Document 6.2

The West Midlands Rail Freight Interchange Order 201X
Technical Appendix 16.3 - Site Wide Surface Water Drainage Strategy
Regulation 5(2)(a)
Waldeck - July 2018

West Midlands Interchange

Four Ashes Ltd

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Contents

1. Executive Summary

1.1 This report establishes that the scheme has adequate infrastructure provision to support the development in terms of rate, volume and quality of surface water runoff. Should the development consent order be granted, details of the drainage for each individual plot will be agreed as the DCO requirements are discharged by the LPA, ensuring that each phase is constructed in accordance with the overall principles of this report and relevant policy.

2. Introduction

2.1 Waldeck Associates Limited has been appointed by Four Ashes Limited to undertake an assessment of the surface water drainage requirements for a new Strategic Rail Freight Interchange at the proposed development site at Four Ashes, Staffordshire. The assessment is to be in support of a Development Consent Order application for the proposed development, known as West Midlands Interchange.

2.2 The scope of this report is as follows:

1. Assess the existing hydrology and hydrogeology at the site to determine the hydraulic regime, identifying existing Greenfield and Brownfield catchments and confirming their outfall arrangements.

2. Calculate the existing Greenfield and Brownfield rates of runoff from the site.

3. Undertake an assessment of the proposed impermeable areas and the associated surface water discharge rates that will result from the development.

4. Develop a surface water drainage strategy for the whole of the development site which adheres to the current sustainable drainage (SuDS) best practise guidelines and complies with National Policy Statements and National Planning Policy Framework technical guidance.

3. Codes, Standards and Design Guides

3.1 The site wide surface water drainage strategy has been developed in accordance with the relevant British Standards, building regulations and design guidance, specifically:

- National Policy Statements by Government
- "National Planning Policy Framework" by the Department for Communities and Local Government
- "Technical Guidance to the National Planning Policy Framework" by the Department for Communities and Local Government
- "Preliminary rainfall runoff management for new developments" by the Environment Agency/ DEFRA
- "Delivering Sustainable Drainage Systems" consultation document by the Department for Communities and Local Government/DEFRA
- "C753 The SuDS Manual" by Ciria
- "BRE Digest 365: Soakaway Design"
- "Staffordshire Local Flood Risk Management Strategy" December 2015
- "River Basin District Management Plan - Humber River Basin District" by the Environment Agency/ DEFRA
- The Building Regulations (Document H)
- Flood Estimation Handbook (FEH)

4. Development Site

4.1 Site Location and Description

4.1.1 The site is situated in south Staffordshire approximately ten kilometres (10km) to the north of Wolverhampton city centre and adjacent to the village of Four Ashes. The approximate centre of the site can be located at National Grid Reference 391880E, 309600N.

4.1.2 The whole site covers an area of approximately 297 Hectares. After the proposed development, the SRFI would comprise a rail freight terminal, approximately eight million sq. ft. warehouses and office developments, along with the associated infrastructure including access roads and bridges.

4.1.3 The site is situated in a rural area, has an irregular shaped outline and is mainly occupied by arable farmland. A quarry (Calf Heath quarry) and a wood (Calf Heath wood) are also located within the proposed development site boundary. The proposed development site and surrounding area comprise predominantly gently undulating countryside. The northern site boundary is marked by the A5 (Watling Street) and the western boundary by the A449 (Stafford Road), the village of Gailey is located at the A5/A449 junction at the western corner of the site. The River Penk flows from south to north approximately 1.5km west of the site. Calf Health Reservoir and the M6 motorway (Junction 12) are sited adjacent to the north eastern corner of the site, and Vicarage Road crosses the site, south of which is an area of the proposed development which runs up to the Staffordshire and Worcester canal and Calf Heath Village with an irregular boundary. The village of Four Ashes is located next to the southern corner of the proposed development site, to the north of which is an industrial estate and chemical works complex.

4.1.4 The West Coast Mainline Railway runs north/south in a cutting through the site between Gailey and Four Ashes. The Staffordshire and Worcestershire Canal meanders through the site from a point approximately midway along the northern boundary next to Croft Lane, past the chemical works to Four Ashes and beyond. A towpath is present on the western side of the canal. Midway along the western site boundary is a road known as Gravelly Way, off the A449, which is aligned west/east and passes over the railway line and canal (Gravelly Way Bridge). Gravelly Way provides access between the A449, and the chemical works and other industrial premises.

4.1.5 Calf Health Wood is situated towards the middle of the site and the quarry is located in the north eastern part of the site, to the north east of the wood.

4.1.6 Figure 4-1 shows a red line around the perimeter of the greater proposed development site area.

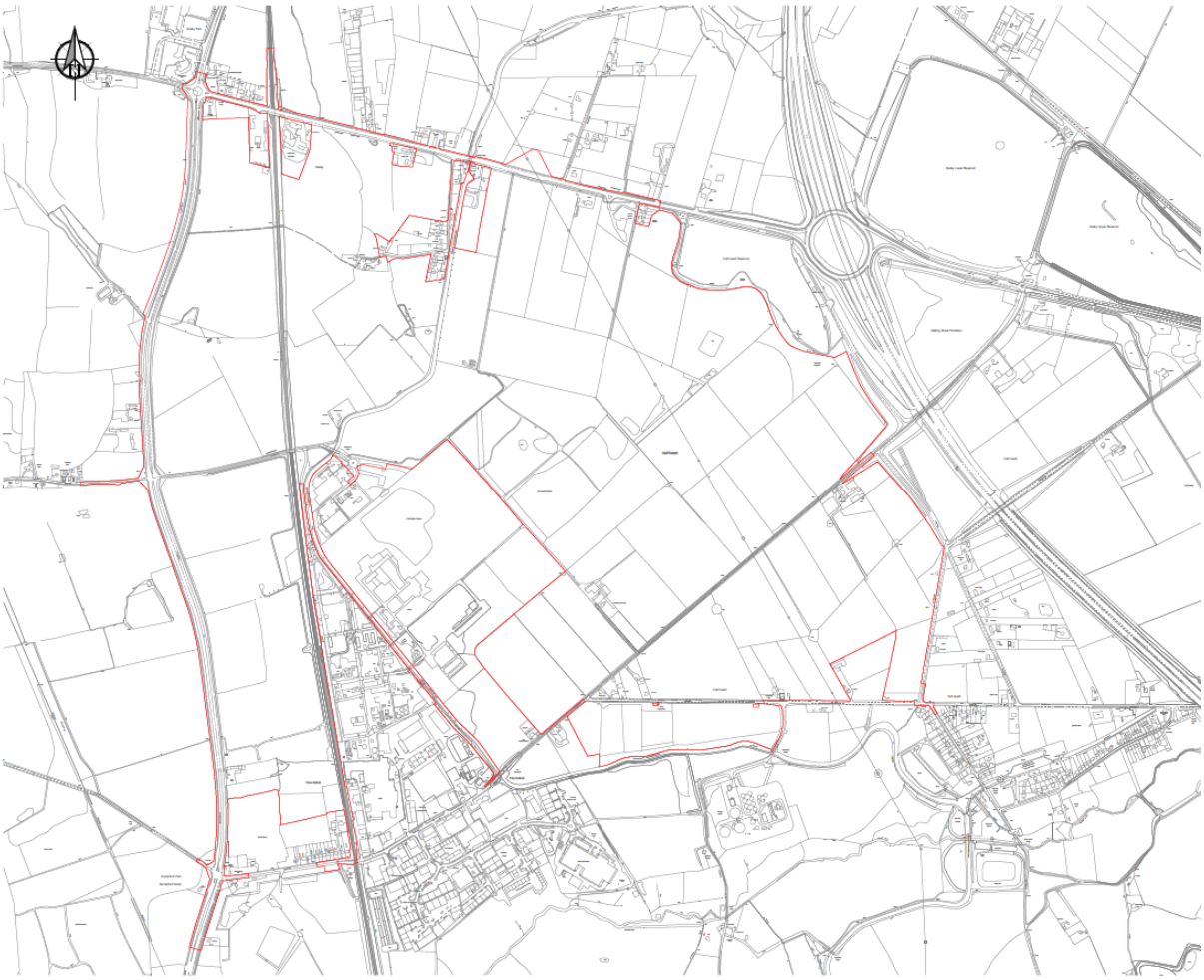


Figure 4-1: Site Location Map

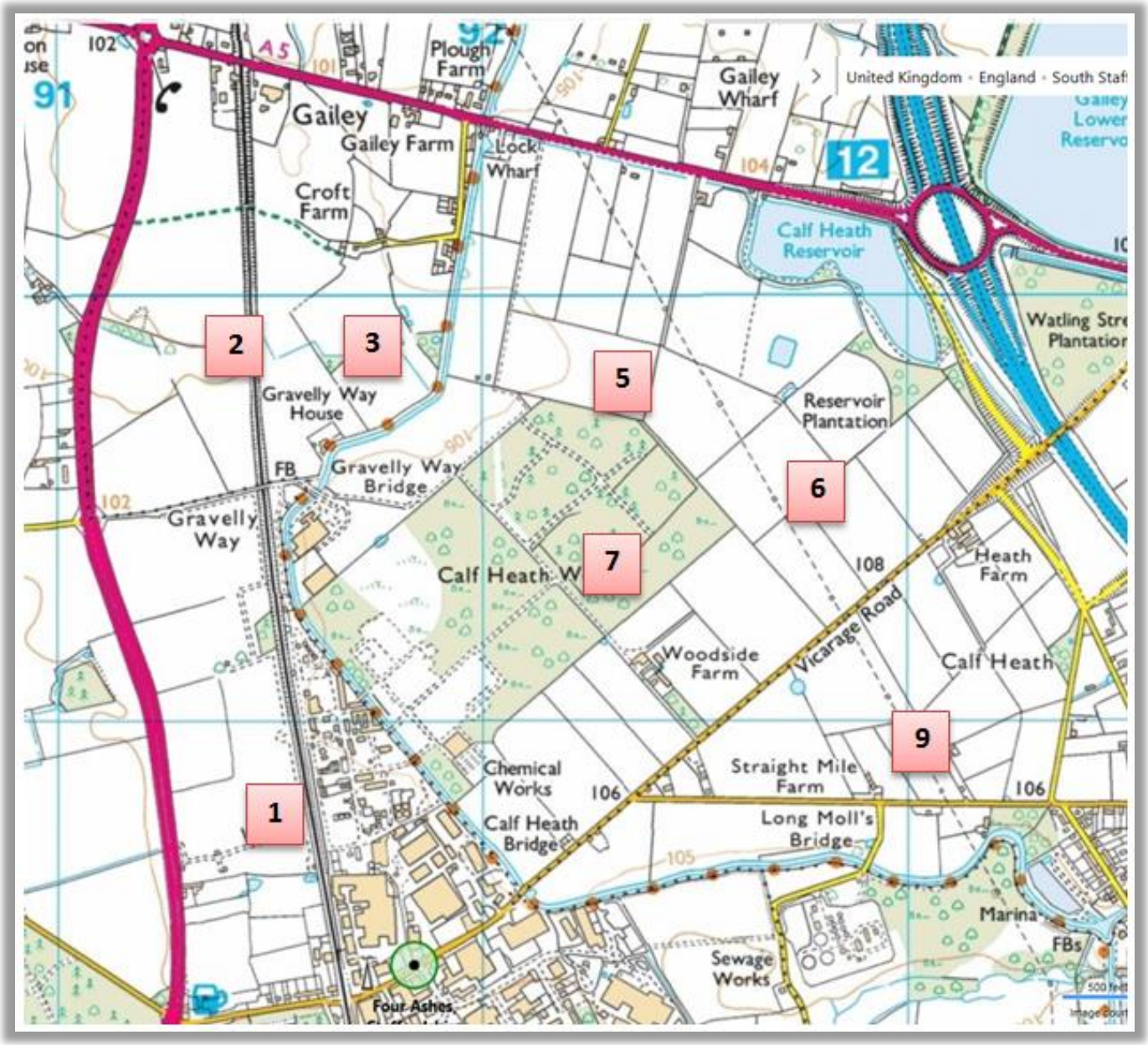


Figure 4-2: Ordnance Survey Site Map

4.2 Topography

4.2.1 Site topographical survey shows a reasonably level site with general shallow falls from north east to west and from south to south east. The topography across the site is described below with reference to Figure 4-2.

4.2.1.1 The region to the west of the West Coast Mainline, south of Gravelly Way and east of the A449 recorded levels of approximately 103.5m along almost the entire length of the eastern boundary. The region generally falls from the east to the North West and to the south west to recorded levels of around 97.5m and 100m respectively. Peak levels are recorded within the central zone of the region, ranging from 103.5m to the east to 102.9m to the west.

4.2.1.2 Within the region to the west of the West Coast Mainline, north of Gravelly Way and east of the A449, levels within the range of 103.2m to 102.7m were recorded to the north east and north west respectively with recorded levels in the range of 103.2m and 101.9m to the south east and south west respectively. The levels then generally fall towards a watercourse running east to west through the centre of the site region with the levels recorded to the east in the range of 100.5m to 99.2m. The lowest levels within this region are towards the west at the watercourse outfall with levels in this area around 97-99m. The levels over the vast majority of the site region are within the range of 102.5m and 101.5m.

4.2.1.3 To the east of the West Coast mainline, south of the A5 (Watling Street) and to the west of the Staffordshire and Worcestershire canal levels are generally within the range of 102-104m with peak levels of 105.5m being recorded to the north east of the region and the lowest levels in the central western area, where the levels generally fall to around 99.7m.

4.2.1.4 The Staffordshire and Worcestershire Canal itself has a consistent tow path level of approximately 104.6m and approximate bed level of 103.0m between Calf Heath Lock, south east of the development site, and Gailey Lock, where the canal passes below the A5.

4.2.1.5 The area to the north/west of Calf Heath Wood, east of the Staffordshire and Worcestershire canal and south of the A5 (Watling Street) is generally very flat with a slight slope from the east down to the south west corner with peak levels to the east of 107-108m and levels of around 104m recorded to the south west.

4.2.1.6 Levels within the region of the Calf Heath Quarry generally fall within the range of 106-108m with peaks of 114m in areas where material has been stockpiled and troughs of 103-104m where excavation has been carried out.

4.2.1.7 Within Calf Heath Wood levels were taken along the central footpath and along waterways through the wood which were generally in the region of 105.5-106.5m. To the north and east of the wood levels are indicated around 105-106m and to the south and west levels are in the range of 106-107m.

4.2.1.8 Within the region to the south of Calf Heath Wood and Quarry and north of Vicarage Road levels across the central 2/3rds of the site are in the region of 107-108m, the region then falls away to the north east down to levels of 106.5m and down to levels of 105m in the south west.

4.2.1.9 The topographical survey has confirmed that the land south of Vicarage Road ranges between 108.5m in the north east and 103.7m at the south west, adjacent and slightly below the Staffordshire and Worcestershire Canal. The majority of this area is notionally flat at approximately 107.0m with a notional fall from NE to SW, the gradient increases in closer proximity to the canal. Lower lying areas are generally coincident with densely wooded areas.

4.3 Ground Conditions

4.3.1 Waldeck Consulting carried out a phase 1 desktop study and a phase 2 intrusive geotechnical survey in order to provide a geotechnical risk assessment of the proposed development site, to determine the ground conditions beneath the site and provide geotechnical recommendations in relation to the proposed development.

4.3.2 The ground investigation included rotary cored boreholes, cable percussion windowless sampling boreholes, machine excavated trial pits, cone penetration tests and percolation (soakage) tests.

4.3.3 The area covered by the geotechnical study is currently limited to the land which is north Vicarage Road. The area between Vicarage Road and the Staffordshire and Worcestershire Canal will be surveyed in due course but reference to the British Geological Survey 1:50,000 scale maps, the area is shown to be underlain by the Wildmoor Sandstone formation with superficial deposits formed of Glacial Till.

4.3.4 The following strata were revealed by the intrusive ground investigation:

- Topsoil

4.3.4.1 Topsoil was present at the majority of the exploratory hole positions. It comprised variably gravelly and silty sand or otherwise consisted of slightly gravelly, sandy silt or silty sandy clay. The topsoil otherwise contained occasional roots and rootlets. The gravel was composed of varying amounts of sandstone, quartzite and occasionally mudstone.

4.3.4.2 Topsoil depth varied across the site but generally ranged from 0.3m to 0.5m thick. In four locations its thickness varied between 0.2m and 0.25m. In one location a thickness of 0.8m was recorded.

- Made Ground

4.3.4.3 Made ground was relatively rare across the site. It generally comprised of mottled grey/brown, slightly clayey sand with sandstone and quartzite gravel with soft/firm sandy gravel below. In one instance broken brick was found within the sandy gravel strata. The top of made ground was discovered at varying depths between 0.2m to 1.0m below ground level and varied in thickness from 0.25m to 1.9m.

- Drift Deposits

➢ Alluvium

4.3.4.4 A strip of Alluvium associated with a tributary of the River Penk was found to be encroaching onto the site. It was found alongside the A449 approximately midway between Gravelly Way and Gailey along the route of the shallow valley. The Alluvium comprised of an upper layer of peaty sand and gravel followed by layers of dark brown, fibrous peat and a dark grey, sandy, gravely silt. It was discovered between the depths of 0.5m and 1.5m below ground level.

➢ Till

4.3.4.5 Glacial Till was discovered in approximately two thirds of the exploratory holes across the site. It comprised of firm/stiff, red/brown variably sandy and silty clay of low/intermediate plasticity with varying amounts of quartzite and sandstone gravel. The surface of Glacial Till was discovered at depths between 0.2m to 3.1m below Ground Level and varied in depth across the site from 0.3m to 5.85m thick.

➢ Glaciofluvial Deposits (sand and gravel)

4.3.4.6 The Glaciofluvial deposits were found in the majority of exploratory holes. They are generally comprised of medium to very dense, brown, grey-brown, orange-brown, or red brown, variably silty, fine to coarse sand with quartzite and sandstone, and occasionally mudstone gravel. The surface of the deposits were generally found at depths between 0.3m to 1.0m below Ground Level but occasionally at depths up to 1.8m and varied in thickness across the site from 0.3m to 4.65m.

- Solid (bedrock) Geology

➢ Wildmoor Sandstone Formation

4.3.4.7 The Wildmoor Sandstone formation was disclosed in most of the exploratory holes across the site, either below the Bromsgrove Sandstone

formation, or where this was absent below the drift deposits. In two locations, to the south of the site between Calf Heath Wood and Vicarage Road, it was found directly beneath the topsoil layer.

4.3.4.8 The top of Wildmoor Sandstone formation was found at depths between 1.4m to 8.8m below Ground Level and the base of sandstone was recorded to a depth of around 65m in a historical borehole log taken of the eastern end of Gravelly Way.

- Bromsgrove Sandstone Formation

4.3.4.9 The Bromsgrove Sandstone formation rests on the Wildmoor Sandstone formation and in the general area of the site in both formations dip gently towards the Northwest on the South Eastern flank of the Staffordshire Basin. The lower part of the formation includes pebbly sandstone which form the basal part of upward fining sedimentary cycles typically around 4m thick. In the north western corner of the site, the bedrock was typically weak to extremely weak, red-brown, occasionally grey/green, generally thinly laminated mudstone or occasional siltstone, with rare reduction spots. The mudstone generally retrieved was locally disintegrated including clay bound lithorelicts. Between the overlying drift deposits and the mudstone, there was a red/brown clay horizon which is considered to be mudstone. The surfaces were generally located at depths between 0.75m to 3.25m below Ground Level and varied in depth across the site from 1.5m to 6.85m thick.

4.3.5 Infiltration testing undertaken in accordance with BRE 365 guidance during the geotechnical investigations recorded slow infiltration rates in soakaway test pits across the site. Test pits generally encountered Glaciofluvial Deposits and occasionally Till which might suggest the suitability of infiltration drainage however rates were recorded between 4.1×10^{-7} and 2.8×10^{-5} m/s, with the better rate within the boundary of Calf Heath Quarry where the Glaciofluvial material is to be removed. The poor infiltration rates are considered to be due to the silt content within the soakage medium.

4.4 Hydrology

River Penk

4.4.1 The nearest river to the proposed development site is River Penk which rises in Tettenhall Wood, approximately three miles west-north-west of Wolverhampton. The Penk skirts around the western Wolverhampton suburbs of Tettenhall and Pendeford, joined by a number of streams from within Wolverhampton, as well as the Moat Brook, which drains Oaken, Codsall and Bilbrook.

4.4.2 The Penk passes through the village of Coven and then flows north, approximately 1.5km to the east of the proposed development site at approximately 85.0m AOD, to the market town of Penkridge, where it turns east and is joined by the Whiston Brook. Turning north again, it flows across the plain, past Acton Trussell, and into a marshy area, where numerous drains have been constructed and brooks canalised to contain flooding. Passing on to Baswich on the outskirts of Stafford, it joins the River Sow, which itself soon empties into the River Trent - a major river which will empty ultimately via the Humber into the North Sea.

4.4.3 The Penk is part of the Humber River Basin District.

Sarendon Brook

4.4.4 Saredon Brook drains the south of Cannock and the area around Cheslyn Hay and Great Wyrley, east and south east of the proposed development site. The Brook flows east to west to the south of Four Ashes Industrial Estate, collecting a series of drainage ditches, before passing below the West Coast Main Line and joining the River Penk just north of the village of Coven.

Staffordshire and Worcestershire Canal

4.4.5 The Staffordshire and Worcestershire Canal passes through the western part of the site from the A5 to the eastern end of Gravelly way and onwards alongside the chemical works and the Four Ashes Industrial Estate. After passing below Vicarage Road, the Canal turns east to the village of Calf Heath, where there is a commercial marina; it then runs southward, crossing Sarendon Brook, before joining the Shropshire Canal and running into Wolverhampton.

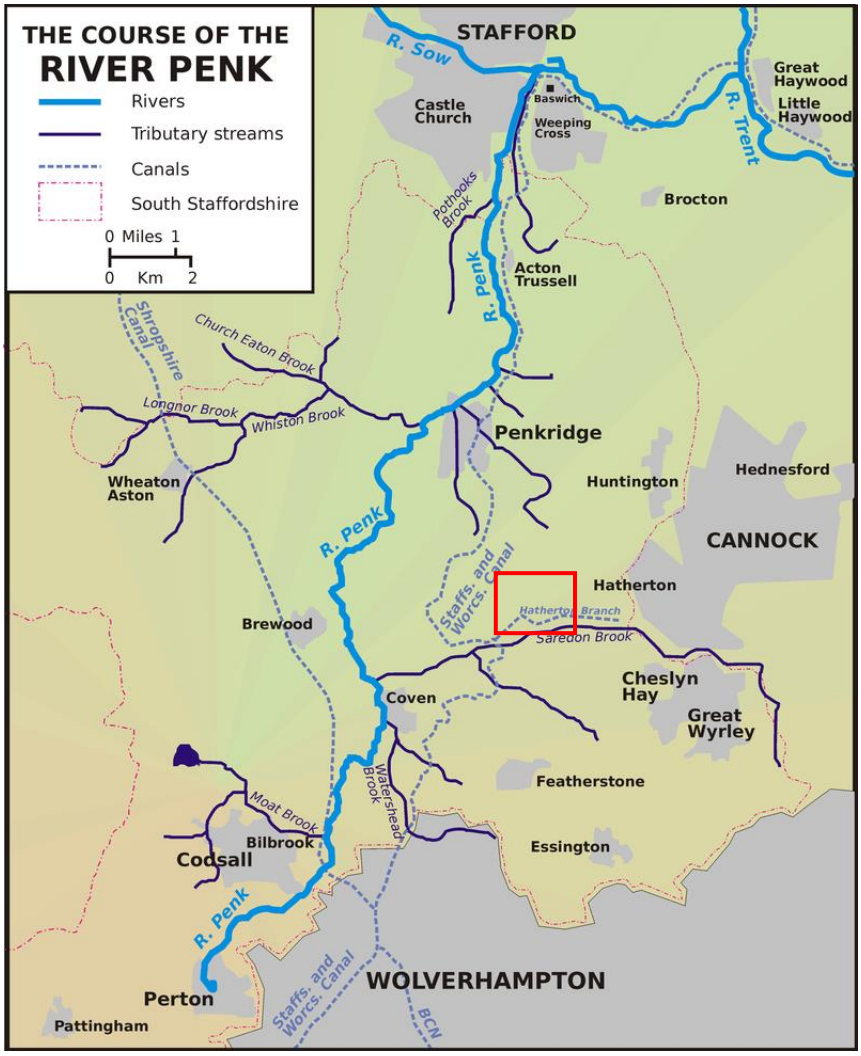


Figure 4-3: Map of River Penk and Tributaries with Approximate Site Location

Drainage Ditches

4.4.6 A total of eight separate catchments have been identified within the proposed development site which are identified on Waldeck drawing 1516-0425-WDK-01-SI-DR-D-310-006 Existing Site Drainage (Appendix A)

4.4.7 The catchment areas, conveyance routes and points of discharge have been assessed through consideration of the conceptual groundwater flow maps and topographical survey data along with analysis of the existing ditch routes and bed slopes.

- *Catchment 1*

4.4.8 A ditch tributary of the River Penk flows towards the northwest and exits the site at the A449 approximately midway between Gravelly Way and Gailey. A shallow valley crosses the north western part of the site from this point, below the railway, and terminates with a pipe inlet to the west of the canal, along what would appear to be the original route of the tributary.

4.4.9 On the eastern side of the railway the original route of the water course appears to have been altered to run in open ditches around the field boundaries. The topographical survey indicates that the eastern and western ditches are connected via a piped culvert which passes beneath the Staffordshire and Worcestershire Canal.

4.4.10 The ditch is culverted beneath the A449 and can be traced following field boundaries to the Penk approximately 1.5km from the site exit point.
Due to the natural topographical fall towards the west, a large area of the site proportioning approximately 32% of the overall area is estimated to drain into the River Penk tributary located at the north west of the site (Outfall A).

- *Catchment 2*

4.4.11 To the south of Gravelly Way, west of the West Coast Mainline and east of the A449, a network of ditches surrounds Ivytree Cottage. A pond located centrally within the southern quarter of this area also outfalls into the ditches which apparently convey water to the south western site boundary. The topographical survey and later visual inspections suggest that the ditches are culverted to the west of the A449 where the tributary can be followed along field boundaries, via Marsh Wood and Brantley Pool, to the River Penk.

4.4.12 The area south of Gravelly way, east of the A449 and west of the West Coast mainline measures 34.4ha and proportions approximately 12% of the overall site area (Outfall B).

- *Catchment 3*

  4.4.13 The western part of Croft lane and the arable land to the north and west is drained via an open ditch which conveys surface water north west, where it is culverted beneath the A5 before flowing north and discharging to the River Penk approximately 1.5km north west. Measures at 11.4ha, this catchment represents approximately 4% of the total proposed development site area.

- *Catchment 4*

  4.4.14 Calf Heath Reservoir, which dates from around the 1700's, is situated adjacent to the north eastern boundary of the site. An overflow from the reservoir is present at its North West corner which discharges via a 1.3m culvert to an open watercourse (spillway) which runs from east to west along the northern boundary adjacent the A5. The Reservoir is elevated above the development site with a cut off ditch at the embankment base which also outfalls to the spillway.

  4.4.15 The spillway is understood to discharge into the Staffordshire and Worcestershire Canal at Gailey Lock and is an essential part of the local infrastructure for regulating the reservoir level.

  4.4.16 To the west of the canal, between the Croft Lane residences and the A5, topographical information indicates a further area which contributes to the Staffordshire and Worcestershire Canal.

  4.4.17 Catchment 4 represents a total 19.9ha, 6% of the total site area.

- *Catchment 5*

  4.4.18 Calf Heath Quarry is located towards the east of the site and, at the time of writing, makes up around 7% of the total site area. The quarry is currently in operation and is constituted by a series of deep excavations, stockpiles and settlement ponds with the main plant area adjacent Calf Heath Wood. Some areas have been partly backfilled with the depth and quality of made ground expected to be variable.

  4.4.19 Topographical information indicates that, prior to the commencement of minerals extraction, this area would have drained via the network of land drainage ditches towards the River Penk Tributary which exits the site to the North West. It is considered that surface water generally collects in the low-

lying areas where it combines with groundwater and is slowly discharged through infiltration and evaporation.

- *Catchment 6*

  4.4.20 The areas towards the south east of the site below Calf Heath Quarry and Wood are less clear as to their point of discharge, the base levels of the ditches within the area directly beneath the Wood indicate that the lower portion of the area drains to a central enlarged ditch/storage area where the water apparently infiltrates into the groundwater system, albeit that the soakage tests in this area indicate low permeability rates. The ditches within the portion above seem to fall towards a point at the base of the Wood where it is assumed that surface water discharges into the undergrowth and disperses through a combination of infiltration and transpiration.

- *Catchment 7*

  4.4.21 The ditches within the area to the south and east of Calf Heath quarry are recorded as falling towards the north east area of dense woodland, where surface water apparently discharges into the undergrowth and disperses through a combination of infiltration and transpiration.

- *Catchment 8*

  4.4.22 A study of topographical data obtained for the site and observations from the site inspections indicate a natural fall towards the south and the canal. A ditch at the east of this catchment runs alongside Woodlands Lane before culverting beneath Straight Mile and contributing to the Staffordshire and Worcester Canal (Outfall C). A network of land drainage ditches is present at field perimeters, most of which contribute to the eastern ditch. Discreet ponds and wet woodlands are also present which are thought to aid discharge through infiltration and transpiration.

- *Catchment 9*

  4.4.23 The area is notionally flat with falls towards local land drainage ditches which apparently terminate in two ponds, the northwest one of which is within a densely wooded area. It is considered that surface water is discharged through a combination of infiltration and evapo-transpiration.

- *Catchment 10*

  4.4.24 The catchment is constituted by grassland which is separated into paddocks to the south of Straight Mile. The topographical survey recorded no drainage features in this catchment. The land falls from approximately 107.1m at the north towards Straight Mile road at approximately 106.0m and then

southward to approximately 104.0m in the dense woodland which borders the canal. The anal bank is approximately 104.4m. It is considered that surface water in this catchment infiltrates to ground with exceedance flows

4.5 Hydrogeology

4.5.1 The site geology is described above as generally being drift deposits overlying sandstone bedrock and is indicated in geological records as being located on a Secondary A Aquifer with the sandstone representing a Principal Aquifer.

4.5.2 Environment Agency information presented in accompanying documents indicates that there are 15 licenced abstraction points within 1km of the site with a further 8 within 2km.

4.5.3 The site is located within a Source Protection Zone (SPZ) as identified by EA (Figure 4-, below). Most of the site (approximately 85%) is within a total catchment (Zone 3) and the north western corner is within an outer zone (zone 2). Zone 3 is defined as ‘’the area around a source within which all groundwater recharge is presumed to be discharged at the source’’ (Zone 2) is defined by ‘’a 400 day travel time from point below the water table to the source’’.

4.5.4 Groundwater was encountered between the depths of 6.30m and 0.4m below ground level in the boreholes carried out in the site investigation, generally the groundwater was encountered between the depths of 2.0m and 4.0m below ground level with the encounters at a shallower level occurring in the regions of the tributary outfalls at the west and south west of the site. The deeper levels were encountered at points around the perimeter of the site to the north and east. The conceptual groundwater water model is shown on Waldeck drawing 1516-0425-WDK-SI-C-310-007 (Appendix C). This interpolates between groundwater strikes from borehole records and provides a conceptual model for the Secondary A Aquifer. The flow is generally from east to west, towards the River Penk, with Calf Heath Quarry providing some anomalous banding in the centre of the site.

4.5.5 On the EA Flood Map for Planning Purposes (Figure 4-4), the site and surrounding area were not shown to be located within a zone of Flooding (Zone 3) or Extreme Flooding (Zone 2) from rivers or sea without defences or within an area benefitting from flood defences. The nearest identified flood zone was along the Sarendon Brook approximately 0.5km south of the site.

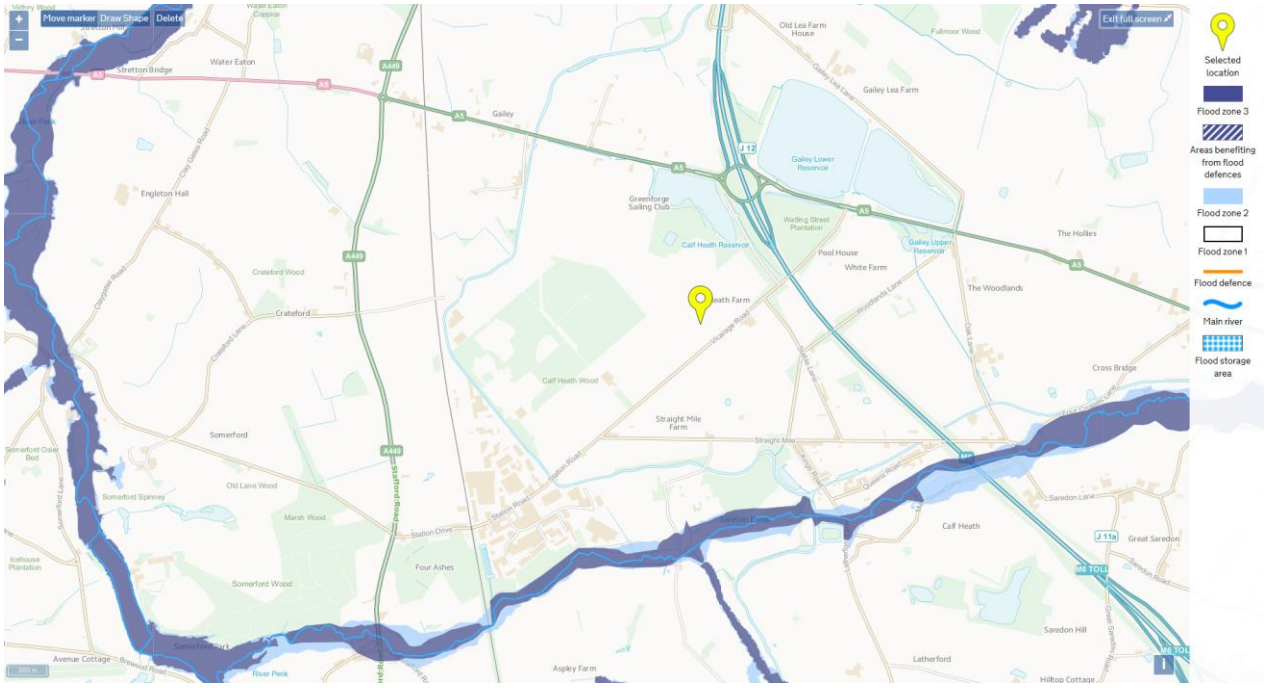


Figure 4-4: Flood Map for Planning (Rivers and Sea)

(flood-map-for-planning. service.gov.uk)

Figure 4-5: Groundwater source protection zones (Environment Agency)

5. Site Drainage

5.1 Existing Drainage Systems

5.1.1 Severn Trent sewer records have been obtained which show that there are no public surface water sewers in the vicinity of the site. Public foul sewers are present alongside the A449 and in Straight Mile road, transporting foul water from Gailey, Four Ashes and Calf Heath towards Four Ashes Sewage treatment works, which is operated by Severn Trent. The existing foul sewers are indicated on drawing 1516-0425-WDK-01-SI-DR-D-310-0006, Existing Site Drainage (Appendix A)

5.1.2 The West Coast Mainline which runs through the site at the western side falls below the ground water level south of the point where Gravelly Way Bridge crosses the railway; this is also within the vicinity of contaminated land which surrounds the chemical works. It is understood that surface and ground water is controlled through the use of a pumping system which maintains the groundwater below the cutting in this area. The water is pumped to the neighbouring chemical works for treatment before being discharged towards Sarendon Brook.

5.1.3 To the north of the Gravelly Way crossing and the pumped section, the West Coast mainline is understood to continue falling northwards. Surface and ground water is understood to fall with the railway to a point approximately 0.5km north of the site before discharging into the River Penk tributary adjacent to the A449 intersection.

5.1.4 In the area east of the A449, south of Gravelly Way, north of Station Road and west of the West Coast Mainline, it has been advised that the ground has been subject to contamination and a process of remediation is ongoing. The process includes the extraction of deep ground water via a network of boreholes; the water is pumped below the railway to the adjacent chemical works for treatment.

5.1.5 There are a small number of residential properties which are proposed to be demolished as part of the development. There are no recorded drainage systems in the vicinity of these properties and it is considered that surface water drainage is discharged via soakaways.

5.1.6 The area immediately to the north east of the existing Four Ashes industrial park, outside the development site boundary, is subject to an existing planning permission (ref. SS.16/00498 MCA) with its own FRA and associated drainage strategy. Upon implementation, it is understood that the surface water drainage is to be discharged into the Staffordshire and Worcestershire Canal under agreement with the Canal and Rivers Trust at a rate equivalent to the Qbar greenfield rate.

6. Site Wide Surface Water Drainage Strategy

6.1 Sustainable Drainage Principles

6.1.1 The independent review into the causes of the widespread major flooding in 2007 (The Pitt Review) concluded Sustainable Drainage Systems (commonly known as SuDS) were an effective way to reduce the risk of 'flash-flooding' which occurs when rainwater rapidly flows into the public sewerage and drainage system, causing overloading and back-up of water to the surface.

6.1.2 Following the Pitt Review, proposals to increase the uptake of sustainable drainage systems in new developments were included in the Flood and Water Management Act 2010. Schedule 3 to the Act introduces a regime for the approval and adoption of sustainable drainage systems for construction work which have drainage implications.

> *6.1.3 "…..The philosophy of Sustainable Drainage Systems (SuDS) is about maximising the benefits and minimising the negative impacts of surface water runoff from developed areas.*
>
> *The SuDS approach involves slowing down and reducing the quantity of surface water runoff from a developed area to manage downstream flood risk, and reducing the risk of that runoff causing pollution. This is achieved by harvesting, infiltrating, slowing, storing, conveying and treating runoff on site and, where possible, on the surface rather than underground. Water then becomes a much more visible and tangible part of the built environment, which can be enjoyed by everyone.*
>
> *By adopting this approach, SuDS have the opportunity to deliver and enhance the green space within developments and link to wider green networks, supporting the provision of habitats and places for wildlife to live and flourish. The benefits to the community of using SuDS are also numerous, including improvements in health, wellbeing and quality of life (liveability) for both individuals and communities, which in turn can increase the value of property and the prosperity of the local economy……"*
>
> *Ciria C573 The SuDS Manual – Para 1.1 (Extract)*

6.1.4 Ciria C753 provides criterion for the design, construction, maintenance and operation of sustainable drainage systems (SuDS) in accordance with paragraph 5 of Schedule 3 (National Standards) to the Flood and Water Management Act 2010 (the Act).

6.1.5 Table 2.1 below lists the 19 design criteria for Sustainable Drainage Systems.

TABLE 2.1 Design criteria for SuDS

	Design criteria	Further information
Water quantity	1 Use surface water runoff as a resource 2 Support the management of flood risk in the receiving catchment 3 Protect morphology and ecology in receiving surface waters 4 Preserve and protect natural hydrological systems on the site 5 Drain the site effectively 6 Manage on-site flood risk 7 Design system flexibility/adaptability to cope with future change	Chapter 3
Water quality	1 Support the management of water quality in the receiving surface waters and groundwaters 2 Design system resilience to cope with future change	Chapter 4
Amenity	1 Maximise multi-functionality 2 Enhance visual character 3 Deliver safe surface water management systems 4 Support development resilience/adaptability to future change 5 Maximise legibility 6 Support community environmental learning	Chapter 5
Biodiversity	1 Support and protect natural local habitats and species 2 Contribute to the delivery of local biodiversity objectives 3 Contribute to habitat connectivity 4 Create diverse, self-sustaining and resilient ecosystems	Chapter 6

Table 6-1: Ciria C573 The SuDS Manual - Table 2.1 (Extract)

6.1.6 The following sections will discuss how the quantity (Section 7) and quality (Section 8) can be managed within the proposed surface water system. Amenity and Biodiversity benefits are discussed in other accompanying documents and the interrelation of these criteria with the engineering requirements will be further developed for the full application.

7. Managing Quantity of Surface Water

7.1 In order to ensure that the surface water runoff from a developed site does not have a detrimental impact on people, property and the environment, it is important to control:

- How much runoff is discharged from the site (i.e. the runoff volume) and
- How fast the runoff is discharged from the site (i.e. the peak runoff rate).

7.2 Table 7.1 below elaborates on the 7 water quantity criteria and provides further guidance on how the criteria should be met by the SuDS design for a development:

TABLE 3.1 Water quantity design criteria and example indicators

Water quantity design criterion	Example indicator
1 Use surface water runoff as a resource	A proportion of runoff from rainfall events is harvested for use or infiltrated to support river baseflows and/or recharge groundwater.
2 Support the effective management of flood risk in the receiving catchment	Discharges to surface waters are prioritised over discharges to sewers. The rates and volumes of runoff for high return period events are controlled in accordance with the water quantity standards (Section 3.3).
3 Protect morphology and ecology in receiving surface waters	The rates and volumes of runoff for low return period events are controlled in accordance with the water quantity standards (Section 3.3).
4 Preserve and protect natural hydrological systems on the site	The natural hydrological drainage systems on the site are preserved or enhanced as part of the landscape and/or surface water management system.
5 Drain the site effectively	Runoff from all rainfall events infiltrates or drains through the SuDS within a suitable time, so that the performance of the system for managing runoff from subsequent rainfall events is not reduced.
6 Manage on-site flood risk	Runoff from rainfall events that exceeds the SuDS capacity is managed in identified exceedance routes and storage areas.
7 Design in system flexibility/ adaptability to cope with future change	The SuDS design includes climate change and urban creep allowances, or is designed with the flexibility (and funding) to be suitably adapted during its design life.

Table 7-1: Ciria C573 The SuDS Manual - Table 3.1 (Extract)

7.3 Using Runoff as a Resource

7.3.1 Rainwater Harvesting

7.3.1.1 Harvesting rainwater for re-use within the development is a possible means using runoff as a resource and is common practice in modern industrial developments. However, the nature of the B8 use category and the scale of the development is such that the water demand and consequent volumes of tanks will offer a negligible impact on the overall runoff quantity.

7.3.1.2 Due to the negligible benefit and as there is no legislative requirement for rainwater harvesting to be implemented by any of the end users, the volume reducing effects of rainwater harvesting have been ignored in this report.

7.3.2 Infiltration

7.3.2.1 At strategic level, infiltration has not been included in the development of the drainage strategy. Factors which may prevent its use across the site, include:

- Infiltration testing undertaken in accordance with BRE 365 guidance during the geotechnical investigations recorded slow infiltration rates between 4.1 x 10^{-7} and 2.8 x 10^{-5} m/s, with the better rate within the boundary of Calf Heath Quarry where the Glaciofluvial material is to be removed.

- An earthworks strategy has been developed for the scheme which includes significant excavation and replacement of material, thus creating areas of deep engineered made ground. Made ground and particularly stabilised material is unsuitable for infiltration drainage and, in the vicinity of structures, would create a risk of inundation settlement.

- The development site is also adjacent the Four Ashes Pit SSSI and is located within an EA Source Protection Zone meaning the base of any soakage pit must be a minimum of 2m above seasonally high ground water level. Furthermore, the viability of using SuDS structures to treat surface water runoff would be significantly reduced due to an increased risk of pollution of the underlying aquifers.

- Areas of shallow groundwater were recorded in the lower areas of the development site during geotechnical investigations. Furthermore, there are

existing ground water inundation issues associated with the West Coast Mainline. Significant infiltration drainage structures would have the potential to artificially charge the groundwater table and increase groundwater flood risk during periods of heavy rainfall.

7.3.2.2 It is therefore proposed at this stage that all SuDS structures are lined with impermeable medium, such as clay, and the effects of infiltration have been excluded in all of the hydrologic calculations.

7.3.2.3 South Staffordshire County Council SFRA Volume 2 reinforces this approach as it identifies the site as being an area of low to medium suitability for infiltration SuDS but high suitability for storage SuDS.

7.3.2.4 The possibility for incorporating infiltration within the drainage scheme can be revisited and assessed across isolated areas of the site during more detailed development of the drainage scheme.

7.4 Support the management of flood risk in the receiving catchment, and protect morphology and ecology in receiving surface waters

7.4.1 To ensure that the development does not have a detrimental impact on the downstream catchment (increasing flood risk or causing morphological or ecological damage) and protects the natural water cycle, designers should do each of the following (which are discussed below):

1) Prioritise where surface water runoff is discharged.
2) Control the volume of runoff discharged from the site.
3) Control the peak runoff rates from the site

7.5 Prioritising where surface water is discharged (SuDS Hierarchy)

7.5.1 Ciria C753 section 3.2.3 sets out the order of priority for establishing means of discharging surface water, otherwise described as the SuDS hierarchy. It is as follows:

1) Discharge into the ground (infiltration); or where not reasonably practicable,
2) Discharge to a surface water body; or where not reasonably practicable,
3) Discharge to a surface water sewer, highway drain, or another drainage system; or where not reasonably practicable,
4) Discharge to a combined sewer.

7.5.2 Section 7.3.2 above establishes that infiltration drainage is not a suitable means of discharging surface water from the development. It is therefore proposed to maintain the existing hydraulic regime as far as possible, discharging to the identified outfall points, as identified in section 3.4, whilst providing all storage within the common site infrastructure.

7.5.3 It is envisaged that the warehouse roofs will be drained discharged to buried pipe drainage networks, the yard areas will be drained via a mixture of linear drainage systems and gullies which will in turn discharge into the buried pipe systems.

7.5.4 It is proposed that the buried pipe systems will terminate at the plot boundaries and discharge freely into a conveyance swale wherever possible to convey the surface water run-off to an open water detention basin or balancing pond before the run-off is discharged to a receiving watercourse at the calculated Greenfield run-off rate for each outfall point.

7.5.5 The access roads running throughout the site will be drained via a combination of filter drains alongside the carriageway and gullies or kerb drains, prior to discharging at shallow depths into the adjacent swales and ditches.

7.5.6 The ditches and swales, in turn, outfall to detention basins located around the site where storm water is held and treated before being discharged to receiving watercourses.

7.5.2 Proposed Drainage Outfalls

7.5.2.1 A total of 3 existing outfalls have been identified as being suitable for use as discharge points from the developed site, all other investigated outfalls were deemed to be unfitting due to initial evidence indicating inadequate capacity or insufficient invert levels to receive the discharge from the attenuated site run-off via gravity.

7.5.2.2 Refer to which shows the proposed surface water drainage system and identifies the proposed outfalls.

7.5.2.3 The 3 outfall points are identified on drawing 1516-0425-WDK-SI-D-331-004 ‘Site Wide Surface Water Drainage Strategy’ (Appendix C) and are briefly described below (refer to Appendix E for site visit report on visual survey of proposed outfalls).

7.5.2.4 The existing catchments have been estimated for each of the identified outfalls to allow calculation of the existing flow rates to the watercourses; this conservative approach will ensure post-development discharges do not exceed that of the current natural watercourses. The estimated existing catchments are illustrated in drawing 1516-0425-WDK-SI-D-310-006 (Appendix A).

- *Outfall A*

  7.5.2.4.1 Tributary to the river Penk located to the west of the A449. Ditch approximately 1.6m depth x 0.5m wide at base x 1 in 2 gradient. Invert level approximately 96.50m

- *Outfall B*

  7.5.2.4.2 Out falling to a ditch network to the west of the A449. Apparently running towards Marsh Wood and Brantley Pool before contributing to the River Penk. Ditch approximately 1.5m depth x 0.5m wide at base x 1 in 2 gradient. Survey required to determine invert level but estimated at 98.0m

- *Outfall C*

  7.5.2.4.3 Ditch running alongside Woodlands Lane at eastern boundary of the land south of Vicarage Road. Flows beneath Straight Mile and contributes to Staffordshire and Worcestershire Canal. Approximately 1.2m depth x 3m wide at top. Invert level approximately 106.50m

- *Outfall D*

  7.5.2.4.4 Outfall D is proposed directly to the Staffordshire and Worcestershire Canal to the south of the proposed Straight Mile Community Park. The volume and rate of discharge proposed, and the detailed outfall arrangement, are to be agreed by the Canal and Rivers Trust through their Code of Practice application process.

Figure 7-2: Outfall A, Outfall B and Outfall C respectively. (Pictures taken via iPhone camera)

7.5.3 Controlling the volume of runoff from the site

7.5.3.1 The volume of runoff discharged from the site should be controlled for both frequent and extreme rainfall events by maximising opportunities to:

1. Use surface water runoff as a resource
2. Intercept and reduce runoff through evapotranspiration (e.g. using green roofs, trees or vegetated storage systems)
3. Intercept and reduce runoff through infiltration (e.g. using soakaways, bioretention systems, permeable pavements or infiltration basins).

7.5.3.2 Ciria 753 describes 2 approaches for a designer to manage runoff volume.

7.5.3.3 Approach 1 generally requires the volume reduction methods described above to ensure that there is no runoff from the site for the first 5mm depth of rainfall, this is considered to represent an equivalent volume for 'frequent' events and is referred to as 'interception'.

7.5.3.4 For extreme events, approach 1 requires the volume of water discharged from the site pre-development to be calculated for a 1 in 100 year + climate change event of 6 hour duration, taking into consideration the volumes discharged through infiltration, evaporation and evapo-transpiration. The same calculation should then be undertaken for the post-development site and any increase in volume should aim to be reduced using the three methods stated above.

7.5.3.5 Section 6.1 describes how it will not be possible at this site to satisfactorily reduce runoff volume using Approach 1, albeit that the vegetated storage systems proposed throughout the scheme will provide some benefit.

7.5.3.6 Approach 2 has therefore been adopted, which allows the discharge to be increased at greenfield rates for more onerous return periods and the additional runoff volume (i.e. the difference between the predicted development runoff volume and the estimated runoff volume for the 100 year event) to be discharge at a rate of 2 l/s/ha or less. This is considered appropriate given the scale of the development and the resultantly large discharge rates at the outfalls.

7.5.3.7 To mitigate the effects of the possible increase in volume of surface water run-off caused by the proposed development, a conservative approach has been taken which proposes to limit the site discharge for all return period storms up to the 1:100 year + climate change event to the Q_{BAR} Greenfield runoff rate.

7.5.3.8 This is in line with approach 2 in section 3.3.1 Water quantity standard 1: Control of runoff volume, part b) Volume control for extreme rainfall events of the Ciria 753 SuDS manual.

7.5.4 Controlling the rate of runoff from the site

7.5.4.1 With the exception of the small areas of residential development and existing infrastructure which are proposed to be demolished, the proposed development site is 'Greenfield'; therefore, the surface water discharge must be restricted to the equivalent Greenfield rate of runoff, in accordance with planning policy guidance.

7.5.4.2 It is proposed that the discharge into each outfall point will be restricted via the use of a flow control to limit the maximum discharge rate to the calculated rates of Greenfield runoff Q_{BAR} values for the relevant catchment areas.

7.5.4.3 Greenfield runoff rates have been calculated to determine the existing rate of discharge from each of the catchments to the receiving watercourse at the relevant outlet points. WinDes Microdrainage was utilised to carry out the calculations using the Institute of Hydrology (IoH) report 124, Flood Estimation for small catchments method.

7.5.4.4 The catchments for each outlet have been assessed in isolation, as they discharge into separate watercourses. Where catchments for an outfall are less than 50ha, the Q_{BAR} rate has been calculated as a proportion of the 50ha Q_{BAR} rate, in accordance with Environment Agency Report SC030219 'Rainfall runoff management for developments'. These are calculated by the MicroDrainage software (Appendix G).

7.5.4.5 The Q_{BAR} discharge rate for each proposed catchment is given in Table 7-3 along with the calculated Greenfield rates for 1, 30 and 100 year return period storms.

Outlet	Proposed ContributingArea (ha)	Q_{BAR} Total Catchment Discharge Rates				
		QBAR (l/s)	QBAR (l/s/ha)	Q1 (l/s)	Q30 (l/s)	Q100 (l/s)
A	105.33	222.5	4.11	193.2	456.0	598.13
B	20.62	80.5	4.39	65.5	154.6	202.8
C	12.52	55	4.39	44.7	105.5	138.3
D	13.80	61.3	4.39	49.2	116.25	152.5

Table 7-3: Q_{bar} Discharge Rates for the proposed contributing areas

7.5.4.6 The Q_{BAR} allowable discharge rate for outfalls A, B and C are based on the area of new development that falls within each of the relevant existing catchments, ensuring that capacity is retained for the remaining greenfield areas, thus the allowable rates are lower than those in table 7-3. The allowable discharge rate for Outlet D has been calculated as the Q_{BAR} 100 runoff rate for the total development area within the

catchment; the discharge is via a pumped outfall directly into the canal and is the subject of ongoing negotiation with the Canal and Rivers Trust.

7.5.4.7 The calculated rate of discharge to each of the respective outfalls is shown on the Q_{BAR} area plan in Appendix G and summarised in Table 7-4 below.

Outlet	Contributing area within existing catchment (ha)	Q_{BAR} Allowable Discharge Rates				
		QBAR (l/s/ha)	QBAR (l/s)	Q1 (l/s)	Q30 (l/s)	Q100 (l/s)
A	54.13	4.11	222.5	222.5	222.5	222.5
B	18.35	4.39	80.6	80.6	80.6	80.6
C	4.85	4.39	24.8	24.8	24.8	24.8
D	13.80	4.39	61.3	61.3	61.3	61.3

Table 7-4: Q_{bar} Allowable discharge rates at outlets

7.5.4.8 The site catchment areas have been assessed from drawing 4049-100 "Illustrative Masterplan". The catchment areas include all impermeable roof and yard areas as well as roads and open water elements of the drainage system such as detention basins and conveyance swales.

7.5.4.9 Calculations have been carried out to estimate the flow capacity of the existing outfalls at the point of discharge to ensure they have sufficient capability to receive the calculated flow rates from the developed site surface water runoff.

