44.107	0.040	0.0	0.0	0.0	1.07	42.4	5.4
S6.001	50.00	4.68	43.897	0.110	0.0	0.0	0.0	1.07	42.4	14.9
S7.000	50.00	4.68	46.000	0.027	0.0	0.0	0.0	0.77	6.0	3.7
S7.001	50.00	4.69	45.684	0.054	0.0	0.0	0.0	8.98	70.5	7.3
S6.002	50.00	4.94	43.818	0.184	0.0	0.0	0.0	1.07	42.4	24.9
S6.003	50.00	5.14	43.712	0.184	0.0	0.0	0.0	1.06	42.1	24.9
S1.018	43.90	7.03	43.627	0.630	0.0	0.0	0.0	1.00	17.7«	74.9

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Manhole Schedules for Storm Network 1 - Outfall 3 - Rev C

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)
SS1	49.211	0.711	Open Manhole	450	S1.000	48.500	100				
SS2	49.212	0.870	Open Manhole	450	S1.001	48.342	100	S1.000	48.342	100	
SS3	49.245	1.062	Open Manhole	450	S1.002	48.183	100	S1.001	48.183	100	
SS4	49.468	0.808	Open Manhole	450	S2.000	48.660	100				
SS5	49.471	1.001	Open Manhole	450	S2.001	48.470	100	S2.000	48.470	100	
SS6	49.473	1.704	Open Manhole	450	S1.003	47.769	100	S1.002	47.769	100	
								S2.001	47.769	100	
SS7	49.408	2.110	Open Manhole	450	S1.004	47.298	100	S1.003	47.298	100	
SS8	48.821	1.646	Open Manhole	450	S1.005	47.175	100	S1.004	47.175	100	
SS9	48.209	1.717	Open Manhole	450	S1.006	46.492	100	S1.005	46.492	100	
SS10	48.726	0.876	Open Manhole	1200	S3.000	47.850	150				
SS11	48.877	0.927	Open Manhole	1200	S4.000	47.950	150				
SS12	47.785	0.485	Open Manhole	1200	S3.001	47.300	150	S3.000	47.300	150	
								S4.000	47.300	150	
SS13	48.007	1.665	Open Manhole	450	S1.007	46.342	100	S1.006	46.342	100	
								S3.001	46.342	150	
SS14	47.866	1.712	Open Manhole	450	S1.008	46.154	100	S1.007	46.154	100	
SS15	47.797	1.742	Open Manhole	450	S1.009	46.055	100	S1.008	46.055	100	
SS16	47.701	1.791	Open Manhole	450	S1.010	45.910	100	S1.009	45.910	100	
SS17	47.627	1.835	Open Manhole	450	S1.011	45.792	100	S1.010	45.792	100	
SS18	47.570	2.051	Open Manhole	450	S1.012	45.519	100	S1.011	45.519	100	
SS19	47.547	2.232	Open Manhole	450	S1.013	45.315	100	S1.012	45.315	100	
SS20	47.473	2.448	Open Manhole	450	S1.014	45.025	100	S1.013	45.025	100	
SS21	47.384	2.773	Open Manhole	450	S1.015	44.611	100	S1.014	44.611	100	
SS22	47.293	2.796	Open Manhole	450	S1.016	44.497	100	S1.015	44.497	100	
SS23	46.496	2.580	Open Manhole	450	S5.000	43.916	100				
SS24	46.776	2.915	Open Manhole	450	S1.017	44.661	100	S1.016	43.861	100	
								S5.000	43.861	100	
SS65	46.857	2.750	Open Manhole	1200	S6.000	44.107	225				
SS66	45.609	1.712	Open Manhole	1200	S6.001	43.897	225	S6.000	43.897	225	
SEX S1	47.000	1.000	Open Manhole	450	S7.000	46.000	100				
SEX S2	46.600	0.916	Open Manhole	450	S7.001	45.684	100	S7.000	45.684	100	
SS67	46.600	2.782	Open Manhole	1200	S6.002	43.818	225	S6.001	43.818	225	
								S7.001	43.943	100	
SS68	47.000	3.288	Open Manhole	1200	S6.003	43.712	225	S6.002	43.712	225	
SS25-HB	46.850	3.223	Open Manhole	1800	S1.018	43.627	150	S1.017	43.627	100	
								S6.003	43.627	225	
S	46.850	3.298	Open Manhole	0		OUTFALL		S1.018	43.552	150	

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Manhole Schedules for Storm Network 1 - Outfall 3 - Rev C

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS1	470043.437	172017.189	470043.437	172017.189	Required	
SS2	470031.196	172014.086	470031.196	172014.086	Required	
SS3	470018.964	172010.687	470018.964	172010.687	Required	
SS4	469980.235	172000.156	469980.235	172000.156	Required	
SS5	469994.926	172004.059	469994.926	172004.059	Required	
SS6	470007.206	172007.445	470007.206	172007.445	Required	
SS7	470009.650	171998.438	470009.650	171998.438	Required	
SS8	470012.234	171988.915	470012.234	171988.915	Required	
SS9	470013.221	171976.554	470013.221	171976.554	Required	
SS10	469976.778	171959.463	469976.778	171959.463	Required	
SS11	469971.434	171991.503	469971.434	171991.503	Required	
SS12	469976.716	171971.790	469976.716	171971.790	Required	
SS13	470013.323	171971.790	470013.323	171971.790	Required	
SS14	470013.574	171958.015	470013.574	171958.015	Required	
SS15	470013.185	171948.161	470013.185	171948.161	Required	

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Manhole Schedules for Storm Network 1 - Outfall 3 - Rev C

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS16	470013.313	171936.560	470013.313	171936.560	Required	
SS17	470013.255	171927.156	470013.255	171927.156	Required	
SS18	470011.874	171919.649	470011.874	171919.649	Required	
SS19	470006.276	171918.578	470006.276	171918.578	Required	
SS20	470005.769	171910.444	470005.769	171910.444	Required	
SS21	470005.718	171899.121	470005.718	171899.121	Required	
SS22	470005.719	171887.705	470005.719	171887.705	Required	
SS23	470005.760	171862.314	470005.760	171862.314	Required	
SS24	470005.760	171867.767	470005.760	171867.767	Required	
SS65	470045.427	171914.992	470045.427	171914.992	Required	
SS66	470045.323	171883.420	470045.323	171883.420	Required	
SEX S1	470034.739	171913.367	470034.739	171913.367	Required	
SEX S2	470034.416	171881.797	470034.416	171881.797	Required	
SS67	470033.924	171880.576	470033.924	171880.576	Required	
SS68	470018.029	171880.620	470018.029	171880.620	Required	

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Manhole Schedules for Storm Network 1 - Outfall 3 - Rev C

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS25-HB	470018.029	171867.737	470018.029	171867.737	Required	
S	470025.533	171867.444			No Entry	

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PIPELINE SCHEDULES for Storm Network 1 - Outfall 3 - Rev C

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)
S1.000	o	100	SS1	49.211	48.500	0.611	Open Manhole	450
S1.001	o	100	SS2	49.212	48.342	0.770	Open Manhole	450
S1.002	o	100	SS3	49.245	48.183	0.962	Open Manhole	450
S2.000	o	100	SS4	49.468	48.660	0.708	Open Manhole	450
S2.001	o	100	SS5	49.471	48.470	0.901	Open Manhole	450
S1.003	o	100	SS6	49.473	47.769	1.604	Open Manhole	450
S1.004	o	100	SS7	49.408	47.298	2.010	Open Manhole	450
S1.005	o	100	SS8	48.821	47.175	1.546	Open Manhole	450
S1.006	o	100	SS9	48.209	46.492	1.617	Open Manhole	450
S3.000	o	150	SS10	48.726	47.850	0.726	Open Manhole	1200
S4.000	o	150	SS11	48.877	47.950	0.777	Open Manhole	1200
S3.001	o	150	SS12	47.785	47.300	0.335	Open Manhole	1200
S1.007	o	100	SS13	48.007	46.342	1.565	Open Manhole	450
S1.008	o	100	SS14	47.866	46.154	1.612	Open Manhole	450
S1.009	o	100	SS15	47.797	46.055	1.642	Open Manhole	450

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)
S1.000	12.628	79.9	SS2	49.212	48.342	0.770	Open Manhole	450
S1.001	12.695	79.8	SS3	49.245	48.183	0.962	Open Manhole	450
S1.002	12.197	29.5	SS6	49.473	47.769	1.604	Open Manhole	450
S2.000	15.201	80.0	SS5	49.471	48.470	0.901	Open Manhole	450
S2.001	12.738	18.2	SS6	49.473	47.769	1.604	Open Manhole	450
S1.003	9.333	19.8	SS7	49.408	47.298	2.010	Open Manhole	450
S1.004	9.867	80.2	SS8	48.821	47.175	1.546	Open Manhole	450
S1.005	12.400	18.2	SS9	48.209	46.492	1.617	Open Manhole	450
S1.006	4.765	31.8	SS13	48.007	46.342	1.565	Open Manhole	450
S3.000	12.327	22.4	SS12	47.785	47.300	0.335	Open Manhole	1200
S4.000	20.408	31.4	SS12	47.785	47.300	0.335	Open Manhole	1200
S3.001	36.728	38.3	SS13	48.007	46.342	1.515	Open Manhole	450
S1.007	13.777	73.3	SS14	47.866	46.154	1.612	Open Manhole	450
S1.008	9.862	99.6	SS15	47.797	46.055	1.642	Open Manhole	450
S1.009	11.602	80.0	SS16	47.701	45.910	1.691	Open Manhole	450

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PIPELINE SCHEDULES for Storm Network 1 - Outfall 3 - Rev C

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)
S1.010	o	100	SS16	47.701	45.910	1.691	Open Manhole	450
S1.011	o	100	SS17	47.627	45.792	1.735	Open Manhole	450
S1.012	o	100	SS18	47.570	45.519	1.951	Open Manhole	450
S1.013	o	100	SS19	47.547	45.315	2.132	Open Manhole	450
S1.014	o	100	SS20	47.473	45.025	2.348	Open Manhole	450
S1.015	o	100	SS21	47.384	44.611	2.673	Open Manhole	450
S1.016	o	100	SS22	47.293	44.497	2.696	Open Manhole	450
S5.000	o	100	SS23	46.496	43.916	2.480	Open Manhole	450
S1.017	o	100	SS24	46.776	44.661	2.015	Open Manhole	450
S6.000	o	225	SS65	46.857	44.107	2.525	Open Manhole	1200
S6.001	o	225	SS66	45.609	43.897	1.487	Open Manhole	1200
S7.000	o	100	SEX S1	47.000	46.000	0.900	Open Manhole	450
S7.001	o	100	SEX S2	46.600	45.684	0.816	Open Manhole	450
S6.002	o	225	SS67	46.600	43.818	2.557	Open Manhole	1200
S6.003	o	225	SS68	47.000	43.712	3.063	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)
S1.010	9.404	79.7	SS17	47.627	45.792	1.735	Open Manhole	450
S1.011	7.633	28.0	SS18	47.570	45.519	1.951	Open Manhole	450
S1.012	5.700	27.9	SS19	47.547	45.315	2.132	Open Manhole	450
S1.013	8.150	28.1	SS20	47.473	45.025	2.348	Open Manhole	450
S1.014	11.323	27.4	SS21	47.384	44.611	2.673	Open Manhole	450
S1.015	11.416	100.1	SS22	47.293	44.497	2.696	Open Manhole	450
S1.016	19.938	31.3	SS24	46.776	43.861	2.815	Open Manhole	450
S5.000	5.453	99.1	SS24	46.776	43.861	2.815	Open Manhole	450
S1.017	12.269	11.9	SS25-HB	46.850	43.627	3.123	Open Manhole	1800
S6.000	31.572	150.0	SS66	45.609	43.897	1.487	Open Manhole	1200
S6.001	11.748	150.0	SS67	46.600	43.818	2.557	Open Manhole	1200
S7.000	31.572	99.9	SEX S2	46.600	45.684	0.816	Open Manhole	450
S7.001	1.315	0.8	SS67	46.600	43.943	2.557	Open Manhole	1200
S6.002	15.896	150.0	SS68	47.000	43.712	3.063	Open Manhole	1200
S6.003	12.883	151.6	SS25-HB	46.850	43.627	2.998	Open Manhole	1800

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PIPELINE SCHEDULES for Storm Network 1 - Outfall 3 - Rev C

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)
S1.018	o	150	SS25-HB	46.850	43.627	3.073	Open Manhole	1800

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)
S1.018	7.510	100.1	S	46.850	43.552	3.148	Open Manhole	0

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Setting Out Information - True Coordinates (Storm Network 1 - Outfall 3 - Rev C)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.000	SS1	450		470043.437	172017.189	470043.437	172017.189	
S1.001	SS2	450		470031.196	172014.086	470031.196	172014.086	
S1.002	SS3	450		470018.964	172010.687	470018.964	172010.687	
S2.000	SS4	450		469980.235	172000.156	469980.235	172000.156	
S2.001	SS5	450		469994.926	172004.059	469994.926	172004.059	
S1.003	SS6	450		470007.206	172007.445	470007.206	172007.445	
S1.004	SS7	450		470009.650	171998.438	470009.650	171998.438	
S1.005	SS8	450		470012.234	171988.915	470012.234	171988.915	
S1.006	SS9	450		470013.221	171976.554	470013.221	171976.554	
S3.000	SS10	1200		469976.778	171959.463	469976.778	171959.463	
S4.000	SS11	1200		469971.434	171991.503	469971.434	171991.503	
S3.001	SS12	1200		469976.716	171971.790	469976.716	171971.790	
S1.007	SS13	450		470013.323	171971.790	470013.323	171971.790	
S1.008	SS14	450		470013.574	171958.015	470013.574	171958.015	
S1.009	SS15	450		470013.185	171948.161	470013.185	171948.161	

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Setting Out Information - True Coordinates (Storm Network 1 - Outfall 3 - Rev C)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.010	SS16	450		470013.313	171936.560	470013.313	171936.560	
S1.011	SS17	450		470013.255	171927.156	470013.255	171927.156	
S1.012	SS18	450		470011.874	171919.649	470011.874	171919.649	
S1.013	SS19	450		470006.276	171918.578	470006.276	171918.578	
S1.014	SS20	450		470005.769	171910.444	470005.769	171910.444	
S1.015	SS21	450		470005.718	171899.121	470005.718	171899.121	
S1.016	SS22	450		470005.719	171887.705	470005.719	171887.705	
S5.000	SS23	450		470005.760	171862.314	470005.760	171862.314	
S1.017	SS24	450		470005.760	171867.767	470005.760	171867.767	
S6.000	SS65	1200		470045.427	171914.992	470045.427	171914.992	
S6.001	SS66	1200		470045.323	171883.420	470045.323	171883.420	
S7.000	SEX S1	450		470034.739	171913.367	470034.739	171913.367	
S7.001	SEX S2	450		470034.416	171881.797	470034.416	171881.797	
S6.002	SS67	1200		470033.924	171880.576	470033.924	171880.576	
S6.003	SS68	1200		470018.029	171880.620	470018.029	171880.620	

