BANNERS GATE

CIVIL, STRUCTURAL AND TRANSPORTATION ENGINEERS

CALA Homes (Chiltern) Limited

Land at Cotefield Farm, Bodicote

Flood Risk Assessment

December 2016

Prepared for:

CALA HOMES

Revision Schedule

Land at Cotefield Farm, Bodicote – Flood Risk Assessment
15031 FRA-v1

Rev	Date	Details	Prepared by	Reviewed by	Approved by
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1 INTRODUCTION & BRIEF

1.1 Background Information

1.1.1 Banners Gate Limited was commissioned by CALA Homes (Chiltern) Limited in September 2016 to prepare a Flood Risk Assessment to support an application for amendments to Cherwell District Council planning permission reference 11/00617/OUT.

1.1.2 An 'RPS Planning and Development Limited' Flood Risk Assessment, reference BES0415, dated April 2010 accompanied the Outline Planning Application.

1.1.3 A 'Fairhurst' Addendum to the RPS Flood Risk Assessment, reference 99538/R1.1, dated October 2013 was subsequently submitted in support of a Discharge of Conditions application.

1.1.4 This Report provides an assessment of an alternative surface water drainage strategy and also takes into consideration changes in legislation and published guidance since the preparation of the previous Flood Risk Assessments.

1.2 Study Objectives and Methodology

1.2.1 The objectives of this Report are as follows:

- Determine likely sources of flooding,
- Assess the proposals in the context of the National Planning Policy Framework,
- Propose an appropriate drainage strategy, and
- Determine appropriate mitigation and / or protection measures.

1.2.2 The methodology followed in the preparation of this report included the following:

- Consideration of previous Flood Risk Assessments,
- Investigation of the flood risk within and external to the Site,
- Consideration of the pre-development and post-development storm water run-off and identification of a means of storm water disposal, and
- Consideration of storm events up to and including the 100 year return period storm, including climate change, and calculation of the required volume of attenuation storage, where applicable.

1.2.3 This Report deals with environmental issues as they are impacted by flooding, other impacts on the environment are not considered.

1.3 Policy Background

1.3.1 With the publication of the 'National Planning Policy Framework' (NPPF) in March 2012 a site-specific Flood Risk Assessment became a requirement for:

- Proposals of 1 hectare or greater in Flood Zone 1,
- All proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the Local Planning Authority by the Environment Agency),
- Where proposed development, or a change of use to a more vulnerable class, may be subject to other sources of flooding.

1.3.2 The site-specific Flood Risk Assessment should demonstrate how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

1.3.3 The Department for Communities & Local Government publishes online Planning Practice Guidance to the NPPF, which is regularly updated, to provide additional guidance to ensure the effective implementation of the planning policy as set out in the NPPF.

1.4 Climate Change

1.4.1 The Environment Agency updated its climate change allowances in February 2016. The following Table shows current anticipated changes in extreme rainfall intensity in small and urban catchments.

Table 1.4: Peak rainfall intensity allowance in small and urban catchments

Applies across all of England	Total potential change anticipated		
	2010 to 2039	2040 to 2059	2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

1.4.2 For Flood Risk Assessments, and Strategic Flood Risk Assessments, both the Central and Upper end allowances are to be considered so that the range of the impact can be assessed.

1.4.3 The design horizon of the proposed development is beyond 2060 and therefore peak rainfall intensity has, where applicable, been increased by 20% and 40%.

1.5 Background to Report

1.5.1 The Report has been prepared using the following documents for guidance:

- The NPPF and Planning Practice Guidance,
- Environment Agency/DEFRA Flood Risk Assessment Standing Advice,
- Environment Agency/DEFRA Rainfall runoff for management for developments - Report-SC030219,
- DEFRA non-statutory Technical Standards for Sustainable Drainage Systems,
- CIRIA Report C624 – Development and Flood Risk – Guidance for the Construction Industry,
- CIRIA Report C753 – The SUDS manual,
- Cherwell and West Oxfordshire Level 1 Strategic Flood Risk Assessment, Scott Wilson, dated April 2009.
- RPS Planning and Development Limited Flood Risk Assessment, reference BES0415, dated April 2010.
- Fairhurst Addendum to RPS Flood Risk Assessment, reference 99538/R1.1, dated October 2013.