7.5.4.10 The calculations are included within Appendix F and indicate that the outfalls have sufficient capacity to receive the required discharge as shown in table 7-5 below.

Drainage Outfalls		
Outfall Reference	Capacity (l/s)	Proposed Discharge (l/s)
A	3,520	222.5
B	2,990	80.5
C	1,606	55.0
D	N/A	60.0

Table 7-5: Drainage Outfall Capacities

7.5.4.11 Individual rates may change depending on the development phasing and the final design, it is also considered that individual plots will require SUDS assessment at detailed design stage.

7.6 Preserve and protect natural hydrological systems on the site

7.6.1 Where natural systems that serve hydrological function are present on a site these should be preserved wherever possible, such as wetlands, streams and river corridors, long serving ditch systems and areas of high water table.

7.6.2 Section 7.2 describes how the existing hydrological regime is to be maintained as far as is practicable by mimicking the existing catchments and utilising the existing gravity outfall points for storm water.

7.6.3 Wherever possible the existing natural land drainage routes will be maintained or reinstated and where this is not possible the watercourses will be picked up within the new drainage system.

7.6.4 The existing reservoir spillway is to be retained by the development; it is understood that this is controlled by the Canal and Rivers Trust and provides a means of regulating the canal level. To allow construction of the new roundabout on the A5, the spillway is proposed to be culverted for a significant section, consultation with Highways England and the CRT will determine the specification of this structure.

7.6.5 The area of shallow wetland south of Croft Lane and west of the Staffs and Worcs Canal and its contributing ditch network is to be retained as part of Croft Lane Community Park and will be incorporated with the proposed Storage Lagoon to ensure that the supply of runoff is maintained.

7.6.6 It has been important during the design to ensure that the groundwater table is not artificially charged as the existing West Coast Mainline cutting in the vicinity of the Gravelly Way crossing runs below the groundwater table and is pumped; any increase in the groundwater table as a result of the development would exacerbate this issue.

7.6.7 Section 9.3 describes specific measures required to ensure that the Staffordshire and Worcestershire Canal is not adversely affected by the proposed inflow from catchment D.

7.7 Drain the site effectively

7.7.1 The surface water drainage network has been analysed using WinDes Microdrainage design software (Appendix H) with the purpose of demonstrating that it is feasible to meet the design parameters for the proposed drainage network within national policy parameters and the constraints of the proposed development site, such as those listed below:

- Depth and direction of drainage due to existing invert levels at outfall points around the site
- Maximum invert level at the point at which the network passes below the canal
- Maximum invert level at the point at which the network passes below the WCML
- Maximum invert level where the network crossed below Vicarage Road
- Target minimal excavation in the land west of the WCML and south of Gravelly Way due to an ongoing programme of remediation
- Minimum pipe gradients to achieve self-cleansing velocities
- Pipe and swale dimensions to accommodate design flows
- Requirements to retain areas of landscaping and protected trees across the site
- Limitations on above ground storage within open storage structures given plan and depth constraints across the site
- 1 in 1 annual probability events to drain adequately with no surcharging
- 1 in 30 annual probability events to drain satisfactorily with no on site flooding
- 1 in 100 annual probability events including climate change to drain satisfactorily with above ground 'flood' storage contained within the site
- Limitations to allowable on site flood storage of up to 50mm maximum depth in areas of secondary use such as car parks and service yards
- The systems have sufficient capacity to accept a 1 in 10 annual probability event 24 hours following a 1 in 100 annual probability event

7.7.2 The drainage network has been designed to satisfy the following criteria:

i. No surcharging during the most onerous 1 in 1 year return period storm
ii. No flooding during the most onerous 1 in 30 year return period storm.
iii. Flood water derived from the most onerous 1 in 100 year return period storm will be contained within the associated plot development boundary and will not exceed a depth of 50mm on open areas.

7.7.3 The analysis was carried out using the Flood Estimation Handbook (FEH) rainfall data with the following parameters:

- Volumetric Runoff Coefficient: 0.75 (summer); 0.84 (winter)
- Global time of entry: 4 minutes

7.8 Manage on site flood risk

7.8.1 All of the surface water attenuation is proposed to be provided above ground in the form of open water detention basins as indicated on Waldeck Drawing 1516-0425-WDK-SI-331-004 (Appendix C), the required volumes of attenuation have been determined in the MicroDrainage simulation software design model.

- *Outlet A Catchment*

  7.8.1.1 A series of detention basins with a storage capacity of approximately 57,500m³ is proposed within the area east of the West Coast Mainline and north of Gravelly (Croft Lane Community Park) which will serve to attenuate a large portion of the site which discharges to outfall A. Two further detention basins with a combined capacity of 3,500m³ are located in close proximity to the outfall in the area west of the WCML and north of Gravelly Way and will attenuate the run-off associated with plot 1030.

- *Outlet B Catchment*

  7.8.1.2 The run-off within the catchment discharging to outfall B will be attenuated in two detention basins, one located to the north which will be an 'online' system and attenuate and treat the runoff from plot 1020 and the associated car parks and hardstanding areas.

  7.8.1.3 The second detention basin is to be located to the south west and will attenuate the runoff from plot 1010, the rail and container terminal areas as well as the length of rail siding below Gravelly Way, this basin is required to be an 'offline' attenuation system owing to the site constraints in this area which preclude excavation into the virgin ground due to ongoing remediation. The two basins have a combined capacity of 4,150m³ with the balance of the storage provided in the buried pipe network and by controlled surcharging of the goods yards.

- *Outlet C Catchment*

  7.8.1.4 A series of open storage structures are proposed over the eastern area of Calf Heath Community Park, south of Vicarage road, to treat and attenuate the discharge into Outlet C. The basins and ponds are required to have a combined capacity of 6,875m³ to attenuate flow to the calculated Q_{BAR} greenfield rate.

- *Outlet D Catchment*

  7.8.1.5 A series of open storage structures are proposed over the western area of Calf Heath Community Park, to either side of Straight Mile, to treat and attenuate the discharge into Outlet D. The basins and ponds are required to have a combined capacity of 2,875m³ to attenuate flow to the calculated Q_{BAR} 100 rate.

7.8.2 Microdrainage hydraulic calculations can be found in Appendix H

7.9 Design in system flexibility/adaptability to cope with future change

7.9.1 National Planning Policy Framework (which details government requirements for the management and reduction of flood risk) requires the investigation of climate change on the proposed development and states that the storm intensity could be increased by up to 40% between 2070 and 2115 (section B9).

7.9.2 Due to the nature of the development, it is considered that the design life of the primary infrastructure could stretch beyond 2070 and therefore the on-site drainage design will ensure climate change of 40% is taken into account in accordance with table 2, below.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

Table 7-6: Technical Guidance to the National Planning Policy Framework, Table 2 (Extract)

7.9.3 Storage and conveyance structures have generally been designed as open SuDS features and as such, are inherently more adaptable than buried pipe and tank storage systems. This would allow for future redevelopment which might increase the impermeable area of the development.

8. Water Quality / Pollution Control

8.1 Methods for Managing Pollution Risks

8.1.1 An effective SuDS scheme provides treatment and pollution removal hand in hand with the systems employed to carry out conveyance and attenuation. The level of treatment required for surface water runoff is dependent on the risk posed from the runoff to the receiving environment. In order to establish the methods for effective pollution control the risk posed by surface water runoff to the receiving environment must be assessed as a function of:

- The pollution hazard at a particular site (i.e. the pollutant **source**)
- The effectiveness of SuDS treatment components in reducing levels of pollutants to environmentally acceptable levels, and/or the effectiveness of underlying soil layers in protecting the receiving groundwater (i.e. the pollutant **pathway**)
- The sensitivity of the receiving environment (i.e. the environmental **receptor**)

8.1.2 The CIRIA C753 SuDS Manual gives pollution hazard levels for specific land use within table 4.3 which is reproduced below. The hazard level for sites with lorry parks and lorry approaches to industrial estates is given as high, whilst the risk posed from non-residential roofs is given as low, therefore even though the percentage of $\frac{yards}{yards+roofs}$ is 40%, a treatment train is provided with 3 components in each catchment area as is the requirement for high risk land use.

Table 4.3	Minimum water quality management requirements for discharges to receiving surface waters and groundwater		
Land use	Pollution hazard level	Requirements for discharge to surface waters, including coasts and estuaries[2]	Requirements for discharge to groundwater
Residential roofs	Very low	Removal of *gross* solids and sediments only	
Individual property driveways, roofs (excluding residential), residential car parks, low traffic roads (e.g. cul de sacs, home zones general access roads) non-residential car parking with infrequent change (e.g. schools, offices)	Low	Simple index apprach[3] *Note: extra measures may be required for discharges to protected resources[1]*	
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk motorways	Medium	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]*	Simple index approach[3] *Note: extra measures may be required for discharges to protected resources[1]* In England and Wales, Risk Screening must be undertaken first to determine whether consultation with the environmental regulators is required.
Trunk roads and motorways	High	Follow the guidelines and risk assessment process set out in HA (2009)	
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored used or manufactured, industrial sites	High	Discharges may require an environmental licence or permit[3]. Obtain pre-permitting advice from the environmental regulator. Risk assessment is likely to be required[5.]	

8.1.3 As the proposed developments catchments pose a high risk to the receiving environment, different component types are required to remove a variety of pollutants.

8.1.4 A number of SuDS components used in sequence forms a SuDS Management Train for a robust pollutant removal strategy. Using a number of different SuDS components in series will help target a good range of particulate-bound and dissolved pollutants, will deliver gradual improvement in water quality and will act as a buffer for accidental spills and intermittent high pollutant loads. Run-off quality control will be in the form of gully pots, detention basins, bio retention systems and detention basins.

8.1.5 In order to deliver adequate treatment, the selected SuDS components have a total pollution mitigation index for each contaminant type that exceeds the pollution hazard index for each contaminant type.

8.1.6 Pollution hazard indices are presented in the table below (Table 26.2, CIRIA C753).

Table 26.2	Pollution hazard indices for different land use classifications			
Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	
Other roofs (typically commercial/industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (e.g. hospitals, retail), all roads except low traffic roads and trunk motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. haulage yards, lorry parks, highly frequented lorry approaches to industrial estate, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

8.1.7 Where the mitigation index of an individual component is insufficient, more structures are provided in the treatment train. Water quality calculations are contained in Appendix K of this report.

Table 26.3	Indicative SuDS mitigation indices for discharges to surface waters		
	Mitigation indices[1]		
Type of SuDS component	TSS	Metals	hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4[2]	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond[4]	0.7[3]	0.7	0.5
Wetland	0.8[3]	0.8	0.8
Proprietary treatment systems[5,6]	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

8.2 SuDS Management Train

8.2.1 The simple index approach has been used to assess the water quality in each treatment catchment as shown on drawing 1516-0425-WDK-SI-D-331-006 'Surface Water Treatment Catchments' (Appendix J). The results of the analysis show that a three stage treatment train is required to adequately mitigate the high pollution hazard level of the site.

8.2.2 The proposed treatment train involves the use of 3 separate treatment components in the form of a swale, attenuation basin and finally a pond. For the train to provide adequate treatment each component in the train must be proven to meet the required design criteria as specified in the SuDS manual. The principle criterion for assessment of the treatment components is specified below.

8.2.3 Swale:

- Longitudinal slopes are to be constrained to 0.5-6% (1in 200 to 1 in 17).
- Check dams are to be incorporated on slopes greater than 3% (1 in 33.33).
- Good pollutant removal required for all runoff events up to and including events which occur on average once a year (1 in 1 year event).
- Depth of flow to be maintained below the height of vegetation (i.e. usually <100mm).
- Mannings ''n'' value to be specified relative to the flow depth in relationship to the vegetative cover a 0.35 value is recommended for a depth of water below or equal to the height of the grass.
- Maximum flow velocity in the swale for such an event should be 0.3m/s to ensure adequate runoff filtration.

- The time of travel of runoff along the swale (residence time = length/velocity) should be at least 9 minutes (18 minutes from top of swale if swale has lateral inflows along its length).

8.2.4 Attenuation Basin:

- Base of a vegetated basin should be fairly flat with a gentle slope (no more than 1 in 100) towards the outlet.
- Good pollutant removal required for all runoff events up to and including events which occur on average once a year (1 in 1 year event).
- Depth of flow to be maintained below the height of vegetation (i.e. usually <100mm).
- The time of travel of runoff along the swale (residence time = length/velocity) should be at least 9 minutes (18 minutes from top of swale if swale has lateral inflows along its length).

8.2.5 Pond:

- Treatment provided by settling out fine silts and in ‘’final polishing of surface water runoff before discharge.
- Attenuation is provided above the permanent water level flow control at outfall controls discharge.
- Larger ponds should preferably be divided into zones – providing water quality and quantity volume storage in a number of independent cells. Increasing attenuation and longer pollutant removal pathways.
- Ratio of length to width to be at least 3:1 and ideally 4:1 or 5:1. Multiple inlets should follow this principle.
- Permanent depth should not exceed 2m. Normally should be a maximum of 1.2m.
- Maximum temporary storage depth of 0.5m usual for small to medium. Increased depths allowed for larger developments or where risk can be managed appropriately.
- Aquatic bench around edge with max depth of 0.4m.

8.2.6 A spreadsheet (appendix K) has been produced for treatment catchments 1 to 3, 6 and 7, to check that the drainage design meets the requirements of the SuDS treatment components. Catchments 4 and 5 do not allow for the implementation of

adequate SuDS treatment methods due to a combination of existing site conditions and layout/space constraints as described below.

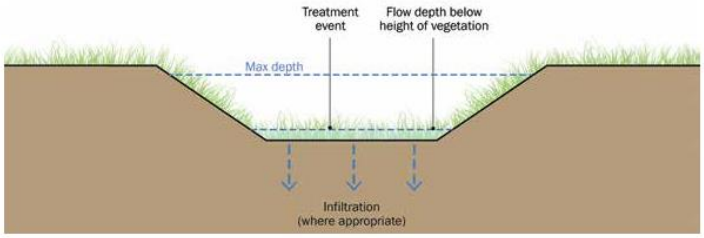
8.2.7 The results of the drainage design model have been checked for all storms durations in the 1 in 1 year return period for treatment components 1 and 2, to check they are within the criteria for design gradient, velocity and flow depth. The flow depth has been checked by using Q = V x A where, Q = Maximum flowrate, V = Velocity and A = area of flow. Component 3 is not checked due to the hydraulic results not being a requirement of the treatment design criteria.

8.2.8 Where the flows were too great to meet the required treatment criteria, upstream controls have been introduced to attenuate and slow the flow prior to entering the treatment component. These controls will only be active for return periods up to the 1 in 1 year requirement for treatment purposes and return periods above this will be unrestricted. In some instances it was found that flow depths could not be kept down to the usual height of vegetation (<100mm) due to restrictions on the swale base width, in these isolated instances vegetation is to be maintained at a greater height to meet the required flow depth.

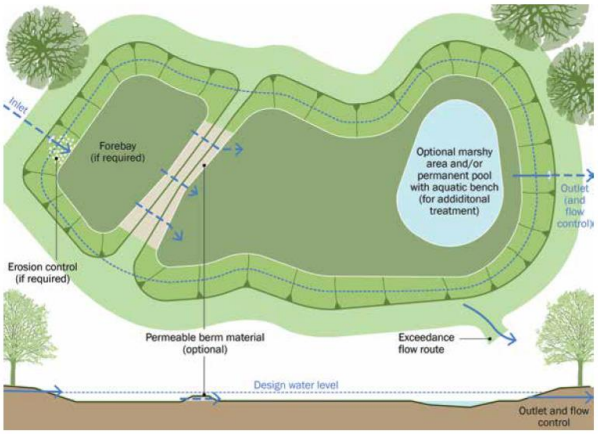
Treatment Catchments 1, 2 and 3

8.2.9 Treatment catchments 1, 2 and 3 make up the majority of the central site area and contain plots 2010, 3020, 3030 and 4010 to 4040; surface water runoff from the external permeable catchment areas will be drained via local gullies and linear drainage systems with silt traps prior to joining roof water runoff and discharging into a conveyance system. For catchment 1 this will be in the form of a series of ditches running along the site access road, although these are not included within the treatment train assessment due to not meeting the required criteria, it is anticipated some cursory treatment will be provided prior to entering the main treatment components. The flow from catchment one has been controlled and attenuated for the 1 year return period within the conveyance ditches to reduce the flow prior to discharge into the treatment components. Runoff from catchments 2 and 3 will be conveyed via buried drainage pipes into the 1st treatment component.

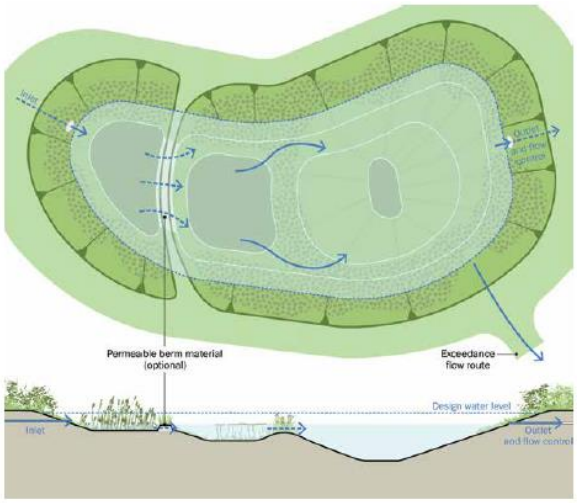
8.2.10 The first treatment component will take the form of individual conveyance swales which will serve catchments 1, 2 and 3 in isolation, secondary treatment will be in the form of a large attenuation basin which will serve all 3 catchments and finally a pond will complete the treatment by settling out fine silts and in provide final polishing of surface water runoff prior to discharge.



Typical conveyance/attenuation swale



Plan and elevation of vegetated detention basin



Plan view and profile of pond details

Figure 8-1: Proposed Treatment Train for Catchment s 1-3

8.2.11 The assessment of the treatment components for catchments 1, 2 and 3 is shown in the table below. The pipe reference number directly references the microdrainage model and can be referenced back to the results output from the 1 in 1 year return period treatment assessment results output in the appendix.

Catchment 1	Value	Units														
Area	72.465	Ha														
Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m^2)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m^2)	Flow Depth (m)	Area (m^2)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	1.023	100.48	641,590	64.159	0.5	307	0.1	101.676	3.07	0.102	3.02	30	30.4	0.1	Ok
Swale	1	1.024	100.33	645,450	64.545	0.5	319	0.1	100.314	3.19	0.106	3.02	30	30.4	0.1	Ok
Swale	1	1.028	99.064	743,450	74.345	0.5	609	0.1	99.249	6.09	0.101	6.02	60	60.4	0.1	Ok

Catchment 2	Value	Units														
Area	5.174	Ha														
Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m^2)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m^2)	Flow Depth (m)	Area (m^2)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	15.007	101.78	67,530	6.753	0.5	406	0.1	102	4.06	0.201	2.02	20	20.4	0.1	Longer Grass
Swale	1	15.009	100.91	72,580	7.258	0.5	250	0.1	101.179	2.5	0.245	1.02	10	10.4	0.1	Not Usable
Swale	1	1.028	99.064	743,450	74.345	0.5	609	0.1	99.249	6.09	0.101	6.02	60	60.4	0.1	Ok

Catchment 3	Value	Units														
Area	10.1916	Ha														
Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m^2)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m^2)	Flow Depth (m)	Area (m^2)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	16.008	98.771	42860	4.286	0.5	195	0.1	99.468	1.95	0.128	1.52	15	15.4	0.1	Ok
Swale	1	17.005	99.768	20620	2.062	0.5	179	0.1	99.355	1.79	0.089	2.02	20	20.4	0.1	Ok
Swale	1	18.006	99.046	39340	3.934	0.5	206.1	0.1	99.356	2.061	0.102	2.02	20	20.4	0.1	Ok

Combined 1, 2 & 3																
Basin	2	1.029	98.63	864070	86.407	0.5	500	0.1	99.02	5	0.100	5.02	50	50.4	0.1	Ok

Figure 8-2: Catchment 1, 2 and 3 treatment assessment

Treatment Catchment 4

8.2.12 Treatment catchment 4 is located towards the north-west of the site and contains plots 1030 and 1040; space is limited within this catchment for implementation of treatment components, therefore a more traditional approach to pollution control has been taken.

8.2.13 The use of full retention interceptors is proposed prior to the discharge into the open storage detention basins. With the use of interceptors the stages of treatment can be reduced from three to two and the necessary protection of the receiving watercourses will be achieved.

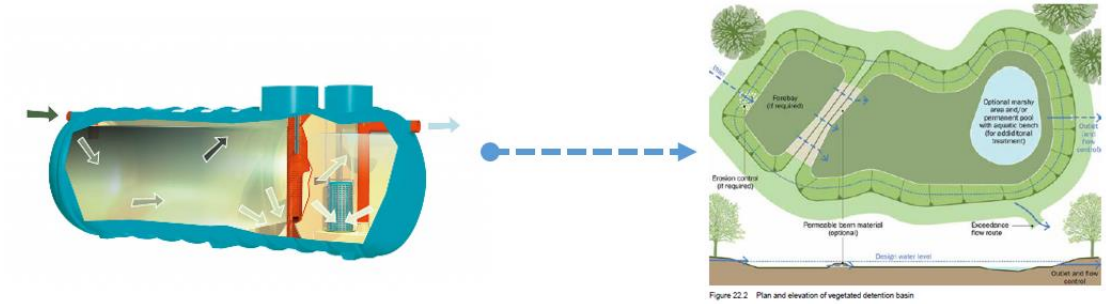


Figure 8-3: Proposed train treatment for catchment area 4

Treatment Catchment 5

8.2.14 Treatment catchment 5 is located to the south-west of the proposed development site and contains plots 1010, 1020 and the rail terminal. Implementation of SuDS treatment in this catchment area is constrained by a combination of site contamination, groundwater table level and the physical site layout.

8.2.15 The upper half of this catchment drains into a storage pond located in the northwest of the catchment area where water quality treatment involving settlement of the particulate pollutants will occur. The bottom half of the catchment and the rail sidings within this area will drain to a storage pond located to the south west of the catchment area, the storage pond will be an 'offline' system in this location therefore negating its use as treatment component.

8.2.16 Due to the restrictions in this catchment oil interceptors are proposed for the surface water run-off from the hardstanding areas and the rail sidings which are deemed to be high risk.

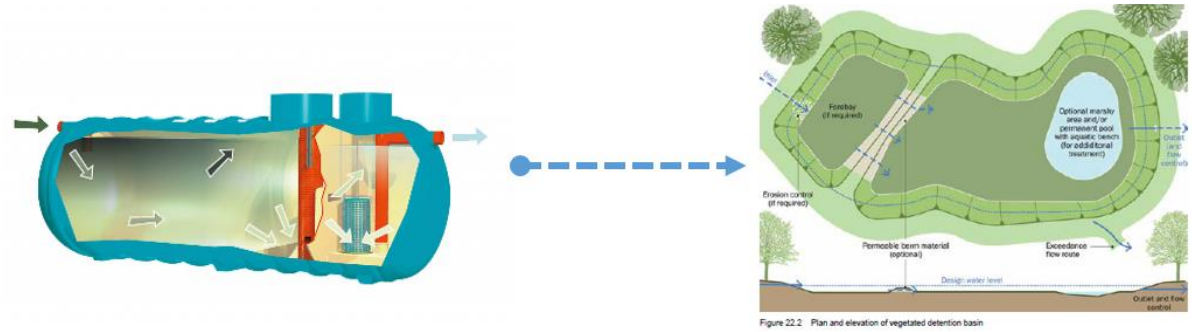


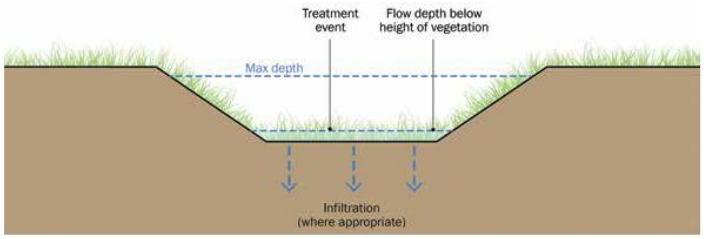
Figure 8-4: Proposed train treatment for catchment area 5

Treatment Catchments 6 & 7

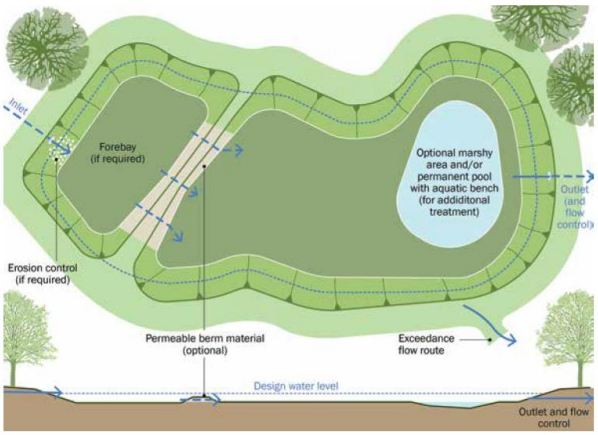
8.2.17 Treatment catchments 6 & 7 are located towards the south- of the proposed development and contain plots 5010 and 5020 and 3010 and 5030 respectively. The surface water runoff in these areas is proposed to discharge into the Staffordshire and Worcestershire canal via a pumped outfall. Catchment 6 will discharge into an existing drainage ditch alongside Woodlands Lane, prior to discharging into the canal.

8.2.18 Surface water runoff from the external impermeable catchment areas will be drained via local gullies and linear drainage systems with silt traps prior to joining roof water runoff and discharging into a conveyance system.

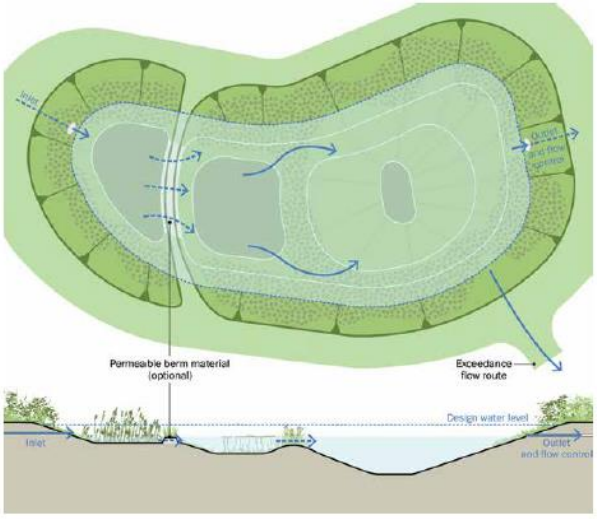
8.2.19 The first treatment component will take the form of individual conveyance swales prior to discharge into an attenuation basin which will provide secondary treatment; a pond will provide the third and final treatment by settling out fine silts and in provide final polishing of surface water runoff prior to discharge.



Typical conveyance/attenuation swale



Plan and elevation of vegetated detention basin



Plan view and profile of pond details

Figure 8-5: Proposed Treatment Train for Catchments 6 & 7

8.2.20 The assessment of the treatment components for catchments 6 & 7 is shown in the table below. The pipe reference directly references the microdrainage model and can be referenced back to the results output from the 1 in 1 year return period treatment assessment results output in the appendix. The flow from catchment six has been controlled and attenuated for the 1 year return period within a small attenuation basin to reduce the flow prior to discharge into the treatment components.

Catchment 6	Value	Units
Area	12.186	Ha
Allowable Dicharge (Qbar)	21.31	l/s
Comments	Pumped outflow	

Component	Treatment Ref.	Pipe Ref.	IL (m)	Acc. Area (m^2)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m^2)	Flow Depth (m)	Area (m^2)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	1.009	104.577	111,180	11.118	0.5	451.5	0.2	104.64	2.2575	0.07	3.04	30	30.8	0.1	Ok
Basin	2	1.011	103.985	121,860	12.186	0.5	244.1	0.2	104.03	1.2205	0.04	3.04	30	30.8	0.1	Ok

Catchment 7	Value	Units
Area	13.95	Ha
Allowable Dicharge (Qbar)	60	l/s
Comments	Pumped outflow	

Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m^2)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m^2)	Flow Depth (m)	Area (m^2)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	1.010	103.473	125,740	12.574	0.5	606.5	0.1	103.838	6.065	0.20	3	20	40	0.1	Longer grass
Basin	2	1.012	103.126	129,090	12.909	0.5	468.7	0.1	103.376	4.687	0.18	2.54	25	25.8	0.1	Longer grass
Basin	2	1.014	102.662	135,940	13.594	0.5	349.8	0.1	102.795	3.498	0.07	5.04	50	50.8	0.1	Ok

Figure 8-6: Catchment 1, 2 and 3 treatment assessment

Access Roads

8.2.21 The surface water runoff from the site access roads will be collected via a filter drain system wherever possible providing the first component in the SuDS treatment train, helping to reduce pollutant levels in the runoff by filtering out fine sediments, metals, hydrocarbons and other pollutants. They can also encourage adsorption and biodegradation processes. Where the use of filter drains is not possible, they will be replaced with gullies or kerb drainage prior to draining into the primary network of ditches, swales and basins around the site.

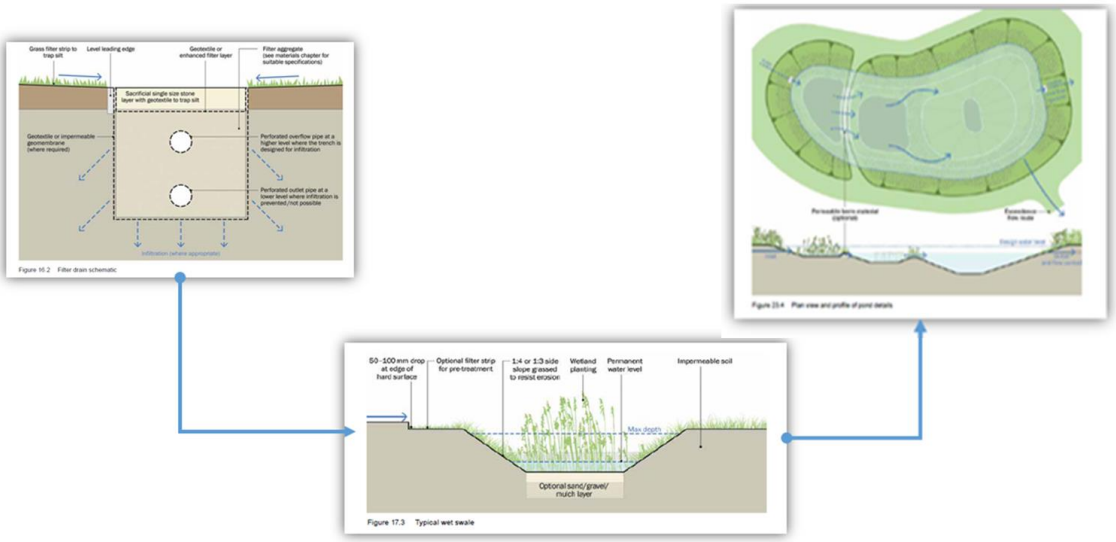


Figure 8-7: Proposed Train Treatment for Roads

8.2.22 Wherever necessary additional measures will be provided to the service yard areas where elevated risk of pollution is present, such as vehicle wash or delivery/loading bays where there is a high risk of spillage.

8.2.23 SuDS Management Train Summary

8.2.24 With reference to drawing 1516-0425-WDK-SI-D-331-007 ‘Surface Water Treatment Catchments’ (Appendix F), table 8-8 below identifies the SuDS management train components for each of the plots and confirms that satisfactory treatment has been provided by the scheme:

Plot/Catchment Reference	Treatment Component 1	Treatment Component 2	Treatment Component 3	Satisfactory Treatment Provided Y/N
Rail Terminal	Trapped gullies or liner drains	Interceptor/ Separator	N/A	Y
Plot 1010	Trapped gullies or liner drains	Interceptor/ Separator	N/A	Y
Plot 1020	Trapped gullies or liner drains	Interceptor/ Separator	Detention basin	Y
Plot 1030 & 1040	Trapped gullies or liner drains	Interceptor/ Separator	Detention basin	Y
Road 1	Trapped gullies or liner drains	Filter drain	Detention basin	Y
Plot 2010	Conveyance swale	Detention basin	Pond	Y
Road 2	Trapped gullies or filter drains	Conveyance swale	Detention basin	Y
Plot 3010	Conveyance swale	Detention basin	Pond	Y
Plot 3020	Conveyance swale	Detention basin	Pond	Y
Plot 3030	Conveyance swale	Detention basin	Pond	Y
Plot 4010	Conveyance swale	Detention basin	Pond	Y
Plot 4020	Conveyance swale	Detention basin	Pond	Y
Plot 4030	Conveyance swale	Detention basin	Pond	Y
Plot 4040	Conveyance swale	Detention basin	Pond	Y
Road 3	Trapped gullies or filter drains	Detention Basin	Swale and Lagoon	Y
Plot 5010	Conveyance swale	Detention basin	Pond	Y
Plot 5020	Conveyance swale	Detention basin	Pond	Y
Plot 5030	Conveyance swale	Detention basin	Pond	Y

Figure 8-8: Proposed Treatment Train Summary

9. Maintenance

9.1 Operation and Maintenance Activity Categories

9.1.1 Maintenance activities are broadly defined in the CIRIA C753 SuDS manual as:

- Regular maintenance (including inspections)
- Occasional maintenance
- Remedial maintenance

9.1.2 Maintenance will be required to keep the drainage system working efficiently throughout the proposed developments design life. The conventional pipe network will be designed to achieve minimum self-cleansing velocities and access points will be included to carry out maintenance as required by relevant standards.

9.1.3 The table below reproduced from the SuDS manual indicates the operation and maintenance activities for typical SuDS components.

Table 32.1	Typical key SuDS components operation and maintenance activities												
Operation and maintenance activity	SuDS component												
	Pond	Wetland	Detention basin	Infiltration basin	Soakaway	Infiltration trench	Filter drain	Modular storage	Pervious pavement	Swale/bioretention/ trees	Filter strip	Green roofs	Proprietary treatment
Regular maintenance													
Inspection	●	●	●	●	●	●	●	●	●	●	●	●	●
Litter and debris removal	●	●	●	●	○	●	●	○	●	●	●		○
Grass cutting	●	●	●	●	○	●	●	○	○	●	●		
Weed and invasive plant control	○	○	○	○		○	○		○		○	●	
Shrub management (including pruning)	○	○	○	○					○	○	○		
Shoreline vegetation management	●	●	○										
Aquatic vegetation management	●	●	○										
Occasional maintenance													
Sediment management[1]	●	●	●	●	●	●	●	●	●	●	●		●
Vegetation replacement	○	○	○	○						○	○	●	
Vacuum sweeping and brushing									●				
Remedial maintenance													
Structure rehabilitation/repair	○	○	○	○	○	○	○	○	○	○	○	○	
Infiltration surface reconditioning				○	○	○	○		○	○	○		

Key

● will be required

○ may be required

Notes

1 Sediment should be collected and managed in pre-treatment systems, upstream of the main device

9.1.4 An initial pre-handover inspection of the final development should be completed to ensure the design detail has been implemented on site. Regular inspection will then help to determine future maintenance activities, help establish system performance and allow identification of potential performance failures.

9.2 Operation and Maintenance Requirements

9.2.1 The regime for minimum maintenance requirements for each SuDS component utilised with the drainage scheme for the proposed development is detailed below.

- **Detention basins**

9.2.1.1 Regular inspection and maintenance is important for the effective operation of detention basins as designed. A maintenance access way should be provided to the detention basins from a public or private road. All detention basins require a sediment forebay or other form of upstream pre-treatment system unless sediment roads are known to be insignificant. The pre-treatment is to remove the majority of incoming sediment from the run off before it is more widely dispersed within the permanent pool.

Table 22.1	Operation and maintenance requirements for detention basins	
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Half yearly (spring – before nesting season and autumn)
	Inspect inlet, outlets and overflows for blockage, and clear if required	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year) then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasional maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlet and forebay and main basin when required	Every 5 year, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial actions	Repair erosion or other damage by reseeding to re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

- **Swales**

9.2.1.2 Regular maintenance and inspection is important for the effective operation of the swales. Adequate access must be provided to all swale areas for inspection and maintenance, including for appropriate equipment and vehicles. Monitoring of the swales is required and remedial actions may need to be undertaken.

Table 17.1	Operation and maintenance requirements for swales	
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

- **Oil Separators**

9.2.1.3 Specific requirements for oil/water separators are provided in PPG3 (EA/SEPA/EHSNI, 2006). The following items should be undertaken every six months as a minimum:

✓ Check volume of sludge
✓ Check thickness of light liquid
✓ Check function of automatic closure device
✓ Empty the separator, if required
✓ Check the coalescing material and clean or change if necessary
✓ Check the function of the warning device (if fitted)

9.2.1.4 General inspection of the integrity of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

✓ Water tightness of system
✓ Structural condition
✓ Internal coatings
✓ In-built parts
✓ Electrical devices and installations
✓ Adjustment of automatic closure devices

- **Filter Drains**

9.2.1.5 Filter drains will require regular maintenance to ensure continuing operation to design performance standards. The treatment performance of filter drains is dependent on maintenance. Adequate access should always be provided to the filter drain for inspection and maintenance. Litter (including leaf litter) and debris removal should be undertaken as part of general landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.

9.2.1.6 **Table 16.1** from CIRIA C753 provides guidance on the type of operational and maintenance requirements that may be appropriate. The list of actions is not exhaustive, and some actions may not always be required.

Table 16.1	Operation and maintenance requirements for filter drains	
Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly (or as required)
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six Monthly
	Remove sediment from pre-treatment devices	Six Monthly, or as required
Occasional maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (e.g. NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

9.3 Special Provisions

9.3.1 In order to direct surface water from the proposed catchments to existing outfalls and maintain the existing hydraulic regime for the site, it has been necessary to design some special drainage features which may require specialist techniques for construction and have specific maintenance requirements.

- **Pumping Stations**

9.3.2 Outlets C and D, due to the topography in the areas, require surface water drainage to be pumped up to the receiving watercourses.

9.3.3 As all the proposed drainage outfalls will serve more than one individual property it is feasible for the drainage networks to be offered for adoption by Severn Trent Water. In this event the pumping stations will be designed in accordance with 'Sewers for Adoption' by WRc and maintained in perpetuity by the adopting authority.

9.3.4 All pumping stations must be in designed in accordance with BS EN 752 and be maintained in strict accordance with the suppliers' requirements.

- **Directional Drilling/Thrust Boring**

9.3.5 In order to convey surface water from the eastern to the western sides of the Staffs and Worcs Canal, it will be necessary for 3 large diameter pipes to be installed beneath the canal bed. Canal and Rivers Trust guidance requires a minimum cover to be achieved and open cut technique would not be appropriate given that the canal is to remain in operation.

9.3.6 It is therefore proposed that 'no dig' guided auger boring technique will be employed to install the pipes approximately 5.5m below existing ground level, 3.5m below the existing canal bed. The resultant local system will therefore include deep manholes with confines space access requirements. Appendix L includes an illustrative section through the pipe and canal.

- **Inverted Siphon**

9.3.7 To achieve the necessary cover depth below the West Coast Mainline it is anticipated that it will be necessary to employ a 'no dig' technique, boring pipework between entry and reception pits at either side of the cutting. Due to level constraints on the proposed drainage network, to achieve the minimum gradient to the existing outfall, the resulting crossing is proposed to be an inverted siphon. Appendix L contains an illustrative section through the inverted siphon and the railway.

9.3.8 Provisions for regular maintenance will be agreed through the Network Rail GRIP approval process, which are anticipated to include a programme for maintenance by an approved contractor and appropriate access for maintenance equipment. As the siphon forms part of the site's primary drainage infrastructure, it is recommended that two pipelines are installed to provide redundancy should the other become blocked.

- **Canal Outfall**

9.3.9 Outlet D is described in Section 7.3 as a pumped outfall to the Staffordshire and Worcestershire Canal with a proposed peak flow rate of 55 litres per second to meet greenfield equivalent rate.

9.3.10 Canal and Rivers Trust (CRT) Code of Practice states that all water discharged to a canal must be controlled such that the transverse discharge velocity does not exceed 0.3m/s, to prevent erosion and impacts on marine life and watercraft.

9.3.11 Following discussion with the CRT engineering team, it is proposed that surface water will be pumped from the attenuation basin to a reception chamber before being released to the canal via a rectangular weir. The width of the weir will be calculated to ensure that the maximum permissible flow velocity is not exceeded, and the form and aesthetic is to be agreed with the CRT.

9.3.12 As the structure is proposed to be constructed on land within the Calf Heath Community Park, it is anticipated that the responsibility for maintenance will rest with the development's management contractor.

9.3.13 A structure specific maintenance schedule will be determined during detailed design and in agreement with the relevant stakeholders. Regular maintenance will be likely to include, but not be limited to, monthly inspections and removal of debris from the structure, six monthly inspection for siltation and general condition, and annual inspections of all mechanical devices, removal of roots, surrounding vegetation and overhanging branches.

10. Phasing Strategy

10.1 The site phasing strategy is illustrated on Chetwoods drawing 4049-1032 'Illustrative Phasing Plan' and is largely conformant with the surface water catchments for each outlet point, therefore allowing for the surface water drainage infrastructure to be largely implemented in conjunction with each phase of construction. ''Environmental Statement Figure 4.5: Indicative Phasing Plan'' contains the indicative phasing plan for the development.

10.2 Construction phase 1 encompasses the majority or the catchment area discharging into outlet A with the exception of plots 3020, 3030 and 4040. Construction of plot 1030 only requires the drainage infrastructure local to this plot to be implemented to facilitate full operation of the surface water system, for all other plots within this construction phase the central attenuation basins and downstream drainage infrastructure must be implemented to facilitate drainage of the surface water runoff. A section of the rail terminal and associated parking to the northern end are also included as part of the phase 1 works, these areas are to discharge into the basin located to the north west of plot 1020 and a temporary outlet is to be provided which will tie into the outlet A drainage system to the south of plot 1030. Upon completion of phases 2 and 3 the temporary outlet is to be abandoned and the areas are to discharge to outlet B as indicated on the surface water plan.

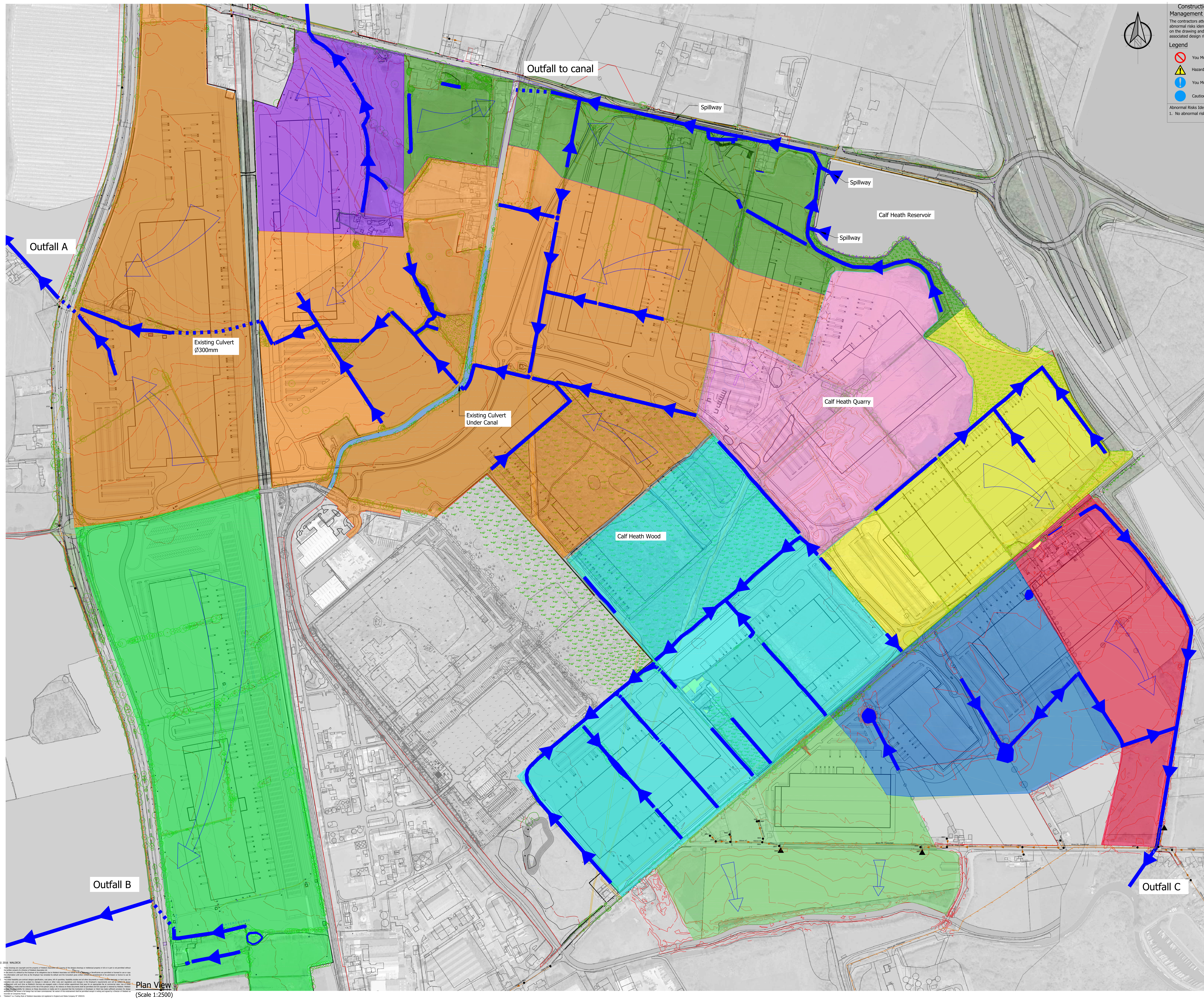
10.3 Construction phase 2 includes plot 3030 as well as the area south of straight mile and the corridor between plots 3010 and 3020 as well as 3010 and 5030. The rail terminal and area including the drainage basin to the south west are also included in this phase. Drainage infrastructure to facilitate plot 3030 will be constructed as part of the phase 1 works therefore this plot can be constructed without issue. The area to the south of straight mile contains the attenuation basins which will facilitate drainage for plots 3010 and 5030 which are part of construction phases 4 and 5 respectively. Drainage infrastructure for the rail terminal will be constructed in conjunction with the terminal itself as part of this construction phase.

10.4 Plots 1010 and 1020 form phase 3 of the site construction, all the required infrastructure to facilitate surface water drainage of these plots is to be constructed as part of phases 1 and 2.

10.5 Phase 4 includes plots 3010, 3020 and 4040 located south of Calf Heath wood, all the required infrastructure to facilitate surface water drainage of these plots is to be constructed as part of phases 1 and 2.

10.6 Construction phase 5 contains the whole of the catchments area discharging into outlet C2 therefore drainage infrastructure within this area is to construction prior to or in conjunction with the plots.

Appendix A – Existing Drainage Plan



Plan View
(Scale 1:2500)

Construction Design And Management Regulations 2015

The contractors attention is drawn to the abnormal risks identified below, annotated on the drawing and explained in the associated design risk registers.

Legend

- You Must Not Do
- Hazard Or Danger
- You Must Do
- Caution

Abnormal Risks Identified:

1. No abnormal risks identified

External References: 14317GI by RSA Geotechnics

Notes

1. If in doubt, ask an Engineer.
2. Do not scale this drawing.
3. All dimensions are in millimetres unless stated otherwise.
4. This drawing to be read in conjunction with all other relevant drawings and specifications.
5. All proprietary items to be installed in strict compliance with manufacturers instructions and recommendations.
6. To be read in alongside around investigation report/ Reference number: 14317GI by RSA Geotechnics.

Key

- Existing ditch/watercourse
- Existing Culvert/Piped Network
- Direction of ditch bed slope
- Catchment flow direction
- Tree/ Bush/ Sapling
- Area of Undergrowth
- Woodland
- STW Existing Foul Pipe
- STW Existing Foul Rising Main
- STW Existing Foul Manhole
- STW Existing Foul Pumping Station

Existing Catchment Schedule

Key	Catchment Reference	Area (ha)	Area %
	1	92.16	33
	2	34.44	12
	3	11.40	4
	4	19.90	7
	5	20.36	7
	6	36.48	13
	7	18.58	7
	8	13.11	5
	9	17.28	6
	10	16.27	6
Total Site Area		279.98	100

Note: Catchments have been estimated from a combination of the groundwater flow maps and topographical survey data along with ditch routes and bed slopes.

Existing Outlfall Schedule

Outfall	Capacity* (l/s)	Greenfield Runoff Estimation (l/s)			
		QBAR	Q1	Q30	Q100
A	3,520	378.3	314.0	741.2	972.2
B	2,990	151.2	125.6	296.5	388.9
C	1,606	57.56	47.81	112.87	148.03

*Estimated capacity based on rough ditch dimensions from Waldeck site survey 7.12.16.

P3	Order limits updated	19.06.18	NG
P2	Ditch south east of site added	06.04.18	NG
P1	Preliminary Issue	24.04.17	MPS

Revisions

West Midlands Interchange

Project

THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status

Preliminary

Drawing Title — Drawing Size A0

Existing Site Drainage

Regulation: 5 (2) (o)

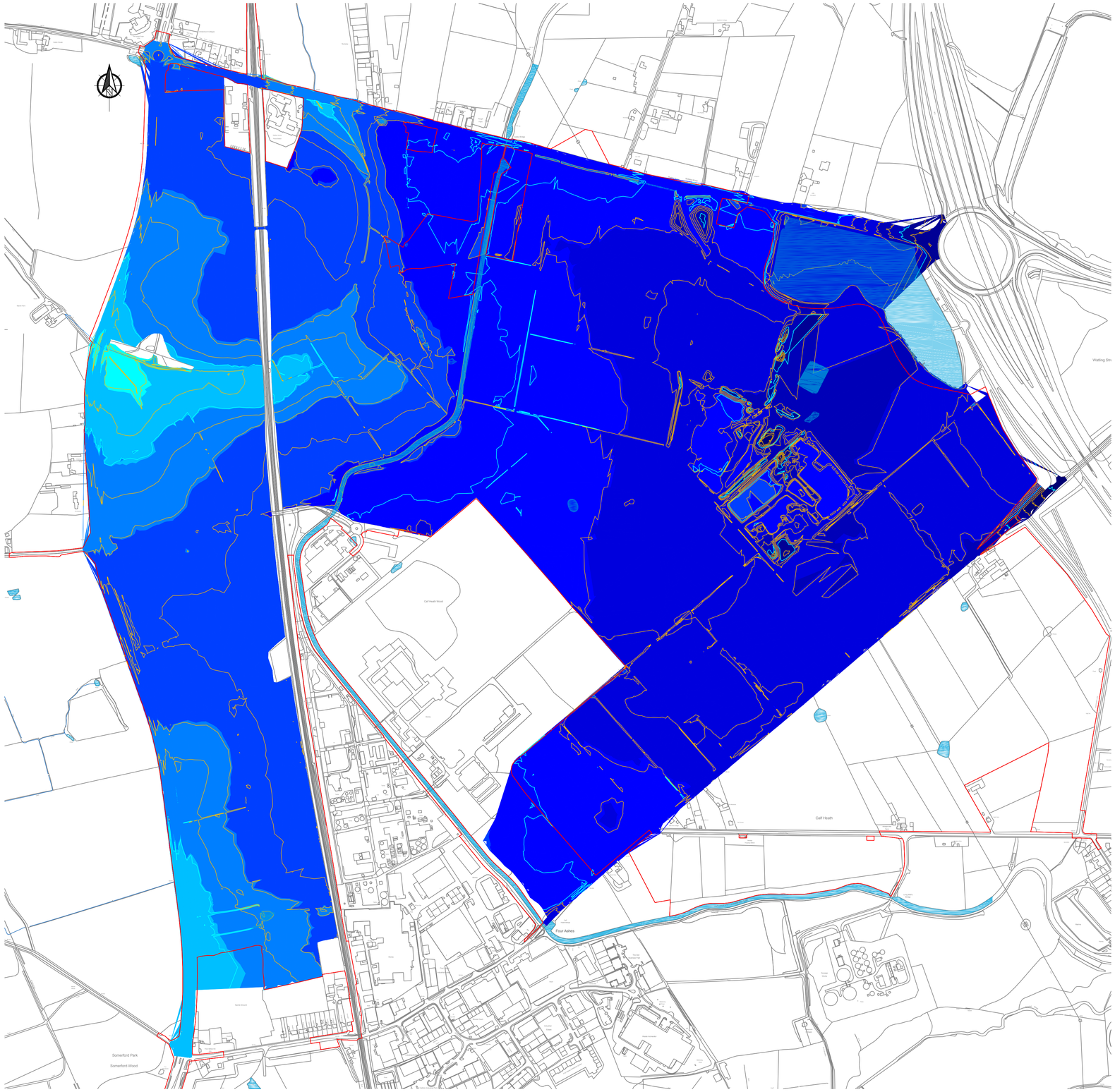
Document: 2.4

Drawn MPS | Date 24.04.17 | Scale 1:2500 | Reviewed TL

Drawing No.: 1516-0425-WDK-SI-D-331-0006

Rev.: P3

Appendix B – Conceptual Ground Water Model



EXISTING GROUND LEVEL DATA			
NUMBER	MINIMUM LEVEL	MAXIMUM LEVEL	COLOUR
1	+ 96.11	+ 98.10	
2	+ 98.10	+ 100.09	
3	+ 100.09	+ 102.08	
4	+ 102.08	+ 104.07	
5	+ 104.07	+ 106.06	
6	+ 106.06	+ 108.05	
7	+ 108.05	+ 110.04	
8	+ 110.04	+ 112.03	
9	+ 112.03	+ 114.02	
10	+ 114.02	+ 116.01	
ALL LEVEL DATA SHOWN IN METRES ABOVE SEA LEVEL			

Notes

1. Do not scale this drawing.
2. All dimensions are in millimetres unless stated otherwise.
3. This drawing to be read in conjunction with all other relevant drawings and specifications.
4. All proprietary items to be installed in strict compliance with manufacturers instructions and recommendations.