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Setting Out Information - True Coordinates (Storm Network 1 - Outfall 3 - Rev C)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S1.018	SS25-HB	1800		470018.029	171867.737	470018.029	171867.737	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S1.018	S	0		470025.533	171867.444	

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Area Summary for Storm Network 1 - Outfall 3 - Rev C

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.007	0.007	0.007
1.001	-	-	100	0.009	0.009	0.009
1.002	-	-	100	0.007	0.007	0.007
2.000	-	-	100	0.009	0.009	0.009
2.001	-	-	100	0.009	0.009	0.009
1.003	-	-	100	0.007	0.007	0.007
1.004	-	-	100	0.011	0.011	0.011
1.005	-	-	100	0.092	0.092	0.092
1.006	-	-	100	0.015	0.015	0.015
3.000	-	-	100	0.032	0.032	0.032
4.000	-	-	100	0.030	0.030	0.030
3.001	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.012	0.012	0.012
1.008	-	-	100	0.031	0.031	0.031
1.009	-	-	100	0.014	0.014	0.014
1.010	-	-	100	0.013	0.013	0.013
1.011	-	-	100	0.011	0.011	0.011
1.012	-	-	100	0.013	0.013	0.013
1.013	-	-	100	0.000	0.000	0.000
1.014	-	-	100	0.017	0.017	0.017
1.015	-	-	100	0.022	0.022	0.022
1.016	-	-	100	0.019	0.019	0.019
5.000	-	-	100	0.019	0.019	0.019
1.017	-	-	100	0.027	0.027	0.027
6.000	-	-	100	0.040	0.040	0.040
6.001	-	-	100	0.070	0.070	0.070
7.000	-	-	100	0.027	0.027	0.027
7.001	-	-	100	0.027	0.027	0.027
6.002	-	-	100	0.020	0.020	0.020
6.003	-	-	100	0.000	0.000	0.000
1.018	-	-	100	0.020	0.020	0.020
				Total	Total	Total
				0.630	0.630	0.630

Free Flowing Outfall Details for Storm Network 1 - Outfall 3 - Rev C

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.018	S	46.850	43.552	0.000	0	0

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Simulation Criteria for Storm Network 1 - Outfall 3 - Rev C

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	20
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm Network 1 - Outfall 3 - Rev C

Hydro-Brake® Optimum Manhole: SS25-HB, DS/PN: S1.018, Volume (m³): 8.7

Unit Reference	MD-SHE-0101-5300-1500-5300
Design Head (m)	1.500
Design Flow (l/s)	5.3
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	101
Invert Level (m)	43.627
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.500	5.3
Flush-Flo™	0.442	5.3
Kick-Flo®	0.903	4.2
Mean Flow over Head Range	-	4.6

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.4	1.200	4.8	3.000	7.3	7.000	10.9
0.200	4.7	1.400	5.1	3.500	7.9	7.500	11.3
0.300	5.1	1.600	5.5	4.000	8.4	8.000	11.7
0.400	5.2	1.800	5.8	4.500	8.9	8.500	12.0
0.500	5.2	2.000	6.1	5.000	9.3	9.000	12.3
0.600	5.2	2.200	6.3	5.500	9.8	9.500	12.7
0.800	4.7	2.400	6.6	6.000	10.2		
1.000	4.4	2.600	6.8	6.500	10.6		

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Storage Structures for Storm Network 1 - Outfall 3 - Rev C

Porous Car Park Manhole: SS1, DS/PN: S1.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	7.0
Max Percolation (l/s)	13.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.600	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS2, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.9
Membrane Percolation (mm/hr)	1000	Length (m)	7.9
Max Percolation (l/s)	17.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.800	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS3, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.0
Membrane Percolation (mm/hr)	1000	Length (m)	7.0
Max Percolation (l/s)	13.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.800	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS4, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.5
Membrane Percolation (mm/hr)	1000	Length (m)	6.5
Max Percolation (l/s)	11.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.000	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS5, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.5
Membrane Percolation (mm/hr)	1000	Length (m)	6.5
Max Percolation (l/s)	11.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	49.000	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS6, DS/PN: S1.003

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	8.1
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

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Porous Car Park Manhole: SS6, DS/PN: S1.003

Porosity	0.30	Slope (1:X)	0.0
Invert Level (m)	48.900	Depression Storage (mm)	5
Width (m)	5.4	Evaporation (mm/day)	3
Length (m)	5.4	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SS7, DS/PN: S1.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.7
Membrane Percolation (mm/hr)	1000	Length (m)	8.7
Max Percolation (l/s)	21.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.671	Cap Volume Depth (m)	1.500

Porous Car Park Manhole: SS8, DS/PN: S1.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.2
Membrane Percolation (mm/hr)	1000	Length (m)	9.2
Max Percolation (l/s)	23.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.528	Cap Volume Depth (m)	1.300

Porous Car Park Manhole: SS9, DS/PN: S1.006

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.9
Membrane Percolation (mm/hr)	1000	Length (m)	9.9
Max Percolation (l/s)	27.2	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.840	Cap Volume Depth (m)	1.300

Porous Car Park Manhole: SS13, DS/PN: S1.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.4
Membrane Percolation (mm/hr)	1000	Length (m)	8.4
Max Percolation (l/s)	19.6	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.650	Cap Volume Depth (m)	1.300

Porous Car Park Manhole: SS14, DS/PN: S1.008

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.7
Membrane Percolation (mm/hr)	1000	Length (m)	8.7
Max Percolation (l/s)	21.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.550	Cap Volume Depth (m)	1.500

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Porous Car Park Manhole: SS15, DS/PN: S1.009

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.8
Membrane Percolation (mm/hr)	1000	Length (m)	9.8
Max Percolation (l/s)	26.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.350	Cap Volume Depth (m)	1.600

Porous Car Park Manhole: SS16, DS/PN: S1.010

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.3
Membrane Percolation (mm/hr)	1000	Length (m)	9.3
Max Percolation (l/s)	24.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.260	Cap Volume Depth (m)	1.800

Porous Car Park Manhole: SS17, DS/PN: S1.011

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.3
Membrane Percolation (mm/hr)	1000	Length (m)	8.3
Max Percolation (l/s)	19.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.135	Cap Volume Depth (m)	1.500

Porous Car Park Manhole: SS20, DS/PN: S1.014

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.4
Membrane Percolation (mm/hr)	1000	Length (m)	10.4
Max Percolation (l/s)	30.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	45.300	Cap Volume Depth (m)	2.000

Porous Car Park Manhole: SS21, DS/PN: S1.015

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	14.8
Membrane Percolation (mm/hr)	1000	Length (m)	14.8
Max Percolation (l/s)	60.8	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.900	Cap Volume Depth (m)	2.150

Porous Car Park Manhole: SS22, DS/PN: S1.016

Infiltration Coefficient Base (m/hr)	0.00000	Invert Level (m)	44.800
Membrane Percolation (mm/hr)	1000	Width (m)	11.3
Max Percolation (l/s)	35.5	Length (m)	11.3
Safety Factor	2.0	Slope (1:X)	200.0
Porosity	0.30	Depression Storage (mm)	5

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Porous Car Park Manhole: SS22, DS/PN: S1.016

Evaporation (mm/day) 3 Cap Volume Depth (m) 2.300

Porous Car Park Manhole: SS23, DS/PN: S5.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.4
Membrane Percolation (mm/hr)	1000	Length (m)	11.4
Max Percolation (l/s)	36.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.250	Cap Volume Depth (m)	1.800

Porous Car Park Manhole: SS24, DS/PN: S1.017

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.6
Membrane Percolation (mm/hr)	1000	Length (m)	12.6
Max Percolation (l/s)	44.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.250	Cap Volume Depth (m)	2.300

Cellular Storage Manhole: SS66, DS/PN: S6.001

Invert Level (m)	44.032	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	260.0	0.0	0.810	0.0	0.0
0.800	260.0	0.0			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 20
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS1	15 Winter	1	+0%	100/15 Summer				48.529
S1.001	SS2	30 Summer	1	+0%	30/15 Summer				48.377
S1.002	SS3	30 Winter	1	+0%	30/15 Summer				48.214
S2.000	SS4	15 Summer	1	+0%	100/15 Summer				48.690
S2.001	SS5	15 Summer	1	+0%	100/15 Summer				48.498
S1.003	SS6	30 Winter	1	+0%	30/15 Summer				47.811
S1.004	SS7	15 Winter	1	+0%	1/15 Winter				47.514
S1.005	SS8	15 Winter	1	+0%	1/15 Summer				47.446
S1.006	SS9	30 Winter	1	+0%	1/15 Summer				46.938
S3.000	SS10	15 Summer	1	+0%					47.886
S4.000	SS11	15 Summer	1	+0%					47.987
S3.001	SS12	15 Summer	1	+0%	100/15 Summer				47.357
S1.007	SS13	30 Winter	1	+0%	1/15 Summer				46.856
S1.008	SS14	60 Winter	1	+0%	1/15 Summer				46.607
S1.009	SS15	60 Winter	1	+0%	1/15 Summer				46.400
S1.010	SS16	30 Winter	1	+0%	1/15 Summer				46.198
S1.011	SS17	30 Winter	1	+0%	1/15 Summer				45.993
S1.012	SS18	30 Winter	1	+0%	1/15 Summer				45.788
S1.013	SS19	30 Winter	1	+0%	1/15 Summer				45.588

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm Network 1 - Outfall 3 - Rev C

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1	-0.071	0.000	0.14		4	0.9	OK	
S1.001	SS2	-0.065	0.000	0.24		7	1.5	OK	
S1.002	SS3	-0.069	0.000	0.21		9	2.2	OK	
S2.000	SS4	-0.070	0.000	0.19		5	1.2	OK	
S2.001	SS5	-0.072	0.000	0.15		5	2.1	OK	
S1.003	SS6	-0.058	0.000	0.36		9	4.6	OK	
S1.004	SS7	0.116	0.000	0.81		3	5.1	SURCHARGED	
S1.005	SS8	0.171	0.000	0.89		4	12.0	SURCHARGED	
S1.006	SS9	0.346	0.000	0.96		9	9.0	SURCHARGED	
S3.000	SS10	-0.114	0.000	0.13			4.5	OK	
S4.000	SS11	-0.113	0.000	0.14			4.2	OK	
S3.001	SS12	-0.093	0.000	0.31			8.6	OK	
S1.007	SS13	0.414	0.000	1.16		13	7.8	SURCHARGED	
S1.008	SS14	0.353	0.000	1.45		14	8.1	SURCHARGED	
S1.009	SS15	0.245	0.000	1.37		19	8.7	SURCHARGED	
S1.010	SS16	0.188	0.000	1.41		28	8.9	SURCHARGED	
S1.011	SS17	0.101	0.000	0.89		12	9.3	SURCHARGED	
S1.012	SS18	0.169	0.000	0.99			10.1	SURCHARGED	
S1.013	SS19	0.173	0.000	0.96			10.1	SURCHARGED	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.014	SS20	120 Winter	1	+0%	1/15 Summer			
S1.015	SS21	120 Winter	1	+0%	1/15 Summer			
S1.016	SS22	240 Winter	1	+0%	1/15 Summer			
S5.000	SS23	360 Winter	1	+0%	1/15 Summer			
S1.017	SS24	360 Winter	1	+0%	100/120 Winter			
S6.000	SS65	15 Winter	1	+0%	30/360 Winter			
S6.001	SS66	30 Winter	1	+0%	30/30 Winter			
S7.000	SEX S1	15 Winter	1	+0%	30/15 Summer	100/15 Summer		
S7.001	SEX S2	15 Winter	1	+0%				
S6.002	SS67	15 Winter	1	+0%	1/15 Summer			
S6.003	SS68	15 Winter	1	+0%	1/15 Summer			
S1.018	SS25-HB	15 Winter	1	+0%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.014	SS20	45.331	0.206	0.000	0.91		8	10.0	SURCHARGED
S1.015	SS21	45.055	0.344	0.000	1.29		19	7.3	SURCHARGED
S1.016	SS22	44.884	0.287	0.000	0.70		28	7.3	SURCHARGED
S5.000	SS23	44.702	0.686	0.000	0.14			0.7	SURCHARGED
S1.017	SS24	44.701	-0.060	0.000	0.34			5.6	OK
S6.000	SS65	44.163	-0.169	0.000	0.14			5.5	OK
S6.001	SS66	44.052	-0.069	0.000	0.21		15	7.7	OK
S7.000	SEX S1	46.058	-0.042	0.000	0.62			3.6	OK
S7.001	SEX S2	45.713	-0.071	0.000	0.18			6.6	OK
S6.002	SS67	44.115	0.072	0.000	0.38			14.1	SURCHARGED
S6.003	SS68	44.109	0.172	0.000	0.25			8.9	SURCHARGED
S1.018	SS25-HB	44.103	0.326	0.000	0.34			5.2	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.014	SS20	
S1.015	SS21	
S1.016	SS22	
S5.000	SS23	
S1.017	SS24	
S6.000	SS65	
S6.001	SS66	
S7.000	SEX S1	3
S7.001	SEX S2	
S6.002	SS67	
S6.003	SS68	
S1.018	SS25-HB	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 20
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS1	15 Winter	30	+0%	100/15 Summer				48.565
S1.001	SS2	15 Winter	30	+0%	30/15 Summer				48.548
S1.002	SS3	15 Winter	30	+0%	30/15 Summer				48.472
S2.000	SS4	15 Winter	30	+0%	100/15 Summer				48.709
S2.001	SS5	15 Winter	30	+0%	100/15 Summer				48.517
S1.003	SS6	15 Winter	30	+0%	30/15 Summer				48.334
S1.004	SS7	30 Winter	30	+0%	1/15 Winter				47.865
S1.005	SS8	30 Winter	30	+0%	1/15 Summer				47.781
S1.006	SS9	60 Winter	30	+0%	1/15 Summer				47.325
S3.000	SS10	15 Winter	30	+0%					47.908
S4.000	SS11	15 Winter	30	+0%					48.010
S3.001	SS12	15 Winter	30	+0%	100/15 Summer				47.418
S1.007	SS13	120 Winter	30	+0%	1/15 Summer				47.206
S1.008	SS14	120 Winter	30	+0%	1/15 Summer				46.858
S1.009	SS15	120 Winter	30	+0%	1/15 Summer				46.603
S1.010	SS16	30 Winter	30	+0%	1/15 Summer				46.325
S1.011	SS17	15 Winter	30	+0%	1/15 Summer				46.177
S1.012	SS18	15 Winter	30	+0%	1/15 Summer				46.025
S1.013	SS19	15 Winter	30	+0%	1/15 Summer				45.739

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm Network 1 - Outfall 3 - Rev C

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1	-0.035	0.000	0.37		2	2.4	OK	
S1.001	SS2	0.106	0.000	0.78		3	5.0	SURCHARGED	
S1.002	SS3	0.189	0.000	0.62		3	6.6	SURCHARGED	
S2.000	SS4	-0.051	0.000	0.48		6	3.1	OK	
S2.001	SS5	-0.053	0.000	0.45		6	6.1	OK	
S1.003	SS6	0.465	0.000	1.09		5	13.8	SURCHARGED	
S1.004	SS7	0.467	0.000	1.01		12	6.4	SURCHARGED	
S1.005	SS8	0.506	0.000	1.02		15	13.8	SURCHARGED	
S1.006	SS9	0.733	0.000	0.99		25	9.3	SURCHARGED	
S3.000	SS10	-0.092	0.000	0.32			10.9	OK	
S4.000	SS11	-0.090	0.000	0.34			10.2	OK	
S3.001	SS12	-0.032	0.000	0.74			20.7	OK	
S1.007	SS13	0.764	0.000	1.40		51	9.4	SURCHARGED	
S1.008	SS14	0.604	0.000	1.65		51	9.3	SURCHARGED	
S1.009	SS15	0.448	0.000	1.41		57	9.0	SURCHARGED	
S1.010	SS16	0.315	0.000	1.50		11	9.4	SURCHARGED	
S1.011	SS17	0.285	0.000	0.95		5	9.9	SURCHARGED	
S1.012	SS18	0.406	0.000	1.19			12.1	SURCHARGED	
S1.013	SS19	0.324	0.000	1.15			12.1	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.014	SS20	240 Winter	30	+0%	1/15 Summer			
S1.015	SS21	240 Winter	30	+0%	1/15 Summer			
S1.016	SS22	360 Winter	30	+0%	1/15 Summer			
S5.000	SS23	360 Winter	30	+0%	1/15 Summer			
S1.017	SS24	360 Winter	30	+0%	100/120 Winter			
S6.000	SS65	480 Winter	30	+0%	30/360 Winter			
S6.001	SS66	480 Winter	30	+0%	30/30 Winter			
S7.000	SEX S1	15 Winter	30	+0%	30/15 Summer	100/15 Summer		
S7.001	SEX S2	15 Winter	30	+0%				
S6.002	SS67	480 Winter	30	+0%	1/15 Summer			
S6.003	SS68	480 Winter	30	+0%	1/15 Summer			
S1.018	SS25-HB	480 Winter	30	+0%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.014	SS20	45.529	0.404	0.000	0.89		24	9.7	SURCHARGED
S1.015	SS21	45.284	0.573	0.000	1.40		45	7.9	SURCHARGED
S1.016	SS22	45.064	0.467	0.000	0.75		71	7.8	SURCHARGED
S5.000	SS23	44.716	0.700	0.000	0.23			1.2	SURCHARGED
S1.017	SS24	44.712	-0.049	0.000	0.51			8.5	OK
S6.000	SS65	44.415	0.083	0.000	0.04			1.4	SURCHARGED
S6.001	SS66	44.415	0.293	0.000	0.18		176	6.5	SURCHARGED
S7.000	SEX S1	46.407	0.307	0.000	1.37			8.1	SURCHARGED
S7.001	SEX S2	45.732	-0.052	0.000	0.45			16.6	OK
S6.002	SS67	44.417	0.374	0.000	0.17			6.3	SURCHARGED
S6.003	SS68	44.421	0.484	0.000	0.16			6.0	SURCHARGED
S1.018	SS25-HB	44.425	0.648	0.000	0.34			5.2	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.014	SS20	
S1.015	SS21	
S1.016	SS22	
S5.000	SS23	
S1.017	SS24	
S6.000	SS65	
S6.001	SS66	
S7.000	SEX S1	3
S7.001	SEX S2	
S6.002	SS67	
S6.003	SS68	
S1.018	SS25-HB	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 20
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	SS1	15 Winter	100	+40%	100/15 Summer				48.746
S1.001	SS2	15 Winter	100	+40%	30/15 Summer				48.803
S1.002	SS3	15 Winter	100	+40%	30/15 Summer				48.802
S2.000	SS4	15 Winter	100	+40%	100/15 Summer				49.032
S2.001	SS5	15 Winter	100	+40%	100/15 Summer				48.989
S1.003	SS6	15 Winter	100	+40%	30/15 Summer				48.728
S1.004	SS7	30 Winter	100	+40%	1/15 Winter				48.243
S1.005	SS8	60 Winter	100	+40%	1/15 Summer				48.157
S1.006	SS9	120 Winter	100	+40%	1/15 Summer				47.744
S3.000	SS10	15 Winter	100	+40%					47.963
S4.000	SS11	15 Winter	100	+40%					48.035
S3.001	SS12	15 Winter	100	+40%	100/15 Summer				47.784
S1.007	SS13	120 Winter	100	+40%	1/15 Summer				47.627
S1.008	SS14	120 Winter	100	+40%	1/15 Summer				47.190
S1.009	SS15	240 Winter	100	+40%	1/15 Summer				46.893
S1.010	SS16	240 Winter	100	+40%	1/15 Summer				46.577
S1.011	SS17	360 Winter	100	+40%	1/15 Summer				46.325
S1.012	SS18	15 Winter	100	+40%	1/15 Summer				46.165
S1.013	SS19	360 Winter	100	+40%	1/15 Summer				45.969

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	SS1	0.146	0.000	0.89		6	5.7	SURCHARGED	
S1.001	SS2	0.361	0.000	0.94		12	6.0	SURCHARGED	
S1.002	SS3	0.519	0.000	0.61		13	6.4	SURCHARGED	
S2.000	SS4	0.272	0.000	0.81		3	5.2	SURCHARGED	
S2.001	SS5	0.419	0.000	0.61		6	8.3	SURCHARGED	
S1.003	SS6	0.859	0.000	1.35		14	17.1	SURCHARGED	
S1.004	SS7	0.845	0.000	1.06		22	6.7	SURCHARGED	
S1.005	SS8	0.882	0.000	1.01		43	13.6	SURCHARGED	
S1.006	SS9	1.152	0.000	0.91		81	8.5	SURCHARGED	
S3.000	SS10	-0.037	0.000	0.56			19.3	OK	
S4.000	SS11	-0.065	0.000	0.62			18.5	OK	
S3.001	SS12	0.334	0.000	0.91			25.3	FLOOD RISK	
S1.007	SS13	1.185	0.000	1.59		99	10.6	SURCHARGED	
S1.008	SS14	0.936	0.000	1.90		120	10.7	SURCHARGED	
S1.009	SS15	0.738	0.000	1.51		117	9.6	SURCHARGED	
S1.010	SS16	0.567	0.000	1.48		113	9.3	SURCHARGED	
S1.011	SS17	0.433	0.000	0.86		92	9.0	SURCHARGED	
S1.012	SS18	0.546	0.000	1.27			12.9	SURCHARGED	
S1.013	SS19	0.554	0.000	0.94			9.9	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 1 - Outfall 3 - Rev C

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S1.014	SS20	480 Winter	100	+40%	1/15 Summer			
S1.015	SS21	480 Winter	100	+40%	1/15 Summer			
S1.016	SS22	480 Winter	100	+40%	1/15 Summer			
S5.000	SS23	960 Winter	100	+40%	1/15 Summer			
S1.017	SS24	960 Winter	100	+40%	100/120 Winter			
S6.000	SS65	960 Winter	100	+40%	30/360 Winter			
S6.001	SS66	960 Winter	100	+40%	30/30 Winter			
S7.000	SEX S1	15 Winter	100	+40%	30/15 Summer	100/15 Summer		
S7.001	SEX S2	15 Winter	100	+40%				
S6.002	SS67	960 Winter	100	+40%	1/15 Summer			
S6.003	SS68	960 Winter	100	+40%	1/15 Summer			
S1.018	SS25-HB	960 Winter	100	+40%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S1.014	SS20	45.774	0.649	0.000	0.84		77	9.2	SURCHARGED
S1.015	SS21	45.538	0.827	0.000	1.44		96	8.2	SURCHARGED
S1.016	SS22	45.319	0.722	0.000	0.75		127	7.9	SURCHARGED
S5.000	SS23	45.095	1.079	0.000	0.18		398	1.0	SURCHARGED
S1.017	SS24	45.095	0.334	0.000	0.55		398	9.1	SURCHARGED
S6.000	SS65	45.043	0.711	0.000	0.04			1.4	SURCHARGED
S6.001	SS66	45.043	0.921	0.000	0.18		668	6.4	SURCHARGED
S7.000	SEX S1	47.001	0.901	0.563	1.97			11.6	FLOOD
S7.001	SEX S2	45.750	-0.034	0.000	0.75			27.7	OK
S6.002	SS67	45.042	0.999	0.000	0.17			6.4	SURCHARGED
S6.003	SS68	45.039	1.102	0.000	0.17			6.2	SURCHARGED
S1.018	SS25-HB	45.038	1.261	0.000	0.34			5.2	SURCHARGED

PN	US/MH Name	Level Exceeded
S1.014	SS20	
S1.015	SS21	
S1.016	SS22	
S5.000	SS23	
S1.017	SS24	
S6.000	SS65	
S6.001	SS66	
S7.000	SEX S1	3
S7.001	SEX S2	
S6.002	SS67	
S6.003	SS68	
S1.018	SS25-HB	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Network 2 - Outfall 5 - Rev C

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.700	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm Network 2 - Outfall 5 - Rev C

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.000	11.810	0.708	16.7	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit	
S6.001	11.356	0.472	24.1	0.027	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.002	11.457	0.115	99.6	0.023	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.003	13.855	0.139	99.7	0.025	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.004	12.931	0.162	79.8	0.098	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.005	12.858	0.857	15.0	0.018	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.006	13.027	0.434	30.0	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	
S6.007	10.548	0.508	20.8	0.017	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.000	14.002	0.175	80.0	0.010	5.00	0.0	0.600	o	100	Pipe/Conduit	
S7.001	16.501	0.206	80.1	0.011	0.00	0.0	0.600	o	100	Pipe/Conduit	

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)
S6.000	50.00	5.10	48.000	0.009	0.0	0.0	0.0	1.90	14.9	1.2
S6.001	50.00	5.22	47.292	0.036	0.0	0.0	0.0	1.58	12.4	4.9
S6.002	49.23	5.47	46.770	0.059	0.0	0.0	0.0	0.77	6.1«	7.9
S6.003	48.04	5.77	46.605	0.084	0.0	0.0	0.0	0.77	6.0«	10.9
S6.004	47.10	6.02	46.341	0.182	0.0	0.0	0.0	0.86	6.8«	23.2
S6.005	46.80	6.10	46.129	0.200	0.0	0.0	0.0	2.61	46.2	25.3
S6.006	46.37	6.22	45.272	0.221	0.0	0.0	0.0	1.84	32.6	27.8
S6.007	46.09	6.30	44.838	0.238	0.0	0.0	0.0	2.22	39.2	29.7
S7.000	50.00	5.27	47.500	0.010	0.0	0.0	0.0	0.86	6.8	1.4
S7.001	48.74	5.59	47.325	0.021	0.0	0.0	0.0	0.86	6.8	2.8

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Network Design Table for Storm Network 2 - Outfall 5 - Rev C

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.002	13.105	0.164	79.9	0.012	0.00	0.0	0.600	o	100	Pipe/Conduit	
S8.000	22.731	1.245	18.3	0.012	5.00	0.0	0.600	o	100	Pipe/Conduit	
S7.003	6.613	0.166	39.8	0.010	0.00	0.0	0.600	o	100	Pipe/Conduit	
S7.004	12.752	0.159	80.2	0.023	0.00	0.0	0.600	o	150	Pipe/Conduit	
S7.005	18.577	1.046	17.8	0.023	0.00	0.0	0.600	o	225	Pipe/Conduit	
S9.000	7.015	0.070	100.2	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
S9.001	4.144	0.041	101.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.006	13.358	0.134	99.7	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	
S7.007	11.376	0.070	162.5	0.079	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.008	8.974	0.090	99.7	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.009	20.171	0.202	99.9	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S6.010	7.233	0.073	99.1	0.041	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	6.760	0.085	79.5	0.008	5.00	0.0	0.600	o	100	Pipe/Conduit	
S10.001	5.900	0.074	79.7	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S6.011	4.384	0.040	109.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

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)
S7.002	47.76	5.84	47.119	0.033	0.0	0.0	0.0	0.86	6.8	4.3
S8.000	50.00	5.21	48.200	0.012	0.0	0.0	0.0	1.82	14.3	1.6
S7.003	47.42	5.93	46.955	0.055	0.0	0.0	0.0	1.23	9.6	7.1
S7.004	46.72	6.12	46.739	0.078	0.0	0.0	0.0	1.12	19.9	9.9
S7.005	46.37	6.22	46.505	0.101	0.0	0.0	0.0	3.12	124.1	12.7
S9.000	50.00	5.09	44.570	0.000	0.0	0.0	0.0	1.31	51.9	0.0
S9.001	50.00	5.14	44.500	0.000	0.0	0.0	0.0	1.30	51.7	0.0
S7.006	45.77	6.39	44.459	0.165	0.0	0.0	0.0	1.31	52.1	20.5
S7.007	45.14	6.58	44.325	0.244	0.0	0.0	0.0	1.02	40.7	29.8
S6.008	44.77	6.69	44.255	0.500	0.0	0.0	0.0	1.31	52.1«	60.6
S6.009	43.94	6.95	44.165	0.518	0.0	0.0	0.0	1.31	52.0«	61.6
S6.010	43.65	7.04	43.963	0.559	0.0	0.0	0.0	1.31	52.2«	66.1
S10.000	50.00	5.13	44.174	0.008	0.0	0.0	0.0	0.86	6.8	1.1
S10.001	50.00	5.24	44.089	0.008	0.0	0.0	0.0	0.86	6.8	1.1
S6.011	43.42	7.12	43.890	0.567	0.0	0.0	0.0	0.96	17.0«	66.7

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Manhole Schedules for Storm Network 2 - Outfall 5 - Rev C

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)	Bac
SS26	48.969	0.969	Open Manhole	450	S6.000	48.000	100				
SS27	48.198	0.906	Open Manhole	450	S6.001	47.292	100	S6.000	47.292	100	
SS28	47.527	0.757	Open Manhole	450	S6.002	46.770	100	S6.001	46.820	100	
SS29	47.700	1.095	Open Manhole	450	S6.003	46.605	100	S6.002	46.655	100	
SS30	47.534	1.193	Open Manhole	450	S6.004	46.341	100	S6.003	46.466	100	
SS31	46.980	0.851	Open Manhole	450	S6.005	46.129	150	S6.004	46.179	100	
SS32	46.401	1.129	Open Manhole	450	S6.006	45.272	150	S6.005	45.272	150	
SS33	46.193	1.355	Open Manhole	450	S6.007	44.838	150	S6.006	44.838	150	
SS34	48.147	0.647	Open Manhole	450	S7.000	47.500	100				
SS35	48.179	0.854	Open Manhole	450	S7.001	47.325	100	S7.000	47.325	100	
SS36	48.725	1.606	Open Manhole	450	S7.002	47.119	100	S7.001	47.119	100	
SS37	48.928	0.728	Open Manhole	450	S8.000	48.200	100				
SS38	48.750	1.795	Open Manhole	450	S7.003	46.955	100	S7.002	46.955	100	
								S8.000	46.955	100	
SS39	48.800	2.061	Open Manhole	450	S7.004	46.739	150	S7.003	46.789	100	
SS40	48.050	1.545	Open Manhole	450	S7.005	46.505	225	S7.004	46.580	150	
SS41A	47.300	2.730	Open Manhole	450	S9.000	44.570	225				
SS41- TANK	47.000	2.500	Open Manhole	450	S9.001	44.500	225	S9.000	44.500	225	
SS42	46.800	2.341	Open Manhole	450	S7.006	44.459	225	S7.005	45.459	225	
								S9.001	44.459	225	
SS43	46.301	1.976	Open Manhole	450	S7.007	44.325	225	S7.006	44.325	225	
SS44	46.062	1.807	Open Manhole	450	S6.008	44.255	225	S6.007	44.330	150	
								S7.007	44.255	225	
SS45	45.967	1.802	Open Manhole	450	S6.009	44.165	225	S6.008	44.165	225	
SS46	45.735	1.772	Open Manhole	450	S6.010	43.963	225	S6.009	43.963	225	
SS47A	45.759	1.585	Open Manhole	450	S10.000	44.174	100				
SS47B	45.787	1.698	Open Manhole	450	S10.001	44.089	100	S10.000	44.089	100	
SS47-HB	45.500	1.610	Open Manhole	1800	S6.011	43.890	150	S6.010	43.890	225	
								S10.001	44.015	100	
S	45.500	1.650	Open Manhole	0		OUTFALL		S6.011	43.850	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS26	470057.772	172021.741	470057.772	172021.741	Required	