CONSTRUCTION DESIGN AND MANAGEMENT REGULATIONS 2016

THE CONTRACTORS ATTENTION IS DRAWN TO THE ABNORMAL RISKS IDENTIFIED BELOW, ANNOTATED ON THE DRAWING AND EXPLAINED IN THE ASSOCIATED DESIGN RISK REGISTERS.

LEGEND

- YOU MUST NOT DO
- HAZARD OR DANGER
- YOU MUST DO
- CAUTION

ABNORMAL RISKS IDENTIFIED:

1. NO ABNORMAL RISKS IDENTIFIED

NOTE:
EXISTING GROUND SURFACE MODEL CREATED FROM POINTS SURVEY DATA RECEIVED FROM GREENHATCH GROUP SURVEYS.

Revisions		
P4	Order Limits updated	19/06/18 NG
P3	Title block amended, Four OS Data Map updated	06/04/18 NG
P2	Colour banding changed to different shades of blue, level data table added to clarify the information shown on the colour banding plan.	04/07/16 TP
P1	Preliminary Issue	04/07/16 TP

West Midlands Interchange

Project
THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status
Preliminary

Drawing Title
Conceptual Groundwater Model

Drawing Size A1

Regulation	Document		
5 (2) (o)	2.4		
Drawn TP	Date 03.03.16	Scale 1:5000	Reviewed TL

Drawing No.
1516-0425-WDK-SI-C-310-003

Rev.
P4

Appendix C – Proposed Site Wide Surface Water Drainage Strategy

Porous Car Park
Existing spillway ditch to be culverted beneath new roundabout. Refer to Drawing Number 1516-045-WDK-SI-C-301-012 for indicative route.
Open Basin and Swale 2,500m³ ~I.L. 98.360m
To River Penk
Outlet A Max discharge 222.5l/s ~IL 96.50m
Open storage Basin 1,000m³ ~I.L. 98.450m
1 No 750mmØ Pipe installed below West Coast Mainline as Siphon
3x750mmØ Pipes installed beneath canal
Open storage lagoon providing 57,500m³ ~I.L. 98.630m
Open storage Basin 400m³ ~I.L. 99.870m
Rail Terminal FL:102.400
Outlet B Max discharge 80.5 l/s
Retained Abstraction Rising Main
Abandoned Abstraction Rising Main
Offline Open Storage Basin 3,750m³ ~I.L. 98.600m
Open storage Basins 6,875m³
Pumped Outlet C Max discharge 24.8 l/s Ditch Reinforcement works to be confirmed at time of development.
Open storage Basins 2,875m³
Porous Car Park
Pumped Outlet D Max discharge 60.0 l/s Outflow velocity to be limited to 0.3m/s
5030 Car Park FL : 106.900
5030 Yard FL : 106.900
Plot 5030 FL : 108.100 42,569m²
5030 Car Park FL : 106.800
Calf Heath Reservoir
Four Ashes

External References: 14317GI by RSA Geotechnics

Notes

1. Do not scale this drawing.
2. All dimensions are in millimetres unless stated otherwise.
3. This drawing to be read in conjunction with all other relevant drawings and specifications.
4. All proprietary items to be installed in strict compliance with manufacturers instructions and recommendations.
5. To be read in alongside ground investigation report/ Reference number: 14317GI by RSA Geotechnics.
6. Awaiting competition of the flood risk assessment to finalize proposed drainage strategy.
7. The drainage proposals and outfalls are indicative only and are subject to approval by the relevant governing bodies.
8. Attenuation volumes and associated infrastructure be designed to accommodate 1:100 year events +40% climate change allowance.

Key

Impermeable areas (total area = 1,379,289 m²)

- Impermeable area draining to Outlet A Area: 105.330ha Note: Contribution from highways into surface water networks approx. 3.5ha
- Impermeable area draining to Outlet B Area: 20.620ha
- Impermeable area draining to Outlet C Area: 12.520ha
- Impermeable area draining to Outlet D Area: 13.800ha
- Denotes Proposed Manhole
- Surface water drainage pipe with direction arrows
- Perforated drainage pipe with direction arrows
- Denotes Proposed Headwall
- Denotes Proposed Swales/Ponds
- Denotes Proposed Interceptor
- Existing Abstraction Rising Main to be Retained and Protected
- Existing Abstraction Rising Main to be capped off and abandoned
- Proposed Abstraction Rising Main Diversion Route
- Dry Swale/Attenuation Basin
- Wet Pond
- Retained Trees & Hedges
- Denotes Permeable Car Park Construction

Attenuation (total volume = 85,077m³)

Open storage (pond)
Volumes per outlet:
- Outlet A = 69,152 m³
- Outlet B = 6,175m³
- Outlet C = 6,875m³
- Outlet D = 2,875m³

P11	Order of Limits Boundary updated, drawing title amended	20.06.18	NG
P10	Attenuation Volumes of Outlet C&D amended, impermeable area draining to outlets B,C&D updated, max discharge of outfall C&D updated	06.04.18	NG
P9	Levels amended, invert levels added, updated to suit architecs' layout; Rev.33, siding drainage updated following discussion with Network Rail	16.03.18	NG
P8	Perforated Drainage Pipes Added	15.01.18	JB
P7	Basins, ponds, mounds & ditches altered & moved with updated roads and veiwports	15.09.17	JB
P6	Catchments updated for consistency with updated strategy report. Basins and swales updated to reflect revised treatment strategy.	24.08.17	TP
P5	Mounds & swales amended to suit FPCR comments received on 27.04.17	24/03/17	NG
P4	Boring pipe's route under the west coast main lines amended, drainage strategy for plots 301, 5010, 5020 & 5030 included	11/04/17	NG
P3	Discharge shapes amended	24/03/17	NG
P2	Discharge volumes & impermeable areas amended	26/01/17	NG
P1	Preliminary Issue	05/01/17	NG

Revisions

West Midlands Interchange

Project
THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status
Preliminary

Drawing Title
Site Wide Surface Water Drainage Strategy

Drawing Size A0

Regulation
5 (2) (o)

Document
2.4

Drawn NG | Date 05.01.17 | Scale 1:2500 | Reviewed TL

Drawing No.
1516-0425-WDK-SI-D-331-004

Rev.
P11

Appendix D – Site Survey of Existing Outfalls

Site Visit Report

To: Tim Leach

Project: West Midlands Interchange

Date: 7th December 2016

Subject: Confirmation of Drainage Outfalls

A site visit was undertaken to visually identify the planned drainage outfalls and to obtain basic geometry for the receiving watercourses which would allow an assessment of peak flow capacity to be undertaken.

1. Outfall A

Tributary to the River Penk to west of A449.

Ditch approx. 1.6m dp x 0.5m wide at base x 1 in 2 gradient.

Incoming box culvert beneath carriageway appox. 1000w x 750h

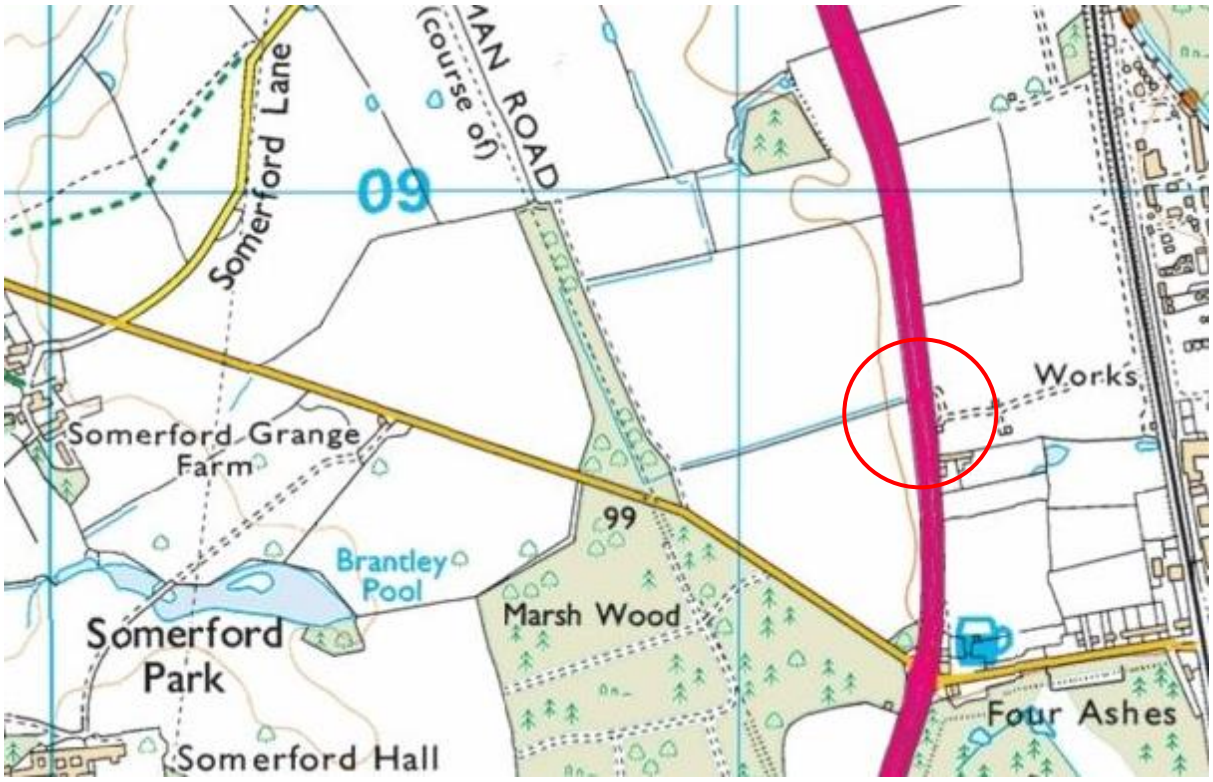
Outfall A

2. Outfall B

Out falling to ditch network to west of A449. Apparently running towards Marsh Wood and, Brantley Pool before contributing to River Penk.

Ditch approx. 1.5m dp x 0.5m wide at base x 1 in 2 gradient.

Incoming 375mm diameter concrete pipe beneath carriageway.



Outfall B

3. Outfall C

Ditch running alongside Woodlands Lane at eastern boundary of the land south of Vicarage Road. Ditch flows beneath Straight Mile and contributes to Staffordshire and Worcestershire Canal.

Ditch approx. 1.2m dp x 3m wide at top.

Surcharge and siltation prevented measurement of outfall pipe diameter but downstream ditch was evident to south of the carriageway and up to the Canal.

Survey required

Outfall C (taken looking north from Straight Mile)

Appendix E – Greenfield Runoff Calculation

West Midlands Interchange Catchment Areas							
Outlet A	Area (m²)	Area (ha)	QBAR Discharge (l/s)	QBAR Discharge l/s/ha	Attenuation Estimate Low (m³)	Attenuation Estimate High (m³)	Attenuation Estimate Average (m³)
Plot 1030 & 1040	169,235	16.92					
Plot 2010	101,916	10.19					
Plot 3020	80,429	8.04					
Plot 3030	144,802	14.48					
Plot 4010	103,219	10.32					
Plot 4020	108,780	10.88					
Plot 4030	133,399	13.34					
Plot 4040	144,040	14.40					
Road	32,272	3.23					
Open Water	35,225	3.52					
Total	1,053,317	105.33	426.3	4.05	55,506	75,009	65,258
Outlet B							
Plot 1010	71,636	7.16					
Plot 1020	51,481	5.15					
Rail Terminal	52,423	5.24					
Road	2,988	0.30					
Open Water	4,653	0.47					
Total	183,181	18.32	80.49	4.39	9,444	12,807	11,126
Outlet C1							
Plot 3010	87,930	8.79					
Plot 5030	42,569	4.26					
Open Water	8,997	0.90					
Total	139,496	13.95	61.29	4.39	7,191	9,752	8,472
Outlet C2							
Plot 5010	32,713	3.27					
Plot 5020	84,717	8.47					
Open Water	7,734	0.77					
Total	125,164	12.52	55.00	4.39	6,455	8,753	7,604
Site Total	1,501,158	150.12	623.08	4.15	78,596	106,321	92,459
50ha QBAR			219.7				

IH 124 Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 700 Urban 0.000
Area (ha) 92.090 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural	378.3
QBAR Urban	378.3
Q100 years	972.2
Q1 year	314.0
Q2 years	339.0
Q5 years	465.3
Q10 years	563.6
Q20 years	672.3
Q25 years	710.4
Q30 years	741.2
Q50 years	833.0
Q100 years	972.2
Q200 years	1142.4
Q250 years	1199.1
Q1000 years	1573.6

IH 124 Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 700 Urban 0.000
Area (ha) 50.000 Soil 0.450 Region Number Region 4

Results l/s

QBAR Rural	219.7
QBAR Urban	219.7
Q100 years	564.5
Q1 year	182.3
Q2 years	196.9
Q5 years	270.2
Q10 years	327.3
Q20 years	390.4
Q25 years	412.5
Q30 years	430.4
Q50 years	483.7
Q100 years	564.5
Q200 years	663.4
Q250 years	696.3
Q1000 years	913.8

Appendix F – Ditch Outfall Capacity Calculations

Date 06/02/2017 Sheet No 1

Project Ref 1516-0425 Designed MPS Checked

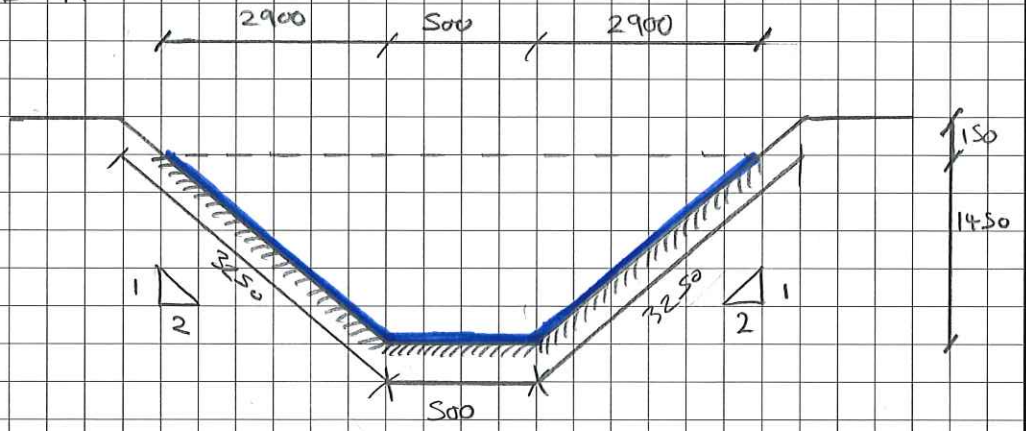
Project WEST MIDLANDS INTERCHANGE

Subject EXISTING OUTFALLS CAPACITY ASSESSMENT

THE EXISTING DITCH OUTFALLS IDENTIFIED AS SUITABLE FOR RECIEVING THE SURFACE WATER RUNOFF DISCHARGE FROM THE PROPOSED DEVELOPMENT ARE TO BE ASSESSED TO CHECK THEY HAVE SUFFICIENT CAPACITY TO RECIEVE THE REQUIRED FLOW RATES.

DETAILS OF THE EXISTING OUTFALLS WERE ACQUIRED FROM A SITE VISIT CARRIED OUT BY WALDECK CONSULTING ON 7TH DECEMBER 2016.

OUTFALL A



OPEN CHANNEL FLOW:

WETTED PERIMETER =	7.0 m
AREA of FLOW = 0.5 x 1.45 + 2.9 x 1.45 =	4.93 m²
BED SLOPE = UNKNOWN, ASSUME 1 IN 1000 =	0.001
MANNINGS NUMBER = EARTH WINDING & SLUGGISH DENSE WEEDS IN DEEP CHANNELS :	0.035

Date 06/02/17 Sheet No 2

Project Ref 1516-0425 Designed MPS Checked

Project WEST MIDLANDS INTERCHANGE

Subject EXISTING OUTFALL CAPACITY ASSESSMENT.

DISCHARGE EQUATION FOR OUTLET A

$$Q = (A/n) \times R^{2/3} \times S_0^{1/2}$$

WHERE:

A = CROSS SECTIONAL AREA of flow	4.93 m^2
n = MANNINGS NUMBER	0.035
R = HYDRAULIC RADIUS	0.704
S_0 = BED SLOPE (ASSUME 1 IN 1000) =	0.001

R (HYDRAULIC RADIUS) = A/P = 4.93m^2 / 7.0m = 0.704

$Q = (4.93/0.035) \times 0.704^{2/3} \times 0.001^{1/2} =$ 3.52 m^3/s

3.52 m^3/s x 1,000 = 3,520 l/s

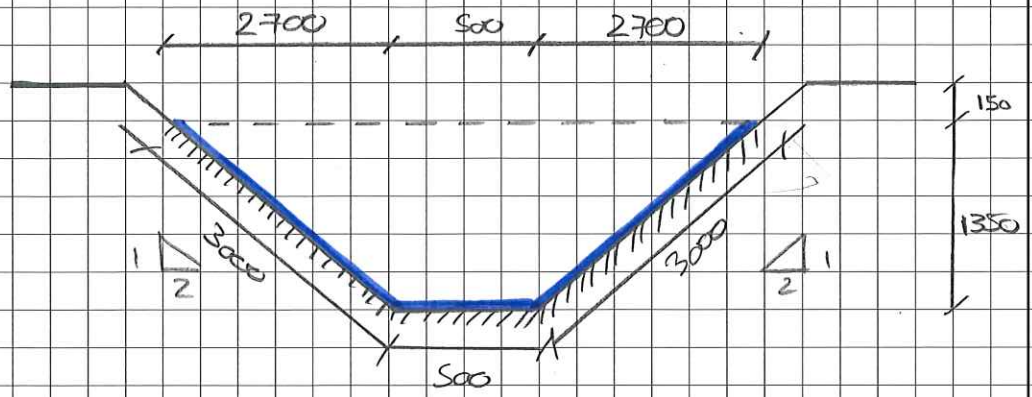
Date 06/02/17 Sheet No 3

Project Ref 516-0425 Designed MPS Checked .....

Project WEST MIDLANDS INTERCHANGE

Subject EXISTING OUTFALLS CAPACITY ASSESSMENT

OUTFALL B



OPEN CHANNEL FLOW:

WETTED PERIMETER =	(P)	6.5M
AREA of FLOW = 0.5 x 1.35 + 2.7 x 1.35 =	(A)	4.32m²
BED SLOPE = UNKNOWN, ASSUME 1 IN 1000 =	(S_o)	0.001
MANNINGS NUMBER =	(n)	0.035

DISCHARGE EQUATION FOR OUTLET A

$Q = (A/n) \times R^{2/3} \times S_o^{1/2}$

R = (HYDRAULIC RADIUS) = A/P = 4.35m² / 6.5M = 0.67

$Q = (4.32 / 0.035) \times 0.67^{2/3} \times 0.001^{1/2} =$ 2.99 m³/s

2.99 m³/s x 1,000 = 2,990 l/s

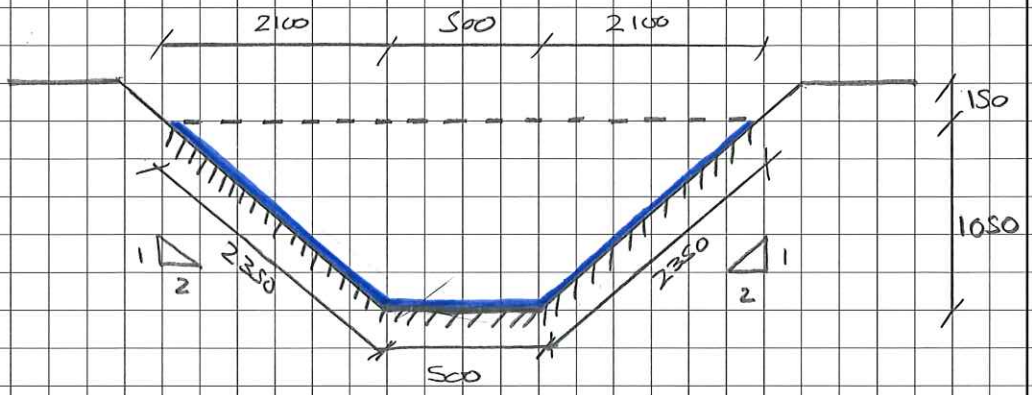
Date 06/02/2017 Sheet No 4

Project Ref 1516-0425 Designed MPS Checked

Project WEST MIDLANDS INTERCHANGE

Subject EXISTING OUTFALLS CAPACITY ASSESSMENT

OUTFALL C



OPEN CHANNEL FLOW:

WETTED PERIMETER =		(P)	5.2m
AREA OF FLOW = 0.5 x 1.05 + 2.1 x 1.05 =		(A)	2.73m²
BED SLOPE = UNKNOWN, ASSUME 1 IN 1000 =		(S_o)	0.001
MANNINGS NUMBER =		(n)	0.035

DISCHARGE EQUATION FOR OUTLET C

$Q = (A/n) \times R^{2/3} \times S_o^{1/2}$

R = (HYDRAULIC RADIUS) = A/P = 2.73m² / 5.2m = 0.525

$Q = (2.73 / 0.035) \times 0.525^{2/3} \times 0.001^{1/2}$ = 1.606m³/s

1.606m³/s x 1,000 = 1606 l/s

Appendix G – Alterations to Canal and Rivers Trust Spillway

Scale 1:1250

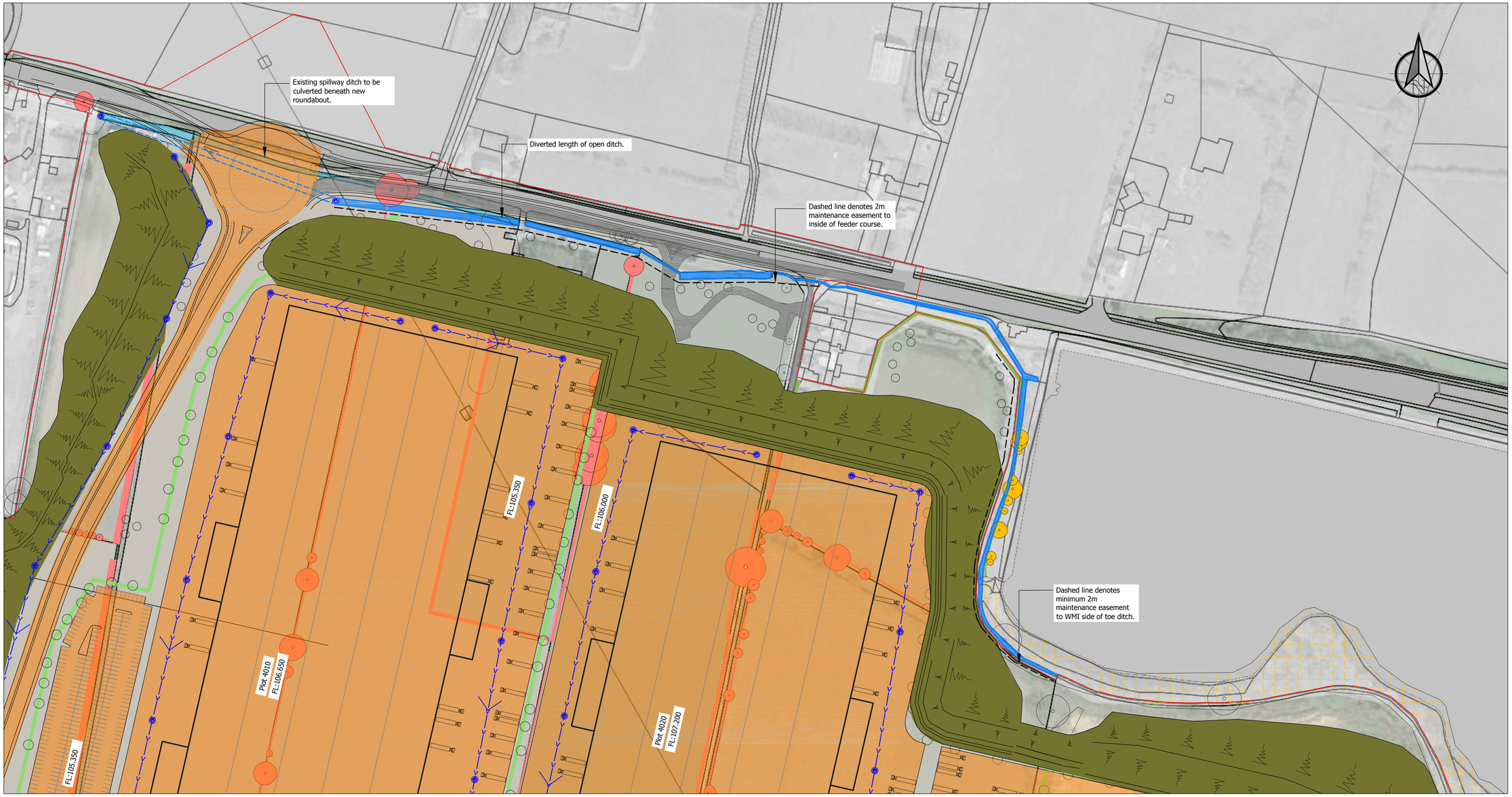
25m 0 25m 50m 75m 100m 125m

Notes

1. All dimensions are in millimeters unless stated otherwise.
2. This drawing to be read in conjunction with all other relevant drawings and specifications.
3. Route of spillway diversion is shown indicatively only.

Key:

Site Boundary



Plan View
(Scale 1:1250)

Location Plan
(NTS)

P3	Order Limits updated	19/06/18 NG
P2	Plan view & location plan swaped	06/04/18 NG
P1	Preliminary Issue	20/03/18 NG

Revisions

West Midlands Interchange

Project
THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status
Preliminary

Drawing Title
Works Associated with Canal and Rivers Trust Ditch Network

Drawing Size A1

Regulation	Document
5 (2) (o)	2.4

Drawn	Date	Scale	Reviewed
NG	20/03/18	1:1250	TL

Drawing No.
1516-0425-WDK-SI-C-301-012

Rev.
P3

Appendix H – Proposed Network Hydraulic Calculations

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S1.000	59.907	0.120	499.2	0.777	4.00	0.0	0.600		o	825
S1.001	90.227	0.180	501.3	0.477	0.00	0.0	0.600		o	825
S1.002	90.227	0.181	498.5	0.000	0.00	0.0	0.600		o	825
S1.003	77.936	0.156	499.6	1.014	0.00	0.0	0.600		o	825
S1.004	83.633	0.167	500.8	0.456	0.00	0.0	0.600		o	825
S1.005	88.200	0.284	310.6	1.050	0.00	0.0	0.600		o	825
S1.006	88.729	0.177	500.0	1.947	0.00	0.0	0.600		o	825
S2.000	4.272	0.009	474.7	0.670	4.00	0.0	0.600		o	825
S2.001	55.048	0.110	500.4	0.000	0.00	0.0	0.600		o	825
S2.002	91.777	0.183	501.5	0.360	0.00	0.0	0.600		o	825
S2.003	94.003	0.188	500.0	0.827	0.00	0.0	0.600		o	825
S2.004	92.014	0.184	500.1	0.823	0.00	0.0	0.600		o	825
S2.005	89.082	0.178	500.5	0.976	0.00	0.0	0.600		o	825
S1.007	157.558	0.532	296.2	0.346	0.00	0.0		0.100	2 _/	11000
S3.000	59.557	0.119	500.5	0.768	4.00	0.0	0.600		o	825
S3.001	84.585	0.169	500.5	0.452	0.00	0.0	0.600		o	825
S3.002	89.342	0.179	499.1	0.000	0.00	0.0	0.600		o	825
S3.003	90.227	0.180	501.3	0.968	0.00	0.0	0.600		o	825
S3.004	88.818	0.178	499.0	0.963	0.00	0.0	0.600		o	825
S3.005	90.227	0.181	498.5	0.969	0.00	0.0	0.600		o	825
S3.006	71.879	0.143	502.7	1.479	0.00	0.0	0.600		o	900
S4.000	54.361	0.109	498.7	0.655	4.00	0.0	0.600		o	700
S4.001	86.955	0.174	499.7	0.344	0.00	0.0	0.600		o	700
S4.002	81.168	0.162	501.0	0.804	0.00	0.0	0.600		o	700
S4.003	94.433	0.189	499.6	0.779	0.00	0.0	0.600		o	700
S4.004	105.000	0.210	500.0	0.797	0.00	0.0	0.600		o	700
S1.008	31.384	0.105	298.9	0.742	0.00	0.0		0.100	2 _/	4800

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	106.080	0.777	0.0	1.32	706.6
S1.001	105.885	1.254	0.0	1.32	705.2
S1.002	105.705	1.254	0.0	1.32	707.2
S1.003	105.449	2.269	0.0	1.32	706.4
S1.004	105.218	2.725	0.0	1.32	705.5
S1.005	105.051	3.775	0.0	1.68	897.7
S1.006	104.617	5.721	0.0	1.32	706.1
S2.000	105.200	0.670	0.0	1.36	724.9
S2.001	105.191	0.670	0.0	1.32	705.8
S2.002	105.081	1.030	0.0	1.32	705.0
S2.003	104.748	1.857	0.0	1.32	706.1
S2.004	104.485	2.680	0.0	1.32	706.0
S2.005	104.226	3.656	0.0	1.32	705.8
S1.007	104.048	9.723	0.0	0.94	46973.1
S3.000	105.200	0.768	0.0	1.32	705.8
S3.001	105.006	1.220	0.0	1.32	705.7
S3.002	104.837	1.220	0.0	1.32	706.7
S3.003	104.583	2.188	0.0	1.32	705.2
S3.004	104.328	3.151	0.0	1.32	706.8
S3.005	104.075	4.120	0.0	1.32	707.2
S3.006	103.819	5.599	0.0	1.39	884.7
S4.000	105.327	0.655	0.0	1.19	459.4
S4.001	105.218	1.000	0.0	1.19	458.9
S4.002	104.894	1.804	0.0	1.19	458.3
S4.003	104.657	2.583	0.0	1.19	458.9
S4.004	104.468	3.380	0.0	1.19	458.8
S1.008	103.516	19.443	0.0	0.92	37791.5

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S1.009	79.551	0.265	300.2	0.290	0.00	0.0	0.600		o	1125
S5.000	76.049	0.152	500.3	1.111	4.00	0.0	0.600		o	900
S5.001	90.213	0.181	498.4	0.459	0.00	0.0	0.600		o	900
S5.002	90.227	0.180	501.3	1.320	0.00	0.0	0.600		o	900
S5.003	90.227	0.180	501.3	1.259	0.00	0.0	0.600		o	900
S5.004	89.012	0.178	500.1	1.045	0.00	0.0	0.600		o	900
S5.005	71.876	0.075	958.3	0.700	0.00	0.0	0.600		o	975
S1.010	188.527	0.628	300.2	0.873	0.00	0.0		0.100	2 _/	10000
S6.000	84.165	0.168	501.0	1.226	4.00	0.0	0.600		o	900
S6.001	90.211	0.181	498.4	1.343	0.00	0.0	0.600		o	900
S6.002	89.647	0.179	500.8	1.743	0.00	0.0	0.600		o	900
S6.003	89.808	0.180	500.0	1.353	0.00	0.0	0.600		o	900
S6.004	83.810	0.167	501.9	0.953	0.00	0.0	0.600		o	975
S6.005	79.204	0.350	226.3	0.798	0.00	0.0	0.600		o	975
S1.011	20.115	0.067	300.2	0.284	0.00	0.0	0.600		2 _/	7400
S1.012	45.836	0.153	299.6	0.267	0.00	0.0	0.600		o	1350
S7.000	42.322	0.094	450.2	0.868	4.00	0.0	0.600		o	825
S7.001	90.493	0.201	450.2	0.326	0.00	0.0	0.600		o	825
S7.002	88.032	0.176	500.2	1.153	0.00	0.0	0.600		o	825
S7.003	86.831	0.173	501.9	1.582	0.00	0.0	0.600		o	825
S7.004	89.635	0.179	500.0	0.857	0.00	0.0	0.600		o	825
S7.005	62.127	0.124	501.0	0.670	0.00	0.0	0.600		o	900
S7.006	64.044	0.128	500.3	0.000	0.00	0.0	0.600		o	900
S1.013	56.648	0.189	300.0	0.432	0.00	0.0	0.600		2 _/	5150
S1.014	67.587	0.229	295.1	0.726	0.00	0.0	0.600		o	1500
S1.015	30.753	0.100	307.5	0.373	0.00	0.0	0.600		2 _/	1425

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.009	103.411	19.734	0.0	2.07	2057.7
S5.000	104.700	1.111	0.0	1.39	886.8
S5.001	104.548	1.571	0.0	1.40	888.5
S5.002	104.217	2.890	0.0	1.39	885.9
S5.003	103.962	4.149	0.0	1.39	885.9
S5.004	103.707	5.195	0.0	1.39	887.0
S5.005	103.379	5.894	0.0	1.06	787.8
S1.010	103.146	26.501	0.0	0.99	55396.9
S6.000	104.600	1.226	0.0	1.39	886.2
S6.001	104.282	2.568	0.0	1.40	888.5
S6.002	103.951	4.311	0.0	1.39	886.3
S6.003	103.697	5.664	0.0	1.39	887.1
S6.004	103.517	6.617	0.0	1.46	1092.1
S6.005	103.350	7.415	0.0	2.18	1630.9
S1.011	102.518	34.200	0.0	7.60	464768.0
S1.012	102.451	34.467	0.0	2.32	3318.4
S7.000	104.260	0.868	0.0	1.39	744.5
S7.001	104.100	1.194	0.0	1.39	744.5
S7.002	103.769	2.347	0.0	1.32	706.0
S7.003	103.518	3.929	0.0	1.32	704.7
S7.004	103.270	4.786	0.0	1.32	706.1
S7.005	103.090	5.455	0.0	1.39	886.1
S7.006	102.966	5.455	0.0	1.39	886.8
S1.013	102.298	40.354	0.0	7.06	327917.8
S1.014	102.109	41.081	0.0	2.49	4403.2
S1.015	101.880	41.454	0.0	6.70	266965.5

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S8.000	76.733	0.171	448.7	0.769	4.00	0.0	0.600		o	800
S8.001	88.389	0.196	451.0	0.357	0.00	0.0	0.600		o	800
S8.002	90.974	0.182	499.9	0.943	0.00	0.0	0.600		o	800
S8.003	86.782	0.174	498.7	0.972	0.00	0.0	0.600		o	800
S8.004	87.428	0.175	499.6	0.779	0.00	0.0	0.600		o	800
S8.005	79.603	0.159	500.6	0.091	0.00	0.0	0.600		o	800
S1.016	73.565	0.240	306.5	0.286	0.00	0.0	0.600		2 _/	17000
S9.000	79.124	0.158	500.8	0.734	4.00	0.0	0.600		o	800
S9.001	88.766	0.178	498.7	0.418	0.00	0.0	0.600		o	800
S9.002	89.359	0.178	502.0	1.149	0.00	0.0	0.600		o	825
S9.003	84.712	0.170	498.3	1.203	0.00	0.0	0.600		o	825
S9.004	85.534	0.171	500.2	0.460	0.00	0.0	0.600		o	975
S9.005	88.980	0.178	499.9	0.989	0.00	0.0	0.600		o	1050
S1.017	20.825	0.070	297.5	0.000	0.00	0.0	0.600		2 _/	6200
S1.018	50.143	0.165	303.9	0.302	0.00	0.0	0.600		o	1500
S1.019	115.390	0.385	299.7	0.292	0.00	0.0	0.600		2 _/	6200
S10.000	71.759	0.144	498.3	0.475	4.00	0.0	0.600		o	700
S10.001	89.842	0.179	501.9	0.557	0.00	0.0	0.600		o	700
S10.002	90.580	0.181	500.4	0.801	0.00	0.0	0.600		o	700
S10.003	86.924	0.174	499.6	0.665	0.00	0.0	0.600		o	750
S10.004	85.813	0.172	498.9	0.856	0.00	0.0	0.600		o	750
S10.005	74.905	0.150	499.4	0.583	0.00	0.0	0.600		o	975
S1.020	23.643	0.080	295.5	0.365	0.00	0.0	0.600		o	1500
S1.021	34.452	0.115	299.6	0.000	0.00	0.0	0.600		2 _/	18000
S11.000	75.009	0.150	500.1	0.171	4.00	0.0	0.600		o	375

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S8.000	104.260	0.769	0.0	1.37	687.9
S8.001	104.032	1.126	0.0	1.37	686.2
S8.002	103.780	2.069	0.0	1.30	651.4
S8.003	103.523	3.041	0.0	1.30	652.2
S8.004	103.274	3.820	0.0	1.30	651.6
S8.005	103.099	3.910	0.0	1.29	650.9
S1.016	101.780	45.650	0.0	8.51	913545.7
S9.000	103.600	0.734	0.0	1.29	650.8
S9.001	103.367	1.153	0.0	1.30	652.2
S9.002	103.039	2.302	0.0	1.32	704.7
S9.003	102.786	3.504	0.0	1.32	707.3
S9.004	102.616	3.964	0.0	1.47	1093.9
S9.005	102.370	4.953	0.0	1.53	1328.7
S1.017	101.540	50.603	0.0	7.23	365503.0
S1.018	101.470	50.906	0.0	2.46	4339.0
S1.019	101.305	51.198	0.0	7.42	412684.5
S10.000	103.450	0.475	0.0	1.19	459.5
S10.001	103.231	1.032	0.0	1.19	457.9
S10.002	102.902	1.834	0.0	1.19	458.6
S10.003	102.646	2.498	0.0	1.25	550.1
S10.004	102.472	3.355	0.0	1.25	550.5
S10.005	102.225	3.937	0.0	1.47	1094.8
S1.020	100.920	55.501	0.0	2.49	4400.2
S1.021	100.840	55.501	0.0	8.85	1046442.7
S11.000	103.600	0.171	0.0	0.80	88.7

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S11.001	50.000	0.100	500.0	0.281	0.00	0.0	0.600		o	375
S11.002	75.029	0.150	500.0	0.330	0.00	0.0	0.600		o	450
S11.003	35.186	0.070	500.0	0.174	0.00	0.0	0.600		o	450
S1.022	50.721	0.175	289.8	0.091	0.00	0.0	0.600		o	1650
S12.000	89.391	0.179	499.4	0.840	4.00	0.0	0.600		o	750
S12.001	88.314	0.176	501.8	0.364	0.00	0.0	0.600		o	750
S12.002	90.954	0.182	499.7	1.618	0.00	0.0	0.600		o	800
S12.003	90.416	0.181	499.5	1.807	0.00	0.0	0.600		o	900
S12.004	90.762	0.182	498.7	2.030	0.00	0.0	0.600		o	975
S12.005	88.672	0.177	501.0	0.185	0.00	0.0	0.600		o	1000
S12.006	88.786	0.178	498.8	0.669	0.00	0.0	0.600		o	1125
S1.023	66.194	0.331	200.0	0.099	0.00	0.0		0.350	3 \=/	30000
S1.024	75.787	0.379	200.0	0.387	0.00	0.0		0.350	3 \=/	30000
S1.025	72.982	0.146	500.0	0.000	0.00	0.0	0.600		oo	825
S13.000	50.935	0.170	299.6	0.299	4.00	0.0	0.600		o	375
S13.001	84.931	0.283	300.0	0.288	0.00	0.0	0.600		o	375
S13.002	83.849	0.279	300.0	0.000	0.00	0.0	0.600		o	375
S13.003	83.849	0.279	300.0	0.084	0.00	0.0	0.600		o	375
S13.004	89.348	0.298	299.8	0.185	0.00	0.0	0.600		o	450
S13.005	94.879	0.316	300.2	0.081	0.00	0.0	0.600		o	450
S13.006	70.565	0.235	300.3	0.173	0.00	0.0	0.600		o	600
S13.007	68.360	0.228	299.8	0.099	0.00	0.0	0.600		o	675
S13.008	56.790	0.189	300.5	0.075	0.00	0.0	0.600		o	675
S13.009	41.657	0.139	299.7	0.000	0.00	0.0	0.600		o	750
S1.026	87.420	0.437	200.0	0.000	0.00	0.0	0.600		3 \=/	10000
S14.000	93.480	0.312	299.6	0.588	4.00	0.0	0.600		o	375

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S11.001	103.375	0.452	0.0	0.80	88.7
S11.002	103.200	0.782	0.0	0.90	143.5
S11.003	103.050	0.956	0.0	0.90	143.5
S1.022	100.725	56.548	0.0	2.67	5699.6
S12.000	103.300	0.840	0.0	1.25	550.2
S12.001	103.046	1.204	0.0	1.24	548.9
S12.002	102.720	2.822	0.0	1.30	651.5
S12.003	102.388	4.628	0.0	1.40	887.5
S12.004	102.132	6.658	0.0	1.47	1095.6
S12.005	101.950	6.843	0.0	1.49	1168.0
S12.006	101.773	7.512	0.0	1.60	1593.5
S1.023	100.475	64.159	0.0	0.45	89435.1
S1.024	100.144	64.545	0.0	0.47	102041.3
S1.025	99.765	64.545	0.0	1.32	1412.2
S13.000	103.400	0.299	0.0	1.04	115.0
S13.001	103.155	0.587	0.0	1.04	115.0
S13.002	102.872	0.587	0.0	1.04	115.0
S13.003	102.593	0.671	0.0	1.04	115.0
S13.004	102.313	0.856	0.0	1.17	185.9
S13.005	102.015	0.938	0.0	1.17	185.8
S13.006	101.624	1.111	0.0	1.40	395.9
S13.007	101.389	1.211	0.0	1.51	539.8
S13.008	101.161	1.285	0.0	1.51	539.2
S13.009	100.972	1.285	0.0	1.61	711.8
S1.026	99.619	65.831	0.0	10.95	1540625.7
S14.000	105.500	0.588	0.0	1.04	115.0

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S14.001	87.010	0.290	300.0	0.193	0.00	0.0	0.600		o	375
S14.002	43.873	0.146	300.5	0.149	0.00	0.0	0.600		o	450
S14.003	52.497	0.175	300.0	0.119	0.00	0.0	0.600		o	450
S15.000	86.500	0.173	500.0	0.953	4.00	0.0	0.600		o	600
S15.001	87.397	0.175	499.4	0.534	0.00	0.0	0.600		o	600
S15.002	90.849	0.182	500.0	1.055	0.00	0.0	0.600		o	675
S15.003	87.653	0.175	500.0	1.732	0.00	0.0	0.600		o	750
S15.004	81.867	0.164	500.0	1.118	0.00	0.0	0.600		o	825
S15.005	70.157	0.140	501.1	0.560	0.00	0.0	0.600		o	825
S15.006	80.052	0.160	500.0	0.799	0.00	0.0	0.600		o	900
S15.007	138.419	0.692	200.0	0.000	0.00	0.0		0.350	4 \=/	25000
S15.008	93.794	0.188	500.0	0.505	0.00	0.0	0.600		o	900
S15.009	58.171	0.291	199.9	0.000	0.00	0.0		0.350	4 \=/	10000
S1.027	58.770	0.118	500.0	0.208	0.00	0.0	0.600		ooo	750
S1.028	61.440	0.307	200.0	0.000	0.00	0.0		0.350	4 \=/	50000
S16.000	42.348	0.100	423.5	0.698	4.00	0.0	0.600		o	525
S16.001	89.848	0.100	898.5	0.393	0.00	0.0	0.600		o	600
S16.002	90.371	0.150	602.5	0.960	0.00	0.0	0.600		o	600
S16.003	84.919	0.100	849.2	0.790	0.00	0.0	0.600		o	675
S16.004	83.381	0.100	833.8	0.780	0.00	0.0	0.600		o	750
S16.005	79.546	0.100	795.5	0.298	0.00	0.0	0.600		o	750
S16.006	65.785	0.100	657.9	0.115	0.00	0.0	0.600		o	750
S16.007	77.598	0.100	776.0	0.000	0.00	0.0	0.600		o	750
S16.008	152.296	0.670	227.3	0.252	0.00	0.0		0.350	4 \=/	20000
S17.000	85.000	0.625	136.0	0.160	5.00	0.0	0.600		o	375
S17.001	81.870	0.350	233.9	0.114	0.00	0.0	0.600		o	450
S17.002	63.029	0.106	594.6	0.097	0.00	0.0	0.600		o	750
S17.003	71.954	0.144	499.7	0.649	4.00	0.0	0.600		o	750

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S14.001	104.000	0.781	0.0	1.04	115.0
S14.002	102.500	0.930	0.0	1.17	185.7
S14.003	102.354	1.049	0.0	1.17	185.8
S15.000	103.400	0.953	0.0	1.08	306.0
S15.001	103.152	1.488	0.0	1.08	306.2
S15.002	102.827	2.543	0.0	1.17	417.0
S15.003	102.571	4.275	0.0	1.24	549.9
S15.004	102.320	5.394	0.0	1.32	706.1
S15.005	102.156	5.954	0.0	1.32	705.3
S15.006	101.941	6.753	0.0	1.39	887.1
S15.007	101.781	6.753	0.0	0.36	43726.2
S15.008	101.089	7.258	0.0	1.39	887.1
S15.009	100.901	7.258	0.0	0.37	39954.2
S1.027	99.182	74.345	0.0	1.24	1649.6
S1.028	99.064	74.345	0.0	0.49	169228.5
S16.000	100.375	0.698	0.0	1.08	234.2
S16.001	100.200	1.091	0.0	0.80	227.4
S16.002	100.100	2.051	0.0	0.98	278.4
S16.003	99.875	2.841	0.0	0.89	319.0
S16.004	99.700	3.621	0.0	0.96	424.6
S16.005	99.600	3.919	0.0	0.98	434.8
S16.006	99.500	4.034	0.0	1.08	478.7
S16.007	99.400	4.034	0.0	1.00	440.3
S16.008	99.300	4.286	0.0	0.27	16841.7
S17.000	101.000	0.160	0.0	1.55	171.4
S17.001	100.300	0.274	0.0	1.32	210.7
S17.002	99.650	0.371	0.0	1.14	503.8
S17.003	99.544	1.020	0.0	1.25	550.0

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S17.004	65.507	0.200	327.5	0.610	0.00	0.0	0.600		o	750
S17.005	117.579	0.570	206.3	0.432	0.00	0.0		0.350	4 \=/	10000
S18.000	48.963	0.125	391.7	0.837	4.00	0.0	0.600		o	525
S18.001	90.585	0.100	905.8	0.372	0.00	0.0	0.600		o	600
S18.002	89.426	0.075	1192.3	0.356	0.00	0.0	0.600		o	600
S18.003	89.365	0.100	893.6	1.422	0.00	0.0	0.600		o	675
S18.004	74.978	0.075	999.7	0.320	0.00	0.0	0.600		o	675
S18.005	83.433	0.115	725.5	0.263	0.00	0.0	0.600		o	675
S18.006	146.256	0.730	200.4	0.364	0.00	0.0		0.350	4 \=/	30000
S1.029	88.950	0.445	200.0	1.781	0.00	0.0		0.350	4 \=/	50000
S1.030	88.141	0.441	199.9	0.000	0.00	0.0		0.350	4 \=/	50000
S1.031	76.344	0.076	1000.0	0.000	0.00	0.0	0.600		o	750
S1.032	75.127	0.075	1000.0	0.036	0.00	0.0	0.600		o	750
S1.033	73.754	0.074	1000.0	0.000	0.00	0.0	0.600		o	750
S1.034	74.182	0.074	1000.0	0.000	0.00	0.0	0.600		o	750
S1.035	72.629	0.073	1000.0	0.000	0.00	0.0	0.600		o	750
S1.036	69.872	0.070	1000.0	0.000	0.00	0.0	0.600		o	750
S1.037	79.551	0.080	1000.0	0.000	0.00	0.0	0.600		o	750
S1.038	79.428	0.079	1000.0	0.000	0.00	0.0	0.600		o	750
S1.039	80.971	0.081	1000.0	0.000	0.00	0.0	0.600		o	750
S1.040	83.913	0.084	1000.0	0.000	0.00	0.0	0.600		o	750
S1.041	97.840	0.360	271.8	0.000	0.00	0.0	0.600		o	750
S19.000	89.255	0.179	498.6	0.929	4.00	0.0	0.600		o	675
S19.001	89.875	0.179	502.1	0.774	0.00	0.0	0.600		o	675
S19.002	90.413	0.181	500.0	0.907	0.00	0.0	0.600		o	675
S19.003	83.472	0.167	499.8	0.258	0.00	0.0	0.600		o	750
S19.004	60.064	0.120	500.0	1.283	0.00	0.0	0.600		o	750
S20.000	90.765	0.182	500.0	0.189	4.00	0.0	0.600		o	300

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S17.004	99.400	1.630	0.0	1.54	680.7
S17.005	99.200	2.062	0.0	0.26	11636.6
S18.000	100.100	0.837	0.0	1.13	243.7
S18.001	99.900	1.209	0.0	0.80	226.5
S18.002	99.800	1.565	0.0	0.70	197.0
S18.003	99.650	2.987	0.0	0.87	310.8
S18.004	99.550	3.307	0.0	0.82	293.6
S18.005	99.475	3.570	0.0	0.97	345.4
S18.006	99.360	3.934	0.0	0.29	24021.4
S1.029	98.630	86.407	0.0	0.36	63816.2
S1.030	98.185	86.407	0.0	0.39	82413.1
S1.031	97.744	86.407	0.0	0.88	387.2
S1.032	97.668	86.443	0.0	0.88	387.2
S1.033	97.593	86.443	0.0	0.88	387.2
S1.034	97.519	86.443	0.0	0.88	387.2
S1.035	97.445	86.443	0.0	0.88	387.2
S1.036	97.372	86.443	0.0	0.88	387.2
S1.037	97.302	86.443	0.0	0.88	387.2
S1.038	97.222	86.443	0.0	0.88	387.2
S1.039	97.143	86.443	0.0	0.88	387.2
S1.040	97.062	86.443	0.0	0.88	387.2
S1.041	96.978	86.443	0.0	1.69	747.8
S19.000	100.500	0.929	0.0	1.17	417.6
S19.001	100.171	1.703	0.0	1.16	416.1
S19.002	99.917	2.610	0.0	1.17	417.0
S19.003	99.736	2.868	0.0	1.24	550.0
S19.004	99.494	4.151	0.0	1.24	549.9
S20.000	100.900	0.189	0.0	0.70	49.2

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S20.001	90.976	0.182	500.0	0.053	0.00	0.0	0.600		o	300
S20.002	85.718	0.171	500.0	0.180	0.00	0.0	0.600		o	375
S19.005	78.096	0.156	500.0	0.560	0.00	0.0	0.600		o	825
S19.006	86.031	0.172	500.0	0.406	0.00	0.0	0.600		o	825
S19.007	144.022	0.480	300.0	0.358	0.00	0.0	0.600		o	825
S21.000	111.178	0.222	500.8	1.303	4.00	0.0	0.600		o	600
S21.001	98.481	0.199	494.1	0.847	0.00	0.0	0.600		o	600
S21.002	34.079	0.068	500.0	0.450	0.00	0.0	0.600		o	675
S19.008	41.687	0.084	496.3	0.000	0.00	0.0	0.600		o	900
S19.009	38.041	0.032	1205.4	0.308	0.00	0.0	0.600		o	1050
S22.000	87.669	0.175	500.0	1.130	4.00	0.0	0.600		o	525
S22.001	90.892	0.182	500.0	1.309	0.00	0.0	0.600		o	675
S22.002	88.037	0.176	500.0	0.852	0.00	0.0	0.600		o	750
S22.003	89.255	0.179	500.0	0.700	0.00	0.0	0.600		o	750
S22.004	77.750	0.156	500.0	0.462	0.00	0.0	0.600		o	750
S22.005	69.610	0.139	500.0	0.461	0.00	0.0	0.600		o	825
S22.006	54.953	0.110	500.0	1.044	0.00	0.0	0.600		o	825
S22.007	130.885	0.262	499.6	0.000	0.00	0.0	0.600		o	825
S22.008	232.762	0.464	501.6	0.000	0.00	0.0	0.600		o	825
S23.000	85.990	0.247	348.1	0.313	4.00	0.0	0.600		o	375
S23.001	89.318	0.179	500.0	0.618	0.00	0.0	0.600		o	450
S23.002	91.005	0.182	500.0	0.260	0.00	0.0	0.600		o	525
S23.003	36.241	1.084	33.4	1.516	0.00	0.0	0.600		o	525
S22.009	62.033	0.099	626.9	0.538	0.00	0.0	0.600		o	825
S1.042	30.322	0.168	180.5	0.000	0.00	0.0	0.600		o	750

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S20.001	100.718	0.242	0.0	0.70	49.2
S20.002	100.462	0.422	0.0	0.80	88.7
S19.005	99.299	5.132	0.0	1.32	706.1
S19.006	99.143	5.538	0.0	1.32	706.1
S19.007	98.971	5.896	0.0	1.71	913.4
S21.000	100.350	1.303	0.0	1.08	305.7
S21.001	100.053	2.151	0.0	1.09	307.8
S21.002	99.779	2.601	0.0	1.17	417.0
S19.008	98.416	8.497	0.0	1.40	890.4
S19.009	98.182	8.805	0.0	0.98	851.9
S22.000	100.500	1.130	0.0	0.99	215.4
S22.001	100.175	2.439	0.0	1.17	417.0
S22.002	99.918	3.291	0.0	1.24	549.9
S22.003	99.742	3.990	0.0	1.24	549.9
S22.004	99.563	4.452	0.0	1.24	549.9
S22.005	99.333	4.913	0.0	1.32	706.1
S22.006	99.194	5.957	0.0	1.32	706.1
S22.007	99.084	5.957	0.0	1.32	706.4
S22.008	98.822	5.957	0.0	1.32	704.9
S23.000	100.500	0.313	0.0	0.97	106.6
S23.001	100.178	0.930	0.0	0.90	143.5
S23.002	99.924	1.190	0.0	0.99	215.4
S23.003	99.742	2.707	0.0	3.88	840.7
S22.009	98.358	9.202	0.0	1.18	629.9
S1.042	96.668	104.450	0.0	2.08	918.9