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Manhole Schedules for Storm Network 2 - Outfall 5 - Rev C

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS27	470060.467	172010.243	470060.467	172010.243	Required	
SS28	470063.273	171999.239	470063.273	171999.239	Required	
SS29	470065.073	171987.924	470065.073	171987.924	Required	
SS30	470065.073	171974.069	470065.073	171974.069	Required	
SS31	470078.003	171974.236	470078.003	171974.236	Required	
SS32	470090.348	171970.639	470090.348	171970.639	Required	
SS33	470103.375	171970.596	470103.375	171970.596	Required	
SS34	470139.801	172040.010	470139.801	172040.010	Required	
SS35	470126.142	172036.932	470126.142	172036.932	Required	
SS36	470110.045	172033.305	470110.045	172033.305	Required	
SS37	470075.152	172025.142	470075.152	172025.142	Required	
SS38	470097.266	172030.402	470097.266	172030.402	Required	
SS39	470098.853	172023.982	470098.853	172023.982	Required	
SS40	470102.010	172011.627	470102.010	172011.627	Required	
SS41A	470095.582	171993.647	470095.582	171993.647	Required	

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Manhole Schedules for Storm Network 2 - Outfall 5 - Rev C

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS41- TANK	470102.563	171994.341	470102.563	171994.341	Required	
SS42	470106.646	171993.638	470106.646	171993.638	Required	
SS43	470109.680	171980.629	470109.680	171980.629	Required	
SS44	470113.910	171970.069	470113.910	171970.069	Required	
SS45	470122.763	171971.539	470122.763	171971.539	Required	
SS46	470142.328	171976.448	470142.328	171976.448	Required	
SS47A	470154.137	171986.318	470154.137	171986.318	Required	
SS47B	470147.617	171984.571	470147.617	171984.571	Required	
SS47-HB	470149.145	171978.867	470149.145	171978.867	Required	
S	470153.383	171979.990			No Entry	

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PIPELINE SCHEDULES for Storm Network 2 - Outfall 5 - Rev C

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)
S6.000	o	100	SS26	48.969	48.000	0.869	Open Manhole	450
S6.001	o	100	SS27	48.198	47.292	0.806	Open Manhole	450
S6.002	o	100	SS28	47.527	46.770	0.657	Open Manhole	450
S6.003	o	100	SS29	47.700	46.605	0.995	Open Manhole	450
S6.004	o	100	SS30	47.534	46.341	1.093	Open Manhole	450
S6.005	o	150	SS31	46.980	46.129	0.701	Open Manhole	450
S6.006	o	150	SS32	46.401	45.272	0.979	Open Manhole	450
S6.007	o	150	SS33	46.193	44.838	1.205	Open Manhole	450
S7.000	o	100	SS34	48.147	47.500	0.547	Open Manhole	450
S7.001	o	100	SS35	48.179	47.325	0.754	Open Manhole	450
S7.002	o	100	SS36	48.725	47.119	1.506	Open Manhole	450
S8.000	o	100	SS37	48.928	48.200	0.628	Open Manhole	450
S7.003	o	100	SS38	48.750	46.955	1.695	Open Manhole	450
S7.004	o	150	SS39	48.800	46.739	1.911	Open Manhole	450
S7.005	o	225	SS40	48.050	46.505	1.320	Open Manhole	450
S9.000	o	225	SS41A	47.300	44.570	2.505	Open Manhole	450
S9.001	o	225	SS41- TANK	47.000	44.500	2.275	Open Manhole	450

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)
S6.000	11.810	16.7	SS27	48.198	47.292	0.806	Open Manhole	450
S6.001	11.356	24.1	SS28	47.527	46.820	0.607	Open Manhole	450
S6.002	11.457	99.6	SS29	47.700	46.655	0.945	Open Manhole	450
S6.003	13.855	99.7	SS30	47.534	46.466	0.968	Open Manhole	450
S6.004	12.931	79.8	SS31	46.980	46.179	0.701	Open Manhole	450
S6.005	12.858	15.0	SS32	46.401	45.272	0.979	Open Manhole	450
S6.006	13.027	30.0	SS33	46.193	44.838	1.205	Open Manhole	450
S6.007	10.548	20.8	SS44	46.062	44.330	1.582	Open Manhole	450
S7.000	14.002	80.0	SS35	48.179	47.325	0.754	Open Manhole	450
S7.001	16.501	80.1	SS36	48.725	47.119	1.506	Open Manhole	450
S7.002	13.105	79.9	SS38	48.750	46.955	1.695	Open Manhole	450
S8.000	22.731	18.3	SS38	48.750	46.955	1.695	Open Manhole	450
S7.003	6.613	39.8	SS39	48.800	46.789	1.911	Open Manhole	450
S7.004	12.752	80.2	SS40	48.050	46.580	1.320	Open Manhole	450
S7.005	18.577	17.8	SS42	46.800	45.459	1.116	Open Manhole	450
S9.000	7.015	100.2	SS41- TANK	47.000	44.500	2.275	Open Manhole	450
S9.001	4.144	101.1	SS42	46.800	44.459	2.116	Open Manhole	450

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PIPELINE SCHEDULES for Storm Network 2 - Outfall 5 - Rev C

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)
S7.006	o	225	SS42	46.800	44.459	2.116	Open Manhole	450
S7.007	o	225	SS43	46.301	44.325	1.751	Open Manhole	450
S6.008	o	225	SS44	46.062	44.255	1.582	Open Manhole	450
S6.009	o	225	SS45	45.967	44.165	1.577	Open Manhole	450
S6.010	o	225	SS46	45.735	43.963	1.547	Open Manhole	450
S10.000	o	100	SS47A	45.759	44.174	1.485	Open Manhole	450
S10.001	o	100	SS47B	45.787	44.089	1.598	Open Manhole	450
S6.011	o	150	SS47-HB	45.500	43.890	1.460	Open Manhole	1800

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)
S7.006	13.358	99.7	SS43	46.301	44.325	1.751	Open Manhole	450
S7.007	11.376	162.5	SS44	46.062	44.255	1.582	Open Manhole	450
S6.008	8.974	99.7	SS45	45.967	44.165	1.577	Open Manhole	450
S6.009	20.171	99.9	SS46	45.735	43.963	1.547	Open Manhole	450
S6.010	7.233	99.1	SS47-HB	45.500	43.890	1.385	Open Manhole	1800
S10.000	6.760	79.5	SS47B	45.787	44.089	1.598	Open Manhole	450
S10.001	5.900	79.7	SS47-HB	45.500	44.015	1.385	Open Manhole	1800
S6.011	4.384	109.6	S	45.500	43.850	1.500	Open Manhole	0

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Setting Out Information - True Coordinates (Storm Network 2 - Outfall 5 - Rev C)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S6.000	SS26	450		470057.772	172021.741	470057.772	172021.741	
S6.001	SS27	450		470060.467	172010.243	470060.467	172010.243	
S6.002	SS28	450		470063.273	171999.239	470063.273	171999.239	
S6.003	SS29	450		470065.073	171987.924	470065.073	171987.924	
S6.004	SS30	450		470065.073	171974.069	470065.073	171974.069	
S6.005	SS31	450		470078.003	171974.236	470078.003	171974.236	
S6.006	SS32	450		470090.348	171970.639	470090.348	171970.639	
S6.007	SS33	450		470103.375	171970.596	470103.375	171970.596	
S7.000	SS34	450		470139.801	172040.010	470139.801	172040.010	
S7.001	SS35	450		470126.142	172036.932	470126.142	172036.932	
S7.002	SS36	450		470110.045	172033.305	470110.045	172033.305	
S8.000	SS37	450		470075.152	172025.142	470075.152	172025.142	
S7.003	SS38	450		470097.266	172030.402	470097.266	172030.402	
S7.004	SS39	450		470098.853	172023.982	470098.853	172023.982	
S7.005	SS40	450		470102.010	172011.627	470102.010	172011.627	

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Setting Out Information - True Coordinates (Storm Network 2 - Outfall 5 - Rev C)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S9.000	SS41A	450		470095.582	171993.647	470095.582	171993.647	
S9.001	SS41- TANK	450		470102.563	171994.341	470102.563	171994.341	
S7.006	SS42	450		470106.646	171993.638	470106.646	171993.638	
S7.007	SS43	450		470109.680	171980.629	470109.680	171980.629	
S6.008	SS44	450		470113.910	171970.069	470113.910	171970.069	
S6.009	SS45	450		470122.763	171971.539	470122.763	171971.539	
S6.010	SS46	450		470142.328	171976.448	470142.328	171976.448	
S10.000	SS47A	450		470154.137	171986.318	470154.137	171986.318	
S10.001	SS47B	450		470147.617	171984.571	470147.617	171984.571	
S6.011	SS47-HB	1800		470149.145	171978.867	470149.145	171978.867	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S6.011	S	0		470153.383	171979.990	

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Area Summary for Storm Network 2 - Outfall 5 - Rev C

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
6.000	-	-	100	0.009	0.009	0.009
6.001	-	-	100	0.027	0.027	0.027
6.002	-	-	100	0.023	0.023	0.023
6.003	-	-	100	0.025	0.025	0.025
6.004	-	-	100	0.098	0.098	0.098
6.005	-	-	100	0.018	0.018	0.018
6.006	-	-	100	0.021	0.021	0.021
6.007	-	-	100	0.017	0.017	0.017
7.000	-	-	100	0.010	0.010	0.010
7.001	-	-	100	0.011	0.011	0.011
7.002	-	-	100	0.012	0.012	0.012
8.000	-	-	100	0.012	0.012	0.012
7.003	-	-	100	0.010	0.010	0.010
7.004	-	-	100	0.023	0.023	0.023
7.005	-	-	100	0.023	0.023	0.023
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
7.006	-	-	100	0.064	0.064	0.064
7.007	-	-	100	0.079	0.079	0.079
6.008	-	-	100	0.018	0.018	0.018
6.009	-	-	100	0.018	0.018	0.018
6.010	-	-	100	0.041	0.041	0.041
10.000	-	-	100	0.008	0.008	0.008
10.001	-	-	100	0.000	0.000	0.000
6.011	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.567	0.567	0.567

Free Flowing Outfall Details for Storm Network 2 - Outfall 5 - Rev C

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S6.011	S	45.500	43.850	0.000	0	0

Simulation Criteria for Storm Network 2 - Outfall 5 - Rev C

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	17
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

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Simulation Criteria for Storm Network 2 - Outfall 5 - Rev C

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm Network 2 - Outfall 5 - Rev C

Hydro-Brake® Optimum Manhole: SS47-HB, DS/PN: S6.011, Volume (m³): 4.4

Unit Reference	MD-SHE-0098-4700-1300-4700
Design Head (m)	1.300
Design Flow (l/s)	4.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	43.890
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.300	4.7
Flush-Flo™	0.389	4.7
Kick-Flo®	0.803	3.8
Mean Flow over Head Range	-	4.1

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.4
0.200	4.4	1.400	4.9	3.500	7.5	7.500	10.7
0.300	4.6	1.600	5.2	4.000	8.0	8.000	11.0
0.400	4.7	1.800	5.5	4.500	8.4	8.500	11.4
0.500	4.6	2.000	5.7	5.000	8.8	9.000	11.7
0.600	4.5	2.200	6.0	5.500	9.2	9.500	12.0
0.800	3.8	2.400	6.3	6.000	9.6		
1.000	4.2	2.600	6.5	6.500	10.0		

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Storage Structures for Storm Network 2 - Outfall 5 - Rev C

Porous Car Park Manhole: SS27, DS/PN: S6.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	13.0
Membrane Percolation (mm/hr)	1000	Length (m)	13.0
Max Percolation (l/s)	46.9	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.800	Cap Volume Depth (m)	0.700

Porous Car Park Manhole: SS28, DS/PN: S6.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.3
Max Percolation (l/s)	42.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.500	Cap Volume Depth (m)	0.850

Porous Car Park Manhole: SS29, DS/PN: S6.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.3
Membrane Percolation (mm/hr)	1000	Length (m)	12.3
Max Percolation (l/s)	42.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	46.700	Cap Volume Depth (m)	0.850

Porous Car Park Manhole: SS30, DS/PN: S6.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.4
Membrane Percolation (mm/hr)	1000	Length (m)	9.4
Max Percolation (l/s)	24.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	45.630	Cap Volume Depth (m)	1.450

Porous Car Park Manhole: SS31, DS/PN: S6.005

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	9.5
Membrane Percolation (mm/hr)	1000	Length (m)	9.5
Max Percolation (l/s)	25.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	45.430	Cap Volume Depth (m)	1.150

Porous Car Park Manhole: SS32, DS/PN: S6.006

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	40.7
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

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Porous Car Park Manhole: SS32, DS/PN: S6.006

Porosity	0.30	Slope (1:X)	200.0
Invert Level (m)	45.370	Depression Storage (mm)	5
Width (m)	12.1	Evaporation (mm/day)	3
Length (m)	12.1	Cap Volume Depth (m)	0.800

Porous Car Park Manhole: SS33, DS/PN: S6.007

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.7
Membrane Percolation (mm/hr)	1000	Length (m)	10.7
Max Percolation (l/s)	31.8	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	45.240	Cap Volume Depth (m)	0.800

Porous Car Park Manhole: SS34, DS/PN: S7.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.9
Membrane Percolation (mm/hr)	1000	Length (m)	7.9
Max Percolation (l/s)	17.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.000	Cap Volume Depth (m)	0.600

Porous Car Park Manhole: SS35, DS/PN: S7.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.6
Membrane Percolation (mm/hr)	1000	Length (m)	8.6
Max Percolation (l/s)	20.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.720	Cap Volume Depth (m)	0.850

Porous Car Park Manhole: SS36, DS/PN: S7.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	8.6
Membrane Percolation (mm/hr)	1000	Length (m)	8.6
Max Percolation (l/s)	20.5	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.600	Cap Volume Depth (m)	1.000

Porous Car Park Manhole: SS37, DS/PN: S8.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	6.6
Membrane Percolation (mm/hr)	1000	Length (m)	6.6
Max Percolation (l/s)	12.1	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	48.200	Cap Volume Depth (m)	0.400

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Porous Car Park Manhole: SS38, DS/PN: S7.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	7.9
Membrane Percolation (mm/hr)	1000	Length (m)	7.9
Max Percolation (l/s)	17.3	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	47.600	Cap Volume Depth (m)	1.000

Cellular Storage Manhole: SS41- TANK, DS/PN: S9.001

Invert Level (m)	44.500	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	183.0	0.0	0.810	0.0	0.0
0.800	183.0	0.0			

Porous Car Park Manhole: SS44, DS/PN: S6.008

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.5
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	36.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.995	Cap Volume Depth (m)	0.960

Porous Car Park Manhole: SS45, DS/PN: S6.009

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	11.5
Membrane Percolation (mm/hr)	1000	Length (m)	11.5
Max Percolation (l/s)	36.7	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.810	Cap Volume Depth (m)	0.960

Porous Car Park Manhole: SS46, DS/PN: S6.010

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	17.8
Membrane Percolation (mm/hr)	1000	Length (m)	17.8
Max Percolation (l/s)	88.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	44.520	Cap Volume Depth (m)	1.150

Porous Car Park Manhole: SS47A , DS/PN: S10.000

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30
Membrane Percolation (mm/hr)	1000	Invert Level (m)	44.480
Max Percolation (l/s)	23.5	Width (m)	9.2
Safety Factor	2.0	Length (m)	9.2

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Porous Car Park Manhole: SS47A , DS/PN: S10.000

Slope (1:X)	200.0	Evaporation (mm/day)	3
Depression Storage (mm)	5	Cap Volume Depth (m)	1.000

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 17
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S6.000	SS26	15 Winter	1	+0%				
S6.001	SS27	1440 Winter	1	+0%				
S6.002	SS28	1440 Winter	1	+0%				
S6.003	SS29	15 Winter	1	+0%	30/15 Summer			
S6.004	SS30	1440 Winter	1	+0%	30/60 Winter			
S6.005	SS31	1440 Winter	1	+0%				
S6.006	SS32	30 Summer	1	+0%				
S6.007	SS33	15 Winter	1	+0%	100/15 Summer			
S7.000	SS34	15 Winter	1	+0%	30/15 Summer			
S7.001	SS35	15 Winter	1	+0%	30/15 Summer			
S7.002	SS36	15 Winter	1	+0%	30/15 Summer			
S8.000	SS37	15 Winter	1	+0%				
S7.003	SS38	15 Winter	1	+0%	30/15 Summer			
S7.004	SS39	15 Winter	1	+0%	30/15 Summer			
S7.005	SS40	15 Winter	1	+0%				
S9.000	SS41A	15 Summer	1	+0%	100/30 Summer			
S9.001	SS41- TANK	120 Winter	1	+0%	30/60 Winter			
S7.006	SS42	30 Winter	1	+0%	1/15 Winter			
S7.007	SS43	30 Winter	1	+0%	1/15 Summer			

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm Network 2 - Outfall 5 - Rev C

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S6.000	SS26	48.019	-0.081	0.000	0.08			1.2	OK
S6.001	SS27	46.990	-0.402	0.000	0.00			0.0	OK
S6.002	SS28	46.638	-0.232	0.000	0.00			0.0	OK
S6.003	SS29	46.653	-0.052	0.000	0.44		7	2.5	OK
S6.004	SS30	46.362	-0.079	0.000	0.10			0.7	OK
S6.005	SS31	45.964	-0.315	0.000	0.00			0.0	OK
S6.006	SS32	45.301	-0.121	0.000	0.06		7	1.9	OK
S6.007	SS33	44.870	-0.118	0.000	0.10		6	3.4	OK
S7.000	SS34	47.530	-0.070	0.000	0.18		6	1.2	OK
S7.001	SS35	47.366	-0.059	0.000	0.31		6	2.0	OK
S7.002	SS36	47.170	-0.049	0.000	0.49		6	3.1	OK
S8.000	SS37	48.221	-0.079	0.000	0.10		5	1.4	OK
S7.003	SS38	47.014	-0.041	0.000	0.62		6	5.4	OK
S7.004	SS39	46.808	-0.081	0.000	0.41			7.5	OK
S7.005	SS40	46.550	-0.180	0.000	0.09			9.6	OK
S9.000	SS41A	44.570	-0.225	0.000	0.00			0.0	OK
S9.001	SS41- TANK	44.550	-0.175	0.000	0.09		47	2.6	OK
S7.006	SS42	44.701	0.017	0.000	0.28			12.4	SURCHARGED
S7.007	SS43	44.689	0.139	0.000	0.50			17.3	SURCHARGED

PN	US/MH Name	Level Exceeded
S6.000	SS26	
S6.001	SS27	
S6.002	SS28	
S6.003	SS29	
S6.004	SS30	
S6.005	SS31	
S6.006	SS32	
S6.007	SS33	
S7.000	SS34	
S7.001	SS35	
S7.002	SS36	
S8.000	SS37	
S7.003	SS38	
S7.004	SS39	
S7.005	SS40	
S9.000	SS41A	
S9.001	SS41- TANK	
S7.006	SS42	
S7.007	SS43	

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm Network 2 - Outfall 5 - Rev C

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.008	SS44	30 Winter	1	+0%	1/15 Summer				44.668
S6.009	SS45	30 Winter	1	+0%	1/15 Summer				44.635
S6.010	SS46	60 Winter	1	+0%	1/15 Summer				44.620
S10.000	SS47A	60 Winter	1	+0%	1/15 Summer				44.593
S10.001	SS47B	120 Winter	1	+0%	1/15 Summer				44.600
S6.011	SS47-HB	60 Winter	1	+0%	1/15 Summer				44.615

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.008	SS44	0.188	0.000	0.44			18.7	SURCHARGED	
S6.009	SS45	0.245	0.000	0.42			20.0	SURCHARGED	
S6.010	SS46	0.432	0.000	0.30		22	11.3	SURCHARGED	
S10.000	SS47A	0.319	0.000	0.34		20	2.1	SURCHARGED	
S10.001	SS47B	0.411	0.000	0.26			1.6	SURCHARGED	
S6.011	SS47-HB	0.575	0.000	0.37			4.7	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 17
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S6.000	SS26	15 Winter	30	+0%				
S6.001	SS27	1440 Winter	30	+0%				
S6.002	SS28	1440 Winter	30	+0%				
S6.003	SS29	15 Winter	30	+0%	30/15 Summer			
S6.004	SS30	120 Winter	30	+0%	30/60 Winter			
S6.005	SS31	360 Winter	30	+0%				
S6.006	SS32	15 Winter	30	+0%				
S6.007	SS33	15 Winter	30	+0%	100/15 Summer			
S7.000	SS34	15 Winter	30	+0%	30/15 Summer			
S7.001	SS35	15 Winter	30	+0%	30/15 Summer			
S7.002	SS36	15 Winter	30	+0%	30/15 Summer			
S8.000	SS37	15 Winter	30	+0%				
S7.003	SS38	15 Winter	30	+0%	30/15 Summer			
S7.004	SS39	15 Winter	30	+0%	30/15 Summer			
S7.005	SS40	15 Winter	30	+0%				
S9.000	SS41A	240 Winter	30	+0%	100/30 Summer			
S9.001	SS41- TANK	240 Winter	30	+0%	30/60 Winter			
S7.006	SS42	15 Winter	30	+0%	1/15 Winter			
S7.007	SS43	15 Winter	30	+0%	1/15 Summer			

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S6.000	SS26	48.031	-0.069	0.000	0.20			2.9	OK
S6.001	SS27	47.178	-0.214	0.000	0.00			0.0	OK
S6.002	SS28	46.771	-0.099	0.000	0.00			0.0	OK
S6.003	SS29	46.732	0.027	0.000	1.11		3	6.3	SURCHARGED
S6.004	SS30	46.467	0.026	0.000	1.09			7.0	SURCHARGED
S6.005	SS31	46.158	-0.121	0.000	0.09			3.6	OK
S6.006	SS32	45.322	-0.100	0.000	0.24		5	7.2	OK
S6.007	SS33	44.961	-0.027	0.000	0.36		3	12.6	OK
S7.000	SS34	47.764	0.164	0.000	0.44		4	2.8	SURCHARGED
S7.001	SS35	47.728	0.303	0.000	0.86		4	5.5	SURCHARGED
S7.002	SS36	47.608	0.389	0.000	1.25		5	8.0	SURCHARGED
S8.000	SS37	48.235	-0.065	0.000	0.26		5	3.6	OK
S7.003	SS38	47.373	0.318	0.000	1.62		5	14.1	SURCHARGED
S7.004	SS39	46.940	0.051	0.000	1.15			20.7	SURCHARGED
S7.005	SS40	46.582	-0.148	0.000	0.25			27.6	OK
S9.000	SS41A	44.778	-0.017	0.000	0.00			0.0	OK
S9.001	SS41- TANK	44.778	0.053	0.000	0.10		191	2.9	SURCHARGED
S7.006	SS42	44.892	0.208	0.000	0.44			19.9	SURCHARGED
S7.007	SS43	44.924	0.374	0.000	0.89			30.8	SURCHARGED

PN	US/MH Name	Level Exceeded
S6.000	SS26	
S6.001	SS27	
S6.002	SS28	
S6.003	SS29	
S6.004	SS30	
S6.005	SS31	
S6.006	SS32	
S6.007	SS33	
S7.000	SS34	
S7.001	SS35	
S7.002	SS36	
S8.000	SS37	
S7.003	SS38	
S7.004	SS39	
S7.005	SS40	
S9.000	SS41A	
S9.001	SS41- TANK	
S7.006	SS42	
S7.007	SS43	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.008	SS44	15 Winter	30	+0%	1/15 Summer				44.897
S6.009	SS45	15 Winter	30	+0%	1/15 Summer				44.796
S6.010	SS46	60 Winter	30	+0%	1/15 Summer				44.764
S10.000	SS47A	240 Winter	30	+0%	1/15 Summer				44.759
S10.001	SS47B	240 Winter	30	+0%	1/15 Summer				44.760
S6.011	SS47-HB	360 Winter	30	+0%	1/15 Summer				44.770

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.008	SS44	0.417	0.000	0.85			35.9	SURCHARGED	
S6.009	SS45	0.406	0.000	0.90			42.2	SURCHARGED	
S6.010	SS46	0.576	0.000	0.31			11.7	SURCHARGED	
S10.000	SS47A	0.485	0.000	0.09		179	0.6	SURCHARGED	
S10.001	SS47B	0.571	0.000	0.08			0.5	SURCHARGED	
S6.011	SS47-HB	0.730	0.000	0.37			4.7	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 17
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S6.000	SS26	15 Winter	100	+40%					48.042
S6.001	SS27	1440 Winter	100	+40%					47.306
S6.002	SS28	1440 Winter	100	+40%					46.796
S6.003	SS29	60 Winter	100	+40%	30/15 Summer				46.820
S6.004	SS30	60 Winter	100	+40%	30/60 Winter				46.835
S6.005	SS31	120 Winter	100	+40%					46.187
S6.006	SS32	120 Winter	100	+40%					45.349
S6.007	SS33	15 Winter	100	+40%	100/15 Summer				45.259
S7.000	SS34	15 Winter	100	+40%	30/15 Summer				47.920
S7.001	SS35	15 Winter	100	+40%	30/15 Summer				47.817
S7.002	SS36	15 Winter	100	+40%	30/15 Summer				47.708
S8.000	SS37	15 Winter	100	+40%					48.249
S7.003	SS38	15 Winter	100	+40%	30/15 Summer				47.620
S7.004	SS39	15 Winter	100	+40%	30/15 Summer				47.131
S7.005	SS40	15 Summer	100	+40%					46.602
S9.000	SS41A	360 Winter	100	+40%	100/30 Summer				45.185

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
S6.000	SS26	-0.058	0.000	0.37			5.2	OK	
S6.001	SS27	-0.086	0.000	0.05			0.6	OK	
S6.002	SS28	-0.074	0.000	0.16			0.9	OK	
S6.003	SS29	0.115	0.000	1.09		17	6.3	SURCHARGED	
S6.004	SS30	0.394	0.000	1.86			11.9	SURCHARGED	
S6.005	SS31	-0.092	0.000	0.32			13.3	OK	
S6.006	SS32	-0.073	0.000	0.52		52	15.4	OK	
S6.007	SS33	0.271	0.000	0.62		3	21.9	SURCHARGED	
S7.000	SS34	0.320	0.000	0.86		12	5.5	FLOOD RISK	
S7.001	SS35	0.392	0.000	1.05		6	6.8	SURCHARGED	
S7.002	SS36	0.489	0.000	1.69		6	10.8	SURCHARGED	
S8.000	SS37	-0.051	0.000	0.48		6	6.6	OK	
S7.003	SS38	0.565	0.000	1.85		6	16.1	SURCHARGED	
S7.004	SS39	0.242	0.000	1.60			28.9	SURCHARGED	
S7.005	SS40	-0.128	0.000	0.39			43.0	OK	
S9.000	SS41A	0.390	0.000	0.00			0.0	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 2 - Outfall 5 - Rev C

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S9.001	SS41- TANK	360 Winter	100	+40%	30/60 Winter			
S7.006	SS42	360 Winter	100	+40%	1/15 Winter			
S7.007	SS43	360 Winter	100	+40%	1/15 Summer			
S6.008	SS44	360 Winter	100	+40%	1/15 Summer			
S6.009	SS45	360 Winter	100	+40%	1/15 Summer			
S6.010	SS46	360 Winter	100	+40%	1/15 Summer			
S10.000	SS47A	360 Winter	100	+40%	1/15 Summer			
S10.001	SS47B	480 Winter	100	+40%	1/15 Summer			
S6.011	SS47-HB	480 Winter	100	+40%	1/15 Summer			

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
S9.001	SS41- TANK	45.185	0.460	0.000	0.07			2.2	SURCHARGED
S7.006	SS42	45.186	0.502	0.000	0.08			3.5	SURCHARGED
S7.007	SS43	45.184	0.634	0.000	0.16			5.7	SURCHARGED
S6.008	SS44	45.181	0.701	0.000	0.33		136	14.0	SURCHARGED
S6.009	SS45	45.176	0.786	0.000	0.26		259	12.4	SURCHARGED
S6.010	SS46	45.167	0.979	0.000	0.16			6.1	SURCHARGED
S10.000	SS47A	45.162	0.888	0.000	0.09			0.6	SURCHARGED
S10.001	SS47B	45.166	0.977	0.000	0.08			0.5	SURCHARGED
S6.011	SS47-HB	45.164	1.124	0.000	0.37			4.7	SURCHARGED

PN	US/MH Name	Level Exceeded
S9.001	SS41- TANK	
S7.006	SS42	
S7.007	SS43	
S6.008	SS44	
S6.009	SS45	
S6.010	SS46	
S10.000	SS47A	
S10.001	SS47B	
S6.011	SS47-HB	

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm Network 3 - Outfall 4 - Rev C

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	PIMP (%)	100
M5-60 (mm)	18.700	Add Flow / Climate Change (%)	0
Ratio R	0.400	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm Network 3 - Outfall 4 - Rev C