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	24	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S8, DS/PN: S1.007, Volume (m³): 94.1

Invert Level (m) 104.048

Depth (m)	Flow (l/s)
0.100	450.0000

Depth/Flow Relationship Manhole: S10, DS/PN: S1.010, Volume (m³): 132.1

Invert Level (m) 103.146

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	750.0000	0.700	2000.0000	1.300	2000.0000	1.900	2000.0000	2.500	2000.0000
0.200	750.0000	0.800	2000.0000	1.400	2000.0000	2.000	2000.0000	2.600	2000.0000
0.300	750.0000	0.900	2000.0000	1.500	2000.0000	2.100	2000.0000	2.700	2000.0000
0.400	750.0000	1.000	2000.0000	1.600	2000.0000	2.200	2000.0000	2.800	2000.0000
0.500	2000.0000	1.100	2000.0000	1.700	2000.0000	2.300	2000.0000	2.900	2000.0000
0.600	2000.0000	1.200	2000.0000	1.800	2000.0000	2.400	2000.0000	3.000	2000.0000

Non Return Valve Manhole: S11, DS/PN: S1.011, Volume (m³): 10623.2

Non Return Valve Manhole: S12, DS/PN: S1.012, Volume (m³): 1230.6

Non Return Valve Manhole: S13, DS/PN: S1.013, Volume (m³): 105.8

Depth/Flow Relationship Manhole: S14, DS/PN: S1.014, Volume (m³): 2632.7

Invert Level (m) 102.109

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	800.0000	0.700	2000.0000	1.300	2000.0000	1.900	2000.0000	2.500	2000.0000
0.200	800.0000	0.800	2000.0000	1.400	2000.0000	2.000	2000.0000	2.600	2000.0000
0.300	800.0000	0.900	2000.0000	1.500	2000.0000	2.100	2000.0000	2.700	2000.0000
0.400	800.0000	1.000	2000.0000	1.600	2000.0000	2.200	2000.0000	2.800	2000.0000
0.500	800.0000	1.100	2000.0000	1.700	2000.0000	2.300	2000.0000	2.900	2000.0000
0.600	2000.0000	1.200	2000.0000	1.800	2000.0000	2.400	2000.0000	3.000	2000.0000

Non Return Valve Manhole: S16, DS/PN: S1.016, Volume (m³): 1264.1

Non Return Valve Manhole: S17, DS/PN: S1.017, Volume (m³): 7974.0

Depth/Flow Relationship Manhole: S19, DS/PN: S1.019, Volume (m³): 88.6

Invert Level (m) 101.305

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	900.0000	0.200	900.0000	0.300	900.0000	0.400	900.0000	0.500	900.0000

Depth/Flow Relationship Manhole: S19, DS/PN: S1.019, Volume (m³): 88.6

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.600	2000.0000	1.100	2000.0000	1.600	2000.0000	2.100	2000.0000	2.600	2000.0000
0.700	2000.0000	1.200	2000.0000	1.700	2000.0000	2.200	2000.0000	2.700	2000.0000
0.800	2000.0000	1.300	2000.0000	1.800	2000.0000	2.300	2000.0000	2.800	2000.0000
0.900	2000.0000	1.400	2000.0000	1.900	2000.0000	2.400	2000.0000	2.900	2000.0000
1.000	2000.0000	1.500	2000.0000	2.000	2000.0000	2.500	2000.0000	3.000	2000.0000

Non Return Valve Manhole: S20, DS/PN: S1.020, Volume (m³): 6469.2

Depth/Flow Relationship Manhole: S22, DS/PN: S1.022, Volume (m³): 4080.3

Invert Level (m) 100.725

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	290.0000	1.400	2500.0000	2.600	2500.0000	3.800	2500.0000	5.000	2500.0000
0.400	290.0000	1.600	2500.0000	2.800	2500.0000	4.000	2500.0000	5.200	2500.0000
0.600	290.0000	1.800	2500.0000	3.000	2500.0000	4.200	2500.0000	5.400	2500.0000
0.800	290.0000	2.000	2500.0000	3.200	2500.0000	4.400	2500.0000	5.600	2500.0000
1.000	290.0000	2.200	2500.0000	3.400	2500.0000	4.600	2500.0000	5.800	2500.0000
1.200	290.0000	2.400	2500.0000	3.600	2500.0000	4.800	2500.0000	6.000	2500.0000

Depth/Flow Relationship Manhole: S23, DS/PN: S1.023, Volume (m³): 195.8

Invert Level (m) 100.475

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	300.0000	1.400	2500.0000	2.600	2500.0000	3.800	2500.0000	5.000	2500.0000
0.400	300.0000	1.600	2500.0000	2.800	2500.0000	4.000	2500.0000	5.200	2500.0000
0.600	300.0000	1.800	2500.0000	3.000	2500.0000	4.200	2500.0000	5.400	2500.0000
0.800	300.0000	2.000	2500.0000	3.200	2500.0000	4.400	2500.0000	5.600	2500.0000
1.000	300.0000	2.200	2500.0000	3.400	2500.0000	4.600	2500.0000	5.800	2500.0000
1.200	300.0000	2.400	2500.0000	3.600	2500.0000	4.800	2500.0000	6.000	2500.0000

Non Return Valve Manhole: S25, DS/PN: S1.025, Volume (m³): 16402.0

Non Return Valve Manhole: S39, DS/PN: S13.007, Volume (m³): 25.9

Non Return Valve Manhole: S41, DS/PN: S13.009, Volume (m³): 26.9

Non Return Valve Manhole: S129, DS/PN: S15.008, Volume (m³): 16876.4

Non Return Valve Manhole: S130, DS/PN: S15.009, Volume (m³): 59.7

Non Return Valve Manhole: S27, DS/PN: S1.027, Volume (m³): 18600.0

Non Return Valve Manhole: S28, DS/PN: S1.028, Volume (m³): 77.9

Depth/Flow Relationship Manhole: S29, DS/PN: S1.029, Volume (m³): 47423.7

Invert Level (m) 98.630

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	500.0000	1.400	2500.0000	2.600	2500.0000	3.800	2500.0000	5.000	2500.0000
0.400	500.0000	1.600	2500.0000	2.800	2500.0000	4.000	2500.0000	5.200	2500.0000
0.600	2500.0000	1.800	2500.0000	3.000	2500.0000	4.200	2500.0000	5.400	2500.0000
0.800	2500.0000	2.000	2500.0000	3.200	2500.0000	4.400	2500.0000	5.600	2500.0000
1.000	2500.0000	2.200	2500.0000	3.400	2500.0000	4.600	2500.0000	5.800	2500.0000
1.200	2500.0000	2.400	2500.0000	3.600	2500.0000	4.800	2500.0000	6.000	2500.0000

Non Return Valve Manhole: S30, DS/PN: S1.030, Volume (m³): 15385.8

Non Return Valve Manhole: S120, DS/PN: S1.031, Volume (m³): 18115.9

Depth/Flow Relationship Manhole: S187, DS/PN: S19.008, Volume (m³): 96.8

Invert Level (m) 98.416

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	22.9000	1.400	22.9000	2.600	22.9000	3.800	22.9000	5.000	22.9000
0.400	22.9000	1.600	22.9000	2.800	22.9000	4.000	22.9000	5.200	22.9000
0.600	22.9000	1.800	22.9000	3.000	22.9000	4.200	22.9000	5.400	22.9000
0.800	22.9000	2.000	22.9000	3.200	22.9000	4.400	22.9000	5.600	22.9000
1.000	22.9000	2.200	22.9000	3.400	22.9000	4.600	22.9000	5.800	22.9000
1.200	22.9000	2.400	22.9000	3.600	22.9000	4.800	22.9000	6.000	22.9000

Depth/Flow Relationship Manhole: S196, DS/PN: S22.009, Volume (m³): 140.2

Invert Level (m) 98.358

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	45.9000	1.400	45.9000	2.600	45.9000	3.800	45.9000	5.000	45.9000
0.400	45.9000	1.600	45.9000	2.800	45.9000	4.000	45.9000	5.200	45.9000
0.600	45.9000	1.800	45.9000	3.000	45.9000	4.200	45.9000	5.400	45.9000
0.800	45.9000	2.000	45.9000	3.200	45.9000	4.400	45.9000	5.600	45.9000
1.000	45.9000	2.200	45.9000	3.400	45.9000	4.600	45.9000	5.800	45.9000
1.200	45.9000	2.400	45.9000	3.600	45.9000	4.800	45.9000	6.000	45.9000

Storage Structures for Storm

Tank or Pond Manhole: S8, DS/PN: S1.007

Invert Level (m) 104.048

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1800.0	0.500	1800.0

Tank or Pond Manhole: S10, DS/PN: S1.010

Invert Level (m) 103.146

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1350.0	0.500	1350.0

Tank or Pond Manhole: S14, DS/PN: S1.014

Invert Level (m) 102.109

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	0.500	600.0

Tank or Pond Manhole: S19, DS/PN: S1.019

Invert Level (m) 101.305

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	0.100	600.0

Tank or Pond Manhole: S22, DS/PN: S1.022

Invert Level (m) 100.725

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.000	1000.0

Tank or Pond Manhole: S23, DS/PN: S1.023

Invert Level (m) 100.475

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.000	1000.0

Tank or Pond Manhole: S29, DS/PN: S1.029

Invert Level (m) 98.630

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28750.0	2.000	28750.0

Tank or Pond Manhole: S120, DS/PN: S1.031

Invert Level (m) 97.744

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28750.0	2.000	28750.0

Tank or Pond Manhole: S187, DS/PN: S19.008

Invert Level (m) 98.416

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2965.0	1.600	2965.0

Tank or Pond Manhole: S196, DS/PN: S22.009

Invert Level (m) 98.358

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	5722.0	1.000	5722.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	24	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			5
S1.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			5
S1.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			5
S1.003	15 Winter	1	0%	30/15 Winter	100/15 Summer			4
S1.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S1.005	15 Winter	1	0%	30/15 Summer	100/15 Summer			2
S1.006	15 Winter	1	0%	30/15 Summer				
S2.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			3
S2.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			3
S2.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			3
S2.003	15 Winter	1	0%	100/15 Summer	100/15 Summer			2
S2.004	15 Winter	1	0%	30/15 Summer				
S2.005	15 Winter	1	0%	30/15 Summer				
S1.007	30 Winter	1	0%					
S3.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S3.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S3.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S3.003	15 Winter	1	0%	30/15 Winter	100/15 Summer			4
S3.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			3
S3.005	15 Winter	1	0%	30/15 Summer				
S3.006	15 Winter	1	0%	30/15 Summer				
S4.000	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S4.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S4.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
S4.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S4.004	15 Winter	1	0%	30/15 Summer				
S1.008	30 Winter	1	0%					
S1.009	30 Winter	1	0%	100/15 Winter				
S5.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			5
S5.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			5
S5.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S5.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S5.004	15 Winter	1	0%	30/15 Summer				
S5.005	15 Winter	1	0%	30/15 Summer				
S1.010	60 Winter	1	0%					
S6.000	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S6.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S6.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S6.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			2
S6.004	15 Winter	1	0%	30/15 Summer				
S6.005	15 Winter	1	0%	30/15 Winter				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.011	60 Winter	1	0%					
S1.012	120 Summer	1	0%	30/240 Winter				
S7.000	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S7.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S7.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S7.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
S7.004	15 Winter	1	0%	30/15 Summer				
S7.005	15 Winter	1	0%	30/15 Summer				
S7.006	15 Winter	1	0%	30/15 Summer				
S1.013	120 Winter	1	0%					
S1.014	120 Winter	1	0%	30/120 Winter				
S1.015	240 Winter	1	0%					
S8.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S8.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S8.002	15 Winter	1	0%	30/15 Winter	100/15 Summer			4
S8.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S8.004	15 Winter	1	0%	30/15 Summer				
S8.005	15 Winter	1	0%	30/15 Summer				
S1.016	240 Winter	1	0%					
S9.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S9.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S9.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S9.003	15 Winter	1	0%	30/15 Summer	100/15 Winter			1
S9.004	15 Winter	1	0%	100/15 Summer				
S9.005	15 Winter	1	0%	100/15 Summer				
S1.017	240 Winter	1	0%					
S1.018	240 Winter	1	0%	30/60 Winter				
S1.019	240 Winter	1	0%					
S10.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			4
S10.001	15 Winter	1	0%	30/15 Winter	100/15 Summer			4
S10.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S10.003	15 Winter	1	0%	30/15 Summer	100/15 Winter			1
S10.004	15 Winter	1	0%	30/15 Summer				
S10.005	15 Winter	1	0%	100/15 Summer				
S1.020	240 Winter	1	0%	30/15 Winter				
S1.021	240 Winter	1	0%					
S11.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S11.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S11.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			2
S11.003	15 Winter	1	0%	30/15 Summer				
S1.022	240 Winter	1	0%	30/60 Summer				
S12.000	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S12.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S12.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S12.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
S12.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			2
S12.005	15 Winter	1	0%	30/15 Summer				
S12.006	15 Winter	1	0%	30/15 Winter				
S1.023	720 Winter	1	0%					
S1.024	120 Summer	1	0%					
S1.025	180 Summer	1	0%	100/120 Winter				
S13.000	15 Winter	1	0%					
S13.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S13.002	15 Winter	1	0%	30/15 Summer				
S13.003	15 Winter	1	0%	30/15 Summer				
S13.004	15 Winter	1	0%	100/15 Summer				
S13.005	15 Winter	1	0%	100/15 Summer				
S13.006	30 Winter	1	0%					
S13.007	30 Winter	1	0%					
S13.008	30 Winter	1	0%					
S13.009	30 Winter	1	0%					
S1.026	120 Winter	1	0%					
S14.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S14.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S14.002	15 Winter	1	0%	30/15 Summer				
S14.003	15 Winter	1	0%	30/15 Summer				
S15.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			8
S15.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S15.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S15.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			6

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S15.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			3
S15.005	15 Winter	1	0%	30/15 Summer				
S15.006	30 Winter	1	0%	30/15 Summer				
S15.007	30 Winter	1	0%					
S15.008	60 Winter	1	0%					
S15.009	60 Winter	1	0%					
S1.027	60 Winter	1	0%	100/15 Winter				
S1.028	60 Winter	1	0%					
S16.000	15 Winter	1	0%	30/15 Summer	30/15 Winter			10
S16.001	15 Winter	1	0%	30/15 Summer	30/15 Winter			10
S16.002	15 Winter	1	0%	30/15 Summer	30/15 Winter			9
S16.003	30 Winter	1	0%	30/15 Summer	100/15 Summer			6
S16.004	30 Winter	1	0%	30/15 Summer	100/15 Summer			4
S16.005	30 Winter	1	0%	30/15 Summer				
S16.006	30 Winter	1	0%	30/15 Summer				
S16.007	30 Winter	1	0%	30/15 Summer				
S16.008	30 Winter	1	0%					
S17.000	15 Winter	1	0%	100/15 Summer				
S17.001	15 Winter	1	0%	100/15 Summer				
S17.002	15 Winter	1	0%	100/15 Summer				
S17.003	15 Winter	1	0%	100/15 Summer				
S17.004	15 Winter	1	0%	100/15 Summer				
S17.005	15 Winter	1	0%					
S18.000	15 Winter	1	0%	30/15 Summer	30/15 Winter			9
S18.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			8
S18.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S18.003	30 Winter	1	0%	30/15 Summer	100/15 Summer			6
S18.004	30 Winter	1	0%	30/15 Summer				
S18.005	30 Winter	1	0%	30/15 Summer				
S18.006	30 Winter	1	0%					
S1.029	960 Winter	1	0%					
S1.030	2160 Winter	1	0%					
S1.031	2160 Winter	1	0%	30/600 Winter				
S1.032	2160 Winter	1	0%	30/600 Winter				
S1.033	2160 Winter	1	0%	30/600 Winter				
S1.034	2160 Winter	1	0%	30/600 Winter				
S1.035	2160 Winter	1	0%	30/600 Winter				
S1.036	2160 Winter	1	0%	30/600 Winter				
S1.037	2160 Winter	1	0%	30/600 Winter				
S1.038	2160 Winter	1	0%	30/600 Winter				
S1.039	2160 Winter	1	0%	30/720 Winter				
S1.040	2160 Winter	1	0%	100/480 Winter				
S1.041	2160 Winter	1	0%					
S19.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S19.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S19.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S19.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S19.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
S20.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S20.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S20.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S19.005	30 Winter	1	0%	30/15 Summer	100/15 Summer			2
S19.006	30 Winter	1	0%	30/15 Summer				
S19.007	30 Winter	1	0%	30/15 Winter				
S21.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S21.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S21.002	15 Winter	1	0%	30/15 Summer				
S19.008	720 Winter	1	0%	30/180 Winter				
S19.009	15 Winter	1	0%					
S22.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			9
S22.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			8
S22.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S22.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S22.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S22.005	30 Winter	1	0%	30/15 Summer	100/15 Summer			4
S22.006	30 Winter	1	0%	30/15 Summer	100/15 Summer			4
S22.007	30 Winter	1	0%	30/15 Summer				
S22.008	30 Winter	1	0%	30/15 Summer				
S23.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S23.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			5

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S23.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			3
S23.003	15 Winter	1	0%	100/15 Summer	100/15 Winter			1
S22.009	720 Winter	1	0%	100/60 Winter				
S1.042	2160 Winter	1	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	106.308	-0.597	0.000	0.16	0.0	93.8	OK
S1.001	S2	106.147	-0.563	0.000	0.20	0.0	128.2	OK
S1.002	S3	105.952	-0.578	0.000	0.18	0.0	115.8	OK
S1.003	S4	105.765	-0.509	0.000	0.30	0.0	187.7	OK
S1.004	S5	105.555	-0.488	0.000	0.33	0.0	203.7	OK
S1.005	S5	105.374	-0.502	0.000	0.32	0.0	254.5	OK
S1.006	S6	105.082	-0.360	0.000	0.61	0.0	382.4	OK
S2.000	S8	105.451	-0.574	0.000	0.20	0.0	85.8	OK
S2.001	S9	105.425	-0.591	0.000	0.14	0.0	82.9	OK
S2.002	S10	105.317	-0.589	0.000	0.17	0.0	107.8	OK
S2.003	S11	105.050	-0.523	0.000	0.27	0.0	174.4	OK
S2.004	S12	104.834	-0.476	0.000	0.36	0.0	227.3	OK
S2.005	S13	104.616	-0.435	0.000	0.45	0.0	281.6	OK
S1.007	S8	104.170	-2.830	0.000	0.01	0.0	422.8	OK
S3.000	S8	105.428	-0.597	0.000	0.15	0.0	93.1	OK
S3.001	S9	105.266	-0.565	0.000	0.20	0.0	126.9	OK
S3.002	S10	105.082	-0.580	0.000	0.18	0.0	114.1	OK
S3.003	S11	104.894	-0.514	0.000	0.29	0.0	182.7	OK
S3.004	S12	104.686	-0.467	0.000	0.38	0.0	238.7	OK
S3.005	S13	104.468	-0.432	0.000	0.45	0.0	283.2	OK
S3.006	S14	104.254	-0.465	0.000	0.46	0.0	352.9	OK
S4.000	S63	105.563	-0.464	0.000	0.20	0.0	78.1	OK
S4.001	S64	105.461	-0.457	0.000	0.24	0.0	101.6	OK
S4.002	S65	105.210	-0.384	0.000	0.40	0.0	166.8	OK
S4.003	S66	105.025	-0.332	0.000	0.50	0.0	211.0	OK
S4.004	S67	104.860	-0.308	0.000	0.60	0.0	253.8	OK
S1.008	S8	103.998	-3.002	0.000	0.02	0.0	772.4	OK
S1.009	S9	103.922	-0.614	0.000	0.43	0.0	770.9	OK*
S5.000	S68	104.974	-0.626	0.000	0.17	0.0	130.0	OK
S5.001	S69	104.829	-0.619	0.000	0.20	0.0	158.4	OK
S5.002	S70	104.584	-0.533	0.000	0.33	0.0	259.8	OK
S5.003	S71	104.386	-0.476	0.000	0.44	0.0	342.2	OK
S5.004	S72	104.161	-0.446	0.000	0.49	0.0	386.7	OK
S5.005	S73	103.926	-0.428	0.000	0.60	0.0	403.6	OK
S1.010	S10	103.430	-3.070	0.000	0.01	0.0	750.0	OK
S6.000	S25	104.875	-0.625	0.000	0.19	0.0	146.9	OK
S6.001	S26	104.642	-0.540	0.000	0.32	0.0	253.7	OK
S6.002	S27	104.407	-0.444	0.000	0.49	0.0	386.1	OK
S6.003	S28	104.206	-0.391	0.000	0.58	0.0	454.5	OK
S6.004	S29	104.020	-0.472	0.000	0.51	0.0	484.0	OK
S6.005	S30	103.755	-0.570	0.000	0.36	0.0	507.3	OK
S1.011	S11	103.035	-3.465	0.000	0.01	0.0	993.8	OK
S1.012	S12	103.042	-0.759	0.000	0.36	0.0	957.1	OK*
S7.000	S33	104.500	-0.585	0.000	0.18	0.0	107.5	OK
S7.001	S34	104.354	-0.571	0.000	0.20	0.0	130.9	OK
S7.002	S35	104.123	-0.471	0.000	0.35	0.0	218.3	OK
S7.003	S36	103.955	-0.388	0.000	0.53	0.0	330.6	OK
S7.004	S37	103.738	-0.357	0.000	0.57	0.0	359.2	OK
S7.005	S38	103.568	-0.422	0.000	0.49	0.0	369.1	OK
S7.006	S39	103.410	-0.456	0.000	0.49	0.0	366.4	OK
S1.013	S13	102.787	-3.213	0.000	0.01	0.0	1153.0	OK
S1.014	S14	102.770	-0.839	0.000	0.30	0.0	1029.1	OK*
S1.015	S15	102.493	-3.507	0.000	0.01	0.0	804.8	OK
S8.000	S42	104.476	-0.584	0.000	0.15	0.0	93.6	OK
S8.001	S43	104.277	-0.555	0.000	0.19	0.0	115.3	OK
S8.002	S44	104.101	-0.479	0.000	0.32	0.0	187.7	OK
S8.003	S45	103.898	-0.425	0.000	0.43	0.0	252.1	OK
S8.004	S46	103.678	-0.396	0.000	0.49	0.0	283.0	OK
S8.005	S47	103.493	-0.406	0.000	0.49	0.0	280.1	OK
S1.016	S16	102.486	-3.514	0.000	0.00	0.0	911.3	OK
S9.000	S49	103.817	-0.583	0.000	0.15	0.0	88.2	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S9.001	S50	103.618	-0.549	0.000	0.20	0.0	118.5	OK
S9.002	S51	103.377	-0.487	0.000	0.33	0.0	210.5	OK
S9.003	S52	103.191	-0.420	0.000	0.46	0.0	290.5	OK
S9.004	S53	102.998	-0.593	0.000	0.32	0.0	301.8	OK
S9.005	S54	102.761	-0.659	0.000	0.30	0.0	340.6	OK
S1.017	S17	102.470	-2.780	0.000	0.01	0.0	995.2	OK
S1.018	S18	102.463	-0.507	0.000	0.31	0.0	1046.3	OK*
S1.019	S19	102.408	-2.842	0.000	0.00	0.0	837.9	OK
S10.000	S58	103.631	-0.519	0.000	0.14	0.0	57.6	OK
S10.001	S59	103.470	-0.461	0.000	0.24	0.0	101.6	OK
S10.002	S60	103.215	-0.387	0.000	0.40	0.0	165.9	OK
S10.003	S61	103.005	-0.391	0.000	0.41	0.0	203.7	OK
S10.004	S62	102.852	-0.370	0.000	0.49	0.0	244.5	OK
S10.005	S64	102.580	-0.620	0.000	0.28	0.0	266.4	OK
S1.020	S20	102.377	-0.043	0.000	0.22	0.0	750.3	OK*
S1.021	S21	102.265	-2.985	0.000	0.00	0.0	740.9	OK
S11.000	S65	103.731	-0.244	0.000	0.24	0.0	19.8	OK
S11.001	S66	103.579	-0.171	0.000	0.54	0.0	44.7	OK
S11.002	S67	103.438	-0.212	0.000	0.52	0.0	69.5	OK
S11.003	S68	103.310	-0.190	0.000	0.63	0.0	79.1	OK
S1.022	S22	102.253	-0.122	0.000	0.07	0.0	289.4	OK*
S12.000	S66	103.537	-0.513	0.000	0.20	0.0	98.5	OK
S12.001	S67	103.306	-0.490	0.000	0.25	0.0	123.0	OK
S12.002	S68	103.098	-0.422	0.000	0.43	0.0	254.7	OK
S12.003	S69	102.841	-0.447	0.000	0.48	0.0	379.3	OK
S12.004	S70	102.642	-0.465	0.000	0.52	0.0	500.7	OK
S12.005	S71	102.444	-0.506	0.000	0.48	0.0	484.8	OK
S12.006	S72	102.242	-0.656	0.000	0.36	0.0	495.5	OK
S1.023	S23	101.676	-3.324	0.000	0.00	0.0	306.9	OK
S1.024	S24	100.314	-4.686	0.000	0.00	0.0	318.7	OK
S1.025	S25	100.027	-0.563	0.000	0.22	0.0	314.6	OK*
S13.000	S33	103.550	-0.225	0.000	0.32	0.0	37.2	OK*
S13.001	S34	103.365	-0.166	0.000	0.55	0.0	60.8	OK
S13.002	S35	103.070	-0.177	0.000	0.52	0.0	56.6	OK
S13.003	S85	102.794	-0.173	0.000	0.54	0.0	58.7	OK
S13.004	S36	102.506	-0.257	0.000	0.37	0.0	64.8	OK
S13.005	S37	102.207	-0.258	0.000	0.37	0.0	65.1	OK
S13.006	S38	101.802	-0.422	0.000	0.19	0.0	69.0	OK
S13.007	S39	101.563	-0.501	0.000	0.15	0.0	72.0	OK
S13.008	S40	101.339	-0.497	0.000	0.16	0.0	74.0	OK
S13.009	S41	101.148	-0.574	0.000	0.13	0.0	74.0	OK
S1.026	S26	99.644	-5.356	0.000	0.00	0.0	362.3	OK
S14.000	S89	105.731	-0.144	0.000	0.69	0.0	75.7	OK
S14.001	S90	104.272	-0.103	0.000	0.87	0.0	95.2	OK
S14.002	S91	102.764	-0.186	0.000	0.62	0.0	104.1	OK
S14.003	S92	102.621	-0.183	0.000	0.66	0.0	112.3	OK
S15.000	S110	103.675	-0.325	0.000	0.38	0.0	107.3	OK
S15.001	S111	103.466	-0.286	0.000	0.51	0.0	142.8	OK
S15.002	S112	103.205	-0.297	0.000	0.57	0.0	218.2	OK
S15.003	S113	103.026	-0.294	0.000	0.66	0.0	328.2	OK
S15.004	S114	102.803	-0.342	0.000	0.59	0.0	370.1	OK
S15.005	S103	102.632	-0.349	0.000	0.62	0.0	380.8	OK
S15.006	S115	102.408	-0.434	0.000	0.52	0.0	406.4	OK
S15.007	S116	102.000	-3.000	0.000	0.01	0.0	406.1	OK
S15.008	S129	101.413	-0.576	0.000	0.28	0.0	250.0	OK*
S15.009	S130	101.179	-3.821	0.000	0.01	0.0	249.8	OK
S1.027	S27	99.496	-0.436	0.000	0.37	0.0	608.9	OK*
S1.028	S28	99.249	-4.751	0.000	0.00	0.0	608.6	OK
S16.000	S92	100.614	-0.286	0.000	0.40	0.0	81.4	OK
S16.001	S93	100.531	-0.269	0.000	0.44	0.0	93.1	OK
S16.002	S94	100.449	-0.251	0.000	0.59	0.0	153.4	OK
S16.003	S95	100.278	-0.272	0.000	0.61	0.0	176.5	OK
S16.004	S96	100.135	-0.315	0.000	0.52	0.0	199.6	OK
S16.005	S114	100.019	-0.331	0.000	0.51	0.0	197.4	OK
S16.006	S97	99.894	-0.356	0.000	0.46	0.0	193.7	OK
S16.007	S98	99.771	-0.379	0.000	0.48	0.0	190.5	OK
S16.008	S99	99.466	-2.034	0.000	0.01	0.0	191.9	OK
S17.000	S129	101.086	-0.289	0.000	0.12	0.0	19.1	OK
S17.001	S130	100.418	-0.332	0.000	0.16	0.0	30.8	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S17.002	S131	99.847	-0.553	0.000	0.09	0.0	38.3	OK
S17.003	S134	99.787	-0.507	0.000	0.20	0.0	95.0	OK
S17.004	S135	99.653	-0.497	0.000	0.25	0.0	146.2	OK
S17.005	S136	99.431	-2.069	0.000	0.02	0.0	176.7	OK
S18.000	S120	100.360	-0.265	0.000	0.46	0.0	100.3	OK
S18.001	S121	100.255	-0.245	0.000	0.51	0.0	106.6	OK
S18.002	S122	100.175	-0.225	0.000	0.53	0.0	105.4	OK
S18.003	S123	100.085	-0.240	0.000	0.60	0.0	171.4	OK
S18.004	S124	99.975	-0.250	0.000	0.65	0.0	173.2	OK
S18.005	S148	99.840	-0.310	0.000	0.56	0.0	175.6	OK
S18.006	S125	99.482	-2.018	0.000	0.01	0.0	182.4	OK
S1.029	S29	98.795	-2.705	0.000	0.01	0.0	411.8	OK
S1.030	S30	98.346	-3.154	0.000	0.00	0.0	392.9	OK
S1.031	S120	98.273	-0.221	0.000	0.56	0.0	192.3	OK
S1.032	S31	98.196	-0.222	0.000	0.56	0.0	192.3	OK
S1.033	S32	98.118	-0.225	0.000	0.56	0.0	192.4	OK
S1.034	S33	98.040	-0.229	0.000	0.56	0.0	192.4	OK
S1.035	S34	97.960	-0.235	0.000	0.56	0.0	192.4	OK
S1.036	S35	97.877	-0.245	0.000	0.56	0.0	192.4	OK
S1.037	S36	97.792	-0.260	0.000	0.56	0.0	192.4	OK
S1.038	S37	97.695	-0.277	0.000	0.56	0.0	192.3	OK
S1.039	S38	97.588	-0.305	0.000	0.55	0.0	192.3	OK
S1.040	S153	97.460	-0.352	0.000	0.55	0.0	192.3	OK
S1.041	S154	97.248	-0.480	0.000	0.28	0.0	192.3	OK
S19.000	S181	100.758	-0.417	0.000	0.28	0.0	107.7	OK
S19.001	S181	100.494	-0.352	0.000	0.44	0.0	166.0	OK
S19.002	S182	100.303	-0.288	0.000	0.59	0.0	224.4	OK
S19.003	S183	100.098	-0.388	0.000	0.46	0.0	225.0	OK
S19.004	S185	99.906	-0.337	0.000	0.58	0.0	273.9	OK
S20.000	S202	101.053	-0.147	0.000	0.43	0.0	20.5	OK
S20.001	S203	100.871	-0.147	0.000	0.46	0.0	21.9	OK
S20.002	S204	100.630	-0.206	0.000	0.42	0.0	35.2	OK
S19.005	S184	99.740	-0.384	0.000	0.52	0.0	322.3	OK
S19.006	S185	99.571	-0.397	0.000	0.53	0.0	331.2	OK
S19.007	S186	99.332	-0.464	0.000	0.40	0.0	339.3	OK
S21.000	S189	100.676	-0.274	0.000	0.49	0.0	140.2	OK
S21.001	S190	100.430	-0.223	0.000	0.67	0.0	191.2	OK
S21.002	S191	100.168	-0.286	0.000	0.63	0.0	213.0	OK
S19.008	S187	98.843	-0.473	0.000	0.03	0.0	22.9	OK
S19.009	S202	98.338	-0.894	0.000	0.05	0.0	32.3	OK
S22.000	S188	100.823	-0.202	0.000	0.61	0.0	123.6	OK
S22.001	S189	100.560	-0.290	0.000	0.59	0.0	225.2	OK
S22.002	S190	100.332	-0.336	0.000	0.54	0.0	269.8	OK
S22.003	S191	100.166	-0.326	0.000	0.59	0.0	292.1	OK
S22.004	S226	99.985	-0.329	0.000	0.59	0.0	289.9	OK
S22.005	S192	99.779	-0.379	0.000	0.48	0.0	294.1	OK
S22.006	S193	99.644	-0.375	0.000	0.54	0.0	318.2	OK
S22.007	S194	99.490	-0.419	0.000	0.48	0.0	312.5	OK
S22.008	S195	99.215	-0.432	0.000	0.46	0.0	310.3	OK
S23.000	S197	100.664	-0.211	0.000	0.35	0.0	36.0	OK
S23.001	S198	100.450	-0.178	0.000	0.63	0.0	85.3	OK
S23.002	S199	100.189	-0.260	0.000	0.48	0.0	97.1	OK
S23.003	S200	99.941	-0.326	0.000	0.31	0.0	220.7	OK
S22.009	S196	98.564	-0.619	0.000	0.09	0.0	45.9	OK
S1.042	S137	96.984	-0.434	0.000	0.37	0.0	239.2	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	24	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			5
S1.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			5
S1.002	15 Winter	30	0%	100/15 Summer	100/15 Summer			5
S1.003	15 Winter	30	0%	30/15 Winter	100/15 Summer			4
S1.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S1.005	15 Winter	30	0%	30/15 Summer	100/15 Summer			2
S1.006	15 Winter	30	0%	30/15 Summer				
S2.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			3
S2.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			3
S2.002	15 Winter	30	0%	100/15 Summer	100/15 Summer			3
S2.003	15 Winter	30	0%	100/15 Summer	100/15 Summer			2
S2.004	15 Winter	30	0%	30/15 Summer				
S2.005	15 Winter	30	0%	30/15 Summer				
S1.007	30 Winter	30	0%					
S3.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S3.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S3.002	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S3.003	15 Winter	30	0%	30/15 Winter	100/15 Summer			4
S3.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			3
S3.005	15 Winter	30	0%	30/15 Summer				
S3.006	15 Winter	30	0%	30/15 Summer				
S4.000	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S4.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S4.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
S4.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S4.004	15 Winter	30	0%	30/15 Summer				
S1.008	30 Winter	30	0%					
S1.009	120 Winter	30	0%	100/15 Winter				
S5.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			5
S5.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			5
S5.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S5.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S5.004	15 Winter	30	0%	30/15 Summer				
S5.005	15 Winter	30	0%	30/15 Summer				
S1.010	120 Winter	30	0%					
S6.000	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S6.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S6.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S6.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			2
S6.004	15 Winter	30	0%	30/15 Summer				
S6.005	15 Winter	30	0%	30/15 Winter				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.011	240 Winter	30	0%					
S1.012	240 Winter	30	0%	30/240 Winter				
S7.000	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S7.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S7.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S7.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
S7.004	15 Winter	30	0%	30/15 Summer				
S7.005	15 Winter	30	0%	30/15 Summer				
S7.006	15 Winter	30	0%	30/15 Summer				
S1.013	240 Winter	30	0%					
S1.014	240 Winter	30	0%	30/120 Winter				
S1.015	600 Winter	30	0%					
S8.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S8.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S8.002	15 Winter	30	0%	30/15 Winter	100/15 Summer			4
S8.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S8.004	15 Winter	30	0%	30/15 Summer				
S8.005	15 Winter	30	0%	30/15 Summer				
S1.016	600 Winter	30	0%					
S9.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S9.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S9.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S9.003	15 Winter	30	0%	30/15 Summer	100/15 Winter			1
S9.004	480 Winter	30	0%	100/15 Summer				
S9.005	480 Winter	30	0%	100/15 Summer				
S1.017	600 Winter	30	0%					
S1.018	600 Winter	30	0%	30/60 Winter				
S1.019	600 Winter	30	0%					
S10.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			4
S10.001	15 Winter	30	0%	30/15 Winter	100/15 Summer			4
S10.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S10.003	15 Winter	30	0%	30/15 Summer	100/15 Winter			1
S10.004	15 Winter	30	0%	30/15 Summer				
S10.005	600 Winter	30	0%	100/15 Summer				
S1.020	600 Winter	30	0%	30/15 Winter				
S1.021	600 Winter	30	0%					
S11.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S11.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S11.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			2
S11.003	15 Winter	30	0%	30/15 Summer				
S1.022	600 Winter	30	0%	30/60 Summer				
S12.000	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S12.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S12.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S12.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
S12.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			2
S12.005	15 Winter	30	0%	30/15 Summer				
S12.006	15 Winter	30	0%	30/15 Winter				
S1.023	600 Winter	30	0%					
S1.024	600 Winter	30	0%					
S1.025	600 Winter	30	0%	100/120 Winter				
S13.000	30 Winter	30	0%					
S13.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S13.002	15 Winter	30	0%	30/15 Summer				
S13.003	15 Winter	30	0%	30/15 Summer				
S13.004	15 Winter	30	0%	100/15 Summer				
S13.005	15 Winter	30	0%	100/15 Summer				
S13.006	30 Winter	30	0%					
S13.007	15 Winter	30	0%					
S13.008	15 Winter	30	0%					
S13.009	30 Winter	30	0%					
S1.026	60 Winter	30	0%					
S14.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S14.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S14.002	15 Winter	30	0%	30/15 Summer				
S14.003	15 Winter	30	0%	30/15 Summer				
S15.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
S15.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S15.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S15.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			6

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S15.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			3
S15.005	15 Winter	30	0%	30/15 Summer				
S15.006	15 Winter	30	0%	30/15 Summer				
S15.007	15 Winter	30	0%					
S15.008	60 Winter	30	0%					
S15.009	60 Winter	30	0%					
S1.027	60 Winter	30	0%	100/15 Winter				
S1.028	60 Winter	30	0%					
S16.000	15 Winter	30	0%	30/15 Summer	30/15 Winter			10
S16.001	15 Winter	30	0%	30/15 Summer	30/15 Winter			10
S16.002	15 Winter	30	0%	30/15 Summer	30/15 Winter			9
S16.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S16.004	30 Winter	30	0%	30/15 Summer	100/15 Summer			4
S16.005	30 Winter	30	0%	30/15 Summer				
S16.006	30 Winter	30	0%	30/15 Summer				
S16.007	30 Winter	30	0%	30/15 Summer				
S16.008	30 Winter	30	0%					
S17.000	15 Winter	30	0%	100/15 Summer				
S17.001	15 Winter	30	0%	100/15 Summer				
S17.002	15 Winter	30	0%	100/15 Summer				
S17.003	15 Winter	30	0%	100/15 Summer				
S17.004	15 Winter	30	0%	100/15 Summer				
S17.005	15 Winter	30	0%					
S18.000	15 Winter	30	0%	30/15 Summer	30/15 Winter			9
S18.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
S18.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S18.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S18.004	15 Winter	30	0%	30/15 Summer				
S18.005	15 Winter	30	0%	30/15 Summer				
S18.006	30 Winter	30	0%					
S1.029	480 Winter	30	0%					
S1.030	1440 Winter	30	0%					
S1.031	1440 Winter	30	0%	30/600 Winter				
S1.032	1440 Winter	30	0%	30/600 Winter				
S1.033	1440 Winter	30	0%	30/600 Winter				
S1.034	1440 Winter	30	0%	30/600 Winter				
S1.035	1440 Winter	30	0%	30/600 Winter				
S1.036	1440 Winter	30	0%	30/600 Winter				
S1.037	1440 Winter	30	0%	30/600 Winter				
S1.038	1440 Winter	30	0%	30/600 Winter				
S1.039	1440 Winter	30	0%	30/720 Winter				
S1.040	4320 Winter	30	0%	100/480 Winter				
S1.041	1440 Winter	30	0%					
S19.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S19.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S19.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S19.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S19.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
S20.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S20.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S20.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S19.005	15 Winter	30	0%	30/15 Summer	100/15 Summer			2
S19.006	15 Winter	30	0%	30/15 Summer				
S19.007	15 Winter	30	0%	30/15 Winter				
S21.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S21.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S21.002	15 Winter	30	0%	30/15 Summer				
S19.008	720 Winter	30	0%	30/180 Winter				
S19.009	15 Winter	30	0%					
S22.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			9
S22.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
S22.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S22.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S22.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S22.005	30 Winter	30	0%	30/15 Summer	100/15 Summer			4
S22.006	30 Winter	30	0%	30/15 Summer	100/15 Summer			4
S22.007	30 Winter	30	0%	30/15 Summer				
S22.008	30 Winter	30	0%	30/15 Summer				
S23.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S23.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			5

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S23.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			3
S23.003	15 Winter	30	0%	100/15 Summer	100/15 Winter			1
S22.009	600 Winter	30	0%	100/60 Winter				
S1.042	1440 Winter	30	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	106.575	-0.330	0.000	0.53	0.0	320.0	OK
S1.001	S2	106.513	-0.197	0.000	0.73	0.0	462.0	OK
S1.002	S3	106.442	-0.088	0.000	0.53	0.0	334.1	OK
S1.003	S4	106.339	0.065	0.000	0.83	0.0	515.4	SURCHARGED
S1.004	S5	106.229	0.186	0.000	0.90	0.0	563.2	SURCHARGED
S1.005	S5	106.097	0.221	0.000	0.94	0.0	749.8	SURCHARGED
S1.006	S6	105.857	0.415	0.000	1.87	0.0	1181.9	SURCHARGED
S2.000	S8	105.710	-0.315	0.000	0.70	0.0	299.5	OK
S2.001	S9	105.680	-0.336	0.000	0.48	0.0	285.9	OK
S2.002	S10	105.575	-0.331	0.000	0.61	0.0	384.2	OK
S2.003	S11	105.505	-0.068	0.000	0.81	0.0	515.9	OK
S2.004	S12	105.388	0.078	0.000	1.05	0.0	663.2	SURCHARGED
S2.005	S13	105.177	0.126	0.000	1.34	0.0	843.5	SURCHARGED
S1.007	S8	104.787	-2.213	0.000	0.01	0.0	449.0	OK
S3.000	S8	105.716	-0.309	0.000	0.53	0.0	317.1	OK
S3.001	S9	105.666	-0.165	0.000	0.72	0.0	454.0	OK
S3.002	S10	105.588	-0.074	0.000	0.53	0.0	334.6	OK
S3.003	S11	105.487	0.079	0.000	0.75	0.0	474.0	SURCHARGED
S3.004	S12	105.388	0.235	0.000	1.05	0.0	661.4	SURCHARGED
S3.005	S13	105.182	0.282	0.000	1.31	0.0	828.5	SURCHARGED
S3.006	S14	104.851	0.132	0.000	1.45	0.0	1103.3	SURCHARGED
S4.000	S63	106.173	0.146	0.000	0.66	0.0	262.9	SURCHARGED
S4.001	S64	106.154	0.236	0.000	0.80	0.0	334.0	SURCHARGED
S4.002	S65	106.116	0.522	0.000	0.99	0.0	409.3	SURCHARGED
S4.003	S66	105.956	0.599	0.000	1.36	0.0	572.9	SURCHARGED
S4.004	S67	105.585	0.417	0.000	1.76	0.0	745.9	SURCHARGED
S1.008	S8	104.290	-2.710	0.000	0.04	0.0	1588.3	OK
S1.009	S9	104.259	-0.277	0.000	0.73	0.0	1329.1	OK*
S5.000	S68	105.495	-0.105	0.000	0.58	0.0	446.9	OK
S5.001	S69	105.400	-0.048	0.000	0.66	0.0	515.5	OK
S5.002	S70	105.286	0.169	0.000	0.88	0.0	688.2	SURCHARGED
S5.003	S71	105.169	0.307	0.000	1.21	0.0	948.4	SURCHARGED
S5.004	S72	104.911	0.304	0.000	1.46	0.0	1142.2	SURCHARGED
S5.005	S73	104.504	0.150	0.000	1.88	0.0	1259.1	SURCHARGED
S1.010	S10	104.165	-2.335	0.000	0.03	0.0	1386.1	OK
S6.000	S25	105.620	0.120	0.000	0.61	0.0	471.8	SURCHARGED
S6.001	S26	105.600	0.418	0.000	0.81	0.0	635.5	SURCHARGED
S6.002	S27	105.504	0.653	0.000	1.27	0.0	996.6	SURCHARGED
S6.003	S28	105.203	0.606	0.000	1.63	0.0	1280.8	SURCHARGED
S6.004	S29	104.757	0.265	0.000	1.52	0.0	1436.9	SURCHARGED
S6.005	S30	104.373	0.048	0.000	1.09	0.0	1536.3	SURCHARGED
S1.011	S11	103.821	-2.679	0.000	0.01	0.0	1140.2	OK
S1.012	S12	103.814	0.013	0.000	0.42	0.0	1105.7	SURCHARGED*
S7.000	S33	105.164	0.079	0.000	0.60	0.0	363.2	SURCHARGED
S7.001	S34	105.156	0.231	0.000	0.60	0.0	396.6	SURCHARGED
S7.002	S35	105.136	0.542	0.000	0.82	0.0	518.4	SURCHARGED
S7.003	S36	105.055	0.712	0.000	1.37	0.0	863.0	SURCHARGED
S7.004	S37	104.752	0.657	0.000	1.61	0.0	1016.2	SURCHARGED
S7.005	S38	104.271	0.281	0.000	1.50	0.0	1122.4	SURCHARGED
S7.006	S39	103.983	0.117	0.000	1.49	0.0	1121.4	SURCHARGED
S1.013	S13	103.795	-2.205	0.000	0.01	0.0	1448.3	OK
S1.014	S14	103.770	0.161	0.000	0.33	0.0	1139.1	SURCHARGED*
S1.015	S15	103.336	-2.664	0.000	0.01	0.0	801.5	OK
S8.000	S42	104.874	-0.186	0.000	0.52	0.0	313.2	OK
S8.001	S43	104.800	-0.032	0.000	0.60	0.0	368.1	OK
S8.002	S44	104.687	0.107	0.000	0.87	0.0	508.8	SURCHARGED
S8.003	S45	104.624	0.301	0.000	1.19	0.0	695.6	SURCHARGED
S8.004	S46	104.398	0.324	0.000	1.40	0.0	819.6	SURCHARGED
S8.005	S47	104.029	0.130	0.000	1.43	0.0	824.4	SURCHARGED
S1.016	S16	103.324	-2.676	0.000	0.00	0.0	924.1	OK
S9.000	S49	104.094	-0.306	0.000	0.51	0.0	295.2	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S9.001	S50	104.038	-0.129	0.000	0.62	0.0	363.0	OK
S9.002	S51	103.944	0.080	0.000	0.96	0.0	607.5	SURCHARGED
S9.003	S52	103.774	0.163	0.000	1.41	0.0	886.2	SURCHARGED
S9.004	S53	103.566	-0.025	0.000	0.16	0.0	155.7	OK
S9.005	S54	103.420	0.000	0.000	0.16	0.0	187.1	OK
S1.017	S17	103.298	-1.952	0.000	0.01	0.0	899.6	OK
S1.018	S18	103.288	0.318	0.000	0.26	0.0	897.4	SURCHARGED*
S1.019	S19	103.269	-1.981	0.000	0.01	0.0	898.1	OK
S10.000	S58	104.007	-0.143	0.000	0.47	0.0	192.4	OK
S10.001	S59	103.937	0.006	0.000	0.74	0.0	308.2	SURCHARGED
S10.002	S60	103.845	0.243	0.000	1.01	0.0	422.5	SURCHARGED
S10.003	S61	103.659	0.263	0.000	1.14	0.0	564.6	SURCHARGED
S10.004	S62	103.418	0.196	0.000	1.47	0.0	726.4	SURCHARGED
S10.005	S64	103.200	0.000	0.000	0.13	0.0	125.4	OK
S1.020	S20	103.068	0.648	0.000	0.28	0.0	952.4	SURCHARGED*
S1.021	S21	103.054	-2.196	0.000	0.00	0.0	952.3	OK
S11.000	S65	104.515	0.540	0.000	0.59	0.0	49.4	SURCHARGED
S11.001	S66	104.455	0.705	0.000	1.61	0.0	132.3	SURCHARGED
S11.002	S67	104.171	0.521	0.000	1.61	0.0	216.4	SURCHARGED
S11.003	S68	103.717	0.217	0.000	2.05	0.0	258.6	SURCHARGED
S1.022	S22	103.038	0.663	0.000	0.22	0.0	969.0	SURCHARGED*
S12.000	S66	104.181	0.131	0.000	0.64	0.0	319.4	SURCHARGED
S12.001	S67	104.158	0.362	0.000	0.57	0.0	284.6	SURCHARGED
S12.002	S68	104.118	0.598	0.000	1.08	0.0	631.5	SURCHARGED
S12.003	S69	103.897	0.609	0.000	1.32	0.0	1035.2	SURCHARGED
S12.004	S70	103.642	0.535	0.000	1.53	0.0	1469.4	SURCHARGED
S12.005	S71	103.253	0.303	0.000	1.41	0.0	1427.4	SURCHARGED
S12.006	S72	102.902	0.004	0.000	1.12	0.0	1524.9	SURCHARGED
S1.023	S23	101.769	-3.231	0.000	0.01	0.0	1067.8	OK
S1.024	S24	100.499	-4.501	0.000	0.01	0.0	1071.6	OK
S1.025	S25	100.306	-0.284	0.000	0.76	0.0	1070.7	OK*
S13.000	S33	103.775	0.000	0.000	0.66	0.0	76.0	SURCHARGED*
S13.001	S34	104.217	0.687	0.000	1.61	0.0	176.1	SURCHARGED
S13.002	S35	103.685	0.438	0.000	1.37	0.0	149.8	SURCHARGED
S13.003	S85	103.207	0.240	0.000	1.32	0.0	144.8	SURCHARGED
S13.004	S36	102.655	-0.108	0.000	0.87	0.0	153.6	OK
S13.005	S37	102.362	-0.103	0.000	0.92	0.0	162.4	OK
S13.006	S38	101.933	-0.291	0.000	0.52	0.0	186.8	OK
S13.007	S39	101.695	-0.369	0.000	0.42	0.0	200.7	OK
S13.008	S40	101.478	-0.358	0.000	0.45	0.0	209.9	OK
S13.009	S41	101.282	-0.440	0.000	0.36	0.0	210.7	OK
S1.026	S26	99.791	-5.209	0.000	0.00	0.0	947.5	OK
S14.000	S89	106.943	1.068	0.000	2.00	0.0	220.9	SURCHARGED
S14.001	S90	105.558	1.183	0.000	2.27	0.0	248.7	SURCHARGED
S14.002	S91	103.543	0.593	0.000	1.63	0.0	272.1	SURCHARGED
S14.003	S92	103.142	0.338	0.000	1.73	0.0	293.7	SURCHARGED
S15.000	S110	104.969	0.969	0.000	1.10	0.0	310.0	FLOOD RISK
S15.001	S111	104.937	1.185	0.000	1.10	0.0	311.8	FLOOD RISK
S15.002	S112	104.815	1.313	0.000	1.29	0.0	493.2	FLOOD RISK
S15.003	S113	104.512	1.191	0.000	1.67	0.0	830.6	SURCHARGED
S15.004	S114	103.999	0.854	0.000	1.65	0.0	1031.8	SURCHARGED
S15.005	S103	103.542	0.560	0.000	1.82	0.0	1118.6	SURCHARGED
S15.006	S115	103.063	0.221	0.000	1.58	0.0	1219.5	SURCHARGED
S15.007	S116	102.199	-2.801	0.000	0.03	0.0	1170.2	OK
S15.008	S129	101.649	-0.340	0.000	0.71	0.0	627.1	OK*
S15.009	S130	101.369	-3.631	0.000	0.02	0.0	626.8	OK
S1.027	S27	99.775	-0.157	0.000	0.96	0.0	1575.4	OK*
S1.028	S28	99.390	-4.610	0.000	0.01	0.0	1574.0	OK
S16.000	S92	101.517	0.617	17.389	0.95	0.0	195.1	FLOOD
S16.001	S93	101.505	0.705	5.516	1.17	0.0	245.3	FLOOD
S16.002	S94	101.500	0.800	0.059	1.59	0.0	409.3	FLOOD
S16.003	S95	101.179	0.629	0.000	1.85	0.0	536.3	SURCHARGED
S16.004	S96	100.885	0.435	0.000	1.56	0.0	595.6	SURCHARGED
S16.005	S114	100.679	0.329	0.000	1.54	0.0	600.8	SURCHARGED
S16.006	S97	100.448	0.198	0.000	1.42	0.0	597.1	SURCHARGED
S16.007	S98	100.244	0.094	0.000	1.48	0.0	582.5	SURCHARGED
S16.008	S99	99.623	-1.877	0.000	0.04	0.0	595.2	OK
S17.000	S129	101.168	-0.207	0.000	0.39	0.0	64.4	OK
S17.001	S130	100.545	-0.205	0.000	0.54	0.0	106.4	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S17.002	S131	100.125	-0.275	0.000	0.30	0.0	133.5	OK
S17.003	S134	100.078	-0.216	0.000	0.70	0.0	341.1	OK
S17.004	S135	99.950	-0.200	0.000	0.87	0.0	519.7	OK
S17.005	S136	99.680	-1.820	0.000	0.05	0.0	622.8	OK
S18.000	S120	101.500	0.875	0.548	0.99	0.0	215.5	FLOOD
S18.001	S121	101.454	0.954	0.000	1.30	0.0	272.5	FLOOD RISK
S18.002	S122	101.372	0.972	0.000	1.52	0.0	302.0	FLOOD RISK
S18.003	S123	101.200	0.875	0.000	2.02	0.0	574.3	SURCHARGED
S18.004	S124	100.789	0.564	0.000	2.18	0.0	576.1	SURCHARGED
S18.005	S148	100.412	0.262	0.000	1.82	0.0	570.5	SURCHARGED
S18.006	S125	99.605	-1.895	0.000	0.02	0.0	589.4	OK
S1.029	S29	99.080	-2.420	0.000	0.02	0.0	998.2	OK
S1.030	S30	98.584	-2.916	0.000	0.01	0.0	537.5	OK
S1.031	S120	98.579	0.085	0.000	1.06	0.0	365.5	SURCHARGED
S1.032	S31	98.493	0.075	0.000	1.06	0.0	365.4	SURCHARGED
S1.033	S32	98.408	0.065	0.000	1.06	0.0	365.4	SURCHARGED
S1.034	S33	98.325	0.056	0.000	1.06	0.0	365.4	SURCHARGED
S1.035	S34	98.241	0.046	0.000	1.07	0.0	365.4	SURCHARGED
S1.036	S35	98.159	0.037	0.000	1.07	0.0	365.4	SURCHARGED
S1.037	S36	98.079	0.027	0.000	1.06	0.0	365.5	SURCHARGED
S1.038	S37	97.990	0.018	0.000	1.06	0.0	365.5	SURCHARGED
S1.039	S38	97.902	0.009	0.000	1.05	0.0	365.5	SURCHARGED
S1.040	S153	97.812	0.000	0.000	1.02	0.0	354.5	OK
S1.041	S154	97.369	-0.359	0.000	0.54	0.0	365.4	OK
S19.000	S181	101.596	0.421	0.000	0.88	0.0	337.5	SURCHARGED
S19.001	S181	101.570	0.724	0.000	1.03	0.0	393.0	SURCHARGED
S19.002	S182	101.459	0.867	0.000	1.44	0.0	550.2	SURCHARGED
S19.003	S183	101.100	0.614	0.000	1.13	0.0	558.0	SURCHARGED
S19.004	S185	100.887	0.643	0.000	1.66	0.0	788.5	SURCHARGED
S20.000	S202	101.554	0.354	0.000	1.32	0.0	62.7	SURCHARGED
S20.001	S203	101.343	0.324	0.000	1.34	0.0	63.7	SURCHARGED
S20.002	S204	100.898	0.062	0.000	1.18	0.0	100.2	SURCHARGED
S19.005	S184	100.557	0.433	0.000	1.53	0.0	954.9	SURCHARGED
S19.006	S185	100.238	0.270	0.000	1.51	0.0	950.9	SURCHARGED
S19.007	S186	99.865	0.069	0.000	1.08	0.0	916.2	SURCHARGED
S21.000	S189	101.753	0.803	0.000	1.26	0.0	362.2	FLOOD RISK
S21.001	S190	101.457	0.804	0.000	1.95	0.0	557.5	SURCHARGED
S21.002	S191	100.599	0.145	0.000	1.83	0.0	621.5	SURCHARGED
S19.008	S187	99.555	0.239	0.000	0.03	0.0	22.8	SURCHARGED
S19.009	S202	98.511	-0.721	0.000	0.21	0.0	130.5	OK
S22.000	S188	101.958	0.933	0.000	1.55	0.0	311.3	FLOOD RISK
S22.001	S189	101.891	1.042	0.000	1.46	0.0	556.3	FLOOD RISK
S22.002	S190	101.671	1.003	0.000	1.38	0.0	684.9	SURCHARGED
S22.003	S191	101.394	0.902	0.000	1.55	0.0	769.0	SURCHARGED
S22.004	S226	100.982	0.668	0.000	1.59	0.0	779.7	SURCHARGED
S22.005	S192	100.704	0.546	0.000	1.24	0.0	760.8	SURCHARGED
S22.006	S193	100.527	0.508	0.000	1.52	0.0	905.0	SURCHARGED
S22.007	S194	100.312	0.403	0.000	1.32	0.0	861.6	SURCHARGED
S22.008	S195	99.895	0.248	0.000	1.17	0.0	787.3	SURCHARGED
S23.000	S197	101.449	0.574	0.000	0.89	0.0	90.9	SURCHARGED
S23.001	S198	101.305	0.677	0.000	1.84	0.0	249.6	SURCHARGED
S23.002	S199	100.643	0.194	0.000	1.38	0.0	278.9	SURCHARGED
S23.003	S200	100.160	-0.107	0.000	0.98	0.0	710.2	OK
S22.009	S196	98.925	-0.258	0.000	0.09	0.0	45.9	OK
S1.042	S137	97.120	-0.298	0.000	0.68	0.0	433.6	OK