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.000	26.524	0.510	52.0	0.028	5.00	0.0	0.600	o	150	Pipe/Conduit	
S10.001	12.182	2.270	5.4	0.023	0.00	0.0	0.600	o	150	Pipe/Conduit	
S11.000	26.410	0.815	32.4	0.045	5.00	0.0	0.600	o	100	Pipe/Conduit	
S11.001	5.001	0.710	7.0	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.000	21.479	0.215	99.9	0.020	5.00	0.0	0.600	o	150	Pipe/Conduit	
S11.002	18.741	1.074	17.4	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
S13.000	10.608	0.071	149.4	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	

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)
S10.000	49.87	5.32	43.880	0.028	0.0	0.0	0.0	1.40	24.7	3.8
S10.001	49.67	5.36	43.370	0.051	0.0	0.0	0.0	4.38	77.4	6.8
S11.000	49.83	5.32	43.810	0.045	0.0	0.0	0.0	1.36	10.7	6.0
S11.001	49.76	5.34	42.870	0.073	0.0	0.0	0.0	4.96	197.3	9.8
S12.000	49.70	5.36	42.450	0.020	0.0	0.0	0.0	1.01	17.8	2.7
S11.002	49.29	5.46	42.160	0.104	0.0	0.0	0.0	3.15	125.2	13.9
S13.000	50.00	5.17	41.171	0.000	0.0	0.0	0.0	1.07	42.4	0.0

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Network Design Table for Storm Network 3 - Outfall 4 - Rev C

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S13.001	2.289	0.014	163.5	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.002	11.996	0.104	115.3	0.024	0.00	0.0	0.600	o	225	Pipe/Conduit	
S14.000	11.009	0.110	100.1	0.011	5.00	0.0	0.600	o	150	Pipe/Conduit	
S14.001	14.405	0.433	33.3	0.015	0.00	0.0	0.600	o	150	Pipe/Conduit	
S15.000	2.974	0.018	165.2	0.022	5.00	0.0	0.600	o	225	Pipe/Conduit	
S10.003	7.168	0.079	90.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

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)
S13.001	50.00	5.20	41.100	0.000	0.0	0.0	0.0	1.02	40.5	0.0
S10.002	48.63	5.62	41.086	0.179	0.0	0.0	0.0	1.22	48.4	23.6
S14.000	50.00	5.18	41.600	0.011	0.0	0.0	0.0	1.00	17.7	1.5
S14.001	49.85	5.32	41.490	0.026	0.0	0.0	0.0	1.75	30.9	3.6
S15.000	50.00	5.05	41.000	0.022	0.0	0.0	0.0	1.01	40.3	3.0
S10.003	48.19	5.73	40.982	0.228	0.0	0.0	0.0	1.06	18.7«	29.7

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Manhole Schedules for Storm Network 3 - Outfall 4 - Rev C

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)
SS48	45.638	1.758	Open Manhole	1200	S10.000	43.880	150			
SS49	44.280	0.910	Open Manhole	1200	S10.001	43.370	150	S10.000	43.370	150
SS50	44.600	0.790	Open Manhole	1200	S11.000	43.810	100			
SS51	44.600	1.730	Open Manhole	1200	S11.001	42.870	225	S11.000	42.995	100
SS52	43.500	1.050	Open Manhole	1200	S12.000	42.450	150			
SS53	43.500	1.340	Open Manhole	1200	S11.002	42.160	225	S11.001	42.160	225
								S12.000	42.235	150
SS54A	42.950	1.779	Open Manhole	1200	S13.000	41.171	225			
S S54 - TANK	43.900	2.800	Open Manhole	1200	S13.001	41.100	225	S13.000	41.100	225
SS55	43.900	2.814	Open Manhole	1200	S10.002	41.086	225	S10.001	41.100	150
								S11.002	41.086	225
								S13.001	41.086	225
SS56	42.500	0.900	Open Manhole	1200	S14.000	41.600	150			
SS57	42.900	1.410	Open Manhole	1200	S14.001	41.490	150	S14.000	41.490	150
SS58	41.770	0.770	Open Manhole	1200	S15.000	41.000	225			
SS59	42.300	1.318	Open Manhole	1800	S10.003	40.982	150	S10.002	40.982	225
								S14.001	41.057	150
								S15.000	40.982	225
S	44.316	3.413	Open Manhole	0		OUTFALL		S10.003	40.903	150

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS48	470095.005	171954.075	470095.005	171954.075	Required	
SS49	470094.727	171927.553	470094.727	171927.553	Required	
SS50	470119.288	171953.327	470119.288	171953.327	Required	
SS51	470118.122	171926.943	470118.122	171926.943	Required	
SS52	470135.839	171930.511	470135.839	171930.511	Required	

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Manhole Schedules for Storm Network 3 - Outfall 4 - Rev C

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SS53	470115.931	171922.448	470115.931	171922.448	Required	
SS54A	470096.073	171905.338	470096.073	171905.338	Required	
S S54 - TANK	470096.073	171915.946	470096.073	171915.946	Required	
SS55	470098.361	171915.926	470098.361	171915.926	Required	
SS56	470087.532	171893.354	470087.532	171893.354	Required	
SS57	470087.536	171904.363	470087.536	171904.363	Required	
SS58	470100.963	171901.669	470100.963	171901.669	Required	
SS59	470101.941	171904.477	470101.941	171904.477	Required	
S	470108.797	171902.387			No Entry	

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PIPELINE SCHEDULES for Storm Network 3 - Outfall 4 - Rev C

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)
S10.000	o	150	SS48	45.638	43.880	1.608	Open Manhole	1200
S10.001	o	150	SS49	44.280	43.370	0.760	Open Manhole	1200
S11.000	o	100	SS50	44.600	43.810	0.690	Open Manhole	1200
S11.001	o	225	SS51	44.600	42.870	1.505	Open Manhole	1200
S12.000	o	150	SS52	43.500	42.450	0.900	Open Manhole	1200
S11.002	o	225	SS53	43.500	42.160	1.115	Open Manhole	1200
S13.000	o	225	SS54A	42.950	41.171	1.554	Open Manhole	1200
S13.001	o	225	S S54 - TANK	43.900	41.100	2.575	Open Manhole	1200
S10.002	o	225	SS55	43.900	41.086	2.589	Open Manhole	1200
S14.000	o	150	SS56	42.500	41.600	0.750	Open Manhole	1200
S14.001	o	150	SS57	42.900	41.490	1.260	Open Manhole	1200
S15.000	o	225	SS58	41.770	41.000	0.545	Open Manhole	1200
S10.003	o	150	SS59	42.300	40.982	1.168	Open Manhole	1800

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)
S10.000	26.524	52.0	SS49	44.280	43.370	0.760	Open Manhole	1200
S10.001	12.182	5.4	SS55	43.900	41.100	2.650	Open Manhole	1200
S11.000	26.410	32.4	SS51	44.600	42.995	1.505	Open Manhole	1200
S11.001	5.001	7.0	SS53	43.500	42.160	1.115	Open Manhole	1200
S12.000	21.479	99.9	SS53	43.500	42.235	1.115	Open Manhole	1200
S11.002	18.741	17.4	SS55	43.900	41.086	2.589	Open Manhole	1200
S13.000	10.608	149.4	S S54 - TANK	43.900	41.100	2.575	Open Manhole	1200
S13.001	2.289	163.5	SS55	43.900	41.086	2.589	Open Manhole	1200
S10.002	11.996	115.3	SS59	42.300	40.982	1.093	Open Manhole	1800
S14.000	11.009	100.1	SS57	42.900	41.490	1.260	Open Manhole	1200
S14.001	14.405	33.3	SS59	42.300	41.057	1.093	Open Manhole	1800
S15.000	2.974	165.2	SS59	42.300	40.982	1.093	Open Manhole	1800
S10.003	7.168	90.7	S	44.316	40.903	3.263	Open Manhole	0

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Setting Out Information - True Coordinates (Storm Network 3 - Outfall 4 - Rev C)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
S10.000	SS48	1200		470095.005	171954.075	470095.005	171954.075	
S10.001	SS49	1200		470094.727	171927.553	470094.727	171927.553	
S11.000	SS50	1200		470119.288	171953.327	470119.288	171953.327	
S11.001	SS51	1200		470118.122	171926.943	470118.122	171926.943	
S12.000	SS52	1200		470135.839	171930.511	470135.839	171930.511	
S11.002	SS53	1200		470115.931	171922.448	470115.931	171922.448	
S13.000	SS54A	1200		470096.073	171905.338	470096.073	171905.338	
S13.001	S S54 - TANK	1200		470096.073	171915.946	470096.073	171915.946	
S10.002	SS55	1200		470098.361	171915.926	470098.361	171915.926	
S14.000	SS56	1200		470087.532	171893.354	470087.532	171893.354	
S14.001	SS57	1200		470087.536	171904.363	470087.536	171904.363	
S15.000	SS58	1200		470100.963	171901.669	470100.963	171901.669	
S10.003	SS59	1800		470101.941	171904.477	470101.941	171904.477	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
S10.003	S	0		470108.797	171902.387	

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Area Summary for Storm Network 3 - Outfall 4 - Rev C

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
10.000	User	-	100	0.014	0.014	0.014
	User	-	100	0.014	0.014	0.028
10.001	User	-	100	0.012	0.012	0.012
	User	-	100	0.010	0.010	0.023
11.000	User	-	100	0.029	0.029	0.029
	User	-	100	0.016	0.016	0.045
11.001	User	-	100	0.014	0.014	0.014
	User	-	100	0.014	0.014	0.028
12.000	-	-	100	0.020	0.020	0.020
11.002	User	-	100	0.011	0.011	0.011
13.000	-	-	100	0.000	0.000	0.000
13.001	-	-	100	0.000	0.000	0.000
10.002	User	-	100	0.024	0.024	0.024
14.000	User	-	100	0.011	0.011	0.011
14.001	User	-	100	0.015	0.015	0.015
15.000	User	-	100	0.022	0.022	0.022
10.003	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.228	0.228	0.228

Free Flowing Outfall Details for Storm Network 3 - Outfall 4 - Rev C

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S10.003	S	44.316	40.903	0.000	0	0

Simulation Criteria for Storm Network 3 - Outfall 4 - Rev C

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	18.700	Storm Duration (mins)	30
Ratio R	0.400		

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Online Controls for Storm Network 3 - Outfall 4 - Rev C

Hydro-Brake® Optimum Manhole: SS59, DS/PN: S10.003, Volume (m³): 4.1

Unit Reference	MD-SHE-0136-8600-1000-8600
Design Head (m)	1.000
Design Flow (l/s)	8.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	136
Invert Level (m)	40.982
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	8.6
Flush-Flo™	0.299	8.6
Kick-Flo®	0.664	7.1
Mean Flow over Head Range	-	7.4

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.9	1.200	9.4	3.000	14.5	7.000	21.7
0.200	8.4	1.400	10.1	3.500	15.6	7.500	22.4
0.300	8.6	1.600	10.7	4.000	16.6	8.000	23.1
0.400	8.5	1.800	11.3	4.500	17.5	8.500	23.8
0.500	8.2	2.000	11.9	5.000	18.4	9.000	24.5
0.600	7.8	2.200	12.5	5.500	19.3	9.500	25.1
0.800	7.7	2.400	13.0	6.000	20.1		
1.000	8.6	2.600	13.5	6.500	20.9		

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Storage Structures for Storm Network 3 - Outfall 4 - Rev C

Cellular Storage Manhole: S S54 - TANK, DS/PN: S13.001

Invert Level (m) 41.100 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	90.0	0.0	0.810	0.0	0.0
0.800	90.0	0.0			

Porous Car Park Manhole: SS58, DS/PN: S15.000

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	12.0
Membrane Percolation (mm/hr)	1000	Length (m)	12.0
Max Percolation (l/s)	40.0	Slope (1:X)	200.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	41.150	Cap Volume Depth (m)	0.250

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 3 - Outfall 4 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S10.000	SS48	15 Winter	1	+0%			
S10.001	SS49	15 Winter	1	+0%			
S11.000	SS50	15 Winter	1	+0%	30/15 Summer	100/15 Summer	
S11.001	SS51	15 Winter	1	+0%			
S12.000	SS52	15 Winter	1	+0%			
S11.002	SS53	15 Winter	1	+0%			
S13.000	SS54A	15 Summer	1	+0%	100/15 Summer		
S13.001	S S54 - TANK	30 Winter	1	+0%	30/30 Winter		
S10.002	SS55	15 Winter	1	+0%	30/15 Summer		
S14.000	SS56	15 Winter	1	+0%	100/15 Winter		
S14.001	SS57	15 Winter	1	+0%	100/15 Summer		
S15.000	SS58	15 Winter	1	+0%	1/15 Winter		
S10.003	SS59	15 Winter	1	+0%	1/15 Summer		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm Network 3 - Outfall 4 - Rev C

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S10.000	SS48		43.920	-0.110	0.000	0.15			3.6
S10.001	SS49		43.400	-0.120	0.000	0.09			6.1
S11.000	SS50		43.864	-0.046	0.000	0.55			5.7
S11.001	SS51		42.911	-0.184	0.000	0.07			8.9
S12.000	SS52		42.489	-0.111	0.000	0.15			2.6
S11.002	SS53		42.210	-0.175	0.000	0.11			12.7
S13.000	SS54A		41.171	-0.225	0.000	0.00			0.0
S13.001	S S54 - TANK		41.149	-0.176	0.000	0.10		24	2.7
S10.002	SS55		41.256	-0.055	0.000	0.36			15.0
S14.000	SS56		41.631	-0.119	0.000	0.09			1.4
S14.001	SS57		41.523	-0.117	0.000	0.11			3.1
S15.000	SS58		41.236	0.011	0.000	0.28		6	7.6
S10.003	SS59		41.238	0.106	0.000	0.54			8.6

PN	US/MH Name	Status	Level Exceeded
S10.000	SS48	OK	
S10.001	SS49	OK	
S11.000	SS50	OK	4
S11.001	SS51	OK	
S12.000	SS52	OK	
S11.002	SS53	OK	
S13.000	SS54A	OK	
S13.001	S S54 - TANK	OK	
S10.002	SS55	OK	
S14.000	SS56	OK	
S14.001	SS57	OK	
S15.000	SS58	SURCHARGED	
S10.003	SS59	SURCHARGED	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 3 - Outfall 4 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S10.000	SS48	15 Winter	30	+0%			
S10.001	SS49	15 Winter	30	+0%			
S11.000	SS50	15 Winter	30	+0%	30/15 Summer	100/15 Summer	
S11.001	SS51	15 Winter	30	+0%			
S12.000	SS52	15 Winter	30	+0%			
S11.002	SS53	15 Winter	30	+0%			
S13.000	SS54A	30 Winter	30	+0%	100/15 Summer		
S13.001	S S54 - TANK	30 Winter	30	+0%	30/30 Winter		
S10.002	SS55	15 Winter	30	+0%	30/15 Summer		
S14.000	SS56	15 Winter	30	+0%	100/15 Winter		
S14.001	SS57	15 Winter	30	+0%	100/15 Summer		
S15.000	SS58	30 Winter	30	+0%	1/15 Winter		
S10.003	SS59	30 Winter	30	+0%	1/15 Summer		

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 3 - Outfall 4 - Rev C

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S10.000	SS48		43.944	-0.086	0.000	0.38			8.9
S10.001	SS49		43.420	-0.100	0.000	0.23			16.5
S11.000	SS50		44.103	0.193	0.000	1.11			11.6
S11.001	SS51		42.933	-0.162	0.000	0.17			20.4
S12.000	SS52		42.514	-0.086	0.000	0.37			6.3
S11.002	SS53		42.240	-0.145	0.000	0.27			30.2
S13.000	SS54A		41.332	-0.064	0.000	0.00			0.1
S13.001	S S54 - TANK		41.332	0.007	0.000	0.21			5.9
S10.002	SS55		41.384	0.073	0.000	0.59			24.4
S14.000	SS56		41.648	-0.102	0.000	0.22			3.5
S14.001	SS57		41.547	-0.093	0.000	0.31			8.7
S15.000	SS58		41.368	0.143	0.000	0.28		27	7.6
S10.003	SS59		41.367	0.235	0.000	0.54			8.6

PN	US/MH Name	Status	Level Exceeded
S10.000	SS48	OK	
S10.001	SS49	OK	
S11.000	SS50	SURCHARGED	4
S11.001	SS51	OK	
S12.000	SS52	OK	
S11.002	SS53	OK	
S13.000	SS54A	OK	
S13.001	S S54 - TANK	SURCHARGED	
S10.002	SS55	SURCHARGED	
S14.000	SS56	OK	
S14.001	SS57	OK	
S15.000	SS58	SURCHARGED	
S10.003	SS59	SURCHARGED	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 3 - Outfall 4 - Rev C

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 2
Number of Online Controls 1 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 18.700 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status ON
DVD Status ON
Inertia Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

WARNING: Half Drain Time has not been calculated as the structure is too full.