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	24	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			5
S1.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			5
S1.002	15 Winter	100	+40%	100/15 Summer	100/15 Summer			5
S1.003	15 Winter	100	+40%	30/15 Winter	100/15 Summer			4
S1.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S1.005	15 Winter	100	+40%	30/15 Summer	100/15 Summer			2
S1.006	15 Winter	100	+40%	30/15 Summer				
S2.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			3
S2.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			3
S2.002	15 Winter	100	+40%	100/15 Summer	100/15 Summer			3
S2.003	15 Winter	100	+40%	100/15 Summer	100/15 Summer			2
S2.004	15 Winter	100	+40%	30/15 Summer				
S2.005	15 Winter	100	+40%	30/15 Summer				
S1.007	60 Winter	100	+40%					
S3.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S3.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S3.002	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S3.003	15 Winter	100	+40%	30/15 Winter	100/15 Summer			4
S3.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			3
S3.005	15 Winter	100	+40%	30/15 Summer				
S3.006	15 Winter	100	+40%	30/15 Summer				
S4.000	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S4.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S4.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
S4.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S4.004	15 Winter	100	+40%	30/15 Summer				
S1.008	240 Winter	100	+40%					
S1.009	240 Winter	100	+40%	100/15 Winter				
S5.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			5
S5.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			5
S5.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S5.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S5.004	15 Winter	100	+40%	30/15 Summer				
S5.005	180 Winter	100	+40%	30/15 Summer				
S1.010	180 Winter	100	+40%					
S6.000	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S6.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S6.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S6.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			2
S6.004	15 Winter	100	+40%	30/15 Summer				
S6.005	15 Winter	100	+40%	30/15 Winter				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.011	180 Winter	100	+40%					
S1.012	180 Winter	100	+40%	30/240 Winter				
S7.000	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S7.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S7.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S7.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
S7.004	15 Winter	100	+40%	30/15 Summer				
S7.005	15 Winter	100	+40%	30/15 Summer				
S7.006	180 Winter	100	+40%	30/15 Summer				
S1.013	180 Winter	100	+40%					
S1.014	180 Winter	100	+40%	30/120 Winter				
S1.015	180 Winter	100	+40%					
S8.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S8.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S8.002	15 Winter	100	+40%	30/15 Winter	100/15 Summer			4
S8.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S8.004	15 Winter	100	+40%	30/15 Summer				
S8.005	15 Winter	100	+40%	30/15 Summer				
S1.016	180 Winter	100	+40%					
S9.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S9.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S9.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S9.003	15 Winter	100	+40%	30/15 Summer	100/15 Winter			1
S9.004	15 Winter	100	+40%	100/15 Summer				
S9.005	180 Winter	100	+40%	100/15 Summer				
S1.017	180 Winter	100	+40%					
S1.018	180 Winter	100	+40%	30/60 Winter				
S1.019	180 Winter	100	+40%					
S10.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
S10.001	15 Winter	100	+40%	30/15 Winter	100/15 Summer			4
S10.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S10.003	15 Winter	100	+40%	30/15 Summer	100/15 Winter			1
S10.004	15 Winter	100	+40%	30/15 Summer				
S10.005	15 Winter	100	+40%	100/15 Summer				
S1.020	180 Winter	100	+40%	30/15 Winter				
S1.021	180 Winter	100	+40%					
S11.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S11.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S11.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			2
S11.003	15 Winter	100	+40%	30/15 Summer				
S1.022	180 Winter	100	+40%	30/60 Summer				
S12.000	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S12.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S12.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S12.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
S12.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			2
S12.005	15 Winter	100	+40%	30/15 Summer				
S12.006	15 Winter	100	+40%	30/15 Winter				
S1.023	240 Winter	100	+40%					
S1.024	240 Winter	100	+40%					
S1.025	240 Winter	100	+40%	100/120 Winter				
S13.000	120 Winter	100	+40%					
S13.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S13.002	15 Winter	100	+40%	30/15 Summer				
S13.003	15 Winter	100	+40%	30/15 Summer				
S13.004	15 Winter	100	+40%	100/15 Summer				
S13.005	15 Winter	100	+40%	100/15 Summer				
S13.006	15 Winter	100	+40%					
S13.007	15 Winter	100	+40%					
S13.008	15 Winter	100	+40%					
S13.009	15 Winter	100	+40%					
S1.026	120 Winter	100	+40%					
S14.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S14.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S14.002	15 Winter	100	+40%	30/15 Summer				
S14.003	15 Winter	100	+40%	30/15 Summer				
S15.000	30 Winter	100	+40%	30/15 Summer	100/15 Summer			8
S15.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S15.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S15.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S15.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			3
S15.005	15 Winter	100	+40%	30/15 Summer				
S15.006	15 Winter	100	+40%	30/15 Summer				
S15.007	15 Winter	100	+40%					
S15.008	60 Winter	100	+40%					
S15.009	60 Winter	100	+40%					
S1.027	120 Winter	100	+40%	100/15 Winter				
S1.028	120 Winter	100	+40%					
S16.000	30 Winter	100	+40%	30/15 Summer	30/15 Winter			10
S16.001	30 Winter	100	+40%	30/15 Summer	30/15 Winter			10
S16.002	15 Winter	100	+40%	30/15 Summer	30/15 Winter			9
S16.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S16.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S16.005	15 Winter	100	+40%	30/15 Summer				
S16.006	30 Winter	100	+40%	30/15 Summer				
S16.007	30 Winter	100	+40%	30/15 Summer				
S16.008	30 Winter	100	+40%					
S17.000	15 Winter	100	+40%	100/15 Summer				
S17.001	15 Winter	100	+40%	100/15 Summer				
S17.002	15 Winter	100	+40%	100/15 Summer				
S17.003	15 Winter	100	+40%	100/15 Summer				
S17.004	15 Winter	100	+40%	100/15 Summer				
S17.005	15 Winter	100	+40%					
S18.000	30 Winter	100	+40%	30/15 Summer	30/15 Winter			9
S18.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			8
S18.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S18.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S18.004	15 Winter	100	+40%	30/15 Summer				
S18.005	15 Winter	100	+40%	30/15 Summer				
S18.006	30 Winter	100	+40%					
S1.029	1440 Winter	100	+40%					
S1.030	1440 Winter	100	+40%					
S1.031	1440 Winter	100	+40%	30/600 Winter				
S1.032	1440 Winter	100	+40%	30/600 Winter				
S1.033	1440 Winter	100	+40%	30/600 Winter				
S1.034	1440 Winter	100	+40%	30/600 Winter				
S1.035	1440 Winter	100	+40%	30/600 Winter				
S1.036	1440 Winter	100	+40%	30/600 Winter				
S1.037	1440 Winter	100	+40%	30/600 Winter				
S1.038	1440 Winter	100	+40%	30/600 Winter				
S1.039	1440 Winter	100	+40%	30/720 Winter				
S1.040	1440 Winter	100	+40%	100/480 Winter				
S1.041	1440 Winter	100	+40%					
S19.000	30 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S19.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S19.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S19.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S19.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
S20.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S20.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S20.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S19.005	15 Winter	100	+40%	30/15 Summer	100/15 Summer			2
S19.006	15 Winter	100	+40%	30/15 Summer				
S19.007	15 Winter	100	+40%	30/15 Winter				
S21.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S21.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S21.002	15 Winter	100	+40%	30/15 Summer				
S19.008	960 Winter	100	+40%	30/180 Winter				
S19.009	15 Winter	100	+40%					
S22.000	30 Winter	100	+40%	30/15 Summer	100/15 Summer			9
S22.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			8
S22.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S22.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S22.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S22.005	30 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S22.006	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S22.007	15 Winter	100	+40%	30/15 Summer				
S22.008	15 Winter	100	+40%	30/15 Summer				
S23.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S23.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S23.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			3
S23.003	15 Winter	100	+40%	100/15 Summer	100/15 Summer			1
S22.009	720 Winter	100	+40%	100/60 Winter				
S1.042	1440 Winter	100	+40%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	107.820	0.915	119.594	0.73	0.0	441.8	FLOOD
S1.001	S2	107.817	1.107	117.314	0.81	0.0	512.1	FLOOD
S1.002	S3	107.814	1.284	113.831	0.43	0.0	273.2	FLOOD
S1.003	S4	107.823	1.549	123.228	0.60	0.0	376.4	FLOOD
S1.004	S5	107.776	1.733	75.836	1.18	0.0	739.1	FLOOD
S1.005	S5	107.732	1.856	32.043	1.35	0.0	1081.3	FLOOD
S1.006	S6	107.525	2.084	0.000	3.52	0.0	2221.2	FLOOD RISK
S2.000	S8	107.054	1.029	54.501	1.36	0.0	586.7	FLOOD
S2.001	S9	107.051	1.035	50.863	0.84	0.0	501.4	FLOOD
S2.002	S10	107.042	1.136	42.886	0.84	0.0	530.3	FLOOD
S2.003	S11	107.032	1.459	33.468	1.20	0.0	762.9	FLOOD
S2.004	S12	106.909	1.599	0.000	1.83	0.0	1157.8	FLOOD RISK
S2.005	S13	106.281	1.230	0.000	2.71	0.0	1707.3	SURCHARGED
S1.007	S8	105.915	-1.085	0.000	0.01	0.0	449.0	OK
S3.000	S8	107.105	1.080	105.243	0.79	0.0	476.6	FLOOD
S3.001	S9	107.100	1.269	99.618	0.88	0.0	549.6	FLOOD
S3.002	S10	107.089	1.427	88.998	0.49	0.0	311.8	FLOOD
S3.003	S11	107.097	1.689	97.390	0.79	0.0	498.6	FLOOD
S3.004	S12	107.037	1.884	36.842	1.64	0.0	1035.2	FLOOD
S3.005	S13	106.821	1.921	0.000	2.21	0.0	1401.0	FLOOD RISK
S3.006	S14	105.894	1.175	0.000	2.97	0.0	2259.5	SURCHARGED
S4.000	S63	107.126	1.099	125.612	0.88	0.0	350.3	FLOOD
S4.001	S64	107.120	1.202	120.201	0.92	0.0	385.7	FLOOD
S4.002	S65	107.117	1.523	116.583	0.97	0.0	403.6	FLOOD
S4.003	S66	107.035	1.678	35.350	1.87	0.0	783.6	FLOOD
S4.004	S67	106.681	1.513	0.000	2.87	0.0	1216.6	SURCHARGED
S1.008	S8	105.204	-1.796	0.000	0.03	0.0	1243.0	OK
S1.009	S9	105.205	0.669	0.000	0.69	0.0	1244.3	SURCHARGED*
S5.000	S68	106.672	1.072	171.884	0.86	0.0	658.1	FLOOD
S5.001	S69	106.659	1.211	158.890	0.79	0.0	620.9	FLOOD
S5.002	S70	106.645	1.528	145.139	1.11	0.0	868.7	FLOOD
S5.003	S71	106.548	1.686	47.592	1.80	0.0	1410.2	FLOOD
S5.004	S72	106.209	1.602	0.000	2.36	0.0	1852.0	FLOOD RISK
S5.005	S73	105.134	0.780	0.000	1.33	0.0	888.9	SURCHARGED
S1.010	S10	105.121	-1.379	0.000	0.02	0.0	1346.3	OK
S6.000	S25	106.783	1.283	282.546	0.79	0.0	616.4	FLOOD
S6.001	S26	106.778	1.596	278.606	0.91	0.0	719.0	FLOOD
S6.002	S27	106.738	1.887	237.631	1.67	0.0	1310.2	FLOOD
S6.003	S28	106.543	1.946	43.787	2.11	0.0	1652.6	FLOOD
S6.004	S29	106.009	1.517	0.000	2.20	0.0	2081.1	SURCHARGED
S6.005	S30	105.159	0.834	0.000	1.85	0.0	2596.7	SURCHARGED
S1.011	S11	104.713	-1.787	0.000	0.01	0.0	1303.6	OK
S1.012	S12	104.702	0.901	0.000	0.49	0.0	1280.3	SURCHARGED*
S7.000	S33	106.172	1.087	171.740	0.85	0.0	511.3	FLOOD
S7.001	S34	106.175	1.250	174.639	0.69	0.0	459.3	FLOOD
S7.002	S35	106.197	1.603	196.567	0.90	0.0	564.0	FLOOD
S7.003	S36	106.153	1.810	153.035	1.77	0.0	1108.9	FLOOD
S7.004	S37	105.971	1.877	0.000	2.19	0.0	1380.8	FLOOD RISK
S7.005	S38	105.139	1.149	0.000	2.37	0.0	1776.0	SURCHARGED
S7.006	S39	104.690	0.824	0.000	1.04	0.0	778.5	SURCHARGED
S1.013	S13	104.674	-1.326	0.000	0.02	0.0	2179.4	OK
S1.014	S14	104.634	1.025	0.000	0.43	0.0	1462.7	SURCHARGED*
S1.015	S15	104.087	-1.913	0.000	0.01	0.0	1432.9	OK
S8.000	S42	106.121	1.061	120.698	0.77	0.0	466.5	FLOOD
S8.001	S43	106.113	1.281	113.272	0.73	0.0	446.8	FLOOD
S8.002	S44	106.108	1.528	107.959	1.12	0.0	658.7	FLOOD
S8.003	S45	106.034	1.711	34.468	1.74	0.0	1012.8	FLOOD
S8.004	S46	105.708	1.634	0.000	2.36	0.0	1374.8	FLOOD RISK
S8.005	S47	104.669	0.770	0.000	2.45	0.0	1415.0	SURCHARGED
S1.016	S16	104.071	-1.929	0.000	0.01	0.0	1909.1	OK
S9.000	S49	105.364	0.964	114.431	0.72	0.0	414.1	FLOOD

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S9.001	S50	105.349	1.182	99.456	0.78	0.0	455.8	FLOOD
S9.002	S51	105.338	1.474	90.079	1.49	0.0	937.3	FLOOD
S9.003	S52	105.253	1.642	2.959	2.20	0.0	1383.2	FLOOD
S9.004	S53	104.402	0.811	0.000	1.68	0.0	1597.5	SURCHARGED
S9.005	S54	104.049	0.629	0.000	0.62	0.0	709.3	SURCHARGED
S1.017	S17	104.039	-1.211	0.000	0.01	0.0	1593.7	OK
S1.018	S18	104.022	1.052	0.000	0.44	0.0	1514.0	SURCHARGED*
S1.019	S19	103.992	-1.258	0.000	0.01	0.0	1455.9	OK
S10.000	S58	105.351	1.201	100.782	0.66	0.0	271.8	FLOOD
S10.001	S59	105.355	1.424	105.146	0.79	0.0	330.4	FLOOD
S10.002	S60	105.330	1.728	80.008	1.64	0.0	685.6	FLOOD
S10.003	S61	105.252	1.856	2.430	1.69	0.0	840.4	FLOOD
S10.004	S62	104.828	1.606	0.000	2.65	0.0	1315.3	SURCHARGED
S10.005	S64	103.487	0.287	0.000	1.78	0.0	1665.5	SURCHARGED
S1.020	S20	103.441	1.021	0.000	0.46	0.0	1561.9	SURCHARGED*
S1.021	S21	103.419	-1.831	0.000	0.00	0.0	1561.4	OK
S11.000	S65	105.294	1.319	43.980	1.18	0.0	99.5	FLOOD
S11.001	S66	105.298	1.548	47.828	2.25	0.0	184.7	FLOOD
S11.002	S67	105.255	1.605	4.690	2.41	0.0	324.4	FLOOD
S11.003	S68	104.380	0.880	0.000	3.64	0.0	458.6	SURCHARGED
S1.022	S22	103.399	1.024	0.000	0.36	0.0	1582.6	SURCHARGED*
S12.000	S66	105.203	1.153	203.409	0.79	0.0	395.2	FLOOD
S12.001	S67	105.211	1.415	211.104	0.62	0.0	307.5	FLOOD
S12.002	S68	105.273	1.753	272.909	1.01	0.0	588.6	FLOOD
S12.003	S69	105.215	1.927	215.315	1.74	0.0	1367.8	FLOOD
S12.004	S70	105.017	1.910	17.480	2.21	0.0	2122.0	FLOOD
S12.005	S71	104.161	1.211	0.000	2.14	0.0	2176.3	SURCHARGED
S12.006	S72	103.314	0.416	0.000	1.89	0.0	2571.9	SURCHARGED
S1.023	S23	102.068	-2.932	0.000	0.02	0.0	1805.9	OK
S1.024	S24	100.733	-4.267	0.000	0.02	0.0	1796.1	OK
S1.025	S25	100.637	0.047	0.000	1.27	0.0	1788.0	SURCHARGED*
S13.000	S33	103.775	0.000	0.000	0.55	0.0	63.6	SURCHARGED*
S13.001	S34	105.091	1.561	91.621	1.88	0.0	205.8	FLOOD
S13.002	S35	104.964	1.717	0.000	1.48	0.0	162.6	FLOOD RISK
S13.003	S85	104.668	1.700	0.000	1.61	0.0	176.6	SURCHARGED
S13.004	S36	103.877	1.114	0.000	1.53	0.0	268.6	SURCHARGED
S13.005	S37	103.113	0.648	0.000	1.65	0.0	290.0	SURCHARGED
S13.006	S38	102.102	-0.122	0.000	0.97	0.0	348.9	OK
S13.007	S39	101.852	-0.212	0.000	0.80	0.0	384.6	OK
S13.008	S40	101.651	-0.185	0.000	0.87	0.0	409.4	OK
S13.009	S41	101.435	-0.287	0.000	0.70	0.0	408.0	OK
S1.026	S26	100.114	-4.886	0.000	0.00	0.0	1747.1	OK
S14.000	S89	109.042	3.167	42.429	2.54	0.0	280.4	FLOOD
S14.001	S90	107.024	2.649	23.739	3.13	0.0	343.5	FLOOD
S14.002	S91	104.771	1.821	0.000	2.37	0.0	394.6	FLOOD RISK
S14.003	S92	103.934	1.130	0.000	2.73	0.0	463.6	FLOOD RISK
S15.000	S110	105.252	1.252	252.003	0.89	0.0	250.9	FLOOD
S15.001	S111	105.254	1.502	253.519	0.89	0.0	251.5	FLOOD
S15.002	S112	105.282	1.779	281.819	1.00	0.0	383.1	FLOOD
S15.003	S113	105.260	1.940	260.093	1.77	0.0	876.2	FLOOD
S15.004	S114	105.036	1.891	36.820	2.01	0.0	1259.8	FLOOD
S15.005	S103	104.608	1.626	0.000	2.41	0.0	1476.7	SURCHARGED
S15.006	S115	103.739	0.897	0.000	2.50	0.0	1936.2	SURCHARGED
S15.007	S116	102.332	-2.668	0.000	0.04	0.0	1789.2	OK
S15.008	S129	101.891	-0.098	0.000	1.00	0.0	887.1	OK*
S15.009	S130	101.468	-3.532	0.000	0.02	0.0	887.1	OK
S1.027	S27	100.100	0.168	0.000	1.62	0.0	2666.7	SURCHARGED*
S1.028	S28	99.511	-4.489	0.000	0.02	0.0	2669.5	OK
S16.000	S92	101.695	0.795	194.567	0.77	0.0	157.4	FLOOD
S16.001	S93	101.690	0.890	189.627	1.01	0.0	211.7	FLOOD
S16.002	S94	101.710	1.010	209.617	1.27	0.0	327.0	FLOOD
S16.003	S95	101.649	1.099	149.133	1.62	0.0	469.7	FLOOD
S16.004	S96	101.530	1.080	29.856	1.97	0.0	751.0	FLOOD
S16.005	S114	101.340	0.990	0.000	2.15	0.0	835.4	FLOOD RISK
S16.006	S97	100.896	0.646	0.000	2.02	0.0	845.0	SURCHARGED
S16.007	S98	100.473	0.323	0.000	2.06	0.0	809.0	SURCHARGED
S16.008	S99	99.710	-1.790	0.000	0.05	0.0	878.6	OK
S17.000	S129	101.842	0.467	0.000	0.79	0.0	128.4	SURCHARGED
S17.001	S130	101.441	0.691	0.000	1.02	0.0	202.1	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S17.002	S131	101.028	0.628	0.000	0.60	0.0	263.6	SURCHARGED
S17.003	S134	100.985	0.691	0.000	1.40	0.0	682.0	SURCHARGED
S17.004	S135	100.666	0.516	0.000	1.82	0.0	1084.2	SURCHARGED
S17.005	S136	99.951	-1.549	0.000	0.12	0.0	1359.9	OK
S18.000	S120	101.687	1.062	186.590	0.78	0.0	168.2	FLOOD
S18.001	S121	101.658	1.158	158.038	1.18	0.0	247.8	FLOOD
S18.002	S122	101.640	1.240	139.874	1.17	0.0	232.5	FLOOD
S18.003	S123	101.662	1.337	162.111	2.29	0.0	652.1	FLOOD
S18.004	S124	101.441	1.216	0.000	2.56	0.0	676.2	FLOOD RISK
S18.005	S148	100.887	0.737	0.000	2.45	0.0	768.6	SURCHARGED
S18.006	S125	99.690	-1.810	0.000	0.04	0.0	965.7	OK
S1.029	S29	99.322	-2.178	0.000	0.03	0.0	1754.1	OK
S1.030	S30	98.973	-2.527	0.000	0.02	0.0	1686.2	OK
S1.031	S120	98.970	0.476	0.000	1.29	0.0	446.1	SURCHARGED
S1.032	S31	98.843	0.425	0.000	1.30	0.0	446.1	SURCHARGED
S1.033	S32	98.717	0.374	0.000	1.30	0.0	446.1	SURCHARGED
S1.034	S33	98.593	0.324	0.000	1.30	0.0	446.1	SURCHARGED
S1.035	S34	98.468	0.273	0.000	1.30	0.0	446.1	SURCHARGED
S1.036	S35	98.345	0.223	0.000	1.31	0.0	446.0	SURCHARGED
S1.037	S36	98.226	0.174	0.000	1.29	0.0	446.0	SURCHARGED
S1.038	S37	98.094	0.122	0.000	1.29	0.0	446.1	SURCHARGED
S1.039	S38	97.962	0.069	0.000	1.29	0.0	446.1	SURCHARGED
S1.040	S153	97.828	0.016	0.000	1.28	0.0	446.1	SURCHARGED
S1.041	S154	97.421	-0.307	0.000	0.65	0.0	446.0	OK
S19.000	S181	102.227	1.052	227.048	0.82	0.0	313.6	FLOOD
S19.001	S181	102.220	1.374	219.988	1.03	0.0	392.8	FLOOD
S19.002	S182	102.194	1.603	194.404	1.25	0.0	477.3	FLOOD
S19.003	S183	102.121	1.635	121.230	1.00	0.0	493.9	FLOOD
S19.004	S185	102.108	1.864	108.003	2.02	0.0	962.2	FLOOD
S20.000	S202	102.440	1.240	39.810	1.84	0.0	87.8	FLOOD
S20.001	S203	102.411	1.393	11.612	1.77	0.0	84.1	FLOOD
S20.002	S204	102.404	1.568	4.209	1.72	0.0	145.8	FLOOD
S19.005	S184	102.004	1.881	5.082	1.88	0.0	1168.4	FLOOD
S19.006	S185	101.626	1.658	0.000	2.07	0.0	1302.1	SURCHARGED
S19.007	S186	100.805	1.009	0.000	1.72	0.0	1462.8	SURCHARGED
S21.000	S189	102.253	1.303	253.440	1.32	0.0	378.7	FLOOD
S21.001	S190	102.052	1.398	51.928	2.53	0.0	726.3	FLOOD
S21.002	S191	100.998	0.544	0.000	2.95	0.0	999.5	SURCHARGED
S19.008	S187	100.687	1.371	0.000	0.03	0.0	22.8	SURCHARGED
S19.009	S202	98.678	-0.554	0.000	0.45	0.0	274.8	OK
S22.000	S188	102.321	1.296	320.640	1.39	0.0	279.3	FLOOD
S22.001	S189	102.303	1.454	303.453	1.47	0.0	559.5	FLOOD
S22.002	S190	102.234	1.566	233.862	1.17	0.0	578.9	FLOOD
S22.003	S191	102.165	1.673	164.845	1.48	0.0	734.2	FLOOD
S22.004	S226	102.079	1.766	80.000	1.74	0.0	852.5	FLOOD
S22.005	S192	102.035	1.877	35.250	1.59	0.0	974.3	FLOOD
S22.006	S193	102.010	1.991	12.726	2.55	0.0	1515.8	FLOOD
S22.007	S194	101.563	1.654	0.000	1.91	0.0	1244.4	SURCHARGED
S22.008	S195	100.722	1.075	0.000	1.51	0.0	1014.4	SURCHARGED
S23.000	S197	102.091	1.216	91.204	1.64	0.0	167.4	FLOOD
S23.001	S198	102.134	1.506	133.910	1.55	0.0	210.1	FLOOD
S23.002	S199	102.044	1.595	44.794	1.78	0.0	358.1	FLOOD
S23.003	S200	102.010	1.743	10.246	1.62	0.0	1170.7	FLOOD
S22.009	S196	99.557	0.374	0.000	0.09	0.0	45.9	SURCHARGED
S1.042	S137	97.178	-0.240	0.000	0.80	0.0	514.8	OK

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
S24.000	87.320	0.175	500.0	1.199	4.00	0.0	0.600	o	525
S24.001	87.473	0.175	500.0	0.077	0.00	0.0	0.600	o	525
S24.002	58.112	0.116	501.0	0.000	0.00	0.0	0.600	o	525
S25.000	64.454	0.129	499.6	0.513	4.00	0.0	0.600	o	600
S25.001	60.548	0.121	500.4	0.506	0.00	0.0	0.600	o	600
S25.002	79.741	0.159	500.0	0.220	0.00	0.0	0.600	oo	45
S25.003	78.219	0.156	500.0	0.496	0.00	0.0	0.600	oo	-18
S26.000	50.534	0.101	500.0	0.474	4.00	0.0	0.600	o	375
S26.001	49.596	0.099	500.0	0.432	0.00	0.0	0.600	o	450
S26.002	88.562	0.177	500.0	0.317	0.00	0.0	0.600	oo	45
S26.003	43.636	0.087	500.0	0.304	0.00	0.0	0.600	oo	45
S26.004	29.282	0.059	500.0	0.000	0.00	0.0	0.600	oo	45
S26.005	51.165	0.103	496.7	0.000	0.00	0.0	0.600	oo	45
S26.006	71.580	0.143	500.6	0.150	0.00	0.0	0.600	oo	-18
S26.007	59.973	0.120	499.8	0.765	0.00	0.0	0.600	oo	-18
S26.008	45.956	0.092	499.5	0.111	0.00	0.0	0.600	oo	-18
S25.004	89.173	0.174	512.5	0.426	0.00	0.0	0.600	oo	-18
S24.003	72.420	0.145	499.4	0.169	0.00	0.0	0.600	o	750
S24.004	90.275	0.350	257.9	0.167	0.00	0.0	0.600	o	750
S24.005	88.513	0.200	442.6	0.096	0.00	0.0	0.600	o	750
S24.006	83.782	0.120	698.2	0.103	0.00	0.0	0.600	o	825
S27.000	88.590	0.221	400.9	0.241	4.00	0.0	0.600	o	450
S27.001	82.550	0.206	400.7	0.201	0.00	0.0	0.600	o	450
S27.002	89.140	0.223	399.7	0.190	0.00	0.0	0.600	o	450
S27.003	88.340	0.221	399.7	0.214	0.00	0.0	0.600	o	450
S27.004	90.851	0.206	441.0	0.300	0.00	0.0	0.600	o	450
S27.005	79.778	0.284	280.9	0.222	0.00	0.0	0.600	o	450

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S24.000	100.700	1.199	0.0	0.99	215.4
S24.001	100.525	1.276	0.0	0.99	215.4
S24.002	100.350	1.276	0.0	0.99	215.2
S25.000	100.900	0.513	0.0	1.08	306.1
S25.001	100.696	1.019	0.0	1.08	305.9
S25.002	100.500	1.238	0.0	1.08	611.1
S25.003	100.266	1.734	0.0	1.24	1100.3
S26.000	100.700	0.474	0.0	0.80	88.7
S26.001	100.524	0.906	0.0	0.90	143.5
S26.002	100.350	1.222	0.0	1.08	611.1
S26.003	100.173	1.526	0.0	1.08	611.1
S26.004	100.010	1.526	0.0	1.08	611.1
S26.005	99.952	1.526	0.0	1.09	613.1
S26.006	99.849	1.676	0.0	1.24	1099.6
S26.007	99.706	2.442	0.0	1.24	1100.5
S26.008	99.586	2.553	0.0	1.25	1100.8
S25.004	100.114	4.713	0.0	1.23	1086.6
S24.003	99.865	6.158	0.0	1.25	550.2
S24.004	99.720	6.325	0.0	1.74	767.7
S24.005	99.540	6.421	0.0	1.32	584.8
S24.006	99.213	6.524	0.0	1.12	596.5
S27.000	101.198	0.241	0.0	1.01	160.5
S27.001	100.977	0.442	0.0	1.01	160.5
S27.002	100.771	0.632	0.0	1.01	160.7
S27.003	100.548	0.846	0.0	1.01	160.7
S27.004	100.327	1.146	0.0	0.96	152.9
S27.005	100.121	1.367	0.0	1.21	192.1

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
S27.006	98.231	0.219	448.5	0.000	0.00	0.0	0.600	o	450
S27.007	27.564	0.198	139.2	0.000	0.00	0.0	0.600	o	450
S24.007	90.159	0.172	525.6	0.071	0.00	0.0	0.600	o	825
S24.008	88.958	0.187	476.7	0.000	0.00	0.0	0.600	o	825
S24.009	90.513	0.179	505.7	0.000	0.00	0.0	0.600	o	825
S24.010	89.586	0.179	500.5	0.000	0.00	0.0	0.600	o	825
S24.011	149.526	0.131	1141.4	0.000	0.00	0.0	0.600	o	825
S28.000	56.055	0.112	500.5	0.257	5.00	0.0	0.600	o	675
S28.001	77.254	0.156	495.2	0.533	0.00	0.0	0.600	o	900
S28.002	90.073	0.179	503.2	0.854	0.00	0.0	0.600	oo	-18
S28.003	87.135	0.174	500.8	0.821	0.00	0.0	0.600	oo	-18
S28.004	82.912	0.166	499.5	0.691	0.00	0.0	0.600	oo	-18
S28.005	80.103	0.160	500.6	0.448	0.00	0.0	0.600	oo	-18
S28.006	85.474	0.171	499.8	0.363	0.00	0.0	0.600	oo	-18
S29.000	88.350	0.177	499.2	0.228	4.00	0.0	0.600	o	600
S29.001	86.100	0.172	500.6	0.208	0.00	0.0	0.600	o	600
S29.002	86.000	0.172	500.0	0.200	0.00	0.0	0.600	o	750
S29.003	88.420	0.177	499.5	0.219	0.00	0.0	0.600	o	750
S29.004	88.410	0.177	499.5	0.215	0.00	0.0	0.600	o	750
S29.005	61.200	0.122	501.6	0.190	0.00	0.0	0.600	o	750
S29.006	80.220	0.160	501.4	0.212	0.00	0.0	0.600	o	750
S29.007	62.000	0.124	500.0	0.000	0.00	0.0	0.600	o	750
S28.007	97.563	0.325	300.2	0.000	0.00	0.0	0.600	oo	-18
S30.000	53.486	0.107	499.9	0.681	4.00	0.0	0.600	o	600
S30.001	87.977	0.176	499.9	0.292	0.00	0.0	0.600	o	600
S30.002	90.623	0.181	500.7	0.796	0.00	0.0	0.600	oo	45
S30.003	84.691	0.170	498.2	0.612	0.00	0.0	0.600	oo	45

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S27.006	99.837	1.367	0.0	0.95	151.6
S27.007	99.618	1.367	0.0	1.72	273.7
S24.007	99.045	7.962	0.0	1.29	688.5
S24.008	98.865	7.962	0.0	1.35	723.3
S24.009	98.687	7.962	0.0	1.31	702.1
S24.010	98.506	7.962	0.0	1.32	705.8
S24.011	98.327	7.962	0.0	0.87	465.1
S28.000	100.300	0.257	0.0	1.16	416.8
S28.001	100.038	0.790	0.0	1.40	891.4
S28.002	99.732	1.644	0.0	1.24	1096.7
S28.003	99.478	2.465	0.0	1.24	1099.4
S28.004	99.304	3.156	0.0	1.25	1100.9
S28.005	99.138	3.604	0.0	1.24	1099.5
S28.006	98.978	3.967	0.0	1.24	1100.4
S29.000	101.198	0.228	0.0	1.08	306.2
S29.001	101.021	0.436	0.0	1.08	305.8
S29.002	100.849	0.636	0.0	1.24	549.9
S29.003	100.677	0.855	0.0	1.25	550.1
S29.004	100.500	1.070	0.0	1.25	550.1
S29.005	100.323	1.260	0.0	1.24	549.0
S29.006	100.201	1.472	0.0	1.24	549.1
S29.007	100.041	1.472	0.0	1.24	549.9
S28.007	98.807	5.439	0.0	1.61	1423.2
S30.000	100.300	0.681	0.0	1.08	306.0
S30.001	100.193	0.973	0.0	1.08	306.0
S30.002	99.867	1.769	0.0	1.08	610.7
S30.003	99.611	2.381	0.0	1.08	612.2

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)
S30.004	89.359	0.178	502.0	0.559	0.00	0.0	0.600	oo	45
S30.005	85.790	0.172	498.8	0.243	0.00	0.0	0.600	oo	45
S28.008	24.438	0.060	407.3	0.300	0.00	0.0	0.600	o	600
S24.012	87.325	0.175	499.0	0.000	0.00	0.0	0.600	o	600

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S30.004	99.441	2.940	0.0	1.08	609.9
S30.005	99.263	3.183	0.0	1.08	611.9
S28.008	98.598	8.922	0.0	1.20	339.4
S24.012	97.710	16.884	0.0	1.08	306.3

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	4	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S145, DS/PN: S24.003, Volume (m³): 93.2

Invert Level (m) 99.865

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	45.0000	1.400	45.0000	2.600	45.0000	3.800	45.0000	5.000	45.0000
0.400	45.0000	1.600	45.0000	2.800	45.0000	4.000	45.0000	5.200	45.0000
0.600	45.0000	1.800	45.0000	3.000	45.0000	4.200	45.0000	5.400	45.0000
0.800	45.0000	2.000	45.0000	3.200	45.0000	4.400	45.0000	5.600	45.0000
1.000	45.0000	2.200	45.0000	3.400	45.0000	4.600	45.0000	5.800	45.0000
1.200	45.0000	2.400	45.0000	3.600	45.0000	4.800	45.0000	6.000	45.0000

Depth/Flow Relationship Manhole: S225, DS/PN: S29.007, Volume (m³): 37.5

Invert Level (m) 100.041

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	60.0000	1.400	60.0000	2.600	60.0000	3.800	60.0000	5.000	60.0000
0.400	60.0000	1.600	60.0000	2.800	60.0000	4.000	60.0000	5.200	60.0000
0.600	60.0000	1.800	60.0000	3.000	60.0000	4.200	60.0000	5.400	60.0000
0.800	60.0000	2.000	60.0000	3.200	60.0000	4.400	60.0000	5.600	60.0000
1.000	60.0000	2.200	60.0000	3.400	60.0000	4.600	60.0000	5.800	60.0000
1.200	60.0000	2.400	60.0000	3.600	60.0000	4.800	60.0000	6.000	60.0000

Depth/Flow Relationship Manhole: S158, DS/PN: S28.008, Volume (m³): 137.9

Invert Level (m) 98.598

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	35.0000	1.400	35.0000	2.600	35.0000	3.800	35.0000	5.000	35.0000
0.400	35.0000	1.600	35.0000	2.800	35.0000	4.000	35.0000	5.200	35.0000
0.600	35.0000	1.800	35.0000	3.000	35.0000	4.200	35.0000	5.400	35.0000
0.800	35.0000	2.000	35.0000	3.200	35.0000	4.400	35.0000	5.600	35.0000
1.000	35.0000	2.200	35.0000	3.400	35.0000	4.600	35.0000	5.800	35.0000
1.200	35.0000	2.400	35.0000	3.600	35.0000	4.800	35.0000	6.000	35.0000

Depth/Flow Relationship Manhole: S150, DS/PN: S24.012, Volume (m³): 92.8

Invert Level (m) 97.710

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	80.5000	1.400	80.5000	2.600	80.5000	3.800	80.5000	5.000	80.5000
0.400	80.5000	1.600	80.5000	2.800	80.5000	4.000	80.5000	5.200	80.5000
0.600	80.5000	1.800	80.5000	3.000	80.5000	4.200	80.5000	5.400	80.5000
0.800	80.5000	2.000	80.5000	3.200	80.5000	4.400	80.5000	5.600	80.5000
1.000	80.5000	2.200	80.5000	3.400	80.5000	4.600	80.5000	5.800	80.5000
1.200	80.5000	2.400	80.5000	3.600	80.5000	4.800	80.5000	6.000	80.5000

Storage Structures for Storm

Tank or Pond Manhole: S145, DS/PN: S24.003

Invert Level (m) 99.865

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2000.0	2.000	2000.0

Tank or Pond Manhole: S157, DS/PN: S28.007

Invert Level (m) 99.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	792.6	2.400	3932.5

Tank or Pond Manhole: S158, DS/PN: S28.008

Invert Level (m) 99.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	792.6	2.400	1966.3

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	4	Number of Storage Structures	3	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S24.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S24.001	15 Winter	1	0%	30/15 Summer				
S24.002	15 Winter	1	0%	30/15 Summer				
S25.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			2
S25.001	15 Winter	1	0%	30/15 Summer	100/15 Winter			1
S25.002	15 Winter	1	0%	100/15 Summer				
S25.003	15 Winter	1	0%	100/15 Summer				
S26.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S26.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S26.002	180 Winter	1	0%	100/15 Summer				
S26.003	240 Winter	1	0%	30/15 Winter				
S26.004	240 Winter	1	0%	30/15 Summer				
S26.005	180 Winter	1	0%					
S26.006	240 Winter	1	0%	30/15 Summer				
S26.007	480 Summer	1	0%	30/15 Summer				
S26.008	480 Winter	1	0%	30/15 Summer				
S25.004	30 Winter	1	0%	100/15 Summer				
S24.003	600 Winter	1	0%	30/360 Winter				
S24.004	600 Winter	1	0%	30/480 Winter				
S24.005	600 Winter	1	0%	30/240 Winter				
S24.006	480 Winter	1	0%	30/120 Summer				
S27.000	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S27.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S27.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S27.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			3
S27.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			9
S27.005	30 Winter	1	0%	30/15 Summer	100/15 Summer			7
S27.006	30 Winter	1	0%	30/15 Summer	100/15 Summer			3
S27.007	30 Winter	1	0%	30/60 Winter	100/15 Winter			3
S24.007	30 Winter	1	0%	30/60 Winter	100/60 Winter			
S24.008	720 Winter	1	0%	30/30 Winter	100/15 Summer			3
S24.009	720 Winter	1	0%	30/15 Winter	100/15 Summer			26
S24.010	720 Winter	1	0%	30/15 Summer	100/15 Summer			29
S24.011	720 Winter	1	0%	30/15 Summer	100/15 Summer			28
S28.000	15 Winter	1	0%	100/15 Summer				
S28.001	15 Winter	1	0%	100/15 Summer				
S28.002	15 Winter	1	0%	100/15 Summer				
S28.003	360 Winter	1	0%	30/120 Winter				
S28.004	360 Winter	1	0%	30/60 Winter				
S28.005	360 Winter	1	0%	30/15 Winter				
S28.006	360 Winter	1	0%	30/15 Summer				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S29.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			14
S29.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			14
S29.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			14
S29.003	15 Winter	1	0%	100/15 Summer	100/15 Summer			14
S29.004	15 Winter	1	0%	30/15 Winter	100/15 Summer			14
S29.005	30 Winter	1	0%	30/15 Summer	100/15 Summer			13
S29.006	30 Winter	1	0%	30/15 Summer	100/15 Summer			12
S29.007	30 Winter	1	0%	30/15 Summer	100/15 Summer			11
S28.007	360 Winter	1	0%	1/60 Summer				
S30.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S30.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
S30.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			3
S30.003	15 Winter	1	0%	30/15 Winter				
S30.004	15 Winter	1	0%	30/15 Summer				
S30.005	360 Winter	1	0%	30/15 Winter				
S28.008	360 Winter	1	0%	1/15 Summer				
S24.012	720 Winter	1	0%	1/15 Summer	100/15 Summer			8

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S24.000	S143	101.039	-0.186	0.000	0.65	0.0	131.5	OK
S24.001	S144	100.835	-0.216	0.000	0.60	0.0	120.8	OK
S24.002	S144	100.641	-0.234	0.000	0.59	0.0	115.5	OK
S25.000	S207	101.099	-0.401	0.000	0.22	0.0	61.8	OK
S25.001	S208	100.953	-0.343	0.000	0.37	0.0	101.9	OK
S25.002	S209	100.684	-0.416	0.000	0.20	0.0	114.1	OK
S25.003	S210	100.450	-0.566	0.000	0.15	0.0	147.9	OK
S26.000	S146	100.941	-0.134	0.000	0.68	0.0	56.1	OK
S26.001	S147	100.810	-0.164	0.000	0.70	0.0	91.8	OK
S26.002	S148	100.689	-0.261	0.000	0.07	0.0	37.1	OK
S26.003	S149	100.664	-0.109	0.000	0.05	0.0	25.6	OK
S26.004	S150	100.610	0.000	0.000	0.04	0.0	21.7	OK
S26.005	S151	100.552	0.000	0.000	0.04	0.0	21.7	OK*
S26.006	S152	100.542	-0.057	0.000	0.02	0.0	23.5	OK
S26.007	S194	100.456	0.000	0.000	0.03	0.0	26.1	OK
S26.008	S195	100.336	0.000	0.000	0.03	0.0	26.8	OK
S25.004	S211	100.282	-0.582	0.000	0.13	0.0	127.9	OK
S24.003	S145	100.081	-0.534	0.000	0.09	0.0	45.0	OK
S24.004	S147	99.853	-0.617	0.000	0.07	0.0	46.5	OK
S24.005	S148	99.691	-0.599	0.000	0.09	0.0	47.5	OK
S24.006	S146	99.388	-0.650	0.000	0.09	0.0	48.4	OK
S27.000	S200	101.336	-0.312	0.000	0.18	0.0	27.6	OK
S27.001	S201	101.146	-0.281	0.000	0.28	0.0	42.6	OK
S27.002	S202	100.962	-0.259	0.000	0.35	0.0	53.9	OK
S27.003	S203	100.755	-0.243	0.000	0.42	0.0	63.5	OK
S27.004	S204	100.560	-0.217	0.000	0.51	0.0	73.8	OK
S27.005	S205	100.335	-0.236	0.000	0.46	0.0	82.2	OK
S27.006	S206	100.080	-0.207	0.000	0.56	0.0	80.3	OK
S27.007	S207	99.800	-0.268	0.000	0.34	0.0	80.2	OK
S24.007	S147	99.272	-0.598	0.000	0.16	0.0	101.4	OK
S24.008	S159	99.163	-0.527	0.000	0.10	0.0	62.4	OK
S24.009	S148	99.125	-0.387	0.000	0.10	0.0	62.0	OK
S24.010	S149	99.073	-0.258	0.000	0.09	0.0	59.9	OK
S24.011	S172	99.004	-0.148	0.000	0.12	0.0	56.4	OK
S28.000	S150	100.433	-0.542	0.000	0.08	0.0	30.9	OK
S28.001	S151	100.233	-0.705	0.000	0.11	0.0	82.1	OK
S28.002	S152	99.926	-0.556	0.000	0.16	0.0	155.5	OK
S28.003	S153	99.899	-0.329	0.000	0.05	0.0	47.4	OK
S28.004	S154	99.877	-0.177	0.000	0.05	0.0	50.1	OK
S28.005	S155	99.824	-0.064	0.000	0.05	0.0	48.5	OK
S28.006	S156	99.728	0.000	0.000	0.05	0.0	46.7	OK
S29.000	S218	101.327	-0.471	0.000	0.09	0.0	26.3	OK
S29.001	S219	101.179	-0.442	0.000	0.15	0.0	41.3	OK
S29.002	S220	101.022	-0.577	0.000	0.11	0.0	53.3	OK
S29.003	S221	100.864	-0.563	0.000	0.13	0.0	63.8	OK
S29.004	S222	100.698	-0.552	0.000	0.14	0.0	70.9	OK
S29.005	S223	100.544	-0.529	0.000	0.16	0.0	75.1	OK
S29.006	S224	100.450	-0.501	0.000	0.16	0.0	78.2	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S29.007	S225	100.407	-0.384	0.000	0.13	0.0	60.0	OK
S28.007	S157	99.655	0.098	0.000	0.04	0.0	51.5	SURCHARGED
S30.000	S159	100.544	-0.356	0.000	0.29	0.0	79.5	OK
S30.001	S160	100.446	-0.347	0.000	0.35	0.0	100.3	OK
S30.002	S161	100.091	-0.376	0.000	0.29	0.0	163.0	OK
S30.003	S162	99.860	-0.351	0.000	0.35	0.0	199.0	OK
S30.004	S163	99.702	-0.339	0.000	0.38	0.0	216.8	OK
S30.005	S164	99.672	-0.191	0.000	0.10	0.0	58.0	OK
S28.008	S158	99.653	0.455	0.000	0.13	0.0	35.0	SURCHARGED
S24.012	S150	98.929	0.619	0.000	0.28	0.0	80.5	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S24.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S24.001	15 Winter	30	0%	30/15 Summer				
S24.002	15 Winter	30	0%	30/15 Summer				
S25.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			2
S25.001	15 Winter	30	0%	30/15 Summer	100/15 Winter			1
S25.002	15 Winter	30	0%	100/15 Summer				
S25.003	480 Winter	30	0%	100/15 Summer				
S26.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S26.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S26.002	30 Winter	30	0%	100/15 Summer				
S26.003	15 Winter	30	0%	30/15 Winter				
S26.004	30 Winter	30	0%	30/15 Summer				
S26.005	30 Winter	30	0%					
S26.006	480 Winter	30	0%	30/15 Summer				
S26.007	480 Winter	30	0%	30/15 Summer				
S26.008	480 Winter	30	0%	30/15 Summer				
S25.004	480 Winter	30	0%	100/15 Summer				
S24.003	480 Winter	30	0%	30/360 Winter				
S24.004	480 Winter	30	0%	30/480 Winter				
S24.005	480 Winter	30	0%	30/240 Winter				
S24.006	480 Winter	30	0%	30/120 Summer				
S27.000	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S27.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S27.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S27.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			3
S27.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			9
S27.005	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S27.006	480 Winter	30	0%	30/15 Summer	100/15 Summer			3
S27.007	480 Winter	30	0%	30/60 Winter	100/15 Winter			3
S24.007	360 Summer	30	0%	30/60 Winter	100/60 Winter			
S24.008	360 Summer	30	0%	30/30 Winter	100/15 Summer			3
S24.009	480 Winter	30	0%	30/15 Winter	100/15 Summer			26
S24.010	720 Winter	30	0%	30/15 Summer	100/15 Summer			29
S24.011	720 Winter	30	0%	30/15 Summer	100/15 Summer			28
S28.000	15 Winter	30	0%	100/15 Summer				
S28.001	600 Winter	30	0%	100/15 Summer				
S28.002	600 Winter	30	0%	100/15 Summer				
S28.003	600 Winter	30	0%	30/120 Winter				
S28.004	600 Winter	30	0%	30/60 Winter				
S28.005	600 Winter	30	0%	30/15 Winter				
S28.006	600 Winter	30	0%	30/15 Summer				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S29.000	30 Winter	30	0%	100/15 Summer	100/15 Summer			14
S29.001	30 Winter	30	0%	100/15 Summer	100/15 Summer			14
S29.002	30 Winter	30	0%	100/15 Summer	100/15 Summer			14
S29.003	30 Winter	30	0%	100/15 Summer	100/15 Summer			14
S29.004	30 Winter	30	0%	30/15 Winter	100/15 Summer			14
S29.005	15 Winter	30	0%	30/15 Summer	100/15 Summer			13
S29.006	30 Winter	30	0%	30/15 Summer	100/15 Summer			12
S29.007	30 Winter	30	0%	30/15 Summer	100/15 Summer			11
S28.007	600 Winter	30	0%	1/60 Summer				
S30.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S30.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S30.002	600 Winter	30	0%	100/15 Summer	100/15 Summer			3
S30.003	600 Winter	30	0%	30/15 Winter				
S30.004	600 Winter	30	0%	30/15 Summer				
S30.005	600 Winter	30	0%	30/15 Winter				
S28.008	600 Winter	30	0%	1/15 Summer				
S24.012	720 Winter	30	0%	1/15 Summer	100/15 Summer			8