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S10.000	SS48	15 Winter	100	+40%			
S10.001	SS49	15 Winter	100	+40%			
S11.000	SS50	15 Winter	100	+40%	30/15 Summer	100/15 Summer	
S11.001	SS51	15 Winter	100	+40%			
S12.000	SS52	15 Winter	100	+40%			
S11.002	SS53	15 Winter	100	+40%			
S13.000	SS54A	60 Winter	100	+40%	100/15 Summer		
S13.001	S S54 - TANK	60 Winter	100	+40%	30/30 Winter		
S10.002	SS55	60 Winter	100	+40%	30/15 Summer		
S14.000	SS56	15 Winter	100	+40%	100/15 Winter		
S14.001	SS57	15 Winter	100	+40%	100/15 Summer		
S15.000	SS58	60 Winter	100	+40%	1/15 Winter		
S10.003	SS59	60 Winter	100	+40%	1/15 Summer		

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm Network 3 - Outfall 4 - Rev C

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)
S10.000	SS48		43.973	-0.057	0.000	0.68			16.1
S10.001	SS49		43.439	-0.081	0.000	0.43			29.9
S11.000	SS50		44.601	0.691	1.466	1.36			14.1
S11.001	SS51		42.949	-0.146	0.000	0.26			30.9
S12.000	SS52		42.542	-0.058	0.000	0.67			11.3
S11.002	SS53		42.265	-0.120	0.000	0.43			48.6
S13.000	SS54A		41.743	0.347	0.000	0.00			0.1
S13.001	S S54 - TANK		41.743	0.418	0.000	0.27			7.7
S10.002	SS55		41.746	0.435	0.000	0.43			17.8
S14.000	SS56		41.796	0.046	0.000	0.40			6.4
S14.001	SS57		41.778	0.138	0.000	0.54			15.3
S15.000	SS58		41.738	0.513	0.000	0.20			5.4
S10.003	SS59		41.738	0.606	0.000	0.54			8.6

PN	US/MH Name	Status	Level Exceeded
S10.000	SS48	OK	
S10.001	SS49	OK	
S11.000	SS50	FLOOD	4
S11.001	SS51	OK	
S12.000	SS52	OK	
S11.002	SS53	OK	
S13.000	SS54A	SURCHARGED	
S13.001	S S54 - TANK	SURCHARGED	
S10.002	SS55	SURCHARGED	
S14.000	SS56	SURCHARGED	
S14.001	SS57	SURCHARGED	
S15.000	SS58	FLOOD RISK	
S10.003	SS59	SURCHARGED	

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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)	0.200
Flow Per Person (l/per/day)	222.00	Maximum Backdrop Height (m)	1.500
Persons per House	3.00	Min Design Depth for Optimisation (m)	1.200
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 Soffits

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)	Section Type	Auto Design
F1.000	3.641	0.061	59.7	0.000	5	0.0	1.500	o	150	Pipe/Conduit	
F1.001	12.886	0.430	30.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.002	8.381	0.140	59.9	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.003	12.055	0.301	40.0	0.000	2	0.0	1.500	o	150	Pipe/Conduit	
F1.004	35.937	0.683	52.6	0.000	4	0.0	1.500	o	150	Pipe/Conduit	
F2.000	10.404	0.297	35.0	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F2.001	27.538	0.618	44.6	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.005	3.506	0.044	79.7	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.006	10.177	0.127	80.1	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.007	10.903	0.136	80.2	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.008	8.466	0.222	38.1	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.009	9.038	0.904	10.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.010	4.641	0.478	9.7	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.011	15.324	0.374	41.0	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.012	5.994	0.922	6.5	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F3.000	32.144	1.410	22.8	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F3.001	22.007	1.862	11.8	0.000	7	0.0	1.500	o	150	Pipe/Conduit	
F1.013	2.328	0.029	80.3	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.014	8.787	0.110	79.9	0.000	0	0.0	1.500	o	150	Pipe/Conduit	
F1.015	15.656	0.683	22.9	0.000	0	0.0	1.500	o	150	Pipe/Conduit	

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)
F1.000	47.400	0.000	0.0	5	0.0	12	0.36	1.14	20.1	0.2
F1.001	47.339	0.000	0.0	5	0.0	10	0.46	1.60	28.4	0.2
F1.002	46.909	0.000	0.0	5	0.0	12	0.36	1.13	20.0	0.2
F1.003	46.769	0.000	0.0	7	0.0	12	0.47	1.39	24.5	0.3
F1.004	46.468	0.000	0.0	11	0.0	16	0.49	1.21	21.4	0.5
F2.000	46.700	0.000	0.0	7	0.0	12	0.49	1.48	26.2	0.3
F2.001	46.403	0.000	0.0	7	0.0	13	0.45	1.31	23.2	0.3
F1.005	45.785	0.000	0.0	18	0.0	23	0.50	0.98	17.4	0.8
F1.006	45.741	0.000	0.0	18	0.0	23	0.50	0.98	17.3	0.8
F1.007	45.614	0.000	0.0	18	0.0	23	0.50	0.98	17.3	0.8
F1.008	45.478	0.000	0.0	18	0.0	19	0.64	1.42	25.1	0.8
F1.009	45.256	0.000	0.0	18	0.0	14	1.02	2.78	49.2	0.8
F1.010	44.352	0.000	0.0	18	0.0	14	1.03	2.82	49.9	0.8
F1.011	43.874	0.000	0.0	18	0.0	19	0.63	1.37	24.2	0.8
F1.012	43.500	0.000	0.0	18	0.0	13	1.17	3.45	61.0	0.8
F3.000	45.850	0.000	0.0	7	0.0	11	0.56	1.84	32.5	0.3
F3.001	44.440	0.000	0.0	14	0.0	13	0.89	2.56	45.2	0.6
F1.013	42.578	0.000	0.0	32	0.0	30	0.59	0.98	17.3	1.5
F1.014	42.549	0.000	0.0	32	0.0	30	0.59	0.98	17.3	1.5
F1.015	42.439	0.000	0.0	32	0.0	22	0.92	1.84	32.4	1.5

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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)
F1	49.086	1.686	Open Manhole	450	F1.000	47.400	150				
F2	48.780	1.441	Open Manhole	450	F1.001	47.339	150	F1.000	47.339	150	
F3	48.252	1.343	Open Manhole	450	F1.002	46.909	150	F1.001	46.909	150	
F4	48.190	1.421	Open Manhole	450	F1.003	46.769	150	F1.002	46.769	150	
F5	48.050	1.582	Open Manhole	450	F1.004	46.468	150	F1.003	46.468	150	
F6	48.230	1.530	Open Manhole	450	F2.000	46.700	150				
F7	48.000	1.597	Open Manhole	450	F2.001	46.403	150	F2.000	46.403	150	
F8	47.770	1.985	Open Manhole	450	F1.005	45.785	150	F1.004	45.785	150	
								F2.001	45.785	150	
F9	47.748	2.007	Open Manhole	450	F1.006	45.741	150	F1.005	45.741	150	
F10	47.521	1.907	Open Manhole	450	F1.007	45.614	150	F1.006	45.614	150	
F11	46.997	1.519	Open Manhole	450	F1.008	45.478	150	F1.007	45.478	150	
F12	46.626	1.370	Open Manhole	450	F1.009	45.256	150	F1.008	45.256	150	
F13	46.302	1.950	Open Manhole	450	F1.010	44.352	150	F1.009	44.352	150	
Fex	46.436	2.562	Open Manhole	450	F1.011	43.874	150	F1.010	43.874	150	
F14	45.972	2.472	Open Manhole	450	F1.012	43.500	150	F1.011	43.500	150	
F15	48.340	2.490	Open Manhole	450	F3.000	45.850	150				
F16	46.150	1.710	Open Manhole	450	F3.001	44.440	150	F3.000	44.440	150	
F17	45.972	3.394	Open Manhole	1200	F1.013	42.578	150	F1.012	42.578	150	
								F3.001	42.578	150	
F18	44.956	2.407	Open Manhole	1200	F1.014	42.549	150	F1.013	42.549	150	
F19	44.510	2.071	Open Manhole	450	F1.015	42.439	150	F1.014	42.439	150	
F	44.436	2.680	Open Manhole	0		OUTFALL		F1.015	41.756	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F1	470007.136	171987.721	470007.136	171987.721	Required	
F2	470008.056	171984.198	470008.056	171984.198	Required	
F3	470008.037	171971.312	470008.037	171971.312	Required	
F4	470008.025	171962.931	470008.025	171962.931	Required	
F5	470020.080	171963.023	470020.080	171963.023	Required	
F6	470053.875	172000.899	470053.875	172000.899	Required	
F7	470056.504	171990.832	470056.504	171990.832	Required	
F8	470056.017	171963.299	470056.017	171963.299	Required	
F9	470059.523	171963.326	470059.523	171963.326	Required	

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Manhole Schedules for Foul - Main

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
F10	470067.571	171969.554	470067.571	171969.554	Required	
F11	470078.474	171969.554	470078.474	171969.554	Required	
F12	470086.208	171966.111	470086.208	171966.111	Required	
F13	470095.246	171966.111	470095.246	171966.111	Required	
Fex	470097.183	171961.894	470097.183	171961.894	Required	
F14	470112.506	171961.947	470112.506	171961.947	Required	
F15	470105.062	172013.213	470105.062	172013.213	Required	
F16	470112.978	171982.059	470112.978	171982.059	Required	
F17	470118.375	171960.724	470118.375	171960.724	Required	
F18	470120.631	171961.294	470120.631	171961.294	Required	
F19	470122.786	171952.775	470122.786	171952.775	Required	
F	470137.212	171946.693			No Entry	

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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)
F1.000	o	150	F1	49.086	47.400	1.536	Open Manhole	450
F1.001	o	150	F2	48.780	47.339	1.291	Open Manhole	450
F1.002	o	150	F3	48.252	46.909	1.193	Open Manhole	450
F1.003	o	150	F4	48.190	46.769	1.271	Open Manhole	450
F1.004	o	150	F5	48.050	46.468	1.432	Open Manhole	450
F2.000	o	150	F6	48.230	46.700	1.380	Open Manhole	450
F2.001	o	150	F7	48.000	46.403	1.447	Open Manhole	450
F1.005	o	150	F8	47.770	45.785	1.835	Open Manhole	450
F1.006	o	150	F9	47.748	45.741	1.857	Open Manhole	450
F1.007	o	150	F10	47.521	45.614	1.757	Open Manhole	450
F1.008	o	150	F11	46.997	45.478	1.369	Open Manhole	450
F1.009	o	150	F12	46.626	45.256	1.220	Open Manhole	450
F1.010	o	150	F13	46.302	44.352	1.800	Open Manhole	450
F1.011	o	150	Fex	46.436	43.874	2.412	Open Manhole	450
F1.012	o	150	F14	45.972	43.500	2.322	Open Manhole	450
F3.000	o	150	F15	48.340	45.850	2.340	Open Manhole	450
F3.001	o	150	F16	46.150	44.440	1.560	Open Manhole	450
F1.013	o	150	F17	45.972	42.578	3.244	Open Manhole	1200
F1.014	o	150	F18	44.956	42.549	2.257	Open Manhole	1200
F1.015	o	150	F19	44.510	42.439	1.921	Open Manhole	450

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)
F1.000	3.641	59.7	F2	48.780	47.339	1.291	Open Manhole	450
F1.001	12.886	30.0	F3	48.252	46.909	1.193	Open Manhole	450
F1.002	8.381	59.9	F4	48.190	46.769	1.271	Open Manhole	450
F1.003	12.055	40.0	F5	48.050	46.468	1.432	Open Manhole	450
F1.004	35.937	52.6	F8	47.770	45.785	1.835	Open Manhole	450
F2.000	10.404	35.0	F7	48.000	46.403	1.447	Open Manhole	450
F2.001	27.538	44.6	F8	47.770	45.785	1.835	Open Manhole	450
F1.005	3.506	79.7	F9	47.748	45.741	1.857	Open Manhole	450
F1.006	10.177	80.1	F10	47.521	45.614	1.757	Open Manhole	450
F1.007	10.903	80.2	F11	46.997	45.478	1.369	Open Manhole	450
F1.008	8.466	38.1	F12	46.626	45.256	1.220	Open Manhole	450
F1.009	9.038	10.0	F13	46.302	44.352	1.800	Open Manhole	450
F1.010	4.641	9.7	Fex	46.436	43.874	2.412	Open Manhole	450
F1.011	15.324	41.0	F14	45.972	43.500	2.322	Open Manhole	450
F1.012	5.994	6.5	F17	45.972	42.578	3.244	Open Manhole	1200
F3.000	32.144	22.8	F16	46.150	44.440	1.560	Open Manhole	450
F3.001	22.007	11.8	F17	45.972	42.578	3.244	Open Manhole	1200
F1.013	2.328	80.3	F18	44.956	42.549	2.257	Open Manhole	1200
F1.014	8.787	79.9	F19	44.510	42.439	1.921	Open Manhole	450
F1.015	15.656	22.9	F	44.436	41.756	2.530	Open Manhole	0

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Setting Out Information - True Coordinates (Foul - Main)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
F1.000	F1	450		470007.136	171987.721	470007.136	171987.721	
F1.001	F2	450		470008.056	171984.198	470008.056	171984.198	
F1.002	F3	450		470008.037	171971.312	470008.037	171971.312	
F1.003	F4	450		470008.025	171962.931	470008.025	171962.931	
F1.004	F5	450		470020.080	171963.023	470020.080	171963.023	
F2.000	F6	450		470053.875	172000.899	470053.875	172000.899	
F2.001	F7	450		470056.504	171990.832	470056.504	171990.832	
F1.005	F8	450		470056.017	171963.299	470056.017	171963.299	
F1.006	F9	450		470059.523	171963.326	470059.523	171963.326	
F1.007	F10	450		470067.571	171969.554	470067.571	171969.554	
F1.008	F11	450		470078.474	171969.554	470078.474	171969.554	
F1.009	F12	450		470086.208	171966.111	470086.208	171966.111	
F1.010	F13	450		470095.246	171966.111	470095.246	171966.111	
F1.011	Fex	450		470097.183	171961.894	470097.183	171961.894	
F1.012	F14	450		470112.506	171961.947	470112.506	171961.947	
F3.000	F15	450		470105.062	172013.213	470105.062	172013.213	
F3.001	F16	450		470112.978	171982.059	470112.978	171982.059	
F1.013	F17	1200		470118.375	171960.724	470118.375	171960.724	
F1.014	F18	1200		470120.631	171961.294	470120.631	171961.294	

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Setting Out Information - True Coordinates (Foul - Main)

PN	USMH Name	Dia/Len (mm)	Width (mm)	US Easting (m)	US Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Layout (North)
F1.015	F19	450		470122.786	171952.775	470122.786	171952.775	

PN	DSMH Name	Dia/Len (mm)	Width (mm)	DS Easting (m)	DS Northing (m)	Layout (North)
F1.015	F	0		470137.212	171946.693	

Free Flowing 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)
F1.015	F	44.436	41.756	0.000	0	0

Simulation Criteria for Foul - Main

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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	Summer
Return Period (years)	0	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	0.000	Storm Duration (mins)	30
Ratio R	0.000		

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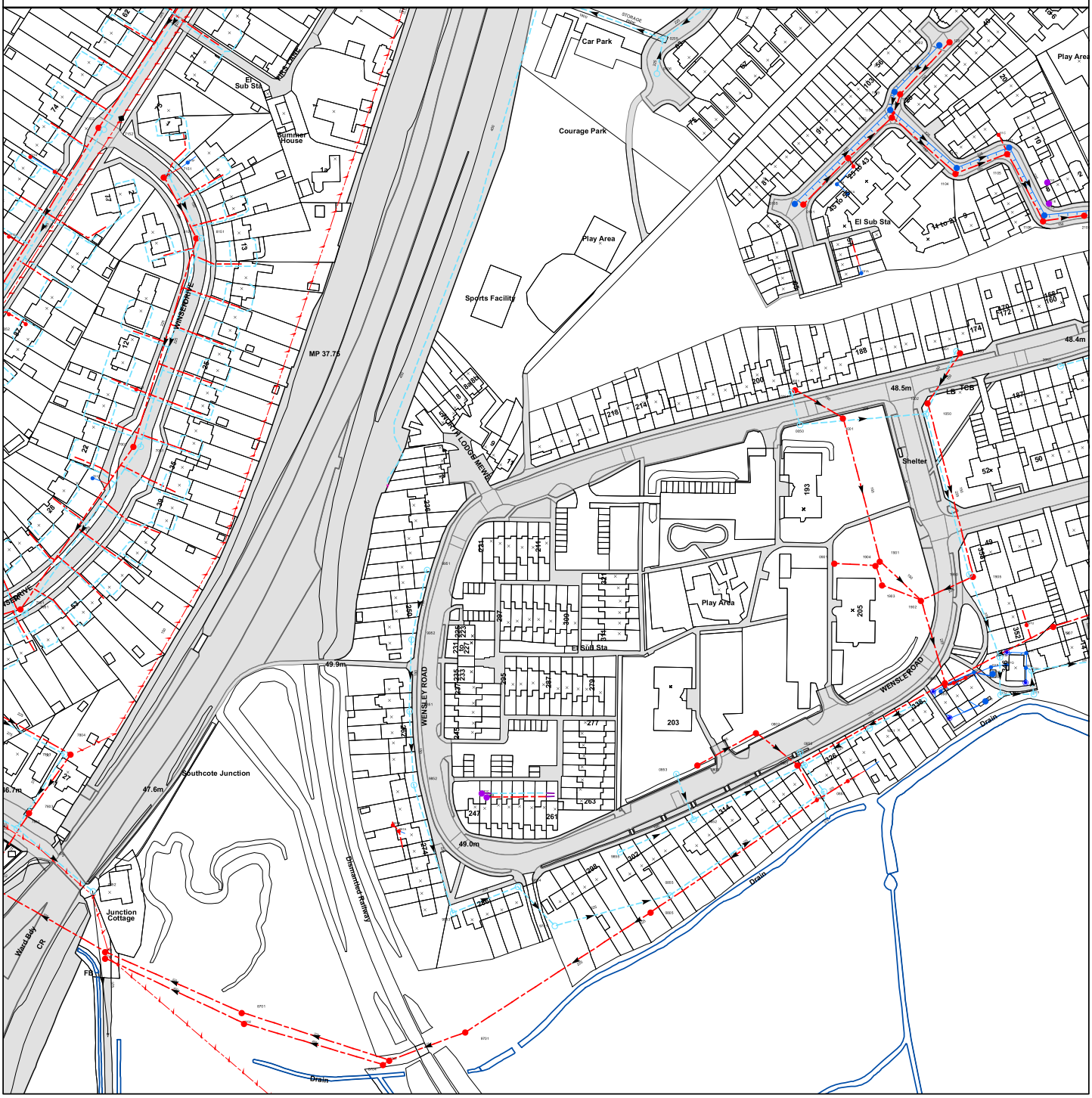
APPENDIX E: THAMES WATER SEWER RECORDS & CORRESPONDENCE

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2019_4124071



0 10 20 40 60 80 Meters

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

Scale:	1:1792
Width:	500m
Printed By:	G1KANAGA
Print Date:	09/12/2019
Map Centre:	469964,171968
Grid Reference:	SU6971NE

Comments:

ALS/ALS Standard/2019_4124071

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
8701	40.78	38.39
9952	49.49	
7051	53.3	51.52
7102	56.71	51.78
7853	48.16	
9854	47.62	
7151	56.35	54.89
9701		
9855	45.93	
8151	55.9	54.22
7951	49.03	47.33
2102		49.25
0801	41.94	39.91
0050		
1108		51.69
0855		
1106		49.71
1907		
1105		50.19
0852	43.57	
1850	41.42	40.81
1002	48.72	46.64
1051	49.37	46.92
1003	49.31	47.05
0851	41.86	40.08
1109		53.38
0106	55.72	54.13
1201		53.95
0805		
0105		52
1101		50.8
101A		
701A		
0205	55.8	52.19
8702	39.91	37.61
7701	40.02	38.15
8704	39.46	37.73
0803	45.32	42.8
1904	45.35	42.68
711A		
1905	44.4	
111A		
011A		
701D		
701C		
981B		
711E		
881A		
191O		
191Q		
191L		
191N		
191T		
191G	42	40.22
191I	41	39.9
111D		
0804		
7101	56.38	54.63

REFERENCE	COVER LEVEL	INVERT LEVEL
9851		
7001	53.31	51.22
7852		
7152	56.69	52.06
7804	48.12	
9951	50	48.31
7851		
9852	49.52	
8101	55.94	53.94
7901	49.02	47.09
9751	44.7	42.84
0001	49.57	47.5
0850	41.93	40.6
1851	41.7	40.4
0802		
0853	45.9	43.47
1112		50.37
2050	48.4	46.86
1111		51.38
1902	44.4	41.68
1050	48.53	46.17
1104		50.36
1110		51.5
0101		51
1102		50.61
1103		53.05
1202		54.14
1906	42.12	40.16
0051		
1001		
191U		
1901	45.33	43.54
9853	48.38	46.32
8703	39.48	37.81
7702	40.74	39.2
7803	46.89	42.97
701B		
0901	44.97	42.97
1903	44.54	42.38
711B		
1950	44.57	
111B		
0854		
111C		
181B		
981C		
881B		
191R		
191P		
191K		
191M		
191S		
181C		
191H	41.8	39.8
191J	41.85	40.07
111E		
711F		

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified before any works are undertaken. Crown copyright Reserved

NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
9851	n/a	n/a
9952	49.49	n/a
9951	50	48.31
0803	45.32	42.8
0802	n/a	n/a

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

JNP Group Consulting Engineers

Zaffar Sultan
The innovation Centre
Venture Court (Hub 2)
Queens Meadow Business Park
Hartlepool
TS25 5TG

Wastewater pre-planning
Our ref DS6090659

17 December 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Site: WENSLEY ROAD, READING, RG1 6DR

Dear Zaffar,

Thank you for providing information on your development.

Proposed site: *Demolition of 29 garages & re development to provide 46 new dwelling units (18 flats and 28 houses).*

Proposed foul water *discharge by gravity: -*

18 flats & 4 houses to 150mm foul water sewer manhole 0901.

14 houses to 225mm foul water sewer, manhole 0803.

Proposed surface water *discharge by gravity (4 outfalls total, with 1 outfall to soakaway and 3 outfalls proposed to public surface sewer (which discharges to watercourse):-*

5.3l/s to 150mm surface water sewer, manhole 0853

8.6l/s to 225mm surface water sewer, manhole 1851

4.7l/s to 225mm sewer water sewer, via new manhole between manholes 1050 & 1950

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

Provided your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in the adjacent foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 clause H3.3. Positive connection to a public surface water will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being;- 1st Soakaways; 2nd Watercourses; 3rd Sewer.

Where connection to the public sewerage network is still required to manage surface water flows we will accept these flows at a discharge rate in line with CIRIA's best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to the above rates, then Thames Water would not have any objections to your proposal.

Diversion

There are existing public sewers crossing the site. New buildings will need to be kept between 3 and 6.5m away from existing sewer depending on the size and depth of the sewer. Alternatively, it may be possible for sewers to be diverted around the new development. To review a diversion proposal, please submit this via a Section 185 Diversion application. On some occasions it may be possible to abandon existing public sewers, via a sewer divestment. Please contact us for further information on this process.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 0800 009 3921.

Yours sincerely,

James Kitching

Technical Co-ordinator – Sewer Connections
Mobile: 07747 647876
Office: 0800 009 3921

developer.services@thameswater.co.uk

Get advice on making your sewer connection correctly at connectright.org.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB
Find us online at developers.thameswater.co.uk

Zaffar Sultan

From: Cook, Darren <Darren.Cook@reading.gov.uk>
Sent: 13 December 2021 16:52
To: Zaffar Sultan
Cc: Colin Cook; John Doyle; Eddie Conlon; Gareth Stephenson; Ben Douglas; WensleyRoadUnitsReading; Inston, Daryn; Pickering, Helen
Subject: RE: Wensley Road, Reading - Levels & Drainage
Attachments: Technical Note 01 - TS Addendum.pdf; M43794-JNP-90-XX-DR-SK-7000 P02 Existing Impermeable Areas Plan.pdf; M43794-JNP-90-XX-DR-SK-7001 P03 Proposed Impermeable Areas Plan.pdf; M43794-JNP-90-XX-DR-C-2000 P02_S38 Arrangement Plan.pdf

OFFICIAL

Hi Zaffer,

Apologies for the delay in responding. I have gone through your points and provided responses in red for ease of reference.

- The proposed crossing points and re-located speed humps outside the site boundary will need to be included on a combined S278/38 plan. Accepted
- The loop road (road 2) will be tracked using a bus to ensure that it does not conflict when a car whilst turning around the sharp 90 degree bend. Please see the TS Addendum attached which provides the previously agreed tracking for the site.
- The steep 1in12 parking bay gradients are acceptable on road 2, which is in order to ensure an M4(2) levelled access achieved to the corner plot on Block B2. Accepted
- The parking bays located to the south of the site, which are connecting onto Wensley Road are going to remain as having 1in12 gradient to negate the use of a retaining wall. Accepted
- A written document is required to include the existing/proposed discharge rates, the maintenance plan and the proposed drainage design. Agreed
- The longitudinal gradients of the parking bays, roads and parking areas, which are steeper than 1in20 will be accepted, where we have constraints such as tie-ing into existing flat levels or providing m4(2) access to plots. Accepted
- The kerbing on road 2, which is located close above the maintenance plant will need be reviewed by JNP/Reading Highways to determine what deterrent is required to prevent a bus from mounting onto the footway. The restraint issue is to be reviewed by the applicant and proposals put forward for review by the Highway Authority.
- The proposed emergency access levels will need to be reviewed by yourself/environmental engineer for the no dig area to ensure that you are happy with these levels. The construction detail will need to be provided for that area, which will need to be reviewed by Highway and Natural Environment officers. At that point we can fully review whether vehicles overrunning this area would be acceptable or not. It is unlikely to be an issue given the other access points to this emergency route and the low frequency of vehicle movement.

I am happy with the proposed discharge rates below as they represent a reduction from the 1 in 1 year event, I am therefore happy for these to be used in an updated SuDs strategy required as part of condition 40.

- Outfall 3 - 5.3l/s - This is approximately 9l/s less than the current 1in1 year,15 minute Winter existing rate, which therefore is substantial betterment. This rate has been agreed with Thames Water previously.
- Outfall 4 - 8.6l/s - This is a 50% betterment compared to the existing 1in1 year,15 minute Winter rate which is 17.3 l/s.
- Outfall 5 (new) - New Connection - 4.7 l/s – This has been agreed with Thames Water previously.

I hope that the above is of use to you but if you have any questions please do not hesitate to contact me.

Kind regards,

Darren Cook
Transport Development Control Manager
Transport | Directorate for Economic Growth and Neighbourhood Services (DEGNS)

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Civic Offices
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From: Zaffar Sultan <Zaffar.Sultan@jnpgroup.co.uk>
Sent: 13 December 2021 11:54
To: Cook, Darren <Darren.Cook@reading.gov.uk>
Cc: Colin Cook <Colin.Cook@jnpgroup.co.uk>; John Doyle <JDoyle@frencon.co.uk>; Eddie Conlon <econlon@glenman.co.uk>; Gareth Stephenson <Gareth.Stephenson@jnpgroup.co.uk>; Ben Douglas <ben.douglas@jnpgroup.co.uk>; WensleyRoadUnitsReading <WensleyRoadUnitsReading@frencon.co.uk>
Subject: RE: Wensley Road, Reading - Levels & Drainage

OFFICIAL

Hi Darren,

Following my previous emails, please can you confirm the following regarding the Wensley Road site, so that we can progress the design:

- Confirm if all the outfall rates are now acceptable
- If the emergency access levels need lifting for the no dig area or if the current arrangement is ok.
- What specification of bus is required in order track the loop road (Road 2) bend.

Please note that I was supposed to be annual leave this week, but have come in today to try and get this resolved, so if you can respond today then I will pick it up from Tuesday next week.

I would appreciate if we can receive a response asap, so that there is no abortive works.

Kind Regards,

Zaffar Sultan
BEng (Hons)
Civil Engineer

JNP GROUP

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