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S24.000	S143	102.117	0.892	0.000	1.79	0.0	360.3	FLOOD RISK
S24.001	S144	101.622	0.572	0.000	1.71	0.0	344.0	SURCHARGED
S24.002	S144	101.100	0.225	0.000	1.77	0.0	344.8	SURCHARGED
S25.000	S207	101.435	-0.065	0.000	0.71	0.0	195.6	OK
S25.001	S208	101.351	0.055	0.000	1.21	0.0	332.0	SURCHARGED
S25.002	S209	100.875	-0.225	0.000	0.65	0.0	365.1	OK
S25.003	S210	100.749	-0.267	0.000	0.07	0.0	68.8	OK
S26.000	S146	101.891	0.816	0.000	2.00	0.0	164.4	SURCHARGED
S26.001	S147	101.445	0.471	0.000	2.34	0.0	305.4	SURCHARGED
S26.002	S148	100.950	0.000	0.000	0.52	0.0	291.7	OK
S26.003	S149	100.837	0.065	0.000	0.68	0.0	360.7	SURCHARGED
S26.004	S150	100.801	0.191	0.000	0.63	0.0	312.1	SURCHARGED
S26.005	S151	100.552	0.000	0.000	0.50	0.0	304.2	SURCHARGED*
S26.006	S152	100.742	0.143	0.000	0.07	0.0	67.3	SURCHARGED
S26.007	S194	100.742	0.286	0.000	0.10	0.0	97.9	SURCHARGED
S26.008	S195	100.740	0.404	0.000	0.11	0.0	100.6	SURCHARGED
S25.004	S211	100.739	-0.125	0.000	0.19	0.0	182.2	OK
S24.003	S145	100.647	0.032	0.000	0.09	0.0	45.0	SURCHARGED
S24.004	S147	100.560	0.090	0.000	0.08	0.0	52.9	SURCHARGED
S24.005	S148	100.518	0.228	0.000	0.11	0.0	60.4	SURCHARGED
S24.006	S146	100.647	0.609	0.000	0.12	0.0	63.6	SURCHARGED
S27.000	S200	101.680	0.032	0.000	0.62	0.0	94.2	SURCHARGED
S27.001	S201	101.637	0.210	0.000	0.80	0.0	120.8	SURCHARGED
S27.002	S202	101.533	0.312	0.000	0.83	0.0	125.5	SURCHARGED
S27.003	S203	101.380	0.382	0.000	1.02	0.0	155.2	SURCHARGED
S27.004	S204	101.166	0.389	0.000	1.32	0.0	190.7	SURCHARGED
S27.005	S205	100.854	0.283	0.000	1.15	0.0	206.9	SURCHARGED
S27.006	S206	100.492	0.205	0.000	0.38	0.0	54.5	SURCHARGED
S27.007	S207	100.674	0.606	0.000	0.23	0.0	54.5	SURCHARGED
S24.007	S147	100.498	0.628	0.000	0.25	0.0	156.7	SURCHARGED
S24.008	S159	100.658	0.968	0.000	0.23	0.0	149.4	SURCHARGED
S24.009	S148	100.534	1.022	0.000	0.16	0.0	98.3	SURCHARGED
S24.010	S149	100.436	1.105	0.000	0.12	0.0	74.9	SURCHARGED
S24.011	S172	100.433	1.281	0.000	0.14	0.0	64.6	SURCHARGED
S28.000	S150	100.555	-0.420	0.000	0.28	0.0	102.8	OK
S28.001	S151	100.447	-0.491	0.000	0.03	0.0	26.5	OK
S28.002	S152	100.447	-0.035	0.000	0.05	0.0	53.3	OK
S28.003	S153	100.422	0.194	0.000	0.08	0.0	76.6	SURCHARGED
S28.004	S154	100.422	0.368	0.000	0.10	0.0	95.7	SURCHARGED
S28.005	S155	100.422	0.534	0.000	0.11	0.0	107.8	SURCHARGED
S28.006	S156	100.421	0.693	0.000	0.12	0.0	119.5	SURCHARGED
S29.000	S218	101.476	-0.322	0.000	0.23	0.0	65.1	OK
S29.001	S219	101.474	-0.147	0.000	0.41	0.0	114.8	OK
S29.002	S220	101.455	-0.144	0.000	0.31	0.0	153.5	OK
S29.003	S221	101.423	-0.004	0.000	0.36	0.0	178.1	OK
S29.004	S222	101.333	0.083	0.000	0.37	0.0	184.0	SURCHARGED
S29.005	S223	101.330	0.257	0.000	0.41	0.0	196.2	SURCHARGED
S29.006	S224	101.320	0.369	0.000	0.32	0.0	158.5	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S29.007	S225	101.309	0.518	0.000	0.13	0.0	60.0	SURCHARGED
S28.007	S157	100.421	0.864	0.000	0.04	0.0	51.4	SURCHARGED
S30.000	S159	100.978	0.078	0.000	0.94	0.0	253.4	SURCHARGED
S30.001	S160	100.882	0.089	0.000	1.16	0.0	326.7	SURCHARGED
S30.002	S161	100.464	-0.003	0.000	0.10	0.0	58.4	OK
S30.003	S162	100.427	0.216	0.000	0.13	0.0	74.0	SURCHARGED
S30.004	S163	100.425	0.384	0.000	0.16	0.0	90.4	SURCHARGED
S30.005	S164	100.423	0.560	0.000	0.17	0.0	94.5	SURCHARGED
S28.008	S158	100.421	1.223	0.000	0.13	0.0	35.0	SURCHARGED
S24.012	S150	100.422	2.112	0.000	0.28	0.0	80.5	SURCHARGED

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 4 Number of Storage Structures 3 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S24.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S24.001	15 Winter	100	+40%	30/15 Summer				
S24.002	480 Winter	100	+40%	30/15 Summer				
S25.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			2
S25.001	15 Winter	100	+40%	30/15 Summer	100/15 Winter			1
S25.002	15 Winter	100	+40%	100/15 Summer				
S25.003	480 Winter	100	+40%	100/15 Summer				
S26.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S26.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S26.002	15 Winter	100	+40%	100/15 Summer				
S26.003	15 Winter	100	+40%	30/15 Winter				
S26.004	15 Winter	100	+40%	30/15 Summer				
S26.005	30 Winter	100	+40%					
S26.006	15 Winter	100	+40%	30/15 Summer				
S26.007	480 Winter	100	+40%	30/15 Summer				
S26.008	480 Winter	100	+40%	30/15 Summer				
S25.004	480 Winter	100	+40%	100/15 Summer				
S24.003	480 Winter	100	+40%	30/360 Winter				
S24.004	600 Winter	100	+40%	30/480 Winter				
S24.005	480 Summer	100	+40%	30/240 Winter				
S24.006	480 Summer	100	+40%	30/120 Summer				
S27.000	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S27.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S27.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S27.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			3
S27.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			9
S27.005	60 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S27.006	60 Winter	100	+40%	30/15 Summer	100/15 Summer			3
S27.007	60 Winter	100	+40%	30/60 Winter	100/15 Winter			3
S24.007	480 Summer	100	+40%	30/60 Winter	100/60 Winter			
S24.008	600 Summer	100	+40%	30/30 Winter	100/15 Summer			3
S24.009	600 Winter	100	+40%	30/15 Winter	100/15 Summer			26
S24.010	600 Winter	100	+40%	30/15 Summer	100/15 Summer			29
S24.011	600 Winter	100	+40%	30/15 Summer	100/15 Summer			28
S28.000	15 Winter	100	+40%	100/15 Summer				
S28.001	15 Winter	100	+40%	100/15 Summer				
S28.002	15 Winter	100	+40%	100/15 Summer				
S28.003	720 Winter	100	+40%	30/120 Winter				
S28.004	720 Winter	100	+40%	30/60 Winter				
S28.005	720 Winter	100	+40%	30/15 Winter				
S28.006	720 Winter	100	+40%	30/15 Summer				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S29.000	60 Winter	100	+40%	100/15 Summer	100/15 Summer			14
S29.001	60 Winter	100	+40%	100/15 Summer	100/15 Summer			14
S29.002	60 Winter	100	+40%	100/15 Summer	100/15 Summer			14
S29.003	60 Winter	100	+40%	100/15 Summer	100/15 Summer			14
S29.004	60 Winter	100	+40%	30/15 Winter	100/15 Summer			14
S29.005	60 Winter	100	+40%	30/15 Summer	100/15 Summer			13
S29.006	60 Winter	100	+40%	30/15 Summer	100/15 Summer			12
S29.007	60 Winter	100	+40%	30/15 Summer	100/15 Summer			11
S28.007	720 Winter	100	+40%	1/60 Summer				
S30.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S30.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S30.002	15 Winter	100	+40%	100/15 Summer	100/15 Summer			3
S30.003	15 Winter	100	+40%	30/15 Winter				
S30.004	720 Winter	100	+40%	30/15 Summer				
S30.005	720 Winter	100	+40%	30/15 Winter				
S28.008	720 Winter	100	+40%	1/15 Summer				
S24.012	180 Summer	100	+40%	1/15 Summer	100/15 Summer			8

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S24.000	S143	102.581	1.356	180.880	1.93	0.0	387.5	FLOOD
S24.001	S144	102.078	1.028	0.000	2.05	0.0	412.4	SURCHARGED
S24.002	S144	101.703	0.828	0.000	0.45	0.0	87.4	SURCHARGED
S25.000	S207	102.419	0.919	19.165	1.34	0.0	368.5	FLOOD
S25.001	S208	102.400	1.104	0.308	2.35	0.0	641.9	FLOOD
S25.002	S209	101.799	0.699	0.000	1.29	0.0	722.2	SURCHARGED
S25.003	S210	101.703	0.687	0.000	0.13	0.0	125.1	SURCHARGED
S26.000	S146	102.499	1.424	99.331	1.81	0.0	148.8	FLOOD
S26.001	S147	102.425	1.451	25.104	3.03	0.0	395.4	FLOOD
S26.002	S148	102.196	1.246	0.000	1.01	0.0	572.0	FLOOD RISK
S26.003	S149	102.094	1.321	0.000	1.39	0.0	734.1	SURCHARGED
S26.004	S150	101.989	1.379	0.000	1.44	0.0	716.1	SURCHARGED
S26.005	S151	100.552	0.000	0.000	1.01	0.0	617.5	SURCHARGED*
S26.006	S152	101.780	1.181	0.000	0.72	0.0	696.5	SURCHARGED
S26.007	S194	101.707	1.251	0.000	0.19	0.0	184.0	SURCHARGED
S26.008	S195	101.705	1.369	0.000	0.21	0.0	192.8	SURCHARGED
S25.004	S211	101.703	0.839	0.000	0.33	0.0	323.9	SURCHARGED
S24.003	S145	101.700	1.085	0.000	0.09	0.0	45.0	SURCHARGED
S24.004	S147	101.308	0.838	0.000	0.08	0.0	52.9	SURCHARGED
S24.005	S148	101.326	1.036	0.000	0.13	0.0	70.0	SURCHARGED
S24.006	S146	101.319	1.281	0.000	0.14	0.0	76.5	FLOOD RISK
S27.000	S200	102.405	0.757	57.459	0.73	0.0	110.6	FLOOD
S27.001	S201	102.398	0.971	49.677	0.86	0.0	130.5	FLOOD
S27.002	S202	102.383	1.162	35.191	0.80	0.0	122.1	FLOOD
S27.003	S203	102.352	1.354	4.098	1.43	0.0	217.8	FLOOD
S27.004	S204	101.879	1.102	78.936	1.68	0.0	243.9	FLOOD
S27.005	S205	101.807	1.236	10.919	1.51	0.0	272.9	FLOOD
S27.006	S206	101.802	1.515	1.989	1.85	0.0	266.0	FLOOD
S27.007	S207	101.602	1.534	2.326	1.14	0.0	264.7	FLOOD
S24.007	S147	101.196	1.326	0.000	0.25	0.0	152.3	SURCHARGED
S24.008	S159	101.201	1.511	1.676	0.21	0.0	137.5	FLOOD
S24.009	S148	101.124	1.612	124.059	0.17	0.0	104.9	FLOOD
S24.010	S149	101.116	1.785	116.288	0.17	0.0	104.9	FLOOD
S24.011	S172	101.106	1.954	110.765	0.22	0.0	103.4	FLOOD
S28.000	S150	101.450	0.475	0.000	0.59	0.0	215.4	SURCHARGED
S28.001	S151	101.437	0.499	0.000	0.67	0.0	516.3	SURCHARGED
S28.002	S152	101.400	0.918	0.000	0.85	0.0	840.7	SURCHARGED
S28.003	S153	101.391	1.163	0.000	0.13	0.0	125.8	SURCHARGED
S28.004	S154	101.391	1.337	0.000	0.16	0.0	161.3	SURCHARGED
S28.005	S155	101.389	1.501	0.000	0.19	0.0	183.3	SURCHARGED
S28.006	S156	101.389	1.661	0.000	0.20	0.0	199.8	SURCHARGED
S29.000	S218	102.405	0.607	56.623	0.24	0.0	67.2	FLOOD
S29.001	S219	102.402	0.781	54.269	0.38	0.0	106.9	FLOOD
S29.002	S220	102.398	0.799	49.767	0.28	0.0	136.3	FLOOD
S29.003	S221	102.394	0.967	45.730	0.29	0.0	144.3	FLOOD
S29.004	S222	102.388	1.138	39.790	0.28	0.0	140.2	FLOOD
S29.005	S223	102.380	1.307	31.894	0.25	0.0	120.7	FLOOD
S29.006	S224	102.372	1.421	23.513	0.25	0.0	122.2	FLOOD

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S29.007	S225	102.360	1.569	12.475	0.13	0.0	60.0	FLOOD
S28.007	S157	101.389	1.832	0.000	0.04	0.0	54.4	SURCHARGED
S30.000	S159	101.892	0.992	92.295	1.41	0.0	382.0	FLOOD
S30.001	S160	101.868	1.075	68.822	1.78	0.0	502.7	FLOOD
S30.002	S161	101.848	1.381	48.184	1.31	0.0	741.4	FLOOD
S30.003	S162	101.799	1.588	0.000	1.67	0.0	940.0	FLOOD RISK
S30.004	S163	101.392	1.351	0.000	0.26	0.0	147.5	SURCHARGED
S30.005	S164	101.390	1.527	0.000	0.28	0.0	159.3	SURCHARGED
S28.008	S158	101.389	2.191	0.000	0.13	0.0	35.0	SURCHARGED
S24.012	S150	101.809	3.499	16.194	0.28	0.0	80.5	FLOOD

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
1.000	60.550	0.121	500.4	0.189	4.00	0.0	0.600		o	450
1.001	62.610	0.125	500.9	0.203	0.00	0.0	0.600		o	525
1.002	76.620	0.153	500.8	0.387	0.00	0.0	0.600		o	525
1.003	68.540	0.137	500.3	0.636	0.00	0.0	0.600		o	525
1.004	55.200	0.100	552.0	0.409	0.00	0.0	0.600		o	525
1.005	53.130	0.106	500.0	0.050	0.00	0.0	0.600		o	525
2.000	38.000	0.076	500.0	0.036	5.00	0.0	0.600		o	375
2.001	42.800	0.086	497.7	0.247	0.00	0.0	0.600		o	375
2.002	44.880	0.090	498.7	0.212	0.00	0.0	0.600		o	450
2.003	55.000	0.110	500.0	0.216	0.00	0.0	0.600		o	450
2.004	67.325	0.135	500.0	0.116	0.00	0.0	0.600		o	525
1.006	60.588	0.114	531.5	0.197	0.00	0.0	0.600		o	600
1.007	128.001	0.640	200.0	0.000	0.00	0.0		0.350	4 \=/	20000
3.000	68.673	0.137	501.3	0.820	4.00	0.0	0.600		o	675
3.001	90.740	0.181	501.3	0.820	0.00	0.0	0.600		o	750
3.002	93.279	0.187	498.8	0.520	0.00	0.0	0.600		o	750
3.003	81.966	0.164	499.8	0.533	0.00	0.0	0.600		o	750
4.000	85.798	0.172	498.8	0.820	4.00	0.0	0.600		o	750
4.001	78.267	0.157	498.5	0.820	0.00	0.0	0.600		o	750
4.002	83.034	0.177	469.1	0.478	0.00	0.0	0.600		o	825
4.003	76.235	0.168	453.8	0.427	0.00	0.0	0.600		o	825
4.004	87.647	0.194	451.8	0.297	0.00	0.0	0.600		o	825
4.005	86.009	0.174	494.3	0.549	0.00	0.0	0.600		o	900
4.006	67.555	0.127	531.9	0.613	0.00	0.0	0.600		o	900
4.007	68.925	0.138	499.5	0.323	0.00	0.0	0.600		o	900
4.008	73.185	0.146	501.3	0.237	0.00	0.0	0.600		o	900
3.004	60.969	0.122	500.0	0.499	0.00	0.0	0.600		o	900

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	106.000	0.189	0.0	0.90	143.5
1.001	105.879	0.392	0.0	0.99	215.2
1.002	105.754	0.779	0.0	0.99	215.2
1.003	105.601	1.415	0.0	0.99	215.3
1.004	105.464	1.824	0.0	0.95	204.8
1.005	105.364	1.874	0.0	0.99	215.4
2.000	106.000	0.036	0.0	0.80	88.7
2.001	105.924	0.283	0.0	0.81	89.0
2.002	105.838	0.495	0.0	0.90	143.7
2.003	105.748	0.711	0.0	0.90	143.5
2.004	105.638	0.827	0.0	0.99	215.4
1.006	105.248	2.898	0.0	1.05	296.7
1.007	105.134	2.898	0.0	0.29	20564.6
3.000	106.000	0.820	0.0	1.16	416.4
3.001	105.863	1.640	0.0	1.24	549.1
3.002	105.682	2.160	0.0	1.25	550.5
3.003	105.495	2.693	0.0	1.24	550.0
4.000	106.300	0.820	0.0	1.25	550.5
4.001	106.128	1.640	0.0	1.25	550.7
4.002	105.957	2.118	0.0	1.36	729.2
4.003	105.780	2.545	0.0	1.39	741.5
4.004	105.612	2.842	0.0	1.39	743.2
4.005	105.418	3.391	0.0	1.40	892.2
4.006	105.244	4.004	0.0	1.35	859.8
4.007	105.117	4.327	0.0	1.40	887.6
4.008	104.979	4.564	0.0	1.39	885.9
3.004	104.833	7.756	0.0	1.39	887.1

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
1.008	77.150	0.154	501.0	0.065	0.00	0.0	0.600		o	900
1.009	152.569	0.763	200.0	0.000	0.00	0.0		0.350	4 \=/	40000
1.010	41.264	0.083	497.2	0.598	0.00	0.0	0.600		o	750
1.011	118.427	0.237	500.0	0.000	0.00	0.0		0.350	4 \=/	40000
1.012	27.923	0.056	500.0	0.454	0.00	0.0	0.600		o	450

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.008	104.494	10.719	0.0	1.39	886.2
1.009	104.340	10.719	0.0	0.37	62202.3
1.010	103.577	11.317	0.0	1.25	551.5
1.011	103.494	11.317	0.0	0.21	25986.9
1.012	103.257	11.771	0.0	0.90	143.5

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S293, DS/PN: 1.010, Volume (m³): 25239.0

Invert Level (m) 103.577

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	55.0000	1.400	55.0000	2.600	55.0000	3.800	55.0000	5.000	55.0000
0.400	55.0000	1.600	55.0000	2.800	55.0000	4.000	55.0000	5.200	55.0000
0.600	55.0000	1.800	55.0000	3.000	55.0000	4.200	55.0000	5.400	55.0000
0.800	55.0000	2.000	55.0000	3.200	55.0000	4.400	55.0000	5.600	55.0000
1.000	55.0000	2.200	55.0000	3.400	55.0000	4.600	55.0000	5.800	55.0000
1.200	55.0000	2.400	55.0000	3.600	55.0000	4.800	55.0000	6.000	55.0000

Pump Manhole: S290, DS/PN: 1.012, Volume (m³): 14756.9

Invert Level (m) 103.257

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	55.0000	1.400	55.0000	2.600	55.0000	3.800	55.0000	5.000	55.0000
0.400	55.0000	1.600	55.0000	2.800	55.0000	4.000	55.0000	5.200	55.0000
0.600	55.0000	1.800	55.0000	3.000	55.0000	4.200	55.0000	5.400	55.0000
0.800	55.0000	2.000	55.0000	3.200	55.0000	4.400	55.0000	5.600	55.0000
1.000	55.0000	2.200	55.0000	3.400	55.0000	4.600	55.0000	5.800	55.0000
1.200	55.0000	2.400	55.0000	3.600	55.0000	4.800	55.0000	6.000	55.0000

Storage Structures for Storm

Tank or Pond Manhole: S293, DS/PN: 1.010

Invert Level (m) 103.577

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1500.0	1.000	2025.0

Tank or Pond Manhole: S290, DS/PN: 1.012

Invert Level (m) 103.257

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	870.0	0.500	1800.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			8
1.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			8
1.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
1.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
1.004	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
1.005	15 Winter	1	0%	30/15 Summer				
2.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
2.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
2.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
2.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			3
2.004	15 Winter	1	0%	30/15 Summer				
1.006	15 Winter	1	0%	30/15 Summer				
1.007	30 Winter	1	0%					
3.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
3.001	15 Winter	1	0%	30/15 Winter	100/15 Summer			4
3.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			4
3.003	15 Winter	1	0%	30/15 Summer				
4.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			6
4.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			6
4.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			6
4.003	15 Winter	1	0%	100/15 Summer	100/15 Summer			6
4.004	30 Winter	1	0%	100/15 Summer	100/15 Summer			4
4.005	30 Winter	1	0%	100/15 Summer	100/15 Summer			3
4.006	30 Winter	1	0%	30/15 Summer	100/15 Winter			1
4.007	30 Winter	1	0%	30/15 Winter				
4.008	30 Winter	1	0%	30/15 Summer				
3.004	30 Winter	1	0%	30/15 Summer				
1.008	60 Winter	1	0%	100/15 Summer				
1.009	60 Winter	1	0%					
1.010	480 Winter	1	0%	30/240 Winter				
1.011	1440 Winter	1	0%					
1.012	1440 Winter	1	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	S276	106.135	-0.315	0.000	0.17	0.0	22.2	OK
1.001	S277	106.055	-0.349	0.000	0.19	0.0	37.0	OK
1.002	S278	105.982	-0.297	0.000	0.32	0.0	62.8	OK
1.003	S279	105.895	-0.231	0.000	0.54	0.0	107.0	OK

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.004	S280	105.793	-0.196	0.000	0.66	0.0	121.1	OK
1.005	S281	105.697	-0.192	0.000	0.61	0.0	117.7	OK
2.000	S284	106.096	-0.279	0.000	0.05	0.0	3.9	OK
2.001	S285	106.087	-0.212	0.000	0.31	0.0	25.6	OK
2.002	S286	106.033	-0.255	0.000	0.33	0.0	42.4	OK
2.003	S287	105.960	-0.238	0.000	0.44	0.0	57.3	OK
2.004	S288	105.844	-0.319	0.000	0.32	0.0	63.2	OK
1.006	S282	105.612	-0.236	0.000	0.67	0.0	177.6	OK
1.007	S290	105.287	-2.213	0.000	0.01	0.0	169.5	OK
3.000	S317	106.260	-0.415	0.000	0.26	0.0	95.1	OK
3.001	S318	106.162	-0.451	0.000	0.30	0.0	151.0	OK
3.002	S319	106.004	-0.428	0.000	0.35	0.0	177.0	OK
3.003	S320	105.833	-0.412	0.000	0.42	0.0	206.5	OK
4.000	S291	106.543	-0.507	0.000	0.19	0.0	92.5	OK
4.001	S292	106.421	-0.457	0.000	0.30	0.0	148.6	OK
4.002	S293	106.261	-0.521	0.000	0.27	0.0	172.7	OK
4.003	S294	106.093	-0.512	0.000	0.28	0.0	185.5	OK
4.004	S295	105.925	-0.512	0.000	0.28	0.0	184.2	OK
4.005	S296	105.762	-0.556	0.000	0.26	0.0	201.6	OK
4.006	S297	105.628	-0.516	0.000	0.30	0.0	217.6	OK
4.007	S298	105.507	-0.510	0.000	0.29	0.0	223.1	OK
4.008	S299	105.393	-0.486	0.000	0.30	0.0	229.5	OK
3.004	S291	105.302	-0.431	0.000	0.53	0.0	398.7	OK
1.008	S291	104.912	-0.482	0.000	0.44	0.0	340.4	OK
1.009	S292	104.489	-3.011	0.000	0.01	0.0	340.4	OK
1.010	S293	103.960	-0.367	0.000	0.12	0.0	55.0	OK
1.011	S290	103.572	-2.428	0.000	0.00	0.0	55.0	OK
1.012	S290	103.461	-0.246	0.000	0.45	0.0	55.0	OK

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
1.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
1.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
1.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
1.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
1.005	15 Winter	30	0%	30/15 Summer				
2.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
2.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
2.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
2.003	15 Winter	30	0%	30/15 Summer	100/15 Summer			3
2.004	15 Winter	30	0%	30/15 Summer				
1.006	15 Winter	30	0%	30/15 Summer				
1.007	15 Winter	30	0%					
3.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
3.001	15 Winter	30	0%	30/15 Winter	100/15 Summer			4
3.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
3.003	15 Winter	30	0%	30/15 Summer				
4.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			6
4.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			6
4.002	30 Winter	30	0%	100/15 Summer	100/15 Summer			6
4.003	30 Winter	30	0%	100/15 Summer	100/15 Summer			6
4.004	30 Winter	30	0%	100/15 Summer	100/15 Summer			4
4.005	15 Winter	30	0%	100/15 Summer	100/15 Summer			3
4.006	15 Winter	30	0%	30/15 Summer	100/15 Winter			1
4.007	15 Winter	30	0%	30/15 Winter				
4.008	15 Winter	30	0%	30/15 Summer				
3.004	15 Winter	30	0%	30/15 Summer				
1.008	60 Winter	30	0%	100/15 Summer				
1.009	60 Winter	30	0%					
1.010	480 Winter	30	0%	30/240 Winter				
1.011	2880 Winter	30	0%					
1.012	2880 Winter	30	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	S276	107.292	0.842	0.000	0.45	0.0	59.4	FLOOD RISK
1.001	S277	107.276	0.872	0.000	0.39	0.0	75.9	FLOOD RISK
1.002	S278	107.252	0.973	0.000	0.74	0.0	148.2	FLOOD RISK
1.003	S279	107.194	1.068	0.000	1.43	0.0	282.5	SURCHARGED

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.004	S280	106.900	0.911	0.000	1.82	0.0	335.2	SURCHARGED
1.005	S281	106.559	0.670	0.000	1.75	0.0	338.4	SURCHARGED
2.000	S284	106.733	0.358	0.000	0.14	0.0	11.3	SURCHARGED
2.001	S285	106.726	0.427	0.000	1.08	0.0	88.2	SURCHARGED
2.002	S286	106.669	0.381	0.000	1.16	0.0	149.5	SURCHARGED
2.003	S287	106.589	0.391	0.000	1.55	0.0	203.8	SURCHARGED
2.004	S288	106.380	0.217	0.000	1.07	0.0	211.1	SURCHARGED
1.006	S282	106.232	0.384	0.000	2.07	0.0	549.7	SURCHARGED
1.007	S290	105.431	-2.069	0.000	0.02	0.0	487.7	OK
3.000	S317	106.739	0.064	0.000	0.82	0.0	304.2	SURCHARGED
3.001	S318	106.710	0.097	0.000	1.01	0.0	502.1	SURCHARGED
3.002	S319	106.601	0.169	0.000	1.12	0.0	557.8	SURCHARGED
3.003	S320	106.360	0.115	0.000	1.30	0.0	643.5	SURCHARGED
4.000	S291	106.967	-0.083	0.000	0.63	0.0	310.6	OK
4.001	S292	106.867	-0.011	0.000	0.99	0.0	486.1	OK
4.002	S293	106.678	-0.104	0.000	0.75	0.0	487.3	OK
4.003	S294	106.570	-0.035	0.000	0.80	0.0	519.0	OK
4.004	S295	106.437	0.000	0.000	0.74	0.0	488.0	OK
4.005	S296	106.318	0.000	0.000	0.76	0.0	594.6	OK
4.006	S297	106.193	0.049	0.000	0.89	0.0	654.2	SURCHARGED
4.007	S298	106.102	0.085	0.000	0.85	0.0	643.6	SURCHARGED
4.008	S299	106.001	0.122	0.000	0.84	0.0	642.4	SURCHARGED
3.004	S291	105.895	0.162	0.000	1.62	0.0	1206.1	SURCHARGED
1.008	S291	105.225	-0.169	0.000	1.00	0.0	770.0	OK
1.009	S292	104.583	-2.917	0.000	0.01	0.0	769.2	OK
1.010	S293	104.365	0.038	0.000	0.12	0.0	55.0	SURCHARGED
1.011	S290	103.582	-2.418	0.000	0.00	0.0	55.0	OK
1.012	S290	103.505	-0.202	0.000	0.45	0.0	55.0	OK

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
1.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			8
1.001	30 Winter	100	+40%	30/15 Summer	100/15 Summer			8
1.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
1.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
1.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
1.005	15 Winter	100	+40%	30/15 Summer				
2.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
2.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
2.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
2.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			3
2.004	15 Winter	100	+40%	30/15 Summer				
1.006	15 Winter	100	+40%	30/15 Summer				
1.007	60 Winter	100	+40%					
3.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
3.001	15 Winter	100	+40%	30/15 Winter	100/15 Summer			4
3.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
3.003	15 Winter	100	+40%	30/15 Summer				
4.000	15 Winter	100	+40%	100/15 Summer	100/15 Summer			6
4.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			6
4.002	15 Winter	100	+40%	100/15 Summer	100/15 Summer			6
4.003	15 Winter	100	+40%	100/15 Summer	100/15 Summer			6
4.004	15 Winter	100	+40%	100/15 Summer	100/15 Summer			4
4.005	15 Winter	100	+40%	100/15 Summer	100/15 Summer			3
4.006	15 Winter	100	+40%	30/15 Summer	100/15 Winter			1
4.007	30 Winter	100	+40%	30/15 Winter				
4.008	30 Winter	100	+40%	30/15 Summer				
3.004	30 Winter	100	+40%	30/15 Summer				
1.008	60 Winter	100	+40%	100/15 Summer				
1.009	720 Winter	100	+40%					
1.010	720 Winter	100	+40%	30/240 Winter				
1.011	5760 Winter	100	+40%					
1.012	5760 Winter	100	+40%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.000	S276	107.476	1.026	101.132	0.50	0.0	65.9	FLOOD
1.001	S277	107.501	1.097	125.780	0.55	0.0	108.3	FLOOD
1.002	S278	107.569	1.290	68.761	0.75	0.0	148.7	FLOOD
1.003	S279	107.620	1.494	119.854	1.23	0.0	242.3	FLOOD

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
1.004	S280	107.530	1.541	30.072	2.18	0.0	402.0	FLOOD
1.005	S281	107.331	1.442	0.000	2.11	0.0	407.3	FLOOD RISK
2.000	S284	107.522	1.147	22.243	1.11	0.0	89.3	FLOOD
2.001	S285	107.548	1.249	48.104	1.53	0.0	124.5	FLOOD
2.002	S286	107.534	1.246	35.320	1.44	0.0	185.9	FLOOD
2.003	S287	107.509	1.311	9.150	1.96	0.0	257.3	FLOOD
2.004	S288	107.330	1.167	0.000	1.60	0.0	316.3	FLOOD RISK
1.006	S282	106.931	1.083	0.000	3.03	0.0	805.0	SURCHARGED
1.007	S290	105.681	-1.819	0.000	0.03	0.0	686.0	OK
3.000	S317	107.911	1.236	110.604	1.25	0.0	464.9	FLOOD
3.001	S318	107.879	1.266	78.658	1.40	0.0	698.5	FLOOD
3.002	S319	107.720	1.288	45.386	1.67	0.0	832.7	FLOOD
3.003	S320	107.469	1.224	0.000	2.08	0.0	1024.3	FLOOD RISK
4.000	S291	107.958	0.908	157.614	0.91	0.0	451.7	FLOOD
4.001	S292	107.951	1.073	150.967	1.35	0.0	665.6	FLOOD
4.002	S293	107.915	1.133	114.972	1.21	0.0	783.5	FLOOD
4.003	S294	107.882	1.277	82.230	1.17	0.0	761.5	FLOOD
4.004	S295	107.855	1.418	54.629	1.20	0.0	792.8	FLOOD
4.005	S296	107.828	1.510	28.961	1.08	0.0	847.1	FLOOD
4.006	S297	107.801	1.657	0.822	1.47	0.0	1080.1	FLOOD
4.007	S298	107.576	1.559	0.000	1.54	0.0	1173.9	FLOOD RISK
4.008	S299	107.233	1.354	0.000	1.61	0.0	1234.0	SURCHARGED
3.004	S291	106.824	1.091	0.000	3.16	0.0	2356.4	SURCHARGED
1.008	S291	105.673	0.279	0.000	1.76	0.0	1354.9	SURCHARGED
1.009	S292	104.866	-2.634	0.000	0.01	0.0	562.8	OK
1.010	S293	104.865	0.538	0.000	0.12	0.0	55.0	SURCHARGED
1.011	S290	103.606	-2.394	0.000	0.00	0.0	55.0	OK
1.012	S290	103.572	-0.135	0.000	0.45	0.0	55.0	OK

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S1.000	74.237	0.148	501.6	0.192	4.00	0.0	0.600		o	600
S1.001	61.065	0.123	496.5	0.835	0.00	0.0	0.600		o	675
S1.002	86.778	0.173	501.6	0.361	0.00	0.0	0.600		oo	750
S1.003	56.088	0.112	500.0	0.278	0.00	0.0	0.600		oo	750
S1.004	38.631	0.077	500.0	0.192	0.00	0.0	0.600		oo	750
S1.005	74.872	0.150	500.0	0.603	0.00	0.0	0.600		oo	750
S1.006	63.341	0.135	469.2	1.400	0.00	0.0	0.600		oo	900
S1.007	74.533	0.149	500.2	0.842	0.00	0.0	0.600		oo	900
S2.000	84.800	0.170	498.8	0.400	4.00	0.0	0.600		o	675
S3.000	86.240	0.172	501.4	0.280	4.00	0.0	0.600		o	750
S3.001	81.197	0.162	501.2	0.256	0.00	0.0	0.600		o	750
S3.002	53.180	0.106	501.7	0.236	0.00	0.0	0.600		o	750
S2.001	56.768	0.113	502.4	0.663	0.00	0.0	0.600		o	750
S2.002	85.142	0.170	500.8	0.804	0.00	0.0	0.600		o	750
S2.003	88.427	0.177	499.6	0.381	0.00	0.0	0.600		o	750
S2.004	49.761	0.100	497.6	0.428	0.00	0.0	0.600		o	825
S2.005	41.257	0.083	497.1	0.474	0.00	0.0	0.600		o	825
S1.008	77.896	0.156	500.0	0.464	0.00	0.0	0.600		o	900
S1.009	51.807	0.104	500.0	0.000	0.00	0.0	0.600		o	900
S4.000	74.638	0.249	299.8	0.388	4.00	0.0	0.600		o	525
S5.000	82.577	0.275	300.3	0.159	4.00	0.0	0.600		o	450
S5.001	86.594	0.289	299.6	0.245	0.00	0.0	0.600		o	525
S4.001	71.641	0.179	400.2	0.399	0.00	0.0	0.600		o	600
S4.002	46.174	0.092	501.9	0.108	0.00	0.0	0.600		o	600
S4.003	46.174	0.231	199.9	0.461	0.00	0.0	0.600		o	675

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	104.950	0.192	0.0	1.08	305.5
S1.001	104.652	1.027	0.0	1.17	418.5
S1.002	104.529	1.389	0.0	1.24	1097.9
S1.003	104.356	1.666	0.0	1.24	1099.7
S1.004	104.244	1.858	0.0	1.24	1099.7
S1.005	104.167	2.461	0.0	1.24	1099.7
S1.006	104.017	3.861	0.0	1.44	1832.0
S1.007	103.882	4.703	0.0	1.39	1773.7
S2.000	105.000	0.400	0.0	1.17	417.5
S3.000	105.000	0.280	0.0	1.24	549.1
S3.001	104.828	0.536	0.0	1.24	549.2
S3.002	104.666	0.772	0.0	1.24	548.9
S2.001	104.830	1.835	0.0	1.24	548.6
S2.002	104.717	2.639	0.0	1.24	549.4
S2.003	104.547	3.020	0.0	1.25	550.1
S2.004	104.370	3.448	0.0	1.32	707.8
S2.005	104.270	3.922	0.0	1.32	708.2
S1.008	103.733	9.089	0.0	1.39	887.1
S1.009	103.577	9.089	0.0	1.39	887.1
S4.000	105.000	0.388	0.0	1.29	278.9
S5.000	105.200	0.159	0.0	1.17	185.8
S5.001	104.925	0.404	0.0	1.29	279.0
S4.001	104.561	1.191	0.0	1.21	342.4
S4.002	104.708	1.299	0.0	1.08	305.4
S4.003	104.616	1.760	0.0	1.85	662.1

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S6.000	86.187	0.287	300.3	0.456	4.00	0.0	0.600		o	600
S6.001	72.325	0.181	399.6	0.343	0.00	0.0	0.600		o	600
S6.002	63.926	0.160	399.5	0.335	0.00	0.0	0.600		o	675
S6.003	78.221	0.156	501.4	0.258	0.00	0.0	0.600		o	750
S6.004	57.116	0.114	501.0	0.387	0.00	0.0	0.600		o	825
S6.005	71.894	0.144	499.3	0.486	0.00	0.0	0.600		o	825
S6.006	52.735	0.105	502.2	0.286	0.00	0.0	0.600		o	900
S4.004	49.798	0.100	498.0	0.251	0.00	0.0	0.600		o	750
S1.010	64.883	0.324	200.3	0.241	0.00	0.0		0.350	4 \=/	45000
S1.011	26.526	0.053	500.0	0.000	0.00	0.0	0.600		o	750
S1.012	91.881	0.459	200.2	0.469	0.00	0.0		0.350	4 \=/	50000
S1.013	82.190	0.164	500.0	0.000	0.00	0.0	0.600		o	750
S1.014	67.917	0.343	198.0	0.545	0.00	0.0	0.600		o	450

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S6.000	104.900	0.456	0.0	1.40	395.8
S6.001	104.613	0.799	0.0	1.21	342.7
S6.002	104.357	1.134	0.0	1.30	467.0
S6.003	104.122	1.392	0.0	1.24	549.1
S6.004	103.966	1.778	0.0	1.32	705.4
S6.005	103.852	2.265	0.0	1.32	706.6
S6.006	103.708	2.551	0.0	1.39	885.1
S4.004	103.603	4.561	0.0	1.25	551.0
S1.010	103.473	13.891	0.0	0.37	63789.7
S1.011	103.149	13.891	0.0	1.24	549.9
S1.012	103.096	14.360	0.0	0.40	86330.4
S1.013	102.637	14.360	0.0	1.24	549.9
S1.014	102.473	14.905	0.0	1.44	229.2

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S260, DS/PN: S1.010, Volume (m³): 54.5

Invert Level (m) 103.473

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	450.0000	0.700	2000.0000	1.300	2000.0000	1.900	2000.0000	2.500	2000.0000
0.200	450.0000	0.800	2000.0000	1.400	2000.0000	2.000	2000.0000	2.600	2000.0000
0.300	2000.0000	0.900	2000.0000	1.500	2000.0000	2.100	2000.0000	2.700	2000.0000
0.400	2000.0000	1.000	2000.0000	1.600	2000.0000	2.200	2000.0000	2.800	2000.0000
0.500	2000.0000	1.100	2000.0000	1.700	2000.0000	2.300	2000.0000	2.900	2000.0000
0.600	2000.0000	1.200	2000.0000	1.800	2000.0000	2.400	2000.0000	3.000	2000.0000

Pump Manhole: S254, DS/PN: S1.014, Volume (m³): 36.3

Invert Level (m) 102.473

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	60.0000	1.400	60.0000	2.600	60.0000	3.800	60.0000	5.000	60.0000
0.400	60.0000	1.600	60.0000	2.800	60.0000	4.000	60.0000	5.200	60.0000
0.600	60.0000	1.800	60.0000	3.000	60.0000	4.200	60.0000	5.400	60.0000
0.800	60.0000	2.000	60.0000	3.200	60.0000	4.400	60.0000	5.600	60.0000
1.000	60.0000	2.200	60.0000	3.400	60.0000	4.600	60.0000	5.800	60.0000
1.200	60.0000	2.400	60.0000	3.600	60.0000	4.800	60.0000	6.000	60.0000

Storage Structures for Storm

Tank or Pond Manhole: S253, DS/PN: S1.013

Invert Level (m) 102.637

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.500	2350.0

Tank or Pond Manhole: S254, DS/PN: S1.014

Invert Level (m) 102.473

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	850.0	0.500	850.0

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			8
S1.001	15 Winter	1	0%	30/60 Summer	100/15 Summer			8
S1.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			8
S1.003	15 Winter	1	0%	100/15 Summer	100/15 Summer			8
S1.004	15 Winter	1	0%	30/15 Winter	100/15 Summer			8
S1.005	15 Winter	1	0%	30/15 Summer	100/15 Summer			8
S1.006	30 Winter	1	0%	30/15 Winter	100/15 Summer			7
S1.007	30 Winter	1	0%	30/15 Summer	100/15 Summer			6
S2.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			8
S3.000	30 Winter	1	0%	30/15 Winter	100/15 Summer			8
S3.001	30 Winter	1	0%	30/15 Winter	100/15 Summer			8
S3.002	30 Winter	1	0%	30/15 Summer	100/15 Summer			8
S2.001	30 Winter	1	0%	100/15 Summer	100/15 Summer			8
S2.002	30 Winter	1	0%	30/15 Winter	100/15 Summer			8
S2.003	30 Winter	1	0%	30/15 Winter	100/15 Summer			8
S2.004	30 Winter	1	0%	100/15 Summer	100/15 Summer			7
S2.005	30 Winter	1	0%	100/15 Summer	100/15 Summer			6
S1.008	30 Winter	1	0%	30/15 Summer	100/15 Summer			6
S1.009	30 Winter	1	0%					
S4.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S5.000	15 Winter	1	0%	30/15 Summer	100/15 Summer			5
S5.001	15 Winter	1	0%	30/15 Summer	100/15 Summer			2
S4.001	30 Winter	1	0%	30/15 Summer	100/15 Summer			6
S4.002	15 Winter	1	0%	30/15 Summer	100/15 Summer			6
S4.003	30 Winter	1	0%	100/15 Summer	100/15 Summer			6
S6.000	15 Winter	1	0%	100/15 Summer	100/15 Summer			7
S6.001	15 Winter	1	0%	100/15 Summer	100/15 Summer			7
S6.002	15 Winter	1	0%	100/15 Summer	100/15 Summer			7
S6.003	15 Winter	1	0%	30/15 Summer	100/15 Summer			7
S6.004	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S6.005	15 Winter	1	0%	30/15 Winter	100/15 Summer			6
S6.006	30 Winter	1	0%	30/15 Winter	100/15 Summer			6
S4.004	30 Winter	1	0%	30/15 Summer	100/15 Summer			4
S1.010	60 Winter	1	0%	100/15 Summer	100/15 Summer			4
S1.011	60 Winter	1	0%	30/30 Summer				
S1.012	60 Winter	1	0%					
S1.013	600 Winter	1	0%	30/180 Summer				
S1.014	480 Winter	1	0%	1/60 Winter				

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S172	105.071	-0.479	0.000	0.09	0.0	23.7	OK
S1.001	S173	104.892	-0.435	0.000	0.27	0.0	99.3	OK
S1.002	S174	104.712	-0.567	0.000	0.12	0.0	122.6	OK
S1.003	S175	104.566	-0.540	0.000	0.14	0.0	132.2	OK
S1.004	S244	104.472	-0.522	0.000	0.16	0.0	138.6	OK
S1.005	S176	104.407	-0.510	0.000	0.17	0.0	164.7	OK
S1.006	S177	104.317	-0.600	0.000	0.15	0.0	230.4	OK
S1.007	S257	104.258	-0.524	0.000	0.17	0.0	258.2	OK
S2.000	S245	105.165	-0.510	0.000	0.13	0.0	48.3	OK
S3.000	S247	105.156	-0.594	0.000	0.05	0.0	24.3	OK
S3.001	S248	105.151	-0.427	0.000	0.05	0.0	23.8	OK
S3.002	S249	105.131	-0.285	0.000	0.07	0.0	32.8	OK
S2.001	S246	105.089	-0.491	0.000	0.19	0.0	89.3	OK
S2.002	S247	104.999	-0.468	0.000	0.27	0.0	135.9	OK
S2.003	S248	104.846	-0.451	0.000	0.30	0.0	147.4	OK
S2.004	S249	104.695	-0.500	0.000	0.27	0.0	159.5	OK
S2.005	S250	104.581	-0.514	0.000	0.30	0.0	173.6	OK
S1.008	S258	104.218	-0.415	0.000	0.56	0.0	432.6	OK
S1.009	S259	104.019	-0.458	0.000	0.48	0.0	429.5	OK*
S4.000	S250	105.157	-0.368	0.000	0.19	0.0	48.2	OK
S5.000	S251	105.303	-0.347	0.000	0.11	0.0	19.1	OK
S5.001	S252	105.070	-0.380	0.000	0.15	0.0	40.2	OK
S4.001	S251	105.005	-0.156	0.000	0.24	0.0	76.2	OK
S4.002	S252	104.942	-0.366	0.000	0.31	0.0	81.9	OK
S4.003	S255	104.818	-0.473	0.000	0.20	0.0	109.9	OK
S6.000	S255	105.061	-0.439	0.000	0.15	0.0	55.3	OK
S6.001	S256	104.829	-0.384	0.000	0.27	0.0	82.8	OK
S6.002	S257	104.595	-0.437	0.000	0.26	0.0	108.5	OK
S6.003	S258	104.402	-0.470	0.000	0.25	0.0	121.2	OK
S6.004	S259	104.278	-0.513	0.000	0.23	0.0	136.1	OK
S6.005	S260	104.178	-0.499	0.000	0.24	0.0	151.0	OK
S6.006	S261	104.079	-0.529	0.000	0.22	0.0	158.0	OK
S4.004	S253	104.014	-0.339	0.000	0.58	0.0	268.4	OK
S1.010	S260	103.802	-2.698	0.000	0.01	0.0	620.2	OK
S1.011	S251	103.611	-0.288	0.000	0.70	0.0	382.3	OK*
S1.012	S252	103.237	-3.263	0.000	0.00	0.0	387.2	OK
S1.013	S253	103.107	-0.280	0.000	0.20	0.0	110.9	OK*
S1.014	S254	103.062	0.139	0.000	0.26	0.0	60.0	SURCHARGED*

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	30 Winter	30	0%	100/15 Summer	100/15 Summer			8
S1.001	60 Summer	30	0%	30/60 Summer	100/15 Summer			8
S1.002	60 Winter	30	0%	100/15 Summer	100/15 Summer			8
S1.003	30 Winter	30	0%	100/15 Summer	100/15 Summer			8
S1.004	15 Winter	30	0%	30/15 Winter	100/15 Summer			8
S1.005	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
S1.006	15 Winter	30	0%	30/15 Winter	100/15 Summer			7
S1.007	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S2.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			8
S3.000	15 Winter	30	0%	30/15 Winter	100/15 Summer			8
S3.001	15 Winter	30	0%	30/15 Winter	100/15 Summer			8
S3.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			8
S2.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			8
S2.002	15 Winter	30	0%	30/15 Winter	100/15 Summer			8
S2.003	15 Winter	30	0%	30/15 Winter	100/15 Summer			8
S2.004	30 Winter	30	0%	100/15 Summer	100/15 Summer			7
S2.005	15 Winter	30	0%	100/15 Summer	100/15 Summer			6
S1.008	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S1.009	30 Winter	30	0%					
S4.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			7
S5.000	15 Winter	30	0%	30/15 Summer	100/15 Summer			5
S5.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			2
S4.001	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S4.002	15 Winter	30	0%	30/15 Summer	100/15 Summer			6
S4.003	15 Winter	30	0%	100/15 Summer	100/15 Summer			6
S6.000	15 Winter	30	0%	100/15 Summer	100/15 Summer			7
S6.001	15 Winter	30	0%	100/15 Summer	100/15 Summer			7
S6.002	15 Winter	30	0%	100/15 Summer	100/15 Summer			7
S6.003	15 Summer	30	0%	30/15 Summer	100/15 Summer			7
S6.004	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S6.005	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S6.006	15 Winter	30	0%	30/15 Winter	100/15 Summer			6
S4.004	15 Winter	30	0%	30/15 Summer	100/15 Summer			4
S1.010	60 Winter	30	0%	100/15 Summer	100/15 Summer			4
S1.011	60 Winter	30	0%	30/30 Summer				
S1.012	600 Winter	30	0%					
S1.013	600 Winter	30	0%	30/180 Summer				
S1.014	600 Winter	30	0%	1/60 Winter				

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S172	105.359	-0.191	0.000	0.20	0.0	55.0	OK
S1.001	S173	105.327	0.000	0.000	0.56	0.0	208.2	SURCHARGED
S1.002	S174	105.226	-0.053	0.000	0.23	0.0	225.5	OK
S1.003	S175	105.106	0.000	0.000	0.29	0.0	273.9	OK
S1.004	S244	105.073	0.079	0.000	0.29	0.0	259.1	SURCHARGED
S1.005	S176	105.057	0.140	0.000	0.33	0.0	320.5	SURCHARGED
S1.006	S177	105.027	0.110	0.000	0.37	0.0	572.8	SURCHARGED
S1.007	S257	105.000	0.218	0.000	0.44	0.0	677.0	SURCHARGED
S2.000	S245	105.675	0.000	0.000	0.39	0.0	146.8	OK
S3.000	S247	105.752	0.002	0.000	0.20	0.0	99.1	SURCHARGED
S3.001	S248	105.638	0.060	0.000	0.19	0.0	93.9	SURCHARGED
S3.002	S249	105.601	0.185	0.000	0.27	0.0	124.8	SURCHARGED
S2.001	S246	105.580	0.000	0.000	0.78	0.0	366.9	OK
S2.002	S247	105.517	0.050	0.000	1.05	0.0	521.4	SURCHARGED
S2.003	S248	105.369	0.072	0.000	1.03	0.0	510.9	SURCHARGED
S2.004	S249	105.195	0.000	0.000	0.86	0.0	503.2	OK
S2.005	S250	105.089	-0.006	0.000	0.95	0.0	540.8	OK
S1.008	S258	104.966	0.333	0.000	1.52	0.0	1174.2	SURCHARGED
S1.009	S259	104.477	0.000	0.000	1.30	0.0	1154.3	SURCHARGED*
S4.000	S250	105.628	0.103	0.000	0.56	0.0	144.5	SURCHARGED
S5.000	S251	105.735	0.085	0.000	0.35	0.0	61.7	SURCHARGED
S5.001	S252	105.651	0.201	0.000	0.38	0.0	100.1	SURCHARGED
S4.001	S251	105.555	0.394	0.000	1.00	0.0	311.6	SURCHARGED
S4.002	S252	105.343	0.035	0.000	1.24	0.0	330.0	SURCHARGED
S4.003	S255	105.067	-0.224	0.000	0.77	0.0	431.3	OK
S6.000	S255	105.229	-0.271	0.000	0.51	0.0	187.5	OK
S6.001	S256	105.124	-0.089	0.000	0.90	0.0	279.7	OK
S6.002	S257	105.018	-0.014	0.000	0.80	0.0	332.1	OK
S6.003	S258	104.890	0.018	0.000	0.63	0.0	306.5	SURCHARGED
S6.004	S259	104.820	0.029	0.000	0.69	0.0	411.2	SURCHARGED
S6.005	S260	104.749	0.072	0.000	0.76	0.0	466.7	SURCHARGED
S6.006	S261	104.661	0.053	0.000	0.68	0.0	495.0	SURCHARGED
S4.004	S253	104.611	0.258	0.000	1.97	0.0	916.0	SURCHARGED
S1.010	S260	104.227	-2.273	0.000	0.02	0.0	1547.8	OK
S1.011	S251	104.010	0.111	0.000	1.28	0.0	703.6	SURCHARGED*
S1.012	S252	103.584	-2.916	0.000	0.01	0.0	447.1	OK
S1.013	S253	103.583	0.196	0.000	0.21	0.0	118.0	SURCHARGED*
S1.014	S254	103.573	0.650	0.000	0.26	0.0	60.0	SURCHARGED*

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	30 Winter	100	+40%	100/15 Summer	100/15 Summer			8
S1.001	30 Winter	100	+40%	30/60 Summer	100/15 Summer			8
S1.002	30 Winter	100	+40%	100/15 Summer	100/15 Summer			8
S1.003	30 Winter	100	+40%	100/15 Summer	100/15 Summer			8
S1.004	15 Winter	100	+40%	30/15 Winter	100/15 Summer			8
S1.005	15 Winter	100	+40%	30/15 Summer	100/15 Summer			8
S1.006	15 Winter	100	+40%	30/15 Winter	100/15 Summer			7
S1.007	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S2.000	30 Winter	100	+40%	100/15 Summer	100/15 Summer			8
S3.000	30 Winter	100	+40%	30/15 Winter	100/15 Summer			8
S3.001	30 Winter	100	+40%	30/15 Winter	100/15 Summer			8
S3.002	30 Winter	100	+40%	30/15 Summer	100/15 Summer			8
S2.001	15 Winter	100	+40%	100/15 Summer	100/15 Summer			8
S2.002	15 Winter	100	+40%	30/15 Winter	100/15 Summer			8
S2.003	15 Winter	100	+40%	30/15 Winter	100/15 Summer			8
S2.004	15 Winter	100	+40%	100/15 Summer	100/15 Summer			7
S2.005	15 Winter	100	+40%	100/15 Summer	100/15 Summer			6
S1.008	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S1.009	180 Winter	100	+40%					
S4.000	30 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S5.000	15 Winter	100	+40%	30/15 Summer	100/15 Summer			5
S5.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			2
S4.001	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S4.002	15 Winter	100	+40%	30/15 Summer	100/15 Summer			6
S4.003	15 Winter	100	+40%	100/15 Summer	100/15 Summer			6
S6.000	30 Winter	100	+40%	100/15 Summer	100/15 Summer			7
S6.001	30 Winter	100	+40%	100/15 Summer	100/15 Summer			7
S6.002	30 Winter	100	+40%	100/15 Summer	100/15 Summer			7
S6.003	15 Winter	100	+40%	30/15 Summer	100/15 Summer			7
S6.004	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S6.005	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S6.006	15 Winter	100	+40%	30/15 Winter	100/15 Summer			6
S4.004	15 Winter	100	+40%	30/15 Summer	100/15 Summer			4
S1.010	15 Summer	100	+40%	100/15 Summer	100/15 Summer			4
S1.011	120 Winter	100	+40%	30/30 Summer				
S1.012	720 Winter	100	+40%					
S1.013	720 Winter	100	+40%	30/180 Summer				
S1.014	720 Winter	100	+40%	1/60 Winter				

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S172	106.604	1.054	104.281	0.31	0.0	87.3	FLOOD
S1.001	S173	106.619	1.292	119.468	0.88	0.0	325.5	FLOOD
S1.002	S174	106.617	1.338	117.080	0.39	0.0	381.5	FLOOD
S1.003	S175	106.615	1.509	114.897	0.38	0.0	359.5	FLOOD
S1.004	S244	106.615	1.621	114.908	0.23	0.0	206.7	FLOOD
S1.005	S176	106.626	1.709	125.606	0.31	0.0	302.4	FLOOD
S1.006	S177	106.650	1.733	150.208	0.53	0.0	825.0	FLOOD
S1.007	S257	106.625	1.843	125.482	1.02	0.0	1563.8	FLOOD
S2.000	S245	106.628	0.953	128.384	0.40	0.0	151.6	FLOOD
S3.000	S247	106.602	0.852	102.271	0.21	0.0	104.1	FLOOD
S3.001	S248	106.603	1.025	103.326	0.26	0.0	129.5	FLOOD
S3.002	S249	106.612	1.196	111.606	0.36	0.0	169.9	FLOOD
S2.001	S246	106.632	1.052	131.933	0.85	0.0	399.7	FLOOD
S2.002	S247	106.642	1.175	142.175	1.07	0.0	529.0	FLOOD
S2.003	S248	106.617	1.320	116.958	1.07	0.0	531.3	FLOOD
S2.004	S249	106.591	1.396	90.918	1.10	0.0	644.7	FLOOD
S2.005	S250	106.582	1.487	82.784	1.43	0.0	815.3	FLOOD
S1.008	S258	106.608	1.975	107.692	2.26	0.0	1740.9	FLOOD
S1.009	S259	104.477	0.000	0.000	1.44	0.0	1274.5	SURCHARGED*
S4.000	S250	106.596	1.071	96.476	0.62	0.0	159.8	FLOOD
S5.000	S251	106.818	1.168	17.787	0.40	0.0	69.7	FLOOD
S5.001	S252	106.802	1.352	1.656	0.89	0.0	231.3	FLOOD
S4.001	S251	106.596	1.435	96.421	1.53	0.0	474.7	FLOOD
S4.002	S252	106.560	1.252	60.407	1.81	0.0	479.6	FLOOD
S4.003	S255	106.555	1.264	56.545	1.34	0.0	755.3	FLOOD
S6.000	S255	106.588	1.088	87.689	0.57	0.0	208.4	FLOOD
S6.001	S256	106.584	1.371	83.660	0.88	0.0	273.7	FLOOD
S6.002	S257	106.577	1.545	77.365	0.90	0.0	372.5	FLOOD
S6.003	S258	106.571	1.699	70.590	0.94	0.0	462.1	FLOOD
S6.004	S259	106.573	1.782	73.045	1.06	0.0	630.4	FLOOD
S6.005	S260	106.572	1.895	72.435	1.33	0.0	822.3	FLOOD
S6.006	S261	106.567	1.959	66.575	1.18	0.0	856.6	FLOOD
S4.004	S253	106.556	2.203	56.418	3.32	0.0	1544.6	FLOOD
S1.010	S260	106.529	0.029	28.946	0.03	0.0	1990.3	FLOOD
S1.011	S251	104.493	0.594	0.000	2.36	0.0	1295.8	SURCHARGED*
S1.012	S252	104.143	-2.357	0.000	0.01	0.0	627.6	OK
S1.013	S253	104.140	0.753	0.000	0.20	0.0	107.9	SURCHARGED*
S1.014	S254	104.130	1.207	0.000	0.26	0.0	60.0	SURCHARGED*

Appendix J – Surface Water Treatment Catchment Plan


Porous Car Park
Existing spillway ditch to be culverted beneath new roundabout. Refer to Drawing Number 1516-045-WDK-SI-C-301-012 for indicative route.
Open Basin and Swale 2,500m³ ~I.L. 98.360m
Plot 1040 FL:102.000
1030 Yard FL:102.000
Plot 1030 FL:103.200
1030 Car Park B FL:102.000
2010 Yard FL:101.500
Plot 2010 FL:102.700
2010 Car Park FL:101.500
To River Penk
Outlet A Max discharge 222.5l/s ~IL 96.50m
Open storage Basin 1,000m³ ~I.L. 98.450m
1 No 750mmØ Pipe installed below West Coast Mainline as Siphon
3x750mmØ Pipes installed beneath canal
Open storage lagoon providing 57,500m³ ~I.L. 98.630m
~I.L:+99.000
~I.L:+98.575
~I.L:+98.630
~I.L:+97.850
Swale ~I.L:+100.150
Swale ~I.L:+101.780
Plot 4010 FL:106.550
4010 Yard FL:105.350
4010 Car Park FL:105.350
Plot 4020 FL:107.200
4020 Yard FL:106.000
4020 Car Park FL:106.000
4030 Yard FL:106.800
Plot 4030 FL:108.000
4030 Car Park FL:106.800
4040 Yard FL:107.800
Plot 4040 FL:109.000
4040 Car Park FL:107.800
3030 Yard FL:105.000
Plot 3030 FL:106.200
3030 Car Park FL:105.000
Plot 3020 FL:108.100
3020 Yard FL:106.900
3020 Car Park FL:106.900
Plot 3010 FL:107.700
3010 Yard FL:106.500
3010 Car Park FL:106.500
5020 Yard FL:107.450
Plot 5020 FL:108.650
5020 Car Park FL:107.450
Plot 5010 FL:108.525
5010 Car Park FL:107.325
5010 Yard FL:107.325
Plot 5030 FL:108.100
5030 Yard FL:106.900
5030 Car Park FL:106.900
5030 Car Park A FL:106.800
Open storage Basin 400m³ ~I.L. 99.870m
Rail Terminal FL:102.400
1020 Car Park FL:102.400
1020 Yard PGL:102.400
Plot 1020 FL:103.600
1010 Car Park FL:102.000
Plot 1010 FL:103.200
1010 Yard FL:102.000
Outlet B Max discharge 80.5 l/s
Offline Open Storage Basin 3,750m³ ~I.L. 98.600m
Retained Abstraction Rising Main
Abandoned Abstraction Rising Main
~I.L:+103.590
~I.L:+104.200
Open storage Basins 6,875m³
Pumped Outlet C Max discharge 24.8 l/s Ditch Reinforcement works to be confirmed at time of development.
~I.L:+103.325
~I.L:+102.850
~I.L:+102.400
Open storage Basins 2,875m³
Porous Car Park
Pumped Outlet D Max discharge 60.0 l/s Outflow velocity to be limited to 0.3m/s
Calf Heath Reservoir
Calf Heath

External References: 14317GI by RSA Geotechnics

Notes

1. Do not scale this drawing.
2. All dimensions are in millimetres unless stated otherwise.
3. This drawing to be read in conjunction with all other relevant drawings and specifications.
4. All proprietary items to be installed in strict compliance with manufacturers instructions and recommendations.
5. To be read in alongside ground investigation report/ Reference number: 14317GI by RSA Geotechnics.
6. Awaiting competition of the flood risk assessment to finalize proposed drainage strategy.
7. The drainage proposals and outfalls are indicative only and are subject to approval by the relevant governing bodies.
8. Attenuation volumes and associated infrastructure be designed to accommodate 1:100 year events +40% climate change allowance.

Key

Impermeable areas (total area = 1,379,289 m²)

- Treatment Catchment 1 Area: 74.074ha
- Treatment Catchment 2 Area: 7.536ha
- Treatment Catchment 3 Area: 10.22ha
- Treatment Catchment 4 Area: 13.500ha
- Treatment Catchment 5 Area: 20.620ha
- Treatment Catchment 6 Area: 12.520ha
- Treatment Catchment 7 Area: 13.800ha
- Denotes Proposed Manhole
- Surface water drainage pipe with direction arrows
- Denotes Proposed Headwall
- Denotes Proposed Swales/Ponds
- Denotes Proposed Interceptor
- Existing Abstraction Rising Main to be Retained and Protected
- Existing Abstraction Rising Main to be capped off and abandoned
- Proposed Abstraction Rising Main Diversion Route
- Dry Swale/Attenuation Basin
- Wet Pond
- Retained Trees & Hedges
- Denotes Permeable Car Park Construction

Attenuation (total volume = 85,077m³)

Open storage (pond)
Volumes per outlet:
- Outlet A = 69,152 m³
- Outlet B = 6,175m³
- Outlet C = 6,875m³
- Outlet D = 2,875m³

Rev.	Description	Date	By
P3	Order limits updated	19/06/18	NG
P2	Levels amended, invert levels added, updated to suit architect's layout Rev.33 siding drainage updated following discussion with Network Rail, outfall notes updated	06/04/18	NG
P1	Preliminary Issue	24/08/17	MPS

Revisions

West Midlands Interchange

Project
THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status
Preliminary

Drawing Title: Surface Water Drainage Treatment Catchments
Drawing Size A0

Regulation	Document
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Drawn MPS | Date 24.08.17 | Scale 1:2500 | Reviewed TL

Drawing No. 1516-0425-WDK-SI-D-331-006 | Rev. P3

Appendix K – Water Quality Calculations

SIMPLE INDEX APPROACH: SUMMARY TABLE

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Waste handling/management/distribution site	These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.		
Pollution Hazard Level	High				
Pollution Hazard Indices					
TSS	0.8				
Metals	0.8				
Hydrocarbons	0.9				
SuDS components proposed					
Component 1	Swale	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 2	Detention basin	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 3	Pond or wetland	SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B	Ponds/wetlands should be preceded by an upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events		
SuDS Pollution Mitigation Indices					
TSS	>0.95				
Metals	>0.95				
Hydrocarbons	>0.95				
Groundwater protection type	None				
Groundwater protection Pollution Mitigation Indices					
TSS	0				
Metals	0				
Hydrocarbons	0				
Combined Pollution Mitigation Indices					
TSS	>0.95	Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
Metals	>0.95				
Hydrocarbons	>0.95				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				

Catchment 1	Value	Units
Area	72.465	Ha

Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m²)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m²)	Flow Depth (m)	Area (m²)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	1.023	100.48	641,590	64.159	0.5	307	0.1	101.749	3.07	0.102	3.02	30	30.4	0.1	Ok
Swale	1	1.024	100.33	645,450	64.545	0.5	319	0.1	100.314	3.19	0.106	3.02	30	30.4	0.1	Ok
Total				1,945,350	194.535											

Catchment 2	Value	Units
Area	5.174	Ha

Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m²)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m²)	Flow Depth (m)	Area (m²)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	15.007	101.78	67,530	6.753	0.5	406	0.1	102	4.06	0.201	2.02	20	20.4	0.1	Longer Grass
Swale	1	15.009	100.31	72,580	7.258	0.5	250	0.1	101.179	2.5	0.245	1.02	10	10.4	0.1	Not Usable
Swale	1	1.028	99.34	74,345	7.4345	0.5	608	0.1	99.604	6.08	0.121	5.02	50	50.4	0.1	Longer Grass
Total				214,455	21.4455											

Catchment 3	Value	Units
Area	10.1916	Ha

Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m²)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m²)	Flow Depth (m)	Area (m²)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	16.008	98.771	42860	4.286	0.5	192	0.1	98.948	1.92	0.095	2.02	20	20.4	0.1	Ok
Swale	1	17.005	99.768	20620	2.062	0.5	177	0.1	99.923	1.77	0.174	1.02	10	10.4	0.1	Ok
Swale	1	18.006	99.046	39340	3.934	0.5	183	0.1	99.187	1.83	0.073	2.52	25	25.4	0.1	Ok

Combined																
Basin	2	1.029	98.63	864070	86.407	0.5	412	0.1	98.848	4.12	0.082	5.02	50	50.4	0.1	Ok
Basin	2	1.030	98.452	864070	86.407	0.5	412	0.1	98.391	4.12	0.082	5.02	50	50.4	0.1	Ok
Total				1,728,140	172.814											

Catchment 6	Value	Units
Area	12.293	Ha
Allowable Dicharge (Qbar)	55	l/s
Comments	Pumped outflow	

Component	Treatment Ref.	Pipe Ref.	IL (m)	Acc. Area (m²)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m²)	Flow Depth (m)	Area (m²)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	1.007	105.134	42,569	4.2569	0.5	170.6	0.1	105.29	1.706	0.08	2.04	20	20.8	0.1	Ok
Basin	2	1.009	104.577	117,430	11.743	0.5	368	0.1	104.76	3.68	0.09	4.04	40	40.8	0.1	Ok
Total				159,999	15.9999											

Catchment 7	Value	Units
Area	13.05	Ha
Allowable Dicharge (Qbar)	60	l/s
Comments	Pumped outflow	

Component	Treatment Ref.	Pipe Ref	IL (m)	Acc. Area (m^2)	Acc. Area (Ha)	Gradient	Flow (l/s)	Velocity (m/s)	Water level (m)	Flow Area (m^2)	Flow Depth (m)	Area (m^2)	Base Width (m)	Surface Width (m)	Desired flow depth (m)	Status
Swale	1	1.010	103.473	138910	13.891	0.5	450	0.1	103.711	4.5	0.106	4.25	45	40	0.1	Ok
Basin	2	10.12	103.096	143600	14.360	0.5	375	0.1	103.242	3.75	0.074	5.04	50	50.8	0.1	Ok
Total																

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S1.000	59.907	0.120	499.2	0.777	4.00	0.0	0.600		o	825
S1.001	90.227	0.180	501.3	0.477	0.00	0.0	0.600		o	825
S1.002	90.227	0.181	498.5	0.000	0.00	0.0	0.600		o	825
S1.003	77.936	0.156	499.6	1.014	0.00	0.0	0.600		o	825
S1.004	83.633	0.167	500.8	0.456	0.00	0.0	0.600		o	825
S1.005	88.200	0.284	310.6	1.050	0.00	0.0	0.600		o	825
S1.006	88.729	0.177	500.0	1.947	0.00	0.0	0.600		o	825
S2.000	4.272	0.009	474.7	0.670	4.00	0.0	0.600		o	825
S2.001	55.048	0.110	500.4	0.000	0.00	0.0	0.600		o	825
S2.002	91.777	0.183	501.5	0.360	0.00	0.0	0.600		o	825
S2.003	94.003	0.188	500.0	0.827	0.00	0.0	0.600		o	825
S2.004	92.014	0.184	500.1	0.823	0.00	0.0	0.600		o	825
S2.005	89.082	0.178	500.5	0.976	0.00	0.0	0.600		o	825
S1.007	157.558	0.532	296.2	0.346	0.00	0.0		0.100	2 _/	11000
S3.000	59.557	0.119	500.5	0.768	4.00	0.0	0.600		o	825
S3.001	84.585	0.169	500.5	0.452	0.00	0.0	0.600		o	825
S3.002	89.342	0.179	499.1	0.000	0.00	0.0	0.600		o	825
S3.003	90.227	0.180	501.3	0.968	0.00	0.0	0.600		o	825
S3.004	88.818	0.178	499.0	0.963	0.00	0.0	0.600		o	825
S3.005	90.227	0.181	498.5	0.969	0.00	0.0	0.600		o	825
S3.006	71.879	0.143	502.7	1.479	0.00	0.0	0.600		o	900
S4.000	54.361	0.109	498.7	0.655	4.00	0.0	0.600		o	700
S4.001	86.955	0.174	499.7	0.344	0.00	0.0	0.600		o	700
S4.002	81.168	0.162	501.0	0.804	0.00	0.0	0.600		o	700
S4.003	94.433	0.189	499.6	0.779	0.00	0.0	0.600		o	700
S4.004	105.000	0.210	500.0	0.797	0.00	0.0	0.600		o	700
S1.008	31.384	0.105	298.9	0.742	0.00	0.0		0.100	2 _/	4800

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	106.080	0.777	0.0	1.32	706.6
S1.001	105.885	1.254	0.0	1.32	705.2
S1.002	105.705	1.254	0.0	1.32	707.2
S1.003	105.449	2.269	0.0	1.32	706.4
S1.004	105.218	2.725	0.0	1.32	705.5
S1.005	105.051	3.775	0.0	1.68	897.7
S1.006	104.617	5.721	0.0	1.32	706.1
S2.000	105.200	0.670	0.0	1.36	724.9
S2.001	105.191	0.670	0.0	1.32	705.8
S2.002	105.081	1.030	0.0	1.32	705.0
S2.003	104.748	1.857	0.0	1.32	706.1
S2.004	104.485	2.680	0.0	1.32	706.0
S2.005	104.226	3.656	0.0	1.32	705.8
S1.007	104.048	9.723	0.0	0.94	46973.1
S3.000	105.200	0.768	0.0	1.32	705.8
S3.001	105.006	1.220	0.0	1.32	705.7
S3.002	104.837	1.220	0.0	1.32	706.7
S3.003	104.583	2.188	0.0	1.32	705.2
S3.004	104.328	3.151	0.0	1.32	706.8
S3.005	104.075	4.120	0.0	1.32	707.2
S3.006	103.819	5.599	0.0	1.39	884.7
S4.000	105.327	0.655	0.0	1.19	459.4
S4.001	105.218	1.000	0.0	1.19	458.9
S4.002	104.894	1.804	0.0	1.19	458.3
S4.003	104.657	2.583	0.0	1.19	458.9
S4.004	104.468	3.380	0.0	1.19	458.8
S1.008	103.516	19.443	0.0	0.92	37791.5

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S1.009	79.551	0.265	300.2	0.290	0.00	0.0	0.600		o	1125
S5.000	76.049	0.152	500.3	1.111	4.00	0.0	0.600		o	900
S5.001	90.213	0.181	498.4	0.459	0.00	0.0	0.600		o	900
S5.002	90.227	0.180	501.3	1.320	0.00	0.0	0.600		o	900
S5.003	90.227	0.180	501.3	1.259	0.00	0.0	0.600		o	900
S5.004	89.012	0.178	500.1	1.045	0.00	0.0	0.600		o	900
S5.005	71.876	0.075	958.3	0.700	0.00	0.0	0.600		o	975
S1.010	188.527	0.628	300.2	0.873	0.00	0.0		0.100	2 _/	10000
S6.000	84.165	0.168	501.0	1.226	4.00	0.0	0.600		o	900
S6.001	90.211	0.181	498.4	1.343	0.00	0.0	0.600		o	900
S6.002	89.647	0.179	500.8	1.743	0.00	0.0	0.600		o	900
S6.003	89.808	0.180	500.0	1.353	0.00	0.0	0.600		o	900
S6.004	83.810	0.167	501.9	0.953	0.00	0.0	0.600		o	975
S6.005	79.204	0.350	226.3	0.798	0.00	0.0	0.600		o	975
S1.011	20.115	0.067	300.2	0.284	0.00	0.0	0.600		2 _/	7400
S1.012	45.836	0.153	299.6	0.267	0.00	0.0	0.600		o	1350
S7.000	42.322	0.094	450.2	0.868	4.00	0.0	0.600		o	825
S7.001	90.493	0.201	450.2	0.326	0.00	0.0	0.600		o	825
S7.002	88.032	0.176	500.2	1.153	0.00	0.0	0.600		o	825
S7.003	86.831	0.173	501.9	1.582	0.00	0.0	0.600		o	825
S7.004	89.635	0.179	500.0	0.857	0.00	0.0	0.600		o	825
S7.005	62.127	0.124	501.0	0.670	0.00	0.0	0.600		o	900
S7.006	64.044	0.128	500.3	0.000	0.00	0.0	0.600		o	900
S1.013	56.648	0.189	300.0	0.432	0.00	0.0	0.600		2 _/	5150
S1.014	67.587	0.229	295.1	0.726	0.00	0.0	0.600		o	1500
S1.015	30.753	0.100	307.5	0.373	0.00	0.0	0.600		2 _/	1425

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.009	103.411	19.734	0.0	2.07	2057.7
S5.000	104.700	1.111	0.0	1.39	886.8
S5.001	104.548	1.571	0.0	1.40	888.5
S5.002	104.217	2.890	0.0	1.39	885.9
S5.003	103.962	4.149	0.0	1.39	885.9
S5.004	103.707	5.195	0.0	1.39	887.0
S5.005	103.379	5.894	0.0	1.06	787.8
S1.010	103.146	26.501	0.0	0.99	55396.9
S6.000	104.600	1.226	0.0	1.39	886.2
S6.001	104.282	2.568	0.0	1.40	888.5
S6.002	103.951	4.311	0.0	1.39	886.3
S6.003	103.697	5.664	0.0	1.39	887.1
S6.004	103.517	6.617	0.0	1.46	1092.1
S6.005	103.350	7.415	0.0	2.18	1630.9
S1.011	102.518	34.200	0.0	7.60	464768.0
S1.012	102.451	34.467	0.0	2.32	3318.4
S7.000	104.260	0.868	0.0	1.39	744.5
S7.001	104.100	1.194	0.0	1.39	744.5
S7.002	103.769	2.347	0.0	1.32	706.0
S7.003	103.518	3.929	0.0	1.32	704.7
S7.004	103.270	4.786	0.0	1.32	706.1
S7.005	103.090	5.455	0.0	1.39	886.1
S7.006	102.966	5.455	0.0	1.39	886.8
S1.013	102.298	40.354	0.0	7.06	327917.8
S1.014	102.109	41.081	0.0	2.49	4403.2
S1.015	101.880	41.454	0.0	6.70	266965.5

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S8.000	76.733	0.171	448.7	0.769	4.00	0.0	0.600		o	800
S8.001	88.389	0.196	451.0	0.357	0.00	0.0	0.600		o	800
S8.002	90.974	0.182	499.9	0.943	0.00	0.0	0.600		o	800
S8.003	86.782	0.174	498.7	0.972	0.00	0.0	0.600		o	800
S8.004	87.428	0.175	499.6	0.779	0.00	0.0	0.600		o	800
S8.005	79.603	0.159	500.6	0.091	0.00	0.0	0.600		o	800
S1.016	73.565	0.240	306.5	0.286	0.00	0.0	0.600		2 _/	17000
S9.000	79.124	0.158	500.8	0.734	4.00	0.0	0.600		o	800
S9.001	88.766	0.178	498.7	0.418	0.00	0.0	0.600		o	800
S9.002	89.359	0.178	502.0	1.149	0.00	0.0	0.600		o	825
S9.003	84.712	0.170	498.3	1.203	0.00	0.0	0.600		o	825
S9.004	85.534	0.171	500.2	0.460	0.00	0.0	0.600		o	975
S9.005	88.980	0.178	499.9	0.989	0.00	0.0	0.600		o	1050
S1.017	20.825	0.070	297.5	0.000	0.00	0.0	0.600		2 _/	6200
S1.018	50.143	0.165	303.9	0.302	0.00	0.0	0.600		o	1500
S1.019	115.390	0.385	299.7	0.292	0.00	0.0	0.600		2 _/	6200
S10.000	71.759	0.144	498.3	0.475	4.00	0.0	0.600		o	700
S10.001	89.842	0.179	501.9	0.557	0.00	0.0	0.600		o	700
S10.002	90.580	0.181	500.4	0.801	0.00	0.0	0.600		o	700
S10.003	86.924	0.174	499.6	0.665	0.00	0.0	0.600		o	750
S10.004	85.813	0.172	498.9	0.856	0.00	0.0	0.600		o	750
S10.005	74.905	0.150	499.4	0.583	0.00	0.0	0.600		o	975
S1.020	23.643	0.080	295.5	0.365	0.00	0.0	0.600		o	1500
S1.021	34.452	0.115	299.6	0.000	0.00	0.0	0.600		2 _/	18000
S11.000	75.009	0.150	500.1	0.171	4.00	0.0	0.600		o	375

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S8.000	104.260	0.769	0.0	1.37	687.9
S8.001	104.032	1.126	0.0	1.37	686.2
S8.002	103.780	2.069	0.0	1.30	651.4
S8.003	103.523	3.041	0.0	1.30	652.2
S8.004	103.274	3.820	0.0	1.30	651.6
S8.005	103.099	3.910	0.0	1.29	650.9
S1.016	101.780	45.650	0.0	8.51	913545.7
S9.000	103.600	0.734	0.0	1.29	650.8
S9.001	103.367	1.153	0.0	1.30	652.2
S9.002	103.039	2.302	0.0	1.32	704.7
S9.003	102.786	3.504	0.0	1.32	707.3
S9.004	102.616	3.964	0.0	1.47	1093.9
S9.005	102.370	4.953	0.0	1.53	1328.7
S1.017	101.540	50.603	0.0	7.23	365503.0
S1.018	101.470	50.906	0.0	2.46	4339.0
S1.019	101.305	51.198	0.0	7.42	412684.5
S10.000	103.450	0.475	0.0	1.19	459.5
S10.001	103.231	1.032	0.0	1.19	457.9
S10.002	102.902	1.834	0.0	1.19	458.6
S10.003	102.646	2.498	0.0	1.25	550.1
S10.004	102.472	3.355	0.0	1.25	550.5
S10.005	102.225	3.937	0.0	1.47	1094.8
S1.020	100.920	55.501	0.0	2.49	4400.2
S1.021	100.840	55.501	0.0	8.85	1046442.7
S11.000	103.600	0.171	0.0	0.80	88.7

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S11.001	50.000	0.100	500.0	0.281	0.00	0.0	0.600		o	375
S11.002	75.029	0.150	500.0	0.330	0.00	0.0	0.600		o	450
S11.003	35.186	0.070	500.0	0.174	0.00	0.0	0.600		o	450
S1.022	50.721	0.175	289.8	0.091	0.00	0.0	0.600		o	1650
S12.000	89.391	0.179	499.4	0.840	4.00	0.0	0.600		o	750
S12.001	88.314	0.176	501.8	0.364	0.00	0.0	0.600		o	750
S12.002	90.954	0.182	499.7	1.618	0.00	0.0	0.600		o	800
S12.003	90.416	0.181	499.5	1.807	0.00	0.0	0.600		o	900
S12.004	90.762	0.182	498.7	2.030	0.00	0.0	0.600		o	975
S12.005	88.672	0.177	501.0	0.185	0.00	0.0	0.600		o	1000
S12.006	88.786	0.178	498.8	0.669	0.00	0.0	0.600		o	1125
S1.023	66.194	0.331	200.0	0.099	0.00	0.0		0.350	3 \=/	30000
S1.024	75.787	0.379	200.0	0.387	0.00	0.0		0.350	3 \=/	30000
S1.025	72.982	0.146	500.0	0.000	0.00	0.0	0.600		oo	825
S13.000	50.935	0.170	299.6	0.299	4.00	0.0	0.600		o	375
S13.001	84.931	0.283	300.0	0.288	0.00	0.0	0.600		o	375
S13.002	83.849	0.279	300.0	0.000	0.00	0.0	0.600		o	375
S13.003	83.849	0.279	300.0	0.084	0.00	0.0	0.600		o	375
S13.004	89.348	0.298	299.8	0.185	0.00	0.0	0.600		o	450
S13.005	94.879	0.316	300.2	0.081	0.00	0.0	0.600		o	450
S13.006	70.565	0.235	300.3	0.173	0.00	0.0	0.600		o	600
S13.007	68.360	0.228	299.8	0.099	0.00	0.0	0.600		o	675
S13.008	56.790	0.189	300.5	0.075	0.00	0.0	0.600		o	675
S13.009	41.657	0.139	299.7	0.000	0.00	0.0	0.600		o	750
S1.026	87.420	0.437	200.0	0.000	0.00	0.0	0.600		3 \=/	10000
S14.000	93.480	0.312	299.6	0.588	4.00	0.0	0.600		o	375

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S11.001	103.375	0.452	0.0	0.80	88.7
S11.002	103.200	0.782	0.0	0.90	143.5
S11.003	103.050	0.956	0.0	0.90	143.5
S1.022	100.725	56.548	0.0	2.67	5699.6
S12.000	103.300	0.840	0.0	1.25	550.2
S12.001	103.046	1.204	0.0	1.24	548.9
S12.002	102.720	2.822	0.0	1.30	651.5
S12.003	102.388	4.628	0.0	1.40	887.5
S12.004	102.132	6.658	0.0	1.47	1095.6
S12.005	101.950	6.843	0.0	1.49	1168.0
S12.006	101.773	7.512	0.0	1.60	1593.5
S1.023	100.475	64.159	0.0	0.45	89435.1
S1.024	100.144	64.545	0.0	0.47	102041.3
S1.025	99.765	64.545	0.0	1.32	1412.2
S13.000	103.400	0.299	0.0	1.04	115.0
S13.001	103.155	0.587	0.0	1.04	115.0
S13.002	102.872	0.587	0.0	1.04	115.0
S13.003	102.593	0.671	0.0	1.04	115.0
S13.004	102.313	0.856	0.0	1.17	185.9
S13.005	102.015	0.938	0.0	1.17	185.8
S13.006	101.624	1.111	0.0	1.40	395.9
S13.007	101.389	1.211	0.0	1.51	539.8
S13.008	101.161	1.285	0.0	1.51	539.2
S13.009	100.972	1.285	0.0	1.61	711.8
S1.026	99.619	65.831	0.0	10.95	1540625.7
S14.000	105.500	0.588	0.0	1.04	115.0

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S14.001	87.010	0.290	300.0	0.193	0.00	0.0	0.600		o	375
S14.002	43.873	0.146	300.5	0.149	0.00	0.0	0.600		o	450
S14.003	52.497	0.175	300.0	0.119	0.00	0.0	0.600		o	450
S15.000	86.500	0.173	500.0	0.953	4.00	0.0	0.600		o	600
S15.001	87.397	0.175	499.4	0.534	0.00	0.0	0.600		o	600
S15.002	90.849	0.182	500.0	1.055	0.00	0.0	0.600		o	675
S15.003	87.653	0.175	500.0	1.732	0.00	0.0	0.600		o	750
S15.004	81.867	0.164	500.0	1.118	0.00	0.0	0.600		o	825
S15.005	70.157	0.140	501.1	0.560	0.00	0.0	0.600		o	825
S15.006	80.052	0.160	500.0	0.799	0.00	0.0	0.600		o	900
S15.007	138.419	0.692	200.0	0.000	0.00	0.0		0.350	4 \=/	25000
S15.008	93.794	0.188	500.0	0.505	0.00	0.0	0.600		o	900
S15.009	58.171	0.291	199.9	0.000	0.00	0.0		0.350	4 \=/	10000
S1.027	58.770	0.118	500.0	0.208	0.00	0.0	0.600		ooo	750
S1.028	61.440	0.307	200.0	0.000	0.00	0.0		0.350	4 \=/	50000
S16.000	42.348	0.100	423.5	0.698	4.00	0.0	0.600		o	525
S16.001	89.848	0.100	898.5	0.393	0.00	0.0	0.600		o	600
S16.002	90.371	0.150	602.5	0.960	0.00	0.0	0.600		o	600
S16.003	84.919	0.100	849.2	0.790	0.00	0.0	0.600		o	675
S16.004	83.381	0.100	833.8	0.780	0.00	0.0	0.600		o	750
S16.005	79.546	0.100	795.5	0.298	0.00	0.0	0.600		o	750
S16.006	65.785	0.100	657.9	0.115	0.00	0.0	0.600		o	750
S16.007	77.598	0.100	776.0	0.000	0.00	0.0	0.600		o	750
S16.008	152.296	0.670	227.3	0.252	0.00	0.0		0.350	4 \=/	20000
S17.000	85.000	0.625	136.0	0.160	5.00	0.0	0.600		o	375
S17.001	81.870	0.350	233.9	0.114	0.00	0.0	0.600		o	450
S17.002	63.029	0.106	594.6	0.097	0.00	0.0	0.600		o	750
S17.003	71.954	0.144	499.7	0.649	4.00	0.0	0.600		o	750

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S14.001	104.000	0.781	0.0	1.04	115.0
S14.002	102.500	0.930	0.0	1.17	185.7
S14.003	102.354	1.049	0.0	1.17	185.8
S15.000	103.400	0.953	0.0	1.08	306.0
S15.001	103.152	1.488	0.0	1.08	306.2
S15.002	102.827	2.543	0.0	1.17	417.0
S15.003	102.571	4.275	0.0	1.24	549.9
S15.004	102.320	5.394	0.0	1.32	706.1
S15.005	102.156	5.954	0.0	1.32	705.3
S15.006	101.941	6.753	0.0	1.39	887.1
S15.007	101.781	6.753	0.0	0.36	43726.2
S15.008	101.089	7.258	0.0	1.39	887.1
S15.009	100.901	7.258	0.0	0.37	39954.2
S1.027	99.182	74.345	0.0	1.24	1649.6
S1.028	99.064	74.345	0.0	0.49	169228.5
S16.000	100.375	0.698	0.0	1.08	234.2
S16.001	100.200	1.091	0.0	0.80	227.4
S16.002	100.100	2.051	0.0	0.98	278.4
S16.003	99.875	2.841	0.0	0.89	319.0
S16.004	99.700	3.621	0.0	0.96	424.6
S16.005	99.600	3.919	0.0	0.98	434.8
S16.006	99.500	4.034	0.0	1.08	478.7
S16.007	99.400	4.034	0.0	1.00	440.3
S16.008	99.300	4.286	0.0	0.27	16841.7
S17.000	101.000	0.160	0.0	1.55	171.4
S17.001	100.300	0.274	0.0	1.32	210.7
S17.002	99.650	0.371	0.0	1.14	503.8
S17.003	99.544	1.020	0.0	1.25	550.0

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S17.004	65.507	0.200	327.5	0.610	0.00	0.0	0.600		o	750
S17.005	117.579	0.570	206.3	0.432	0.00	0.0		0.350	4 \=/	10000
S18.000	48.963	0.125	391.7	0.837	4.00	0.0	0.600		o	525
S18.001	90.585	0.100	905.8	0.372	0.00	0.0	0.600		o	600
S18.002	89.426	0.075	1192.3	0.356	0.00	0.0	0.600		o	600
S18.003	89.365	0.100	893.6	1.422	0.00	0.0	0.600		o	675
S18.004	74.978	0.075	999.7	0.320	0.00	0.0	0.600		o	675
S18.005	83.433	0.115	725.5	0.263	0.00	0.0	0.600		o	675
S18.006	146.256	0.730	200.4	0.364	0.00	0.0		0.350	4 \=/	30000
S1.029	88.950	0.445	200.0	1.781	0.00	0.0		0.350	4 \=/	50000
S1.030	88.141	0.441	199.9	0.000	0.00	0.0		0.350	4 \=/	50000
S1.031	76.344	0.076	1000.0	0.000	0.00	0.0	0.600		o	750
S1.032	75.127	0.075	1000.0	0.036	0.00	0.0	0.600		o	750
S1.033	73.754	0.074	1000.0	0.000	0.00	0.0	0.600		o	750
S1.034	74.182	0.074	1000.0	0.000	0.00	0.0	0.600		o	750
S1.035	72.629	0.073	1000.0	0.000	0.00	0.0	0.600		o	750
S1.036	69.872	0.070	1000.0	0.000	0.00	0.0	0.600		o	750
S1.037	79.551	0.080	1000.0	0.000	0.00	0.0	0.600		o	750
S1.038	79.428	0.079	1000.0	0.000	0.00	0.0	0.600		o	750
S1.039	80.971	0.081	1000.0	0.000	0.00	0.0	0.600		o	750
S1.040	83.913	0.084	1000.0	0.000	0.00	0.0	0.600		o	750
S1.041	97.840	0.360	271.8	0.000	0.00	0.0	0.600		o	750
S19.000	89.255	0.179	498.6	0.929	4.00	0.0	0.600		o	675
S19.001	89.875	0.179	502.1	0.774	0.00	0.0	0.600		o	675
S19.002	90.413	0.181	500.0	0.907	0.00	0.0	0.600		o	675
S19.003	83.472	0.167	499.8	0.258	0.00	0.0	0.600		o	750
S19.004	60.064	0.120	500.0	1.283	0.00	0.0	0.600		o	750
S20.000	90.765	0.182	500.0	0.189	4.00	0.0	0.600		o	300

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S17.004	99.400	1.630	0.0	1.54	680.7
S17.005	99.200	2.062	0.0	0.26	11636.6
S18.000	100.100	0.837	0.0	1.13	243.7
S18.001	99.900	1.209	0.0	0.80	226.5
S18.002	99.800	1.565	0.0	0.70	197.0
S18.003	99.650	2.987	0.0	0.87	310.8
S18.004	99.550	3.307	0.0	0.82	293.6
S18.005	99.475	3.570	0.0	0.97	345.4
S18.006	99.360	3.934	0.0	0.29	24021.4
S1.029	98.630	86.407	0.0	0.36	63816.2
S1.030	98.185	86.407	0.0	0.39	82413.1
S1.031	97.744	86.407	0.0	0.88	387.2
S1.032	97.668	86.443	0.0	0.88	387.2
S1.033	97.593	86.443	0.0	0.88	387.2
S1.034	97.519	86.443	0.0	0.88	387.2
S1.035	97.445	86.443	0.0	0.88	387.2
S1.036	97.372	86.443	0.0	0.88	387.2
S1.037	97.302	86.443	0.0	0.88	387.2
S1.038	97.222	86.443	0.0	0.88	387.2
S1.039	97.143	86.443	0.0	0.88	387.2
S1.040	97.062	86.443	0.0	0.88	387.2
S1.041	96.978	86.443	0.0	1.69	747.8
S19.000	100.500	0.929	0.0	1.17	417.6
S19.001	100.171	1.703	0.0	1.16	416.1
S19.002	99.917	2.610	0.0	1.17	417.0
S19.003	99.736	2.868	0.0	1.24	550.0
S19.004	99.494	4.151	0.0	1.24	549.9
S20.000	100.900	0.189	0.0	0.70	49.2

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S20.001	90.976	0.182	500.0	0.053	0.00	0.0	0.600		o	300
S20.002	85.718	0.171	500.0	0.180	0.00	0.0	0.600		o	375
S19.005	78.096	0.156	500.0	0.560	0.00	0.0	0.600		o	825
S19.006	86.031	0.172	500.0	0.406	0.00	0.0	0.600		o	825
S19.007	144.022	0.480	300.0	0.358	0.00	0.0	0.600		o	825
S21.000	111.178	0.222	500.8	1.303	4.00	0.0	0.600		o	600
S21.001	98.481	0.199	494.1	0.847	0.00	0.0	0.600		o	600
S21.002	34.079	0.068	500.0	0.450	0.00	0.0	0.600		o	675
S19.008	41.687	0.084	496.3	0.000	0.00	0.0	0.600		o	900
S19.009	38.041	0.032	1205.4	0.308	0.00	0.0	0.600		o	1050
S22.000	87.669	0.175	500.0	1.130	4.00	0.0	0.600		o	525
S22.001	90.892	0.182	500.0	1.309	0.00	0.0	0.600		o	675
S22.002	88.037	0.176	500.0	0.852	0.00	0.0	0.600		o	750
S22.003	89.255	0.179	500.0	0.700	0.00	0.0	0.600		o	750
S22.004	77.750	0.156	500.0	0.462	0.00	0.0	0.600		o	750
S22.005	69.610	0.139	500.0	0.461	0.00	0.0	0.600		o	825
S22.006	54.953	0.110	500.0	1.044	0.00	0.0	0.600		o	825
S22.007	130.885	0.262	499.6	0.000	0.00	0.0	0.600		o	825
S22.008	232.762	0.464	501.6	0.000	0.00	0.0	0.600		o	825
S23.000	85.990	0.247	348.1	0.313	4.00	0.0	0.600		o	375
S23.001	89.318	0.179	500.0	0.618	0.00	0.0	0.600		o	450
S23.002	91.005	0.182	500.0	0.260	0.00	0.0	0.600		o	525
S23.003	36.241	1.084	33.4	1.516	0.00	0.0	0.600		o	525
S22.009	62.033	0.099	626.9	0.538	0.00	0.0	0.600		o	825
S1.042	30.322	0.168	180.5	0.000	0.00	0.0	0.600		o	750

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S20.001	100.718	0.242	0.0	0.70	49.2
S20.002	100.462	0.422	0.0	0.80	88.7
S19.005	99.299	5.132	0.0	1.32	706.1
S19.006	99.143	5.538	0.0	1.32	706.1
S19.007	98.971	5.896	0.0	1.71	913.4
S21.000	100.350	1.303	0.0	1.08	305.7
S21.001	100.053	2.151	0.0	1.09	307.8
S21.002	99.779	2.601	0.0	1.17	417.0
S19.008	98.416	8.497	0.0	1.40	890.4
S19.009	98.182	8.805	0.0	0.98	851.9
S22.000	100.500	1.130	0.0	0.99	215.4
S22.001	100.175	2.439	0.0	1.17	417.0
S22.002	99.918	3.291	0.0	1.24	549.9
S22.003	99.742	3.990	0.0	1.24	549.9
S22.004	99.563	4.452	0.0	1.24	549.9
S22.005	99.333	4.913	0.0	1.32	706.1
S22.006	99.194	5.957	0.0	1.32	706.1
S22.007	99.084	5.957	0.0	1.32	706.4
S22.008	98.822	5.957	0.0	1.32	704.9
S23.000	100.500	0.313	0.0	0.97	106.6
S23.001	100.178	0.930	0.0	0.90	143.5
S23.002	99.924	1.190	0.0	0.99	215.4
S23.003	99.742	2.707	0.0	3.88	840.7
S22.009	98.358	9.202	0.0	1.18	629.9
S1.042	96.668	104.450	0.0	2.08	918.9

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	24	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S8, DS/PN: S1.007, Volume (m³): 94.1

Invert Level (m) 104.048

Depth (m)	Flow (l/s)
0.100	450.0000

Depth/Flow Relationship Manhole: S10, DS/PN: S1.010, Volume (m³): 132.1

Invert Level (m) 103.146

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	750.0000	0.700	2000.0000	1.300	2000.0000	1.900	2000.0000	2.500	2000.0000
0.200	750.0000	0.800	2000.0000	1.400	2000.0000	2.000	2000.0000	2.600	2000.0000
0.300	750.0000	0.900	2000.0000	1.500	2000.0000	2.100	2000.0000	2.700	2000.0000
0.400	750.0000	1.000	2000.0000	1.600	2000.0000	2.200	2000.0000	2.800	2000.0000
0.500	2000.0000	1.100	2000.0000	1.700	2000.0000	2.300	2000.0000	2.900	2000.0000
0.600	2000.0000	1.200	2000.0000	1.800	2000.0000	2.400	2000.0000	3.000	2000.0000

Non Return Valve Manhole: S11, DS/PN: S1.011, Volume (m³): 10623.2

Non Return Valve Manhole: S12, DS/PN: S1.012, Volume (m³): 1230.6

Non Return Valve Manhole: S13, DS/PN: S1.013, Volume (m³): 105.8

Depth/Flow Relationship Manhole: S14, DS/PN: S1.014, Volume (m³): 2632.7

Invert Level (m) 102.109

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	800.0000	0.700	2000.0000	1.300	2000.0000	1.900	2000.0000	2.500	2000.0000
0.200	800.0000	0.800	2000.0000	1.400	2000.0000	2.000	2000.0000	2.600	2000.0000
0.300	800.0000	0.900	2000.0000	1.500	2000.0000	2.100	2000.0000	2.700	2000.0000
0.400	800.0000	1.000	2000.0000	1.600	2000.0000	2.200	2000.0000	2.800	2000.0000
0.500	800.0000	1.100	2000.0000	1.700	2000.0000	2.300	2000.0000	2.900	2000.0000
0.600	2000.0000	1.200	2000.0000	1.800	2000.0000	2.400	2000.0000	3.000	2000.0000

Non Return Valve Manhole: S16, DS/PN: S1.016, Volume (m³): 1264.1

Non Return Valve Manhole: S17, DS/PN: S1.017, Volume (m³): 7974.0

Depth/Flow Relationship Manhole: S19, DS/PN: S1.019, Volume (m³): 88.6

Invert Level (m) 101.305

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	900.0000	0.200	900.0000	0.300	900.0000	0.400	900.0000	0.500	900.0000

Depth/Flow Relationship Manhole: S19, DS/PN: S1.019, Volume (m³): 88.6

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.600	2000.0000	1.100	2000.0000	1.600	2000.0000	2.100	2000.0000	2.600	2000.0000
0.700	2000.0000	1.200	2000.0000	1.700	2000.0000	2.200	2000.0000	2.700	2000.0000
0.800	2000.0000	1.300	2000.0000	1.800	2000.0000	2.300	2000.0000	2.800	2000.0000
0.900	2000.0000	1.400	2000.0000	1.900	2000.0000	2.400	2000.0000	2.900	2000.0000
1.000	2000.0000	1.500	2000.0000	2.000	2000.0000	2.500	2000.0000	3.000	2000.0000

Non Return Valve Manhole: S20, DS/PN: S1.020, Volume (m³): 6469.2

Depth/Flow Relationship Manhole: S22, DS/PN: S1.022, Volume (m³): 4080.3

Invert Level (m) 100.725

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	290.0000	1.400	2500.0000	2.600	2500.0000	3.800	2500.0000	5.000	2500.0000
0.400	290.0000	1.600	2500.0000	2.800	2500.0000	4.000	2500.0000	5.200	2500.0000
0.600	290.0000	1.800	2500.0000	3.000	2500.0000	4.200	2500.0000	5.400	2500.0000
0.800	290.0000	2.000	2500.0000	3.200	2500.0000	4.400	2500.0000	5.600	2500.0000
1.000	290.0000	2.200	2500.0000	3.400	2500.0000	4.600	2500.0000	5.800	2500.0000
1.200	290.0000	2.400	2500.0000	3.600	2500.0000	4.800	2500.0000	6.000	2500.0000

Depth/Flow Relationship Manhole: S23, DS/PN: S1.023, Volume (m³): 195.8

Invert Level (m) 100.475

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	300.0000	1.400	2500.0000	2.600	2500.0000	3.800	2500.0000	5.000	2500.0000
0.400	300.0000	1.600	2500.0000	2.800	2500.0000	4.000	2500.0000	5.200	2500.0000
0.600	300.0000	1.800	2500.0000	3.000	2500.0000	4.200	2500.0000	5.400	2500.0000
0.800	300.0000	2.000	2500.0000	3.200	2500.0000	4.400	2500.0000	5.600	2500.0000
1.000	300.0000	2.200	2500.0000	3.400	2500.0000	4.600	2500.0000	5.800	2500.0000
1.200	300.0000	2.400	2500.0000	3.600	2500.0000	4.800	2500.0000	6.000	2500.0000

Non Return Valve Manhole: S25, DS/PN: S1.025, Volume (m³): 16402.0

Non Return Valve Manhole: S39, DS/PN: S13.007, Volume (m³): 25.9

Non Return Valve Manhole: S41, DS/PN: S13.009, Volume (m³): 26.9

Non Return Valve Manhole: S129, DS/PN: S15.008, Volume (m³): 16876.4

Non Return Valve Manhole: S130, DS/PN: S15.009, Volume (m³): 59.7

Non Return Valve Manhole: S27, DS/PN: S1.027, Volume (m³): 18600.0

Non Return Valve Manhole: S28, DS/PN: S1.028, Volume (m³): 77.9

Depth/Flow Relationship Manhole: S29, DS/PN: S1.029, Volume (m³): 47423.7

Invert Level (m) 98.630

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	500.0000	1.400	2500.0000	2.600	2500.0000	3.800	2500.0000	5.000	2500.0000
0.400	500.0000	1.600	2500.0000	2.800	2500.0000	4.000	2500.0000	5.200	2500.0000
0.600	2500.0000	1.800	2500.0000	3.000	2500.0000	4.200	2500.0000	5.400	2500.0000
0.800	2500.0000	2.000	2500.0000	3.200	2500.0000	4.400	2500.0000	5.600	2500.0000
1.000	2500.0000	2.200	2500.0000	3.400	2500.0000	4.600	2500.0000	5.800	2500.0000
1.200	2500.0000	2.400	2500.0000	3.600	2500.0000	4.800	2500.0000	6.000	2500.0000

Non Return Valve Manhole: S30, DS/PN: S1.030, Volume (m³): 15385.8

Non Return Valve Manhole: S120, DS/PN: S1.031, Volume (m³): 18115.9

Depth/Flow Relationship Manhole: S187, DS/PN: S19.008, Volume (m³): 96.8

Invert Level (m) 98.416

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	22.9000	1.400	22.9000	2.600	22.9000	3.800	22.9000	5.000	22.9000
0.400	22.9000	1.600	22.9000	2.800	22.9000	4.000	22.9000	5.200	22.9000
0.600	22.9000	1.800	22.9000	3.000	22.9000	4.200	22.9000	5.400	22.9000
0.800	22.9000	2.000	22.9000	3.200	22.9000	4.400	22.9000	5.600	22.9000
1.000	22.9000	2.200	22.9000	3.400	22.9000	4.600	22.9000	5.800	22.9000
1.200	22.9000	2.400	22.9000	3.600	22.9000	4.800	22.9000	6.000	22.9000

Depth/Flow Relationship Manhole: S196, DS/PN: S22.009, Volume (m³): 140.2

Invert Level (m) 98.358

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	45.9000	1.400	45.9000	2.600	45.9000	3.800	45.9000	5.000	45.9000
0.400	45.9000	1.600	45.9000	2.800	45.9000	4.000	45.9000	5.200	45.9000
0.600	45.9000	1.800	45.9000	3.000	45.9000	4.200	45.9000	5.400	45.9000
0.800	45.9000	2.000	45.9000	3.200	45.9000	4.400	45.9000	5.600	45.9000
1.000	45.9000	2.200	45.9000	3.400	45.9000	4.600	45.9000	5.800	45.9000
1.200	45.9000	2.400	45.9000	3.600	45.9000	4.800	45.9000	6.000	45.9000

Storage Structures for Storm

Tank or Pond Manhole: S8, DS/PN: S1.007

Invert Level (m) 104.048

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1800.0	0.500	1800.0

Tank or Pond Manhole: S10, DS/PN: S1.010

Invert Level (m) 103.146

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1350.0	0.500	1350.0

Tank or Pond Manhole: S14, DS/PN: S1.014

Invert Level (m) 102.109

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	0.500	600.0

Tank or Pond Manhole: S19, DS/PN: S1.019

Invert Level (m) 101.305

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	600.0	0.100	600.0

Tank or Pond Manhole: S22, DS/PN: S1.022

Invert Level (m) 100.725

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.000	1000.0

Tank or Pond Manhole: S23, DS/PN: S1.023

Invert Level (m) 100.475

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.000	1000.0

Tank or Pond Manhole: S29, DS/PN: S1.029

Invert Level (m) 98.630

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28750.0	2.000	28750.0

Tank or Pond Manhole: S120, DS/PN: S1.031

Invert Level (m) 97.744

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28750.0	2.000	28750.0

Tank or Pond Manhole: S187, DS/PN: S19.008

Invert Level (m) 98.416

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2965.0	1.600	2965.0

Tank or Pond Manhole: S196, DS/PN: S22.009

Invert Level (m) 98.358

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	5722.0	1.000	5722.0

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	24	Number of Storage Structures	10	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1
Climate Change (%)	0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Winter	1	0%					
S1.001	15 Winter	1	0%					
S1.002	15 Winter	1	0%					
S1.003	15 Winter	1	0%					
S1.004	15 Winter	1	0%					
S1.005	15 Winter	1	0%					
S1.006	15 Winter	1	0%					
S2.000	15 Winter	1	0%					
S2.001	15 Winter	1	0%					
S2.002	15 Winter	1	0%					
S2.003	15 Winter	1	0%					
S2.004	15 Winter	1	0%					
S2.005	15 Winter	1	0%					
S1.007	15 Winter	1	0%					
S3.000	15 Winter	1	0%					
S3.001	15 Winter	1	0%					
S3.002	15 Winter	1	0%					
S3.003	15 Winter	1	0%					
S3.004	15 Winter	1	0%					
S3.005	15 Winter	1	0%					
S3.006	15 Winter	1	0%					
S4.000	15 Winter	1	0%					
S4.001	15 Winter	1	0%					
S4.002	15 Winter	1	0%					
S4.003	15 Winter	1	0%					
S4.004	15 Winter	1	0%					
S1.008	30 Winter	1	0%					
S1.009	30 Winter	1	0%					
S5.000	15 Winter	1	0%					
S5.001	15 Winter	1	0%					
S5.002	15 Winter	1	0%					
S5.003	15 Winter	1	0%					
S5.004	15 Winter	1	0%					
S5.005	15 Winter	1	0%					
S1.010	60 Winter	1	0%					
S6.000	15 Winter	1	0%					
S6.001	15 Winter	1	0%					
S6.002	15 Winter	1	0%					
S6.003	15 Winter	1	0%					
S6.004	15 Winter	1	0%					
S6.005	15 Winter	1	0%					

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.011	60 Winter	1	0%					
S1.012	60 Winter	1	0%					
S7.000	15 Winter	1	0%					
S7.001	15 Winter	1	0%					
S7.002	15 Winter	1	0%					
S7.003	15 Winter	1	0%					
S7.004	15 Winter	1	0%					
S7.005	15 Winter	1	0%					
S7.006	15 Winter	1	0%					
S1.013	60 Winter	1	0%					
S1.014	120 Winter	1	0%					
S1.015	120 Winter	1	0%					
S8.000	15 Winter	1	0%					
S8.001	15 Winter	1	0%					
S8.002	15 Winter	1	0%					
S8.003	15 Winter	1	0%					
S8.004	15 Winter	1	0%					
S8.005	15 Winter	1	0%					
S1.016	120 Winter	1	0%					
S9.000	15 Winter	1	0%					
S9.001	15 Winter	1	0%					
S9.002	15 Winter	1	0%					
S9.003	15 Winter	1	0%					
S9.004	15 Winter	1	0%					
S9.005	15 Winter	1	0%					
S1.017	30 Winter	1	0%					
S1.018	60 Winter	1	0%					
S1.019	30 Winter	1	0%					
S10.000	15 Winter	1	0%					
S10.001	15 Winter	1	0%					
S10.002	15 Winter	1	0%					
S10.003	15 Winter	1	0%					
S10.004	15 Winter	1	0%					
S10.005	15 Winter	1	0%					
S1.020	60 Winter	1	0%					
S1.021	60 Winter	1	0%					
S11.000	15 Winter	1	0%					
S11.001	15 Winter	1	0%					
S11.002	15 Winter	1	0%					
S11.003	15 Winter	1	0%					
S1.022	30 Winter	1	0%					
S12.000	15 Winter	1	0%					
S12.001	15 Winter	1	0%					
S12.002	15 Winter	1	0%					
S12.003	15 Winter	1	0%					
S12.004	15 Winter	1	0%					
S12.005	15 Winter	1	0%					
S12.006	15 Winter	1	0%					
S1.023	720 Winter	1	0%					
S1.024	120 Summer	1	0%					
S1.025	180 Summer	1	0%					
S13.000	15 Winter	1	0%					
S13.001	15 Winter	1	0%					
S13.002	15 Winter	1	0%					
S13.003	15 Winter	1	0%					
S13.004	15 Winter	1	0%					
S13.005	15 Winter	1	0%					
S13.006	30 Winter	1	0%					
S13.007	30 Winter	1	0%					
S13.008	30 Winter	1	0%					
S13.009	30 Winter	1	0%					
S1.026	120 Summer	1	0%					
S14.000	15 Winter	1	0%					
S14.001	15 Winter	1	0%					
S14.002	15 Winter	1	0%					
S14.003	15 Winter	1	0%					
S15.000	15 Winter	1	0%					
S15.001	15 Winter	1	0%					
S15.002	15 Winter	1	0%					
S15.003	15 Winter	1	0%					

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S15.004	15 Winter	1	0%					
S15.005	30 Winter	1	0%					
S15.006	30 Winter	1	0%					
S15.007	30 Winter	1	0%					
S15.008	60 Winter	1	0%					
S15.009	60 Winter	1	0%					
S1.027	60 Winter	1	0%					
S1.028	60 Winter	1	0%					
S16.000	15 Winter	1	0%					
S16.001	15 Winter	1	0%					
S16.002	15 Winter	1	0%					
S16.003	15 Winter	1	0%					
S16.004	30 Winter	1	0%					
S16.005	30 Winter	1	0%					
S16.006	30 Winter	1	0%					
S16.007	30 Winter	1	0%					
S16.008	30 Winter	1	0%					
S17.000	15 Winter	1	0%					
S17.001	15 Winter	1	0%					
S17.002	15 Winter	1	0%					
S17.003	15 Winter	1	0%					
S17.004	15 Winter	1	0%					
S17.005	15 Winter	1	0%					
S18.000	15 Winter	1	0%					
S18.001	15 Winter	1	0%					
S18.002	15 Winter	1	0%					
S18.003	15 Winter	1	0%					
S18.004	30 Winter	1	0%					
S18.005	30 Winter	1	0%					
S18.006	30 Winter	1	0%					
S1.029	960 Winter	1	0%					
S1.030	960 Winter	1	0%					
S1.031	2160 Winter	1	0%					
S1.032	2160 Winter	1	0%					
S1.033	2160 Winter	1	0%					
S1.034	2160 Winter	1	0%					
S1.035	2160 Winter	1	0%					
S1.036	2160 Winter	1	0%					
S1.037	2160 Winter	1	0%					
S1.038	2160 Winter	1	0%					
S1.039	2160 Winter	1	0%					
S1.040	2160 Winter	1	0%					
S1.041	2160 Winter	1	0%					
S19.000	15 Winter	1	0%					
S19.001	15 Winter	1	0%					
S19.002	15 Winter	1	0%					
S19.003	15 Winter	1	0%					
S19.004	15 Winter	1	0%					
S20.000	15 Winter	1	0%					
S20.001	15 Winter	1	0%					
S20.002	15 Winter	1	0%					
S19.005	30 Winter	1	0%					
S19.006	30 Winter	1	0%					
S19.007	30 Winter	1	0%					
S21.000	15 Winter	1	0%					
S21.001	15 Winter	1	0%					
S21.002	15 Winter	1	0%					
S19.008	60 Winter	1	0%					
S19.009	15 Winter	1	0%					
S22.000	15 Winter	1	0%					
S22.001	15 Winter	1	0%					
S22.002	15 Winter	1	0%					
S22.003	15 Winter	1	0%					
S22.004	15 Winter	1	0%					
S22.005	30 Winter	1	0%					
S22.006	30 Winter	1	0%					
S22.007	30 Winter	1	0%					
S22.008	30 Winter	1	0%					
S23.000	15 Winter	1	0%					
S23.001	15 Winter	1	0%					

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S23.002	15 Winter	1	0%					
S23.003	15 Winter	1	0%					
S22.009	600 Winter	1	0%					
S1.042	2160 Winter	1	0%					

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	106.308	-0.597	0.000	0.16	0.0	93.8	OK
S1.001	S2	106.147	-0.563	0.000	0.20	0.0	128.2	OK
S1.002	S3	105.952	-0.578	0.000	0.18	0.0	115.8	OK
S1.003	S4	105.765	-0.509	0.000	0.30	0.0	187.7	OK
S1.004	S5	105.555	-0.488	0.000	0.33	0.0	203.7	OK
S1.005	S5	105.374	-0.502	0.000	0.32	0.0	254.5	OK
S1.006	S6	105.082	-0.360	0.000	0.61	0.0	382.4	OK
S2.000	S8	105.451	-0.574	0.000	0.20	0.0	85.8	OK
S2.001	S9	105.425	-0.591	0.000	0.14	0.0	82.9	OK
S2.002	S10	105.317	-0.589	0.000	0.17	0.0	107.8	OK
S2.003	S11	105.050	-0.523	0.000	0.27	0.0	174.4	OK
S2.004	S12	104.834	-0.476	0.000	0.36	0.0	227.3	OK
S2.005	S13	104.616	-0.435	0.000	0.45	0.0	281.6	OK
S1.007	S8	104.156	-2.844	0.000	0.01	0.0	426.5	OK
S3.000	S8	105.428	-0.597	0.000	0.15	0.0	93.1	OK
S3.001	S9	105.266	-0.565	0.000	0.20	0.0	126.9	OK
S3.002	S10	105.082	-0.580	0.000	0.18	0.0	114.1	OK
S3.003	S11	104.894	-0.514	0.000	0.29	0.0	182.7	OK
S3.004	S12	104.686	-0.467	0.000	0.38	0.0	238.7	OK
S3.005	S13	104.468	-0.432	0.000	0.45	0.0	283.2	OK
S3.006	S14	104.254	-0.465	0.000	0.46	0.0	352.9	OK
S4.000	S63	105.563	-0.464	0.000	0.20	0.0	78.1	OK
S4.001	S64	105.461	-0.457	0.000	0.24	0.0	101.6	OK
S4.002	S65	105.210	-0.384	0.000	0.40	0.0	166.8	OK
S4.003	S66	105.025	-0.332	0.000	0.50	0.0	211.0	OK
S4.004	S67	104.860	-0.308	0.000	0.60	0.0	253.8	OK
S1.008	S8	103.998	-3.002	0.000	0.02	0.0	772.4	OK
S1.009	S9	103.922	-0.614	0.000	0.43	0.0	770.9	OK*
S5.000	S68	104.974	-0.626	0.000	0.17	0.0	130.0	OK
S5.001	S69	104.829	-0.619	0.000	0.20	0.0	158.4	OK
S5.002	S70	104.584	-0.533	0.000	0.33	0.0	259.8	OK
S5.003	S71	104.386	-0.476	0.000	0.44	0.0	342.2	OK
S5.004	S72	104.161	-0.446	0.000	0.49	0.0	386.7	OK
S5.005	S73	103.926	-0.428	0.000	0.60	0.0	403.6	OK
S1.010	S10	103.430	-3.070	0.000	0.01	0.0	750.0	OK
S6.000	S25	104.875	-0.625	0.000	0.19	0.0	146.9	OK
S6.001	S26	104.642	-0.540	0.000	0.32	0.0	253.7	OK
S6.002	S27	104.407	-0.444	0.000	0.49	0.0	386.1	OK
S6.003	S28	104.206	-0.391	0.000	0.58	0.0	454.5	OK
S6.004	S29	104.020	-0.472	0.000	0.51	0.0	484.0	OK
S6.005	S30	103.755	-0.570	0.000	0.36	0.0	507.3	OK
S1.011	S11	103.035	-3.465	0.000	0.01	0.0	993.8	OK
S1.012	S12	103.015	-0.786	0.000	0.38	0.0	996.5	OK*
S7.000	S33	104.500	-0.585	0.000	0.18	0.0	107.5	OK
S7.001	S34	104.354	-0.571	0.000	0.20	0.0	130.9	OK
S7.002	S35	104.123	-0.471	0.000	0.35	0.0	218.3	OK
S7.003	S36	103.955	-0.388	0.000	0.53	0.0	330.6	OK
S7.004	S37	103.738	-0.357	0.000	0.57	0.0	359.2	OK
S7.005	S38	103.568	-0.422	0.000	0.49	0.0	369.1	OK
S7.006	S39	103.410	-0.456	0.000	0.49	0.0	366.4	OK
S1.013	S13	102.750	-3.250	0.000	0.01	0.0	1224.3	OK
S1.014	S14	102.770	-0.839	0.000	0.30	0.0	1029.1	OK*
S1.015	S15	102.390	-3.610	0.000	0.01	0.0	1028.4	OK
S8.000	S42	104.476	-0.584	0.000	0.15	0.0	93.6	OK
S8.001	S43	104.277	-0.555	0.000	0.19	0.0	115.3	OK
S8.002	S44	104.101	-0.479	0.000	0.32	0.0	187.7	OK
S8.003	S45	103.898	-0.425	0.000	0.43	0.0	252.1	OK
S8.004	S46	103.678	-0.396	0.000	0.49	0.0	283.0	OK
S8.005	S47	103.493	-0.406	0.000	0.49	0.0	280.1	OK
S1.016	S16	102.383	-3.617	0.000	0.00	0.0	1120.5	OK
S9.000	S49	103.817	-0.583	0.000	0.15	0.0	88.2	OK

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m³)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S9.001	S50	103.618	-0.549	0.000	0.20	0.0	118.5	OK
S9.002	S51	103.377	-0.487	0.000	0.33	0.0	210.5	OK
S9.003	S52	103.191	-0.420	0.000	0.46	0.0	290.5	OK
S9.004	S53	102.998	-0.593	0.000	0.32	0.0	301.8	OK
S9.005	S54	102.761	-0.659	0.000	0.30	0.0	340.6	OK
S1.017	S17	102.090	-3.160	0.000	0.01	0.0	1207.3	OK
S1.018	S18	102.216	-0.754	0.000	0.35	0.0	1209.4	OK*
S1.019	S19	101.910	-3.340	0.000	0.01	0.0	898.5	OK
S10.000	S58	103.631	-0.519	0.000	0.14	0.0	57.6	OK
S10.001	S59	103.470	-0.461	0.000	0.24	0.0	101.6	OK
S10.002	S60	103.215	-0.387	0.000	0.40	0.0	165.9	OK
S10.003	S61	103.005	-0.391	0.000	0.41	0.0	203.7	OK
S10.004	S62	102.852	-0.370	0.000	0.49	0.0	244.5	OK
S10.005	S64	102.580	-0.620	0.000	0.28	0.0	266.4	OK
S1.020	S20	102.128	-0.292	0.000	0.31	0.0	1064.1	OK*
S1.021	S21	102.089	-3.161	0.000	0.00	0.0	1047.1	OK
S11.000	S65	103.731	-0.244	0.000	0.24	0.0	19.8	OK
S11.001	S66	103.579	-0.171	0.000	0.54	0.0	44.7	OK
S11.002	S67	103.438	-0.212	0.000	0.52	0.0	69.5	OK
S11.003	S68	103.310	-0.190	0.000	0.63	0.0	79.1	OK
S1.022	S22	101.737	-0.638	0.000	0.07	0.0	289.4	OK*
S12.000	S66	103.537	-0.513	0.000	0.20	0.0	98.5	OK
S12.001	S67	103.306	-0.490	0.000	0.25	0.0	123.0	OK
S12.002	S68	103.098	-0.422	0.000	0.43	0.0	254.7	OK
S12.003	S69	102.841	-0.447	0.000	0.48	0.0	379.3	OK
S12.004	S70	102.642	-0.465	0.000	0.52	0.0	500.7	OK
S12.005	S71	102.444	-0.506	0.000	0.48	0.0	484.8	OK
S12.006	S72	102.242	-0.656	0.000	0.36	0.0	495.5	OK
S1.023	S23	101.676	-3.324	0.000	0.00	0.0	306.9	OK
S1.024	S24	100.314	-4.686	0.000	0.00	0.0	318.7	OK
S1.025	S25	100.027	-0.563	0.000	0.22	0.0	314.6	OK*
S13.000	S33	103.550	-0.225	0.000	0.32	0.0	37.2	OK*
S13.001	S34	103.365	-0.166	0.000	0.55	0.0	60.8	OK
S13.002	S35	103.070	-0.177	0.000	0.52	0.0	56.6	OK
S13.003	S85	102.794	-0.173	0.000	0.54	0.0	58.7	OK
S13.004	S36	102.506	-0.257	0.000	0.37	0.0	64.8	OK
S13.005	S37	102.207	-0.258	0.000	0.37	0.0	65.1	OK
S13.006	S38	101.802	-0.422	0.000	0.19	0.0	69.0	OK
S13.007	S39	101.563	-0.501	0.000	0.15	0.0	72.0	OK
S13.008	S40	101.339	-0.497	0.000	0.16	0.0	74.0	OK
S13.009	S41	101.148	-0.574	0.000	0.13	0.0	74.0	OK
S1.026	S26	99.644	-5.356	0.000	0.00	0.0	367.4	OK
S14.000	S89	105.731	-0.144	0.000	0.69	0.0	75.7	OK
S14.001	S90	104.272	-0.103	0.000	0.87	0.0	95.2	OK
S14.002	S91	102.764	-0.186	0.000	0.62	0.0	104.1	OK
S14.003	S92	102.621	-0.183	0.000	0.66	0.0	112.3	OK
S15.000	S110	103.675	-0.325	0.000	0.38	0.0	107.3	OK
S15.001	S111	103.466	-0.286	0.000	0.51	0.0	142.8	OK
S15.002	S112	103.205	-0.297	0.000	0.57	0.0	218.2	OK
S15.003	S113	103.026	-0.294	0.000	0.66	0.0	328.2	OK
S15.004	S114	102.803	-0.342	0.000	0.59	0.0	370.1	OK
S15.005	S103	102.630	-0.351	0.000	0.62	0.0	381.1	OK
S15.006	S115	102.408	-0.434	0.000	0.52	0.0	406.4	OK
S15.007	S116	102.000	-3.000	0.000	0.01	0.0	406.1	OK
S15.008	S129	101.413	-0.576	0.000	0.28	0.0	250.0	OK*
S15.009	S130	101.179	-3.821	0.000	0.01	0.0	249.8	OK
S1.027	S27	99.496	-0.436	0.000	0.37	0.0	608.9	OK*
S1.028	S28	99.249	-4.751	0.000	0.00	0.0	608.6	OK
S16.000	S92	100.614	-0.286	0.000	0.40	0.0	81.4	OK
S16.001	S93	100.531	-0.269	0.000	0.44	0.0	93.1	OK
S16.002	S94	100.449	-0.251	0.000	0.59	0.0	153.4	OK
S16.003	S95	100.277	-0.273	0.000	0.62	0.0	179.7	OK
S16.004	S96	100.135	-0.315	0.000	0.52	0.0	199.6	OK
S16.005	S114	100.019	-0.331	0.000	0.51	0.0	197.4	OK
S16.006	S97	99.894	-0.356	0.000	0.46	0.0	193.7	OK
S16.007	S98	99.771	-0.379	0.000	0.48	0.0	190.5	OK
S16.008	S99	99.466	-2.034	0.000	0.01	0.0	191.9	OK
S17.000	S129	101.086	-0.289	0.000	0.12	0.0	19.1	OK
S17.001	S130	100.418	-0.332	0.000	0.16	0.0	30.8	OK

1 year Return Period Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S17.002	S131	99.847	-0.553	0.000	0.09	0.0	38.3	OK
S17.003	S134	99.787	-0.507	0.000	0.20	0.0	95.0	OK
S17.004	S135	99.653	-0.497	0.000	0.25	0.0	146.2	OK
S17.005	S136	99.431	-2.069	0.000	0.02	0.0	176.7	OK
S18.000	S120	100.360	-0.265	0.000	0.46	0.0	100.3	OK
S18.001	S121	100.255	-0.245	0.000	0.51	0.0	106.6	OK
S18.002	S122	100.175	-0.225	0.000	0.53	0.0	105.4	OK
S18.003	S123	100.078	-0.247	0.000	0.61	0.0	172.0	OK
S18.004	S124	99.975	-0.250	0.000	0.65	0.0	173.2	OK
S18.005	S148	99.840	-0.310	0.000	0.56	0.0	175.6	OK
S18.006	S125	99.482	-2.018	0.000	0.01	0.0	182.4	OK
S1.029	S29	98.795	-2.705	0.000	0.01	0.0	411.8	OK
S1.030	S30	98.331	-3.169	0.000	0.01	0.0	411.7	OK
S1.031	S120	98.273	-0.221	0.000	0.56	0.0	192.3	OK
S1.032	S31	98.196	-0.222	0.000	0.56	0.0	192.3	OK
S1.033	S32	98.118	-0.225	0.000	0.56	0.0	192.4	OK
S1.034	S33	98.040	-0.229	0.000	0.56	0.0	192.4	OK
S1.035	S34	97.960	-0.235	0.000	0.56	0.0	192.4	OK
S1.036	S35	97.877	-0.245	0.000	0.56	0.0	192.4	OK
S1.037	S36	97.792	-0.260	0.000	0.56	0.0	192.4	OK
S1.038	S37	97.695	-0.277	0.000	0.56	0.0	192.3	OK
S1.039	S38	97.588	-0.305	0.000	0.55	0.0	192.3	OK
S1.040	S153	97.460	-0.352	0.000	0.55	0.0	192.3	OK
S1.041	S154	97.248	-0.480	0.000	0.28	0.0	192.3	OK
S19.000	S181	100.758	-0.417	0.000	0.28	0.0	107.7	OK
S19.001	S181	100.494	-0.352	0.000	0.44	0.0	166.0	OK
S19.002	S182	100.303	-0.288	0.000	0.59	0.0	224.4	OK
S19.003	S183	100.098	-0.388	0.000	0.46	0.0	225.0	OK
S19.004	S185	99.906	-0.337	0.000	0.58	0.0	273.9	OK
S20.000	S202	101.053	-0.147	0.000	0.43	0.0	20.5	OK
S20.001	S203	100.871	-0.147	0.000	0.46	0.0	21.9	OK
S20.002	S204	100.630	-0.206	0.000	0.42	0.0	35.2	OK
S19.005	S184	99.740	-0.384	0.000	0.52	0.0	322.3	OK
S19.006	S185	99.571	-0.397	0.000	0.53	0.0	331.2	OK
S19.007	S186	99.332	-0.464	0.000	0.40	0.0	339.3	OK
S21.000	S189	100.676	-0.274	0.000	0.49	0.0	140.2	OK
S21.001	S190	100.430	-0.223	0.000	0.67	0.0	191.2	OK
S21.002	S191	100.168	-0.286	0.000	0.63	0.0	213.0	OK
S19.008	S187	98.660	-0.656	0.000	0.03	0.0	22.9	OK
S19.009	S202	98.338	-0.894	0.000	0.05	0.0	32.3	OK
S22.000	S188	100.823	-0.202	0.000	0.61	0.0	123.6	OK
S22.001	S189	100.560	-0.290	0.000	0.59	0.0	225.2	OK
S22.002	S190	100.332	-0.336	0.000	0.54	0.0	269.8	OK
S22.003	S191	100.166	-0.326	0.000	0.59	0.0	292.1	OK
S22.004	S226	99.985	-0.329	0.000	0.59	0.0	289.9	OK
S22.005	S192	99.779	-0.379	0.000	0.48	0.0	294.1	OK
S22.006	S193	99.644	-0.375	0.000	0.54	0.0	318.2	OK
S22.007	S194	99.490	-0.419	0.000	0.48	0.0	312.5	OK
S22.008	S195	99.215	-0.432	0.000	0.46	0.0	310.3	OK
S23.000	S197	100.664	-0.211	0.000	0.35	0.0	36.0	OK
S23.001	S198	100.450	-0.178	0.000	0.63	0.0	85.3	OK
S23.002	S199	100.189	-0.260	0.000	0.48	0.0	97.1	OK
S23.003	S200	99.941	-0.326	0.000	0.31	0.0	220.7	OK
S22.009	S196	98.564	-0.619	0.000	0.09	0.0	45.9	OK
S1.042	S137	96.984	-0.434	0.000	0.37	0.0	239.2	OK

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
1.000	60.550	0.121	500.4	0.189	4.00	0.0	0.600		o	450
1.001	62.610	0.125	500.9	0.203	0.00	0.0	0.600		o	525
1.002	76.620	0.153	500.8	0.387	0.00	0.0	0.600		o	525
1.003	68.540	0.137	500.3	0.636	0.00	0.0	0.600		o	525
1.004	55.200	0.100	552.0	0.409	0.00	0.0	0.600		o	525
1.005	53.130	0.106	500.0	0.050	0.00	0.0	0.600		o	525
2.000	38.000	0.076	500.0	0.036	5.00	0.0	0.600		o	375
2.001	42.800	0.086	497.7	0.247	0.00	0.0	0.600		o	375
2.002	44.880	0.090	498.7	0.212	0.00	0.0	0.600		o	450
2.003	55.000	0.110	500.0	0.216	0.00	0.0	0.600		o	450
2.004	67.325	0.135	500.0	0.116	0.00	0.0	0.600		o	525
1.006	60.588	0.114	531.5	0.197	0.00	0.0	0.600		o	600
1.007	128.001	0.640	200.0	0.000	0.00	0.0		0.350	4 \=/	20000
3.000	68.673	0.137	501.3	0.820	4.00	0.0	0.600		o	675
3.001	90.740	0.181	501.3	0.820	0.00	0.0	0.600		o	750
3.002	93.279	0.187	498.8	0.520	0.00	0.0	0.600		o	750
3.003	81.966	0.164	499.8	0.533	0.00	0.0	0.600		o	750
4.000	85.798	0.172	498.8	0.820	4.00	0.0	0.600		o	750
4.001	78.267	0.157	498.5	0.820	0.00	0.0	0.600		o	750
4.002	83.034	0.177	469.1	0.478	0.00	0.0	0.600		o	825
4.003	76.235	0.168	453.8	0.427	0.00	0.0	0.600		o	825
4.004	87.647	0.194	451.8	0.297	0.00	0.0	0.600		o	825
4.005	86.009	0.174	494.3	0.549	0.00	0.0	0.600		o	900
4.006	67.555	0.127	531.9	0.613	0.00	0.0	0.600		o	900
4.007	68.925	0.138	499.5	0.323	0.00	0.0	0.600		o	900
4.008	73.185	0.146	501.3	0.237	0.00	0.0	0.600		o	900
3.004	60.969	0.122	500.0	0.499	0.00	0.0	0.600		o	900

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.000	106.000	0.189	0.0	0.90	143.5
1.001	105.879	0.392	0.0	0.99	215.2
1.002	105.754	0.779	0.0	0.99	215.2
1.003	105.601	1.415	0.0	0.99	215.3
1.004	105.464	1.824	0.0	0.95	204.8
1.005	105.364	1.874	0.0	0.99	215.4
2.000	106.000	0.036	0.0	0.80	88.7
2.001	105.924	0.283	0.0	0.81	89.0
2.002	105.838	0.495	0.0	0.90	143.7
2.003	105.748	0.711	0.0	0.90	143.5
2.004	105.638	0.827	0.0	0.99	215.4
1.006	105.248	2.898	0.0	1.05	296.7
1.007	105.134	2.898	0.0	0.29	20564.6
3.000	106.000	0.820	0.0	1.16	416.4
3.001	105.863	1.640	0.0	1.24	549.1
3.002	105.682	2.160	0.0	1.25	550.5
3.003	105.495	2.693	0.0	1.24	550.0
4.000	106.300	0.820	0.0	1.25	550.5
4.001	106.128	1.640	0.0	1.25	550.7
4.002	105.957	2.118	0.0	1.36	729.2
4.003	105.780	2.545	0.0	1.39	741.5
4.004	105.612	2.842	0.0	1.39	743.2
4.005	105.418	3.391	0.0	1.40	892.2
4.006	105.244	4.004	0.0	1.35	859.8
4.007	105.117	4.327	0.0	1.40	887.6
4.008	104.979	4.564	0.0	1.39	885.9
3.004	104.833	7.756	0.0	1.39	887.1

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
1.008	77.150	0.154	501.0	0.065	0.00	0.0	0.600		o	900
1.009	152.569	0.763	200.0	0.000	0.00	0.0		0.350	4 \=/	40000
1.010	41.264	0.083	497.2	0.598	0.00	0.0	0.600		o	750
1.011	118.427	0.237	500.0	0.000	0.00	0.0		0.350	4 \=/	40000
1.012	27.923	0.056	500.0	0.454	0.00	0.0	0.600		o	450

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
1.008	104.494	10.719	0.0	1.39	886.2
1.009	104.340	10.719	0.0	0.37	62202.3
1.010	103.577	11.317	0.0	1.25	551.5
1.011	103.494	11.317	0.0	0.21	25986.9
1.012	103.257	11.771	0.0	0.90	143.5

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.012	SOutfall C1	105.500	103.201	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S293, DS/PN: 1.010, Volume (m³): 25239.0

Invert Level (m) 103.577

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	55.0000	1.400	55.0000	2.600	55.0000	3.800	55.0000	5.000	55.0000
0.400	55.0000	1.600	55.0000	2.800	55.0000	4.000	55.0000	5.200	55.0000
0.600	55.0000	1.800	55.0000	3.000	55.0000	4.200	55.0000	5.400	55.0000
0.800	55.0000	2.000	55.0000	3.200	55.0000	4.400	55.0000	5.600	55.0000
1.000	55.0000	2.200	55.0000	3.400	55.0000	4.600	55.0000	5.800	55.0000
1.200	55.0000	2.400	55.0000	3.600	55.0000	4.800	55.0000	6.000	55.0000

Pump Manhole: S290, DS/PN: 1.012, Volume (m³): 14756.9

Invert Level (m) 103.257

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	55.0000	1.400	55.0000	2.600	55.0000	3.800	55.0000	5.000	55.0000
0.400	55.0000	1.600	55.0000	2.800	55.0000	4.000	55.0000	5.200	55.0000
0.600	55.0000	1.800	55.0000	3.000	55.0000	4.200	55.0000	5.400	55.0000
0.800	55.0000	2.000	55.0000	3.200	55.0000	4.400	55.0000	5.600	55.0000
1.000	55.0000	2.200	55.0000	3.400	55.0000	4.600	55.0000	5.800	55.0000
1.200	55.0000	2.400	55.0000	3.600	55.0000	4.800	55.0000	6.000	55.0000

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S1.000	74.237	0.148	501.6	0.192	4.00	0.0	0.600		o	600
S1.001	61.065	0.123	496.5	0.835	0.00	0.0	0.600		o	675
S1.002	86.778	0.173	501.6	0.361	0.00	0.0	0.600		oo	750
S1.003	56.088	0.112	500.0	0.278	0.00	0.0	0.600		oo	750
S1.004	38.631	0.077	500.0	0.192	0.00	0.0	0.600		oo	750
S1.005	74.872	0.150	500.0	0.603	0.00	0.0	0.600		oo	750
S1.006	63.341	0.135	469.2	1.400	0.00	0.0	0.600		o	900
S1.007	74.533	0.149	500.0	0.842	0.00	0.0	0.600		o	900
S2.000	84.800	0.170	498.8	0.400	4.00	0.0	0.600		o	675
S3.000	86.240	0.172	501.4	0.280	4.00	0.0	0.600		o	525
S3.001	81.197	0.162	501.2	0.256	0.00	0.0	0.600		o	525
S3.002	53.180	0.106	501.7	0.236	0.00	0.0	0.600		o	525
S2.001	56.768	0.113	502.4	0.663	0.00	0.0	0.600		o	750
S2.002	85.142	0.170	500.8	0.804	0.00	0.0	0.600		o	750
S2.003	88.427	0.177	499.6	0.381	0.00	0.0	0.600		o	750
S2.004	49.761	0.100	497.6	0.428	0.00	0.0	0.600		o	825
S2.005	41.257	0.083	497.1	0.474	0.00	0.0	0.600		o	825
S1.008	77.896	0.156	500.0	0.464	0.00	0.0	0.600		o	900
S1.009	51.807	0.104	500.0	0.000	0.00	0.0	0.600		o	900
S4.000	74.638	0.249	299.8	0.388	4.00	0.0	0.600		o	525
S5.000	82.577	0.275	300.3	0.159	4.00	0.0	0.600		o	450
S5.001	86.594	0.289	299.6	0.245	0.00	0.0	0.600		o	525
S4.001	71.641	0.179	400.2	0.399	0.00	0.0	0.600		o	600
S4.002	46.174	0.092	501.9	0.108	0.00	0.0	0.600		o	600
S4.003	46.174	0.231	199.9	0.461	0.00	0.0	0.600		o	675

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S1.000	104.950	0.192	0.0	1.08	305.5
S1.001	104.652	1.027	0.0	1.17	418.5
S1.002	104.529	1.389	0.0	1.24	1097.9
S1.003	104.356	1.666	0.0	1.24	1099.7
S1.004	104.244	1.858	0.0	1.24	1099.7
S1.005	104.167	2.461	0.0	1.24	1099.7
S1.006	104.017	3.861	0.0	1.44	916.0
S1.007	103.882	4.703	0.0	1.39	887.1
S2.000	105.000	0.400	0.0	1.17	417.5
S3.000	105.000	0.280	0.0	0.99	215.1
S3.001	104.828	0.536	0.0	0.99	215.1
S3.002	104.666	0.772	0.0	0.99	215.0
S2.001	104.830	1.835	0.0	1.24	548.6
S2.002	104.717	2.639	0.0	1.24	549.4
S2.003	104.547	3.020	0.0	1.25	550.1
S2.004	104.370	3.448	0.0	1.32	707.8
S2.005	104.270	3.922	0.0	1.32	708.2
S1.008	103.733	9.089	0.0	1.39	887.1
S1.009	103.577	9.089	0.0	1.39	887.1
S4.000	105.000	0.388	0.0	1.29	278.9
S5.000	105.200	0.159	0.0	1.17	185.8
S5.001	104.925	0.404	0.0	1.29	279.0
S4.001	104.561	1.191	0.0	1.21	342.4
S4.002	104.708	1.299	0.0	1.08	305.4
S4.003	104.616	1.760	0.0	1.85	662.1

Existing Network Details for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)
S6.000	86.187	0.287	300.3	0.456	4.00	0.0	0.600		o	600
S6.001	72.325	0.181	399.6	0.343	0.00	0.0	0.600		o	600
S6.002	63.926	0.160	399.5	0.335	0.00	0.0	0.600		o	675
S6.003	78.221	0.156	501.4	0.258	0.00	0.0	0.600		o	750
S6.004	57.116	0.114	501.0	0.387	0.00	0.0	0.600		o	825
S6.005	71.894	0.144	499.3	0.486	0.00	0.0	0.600		o	825
S6.006	52.735	0.105	502.2	0.286	0.00	0.0	0.600		o	900
S4.004	49.798	0.100	498.0	0.251	0.00	0.0	0.600		o	750
S1.010	64.883	0.324	200.3	0.241	0.00	0.0		0.350	4 \=/	45000
S1.011	26.526	0.053	500.0	0.000	0.00	0.0	0.600		o	750
S1.012	91.881	0.459	200.2	0.469	0.00	0.0		0.350	4 \=/	50000
S1.013	82.190	0.164	500.0	0.000	0.00	0.0	0.600		o	750
S1.014	67.917	0.343	198.0	0.545	0.00	0.0	0.600		o	450

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
S6.000	104.900	0.456	0.0	1.40	395.8
S6.001	104.613	0.799	0.0	1.21	342.7
S6.002	104.357	1.134	0.0	1.30	467.0
S6.003	104.122	1.392	0.0	1.24	549.1
S6.004	103.966	1.778	0.0	1.32	705.4
S6.005	103.852	2.265	0.0	1.32	706.6
S6.006	103.708	2.551	0.0	1.39	885.1
S4.004	103.603	4.561	0.0	1.25	551.0
S1.010	103.473	13.891	0.0	0.37	63789.7
S1.011	103.149	13.891	0.0	1.24	549.9
S1.012	103.096	14.360	0.0	0.40	86330.4
S1.013	102.637	14.360	0.0	1.24	549.9
S1.014	102.473	14.905	0.0	1.44	229.2

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.840	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	5.000
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	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	E (1km)	0.320
Return Period (years)	1	F (1km)	2.406
Site Location	GB 392550 309750 SJ 92550 09750	Summer Storms	No
C (1km)	-0.032	Winter Storms	Yes
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840
D3 (1km)	0.297	Storm Duration (mins)	15

Online Controls for Storm

Depth/Flow Relationship Manhole: S260, DS/PN: S1.010, Volume (m³): 54.5

Invert Level (m) 103.473

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	450.0000	0.200	450.0000

Pump Manhole: S254, DS/PN: S1.014, Volume (m³): 36.3

Invert Level (m) 102.473

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	60.0000	1.400	60.0000	2.600	60.0000	3.800	60.0000	5.000	60.0000
0.400	60.0000	1.600	60.0000	2.800	60.0000	4.000	60.0000	5.200	60.0000
0.600	60.0000	1.800	60.0000	3.000	60.0000	4.200	60.0000	5.400	60.0000
0.800	60.0000	2.000	60.0000	3.200	60.0000	4.400	60.0000	5.600	60.0000
1.000	60.0000	2.200	60.0000	3.400	60.0000	4.600	60.0000	5.800	60.0000
1.200	60.0000	2.400	60.0000	3.600	60.0000	4.800	60.0000	6.000	60.0000

Storage Structures for Storm

Tank or Pond Manhole: S253, DS/PN: S1.013

Invert Level (m) 102.637

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	1000.0	1.500	1750.0

Tank or Pond Manhole: S254, DS/PN: S1.014

Invert Level (m) 102.473

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	850.0	0.500	850.0

Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	5.000
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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	2	Number of Storage Structures	2	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.297
Site Location	GB 392550 309750 SJ 92550 09750	E (1km)	0.320
C (1km)	-0.032	F (1km)	2.406
D1 (1km)	0.354	Cv (Summer)	0.750
D2 (1km)	0.297	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years)	1
Climate Change (%)	0

PN	Storm	Return Period	Climate Change	First X Surcharge	First Y Flood	First Z Overflow	O/F Act.	Lvl Exc.
S1.000	15 Summer	1	0%					
S1.001	15 Winter	1	0%					
S1.002	15 Winter	1	0%					
S1.003	15 Winter	1	0%					
S1.004	15 Winter	1	0%					
S1.005	15 Winter	1	0%					
S1.006	30 Winter	1	0%					
S1.007	30 Winter	1	0%					
S2.000	15 Summer	1	0%					
S3.000	15 Winter	1	0%					
S3.001	15 Winter	1	0%					
S3.002	30 Winter	1	0%					
S2.001	15 Winter	1	0%					
S2.002	30 Winter	1	0%					
S2.003	30 Winter	1	0%					
S2.004	30 Winter	1	0%					
S2.005	30 Winter	1	0%					
S1.008	30 Winter	1	0%					
S1.009	30 Winter	1	0%					
S4.000	15 Winter	1	0%					
S5.000	15 Winter	1	0%					
S5.001	15 Winter	1	0%					
S4.001	15 Winter	1	0%					
S4.002	15 Winter	1	0%					
S4.003	30 Winter	1	0%					
S6.000	15 Winter	1	0%					
S6.001	15 Winter	1	0%					
S6.002	15 Winter	1	0%					
S6.003	15 Winter	1	0%					
S6.004	15 Winter	1	0%					
S6.005	15 Winter	1	0%					
S6.006	15 Winter	1	0%					
S4.004	30 Winter	1	0%					
S1.010	30 Winter	1	0%					
S1.011	60 Winter	1	0%					
S1.012	120 Winter	1	0%					
S1.013	120 Winter	1	0%					
S1.014	600 Winter	1	0%	1/60 Winter				

Summary of Critical Results by Maximum Outflow (Rank 1) for Storm

PN	US/MH Name	Water Level (m)	Surch'ed Depth (m)	Flooded Volume (m^3)	Flow / Cap.	O'flow (l/s)	Pipe Flow (l/s)	Status
S1.000	S172	105.071	-0.479	0.000	0.09	0.0	23.8	OK
S1.001	S173	104.892	-0.435	0.000	0.27	0.0	99.3	OK
S1.002	S174	104.713	-0.566	0.000	0.12	0.0	122.4	OK
S1.003	S175	104.574	-0.532	0.000	0.14	0.0	129.0	OK
S1.004	S244	104.496	-0.498	0.000	0.15	0.0	134.1	OK
S1.005	S176	104.453	-0.464	0.000	0.16	0.0	156.3	OK
S1.006	S177	104.422	-0.495	0.000	0.28	0.0	217.2	OK
S1.007	S257	104.381	-0.401	0.000	0.33	0.0	249.9	OK
S2.000	S245	105.165	-0.510	0.000	0.13	0.0	47.7	OK
S3.000	S247	105.188	-0.337	0.000	0.16	0.0	31.4	OK
S3.001	S248	105.186	-0.167	0.000	0.14	0.0	28.4	OK
S3.002	S249	105.178	-0.013	0.000	0.16	0.0	31.4	OK
S2.001	S246	105.096	-0.484	0.000	0.20	0.0	93.8	OK
S2.002	S247	105.007	-0.460	0.000	0.29	0.0	142.2	OK
S2.003	S248	104.853	-0.444	0.000	0.31	0.0	154.3	OK
S2.004	S249	104.702	-0.493	0.000	0.28	0.0	166.4	OK
S2.005	S250	104.588	-0.507	0.000	0.32	0.0	180.2	OK
S1.008	S258	104.331	-0.302	0.000	0.53	0.0	406.5	OK
S1.009	S259	104.266	-0.211	0.000	0.40	0.0	352.3	OK*
S4.000	S250	105.157	-0.368	0.000	0.19	0.0	48.2	OK
S5.000	S251	105.303	-0.347	0.000	0.11	0.0	19.1	OK
S5.001	S252	105.070	-0.380	0.000	0.15	0.0	40.2	OK
S4.001	S251	105.003	-0.158	0.000	0.25	0.0	79.3	OK
S4.002	S252	104.942	-0.366	0.000	0.31	0.0	81.9	OK
S4.003	S255	104.818	-0.473	0.000	0.20	0.0	109.9	OK
S6.000	S255	105.061	-0.439	0.000	0.15	0.0	55.3	OK
S6.001	S256	104.829	-0.384	0.000	0.27	0.0	82.8	OK
S6.002	S257	104.595	-0.437	0.000	0.26	0.0	108.5	OK
S6.003	S258	104.402	-0.470	0.000	0.25	0.0	121.2	OK
S6.004	S259	104.278	-0.513	0.000	0.23	0.0	136.1	OK
S6.005	S260	104.226	-0.451	0.000	0.24	0.0	150.9	OK
S6.006	S261	104.199	-0.409	0.000	0.21	0.0	152.8	OK
S4.004	S253	104.277	-0.076	0.000	0.54	0.0	253.2	OK
S1.010	S260	104.186	-2.314	0.000	0.01	0.0	449.2	OK
S1.011	S251	103.600	-0.299	0.000	0.67	0.0	369.7	OK*
S1.012	S252	103.234	-3.266	0.000	0.00	0.0	374.3	OK
S1.013	S253	103.036	-0.351	0.000	0.38	0.0	211.6	OK*
S1.014	S254	103.067	0.144	0.000	0.26	0.0	60.0	SURCHARGED*

Appendix L – Illustrative Drainage Sections at Staffordshire and Worcestershire Canal and West Coast Mainline

Construction Design And Management Regulations 2015

The contractors attention is drawn to the abnormal risks identified below, annotated on the drawing and explained in the associated design risk registers.

LEGEND

- You Must Not Do
- Hazard Or Danger
- You Must Do
- Caution

Abnormal Risks Identified:

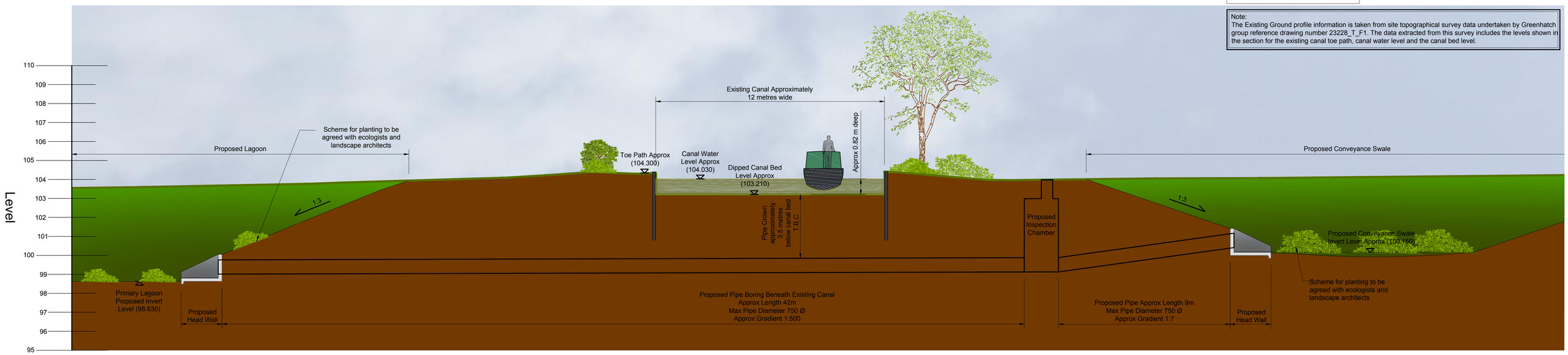
1. Deep Excavation
2. Excavation below groundwater level
3. Excavation adjacent to canal
4. Boring under active canal

External References:External References

Notes

1. Do not scale this drawing.
2. All dimensions are in meters unless stated otherwise.
3. This drawing to be read in conjunction with all other relevant drawings and specifications.
4. All proprietary items to be installed in strict compliance with manufacturers instructions and recommendations.

Note:
The Existing Ground profile information is taken from site topographical survey data undertaken by Greenhatch group reference drawing number 23228_T_F1. The data extracted from this survey includes the levels shown in the section for the existing canal toe path, canal water level and the canal bed level.

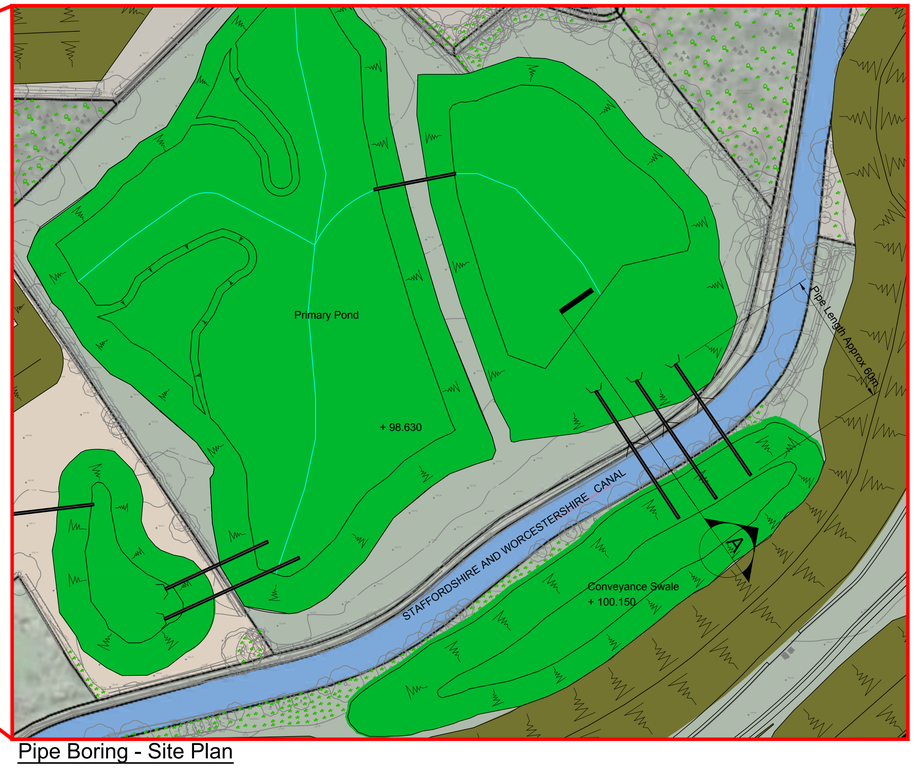


Pipe Boring Section (Section A)

(Scale 1:100)

Proposed Pipe Boring Area - Site Location Plan

(Scale 1:10000)



Pipe Boring - Site Plan

(Scale 1:1000)

P3	Order Limits updated	19/06/18 NG
P2	Swales & Mounds, Levels & Architect's Layout Updated	06/04/18 NG
P1	Preliminary Issue	09/12/16 TP

Revisions

West Midlands Interchange

Project
THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status
Preliminary

Drawing Title
Proposed Drainage Pipe Boring Under Existing Canal(Plan View&Section Detail)

Drawing Size A1

Regulation	Document
5 (2) (o)	2.4

Drawn	Date	Scale	Reviewed
TP	09/12/16	As Shown	TL

Drawing No.
1516-0425-WDK-SI-C-301-003

Rev.
P3

Note:
The Water Table Information shown has been taken from Ground Investigation Report 14317GI produced by RSA Geotechnics LTD
More specifically the first strike approx water level from BH210
Borehole Location is shown indicatively & approximately on site location plan.
The current water levels shown are indicative only and will be subject to change once another Bore Hole exercise in undertaken within a closer proximity to the existing canal.

Construction Design And Management Regulations 2015

The contractors attention is drawn to the abnormal risks identified below, annotated on the drawing and explained in the associated design risk registers.

LEGEND

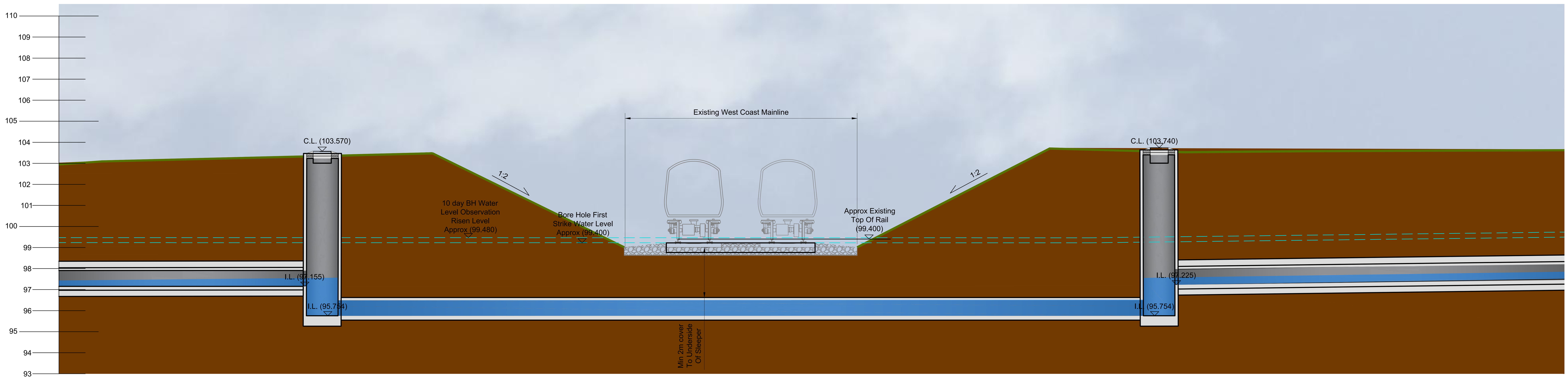
- You Must Not Do
- Hazard Or Danger
- You Must Do
- Caution

Abnormal Risks Identified:
1. Deep Excavation
2. Excavation below groundwater level
3. Excavation adjacent to live rail line
4. Boring under active rail line

External References:External References

Notes

1. Do not scale this drawing.
2. All dimensions are in millimetres unless stated otherwise.
3. This drawing to be read in conjunction with all other relevant drawings and specifications.
4. All proprietary items to be installed in strict compliance with manufacturers instructions and recommendations.

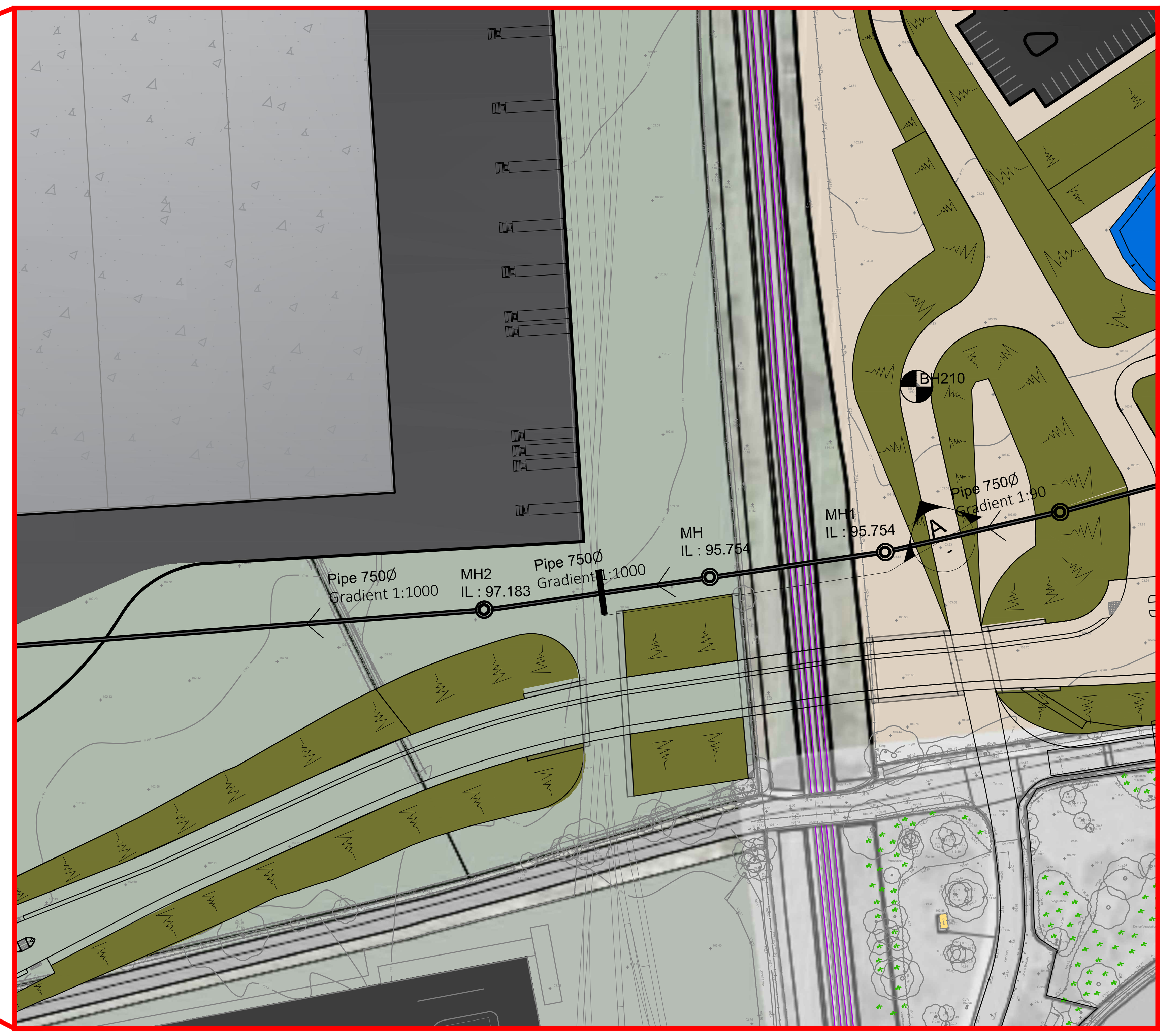


Indicative Section A

(Scale 1:100)

Location Plan

(Scale 1:10000)



Pipe Boring Under Existing West Coast Mainline

(Scale 1:1000)

P5	Order Limits updated	19/06/18 NG
P4	Architectural layout updated	16/03/18 NG
P3	Drainage Updated To Suit Railways	08/01/18 JB
P2	Levels & Architectural Layouts Updated	11/04/17 TP
P1	Preliminary Issue	09/12/16 TP

Revisions

West Midlands Interchange

Project
THE WEST MIDLANDS RAIL FREIGHT INTERCHANGE ORDER 2017

Drawing Status
Preliminary

Drawing Title — Drawing Size A1
Proposed Drainage Pipe Boring Under Existing WCML(Plan View&Section Detail)

Regulation	Document
5 (2) (o)	2.4

Drawn TP	Date 09/12/16	Scale As Shown	Reviewed TL

Drawing No.	Rev.
1516-0425-WDK-SI-C-301-004	P5