1.6 Strategic Flood Risk Assessment

1.6.1 The Strategic Flood Risk Assessment (SFRA) Final Report dated April 2009, prepared by Scott Wilson, was commissioned by Cherwell District Council, West Oxfordshire District Council and Oxfordshire County Council to assess and map the different levels and types of flood risk in the study area for the land use planning process.

1.6.2 The following extracts from the SFRA are relevant:

1.6.3 The predominant risk of flooding within the Cherwell and West Oxfordshire Districts is due to flooding from rivers and watercourses.

1.6.4 Flooding from the land caused by overland flow or as a result of sudden intense downpours has led to wide scale flooding of varying degrees across both Cherwell and West Oxfordshire.

1.6.5 Groundwater flooding is more likely to occur to settlements located at the base of hilly outcrops or where embankments have been formed. The following areas in Cherwell are at a greater risk of ground water flooding: The base of Crouch Hill in Banbury, Upper Heyford, Kidington, Bodicote, Hook Norton, Steeple Aston and Mollington.

1.6.6 There have been numerous historical flood events in the Cherwell study area. The most severe flood event recorded in Cherwell District, along the River Cherwell Corridor, in terms of danger to life and property occurred in April 1998 when flood levels reached what were at the time considered to have return period of greater than 1 in 100 years.

1.6.7 All new development should have flood risk management factored in at the planning stage to include the rigorous application of PPS25 with the use of Sustainable Flood Management measures encouraged where possible.

1.6.8 Development should be directed to Flood Zone 1 wherever possible.

1.6.9 All sources of flooding must be considered when looking to locate new development. Other sources of flooding that require consideration when site new development allocations include:

- *Flooding from the Land – Surface Water;*
- *Flooding from Groundwater;*
- *Flooding from Sewers and Drains, and*
- *Flooding from Manmade or Artificial Sources.*

1.6.10 Wherever possible, SuDS techniques should seek to contribute to each of the three goals identified below, with the preferred system contributing significantly to each objective. SuDS solutions for specific sites should seek to:

- *Reduce flood risk (to the site and neighbouring areas);*
- *Reduce pollution, and*
- *Provide landscape and wildlife benefits.*

1.6.11 In the following situations a Flood Risk Assessment should always be provided with a planning application:

- *Development sites located in Flood Zone 2 or 3;*
- *Proposed development that is classified as a major development and located in Flood Zone 1. These are residential developments consisting of sites greater than 0.5 ha or greater than 10 dwellings and commercial developments that are greater than 1 ha or have a floor area greater than 1000 m^2. Since the risk of fluvial flooding is minimal such FRAs should focus on the management of surface water;*

1.7 RPS Flood Risk Assessment

1.7.1 The RPS Flood Risk Assessment concluded that the Greenfield Site is located entirely within Flood Zone 1, Low Probability, and is not considered to be at risk of fluvial flooding.

1.7.2 Groundwater was detected within one of five Trial Pits, at 1.7m below ground level, and further investigation was recommended to determine the nature of the groundwater encountered to establish if localised groundwater flooding could be an issue; it was noted however that due to the gradient of the Site this was unlikely.

1.7.3 Greenfield equivalent runoff rates were calculated for a range of return period storms using the methodology outlined within IoH124 in order to estimate a conservative attenuation storage estimate to demonstrate that adequate storage could be provided without difficulty. It was noted that the ADAS 345 methodology may be more suited to determining Greenfield runoff rates, as gradients are taken into consideration, and advises further work will be carried out during the detailed design stage.

1.7.4 The results of infiltration testing suggested that the higher parts of the Site could utilise infiltration techniques but the lower part of the were not suitable for discharging surface water to ground owing to the lower infiltration rates observed and the presence of groundwater.

1.7.5 The drainage strategy outlined within the Assessment described a preference for infiltration, wherever possible, and a discharge to an existing reservoir to the west of the Site, on land owned by the client, with a controlled discharge into the Sor Brook.

1.8 Fairhurst Addendum Flood Risk Assessment

1.8.1 The Addendum to the RPS Flood Risk Assessment described a revised surface water drainage strategy, with increased Greenfield equivalent runoff rates calculated using the ADAS 345 methodology and an outfall into the Sor Brook, bypassing the existing reservoir, as Thames Water Utilities Limited had advised that the sewerage would not be adoptable, under a Water industry Act Section 104 Agreement, if the drainage was routed through the private reservoir.

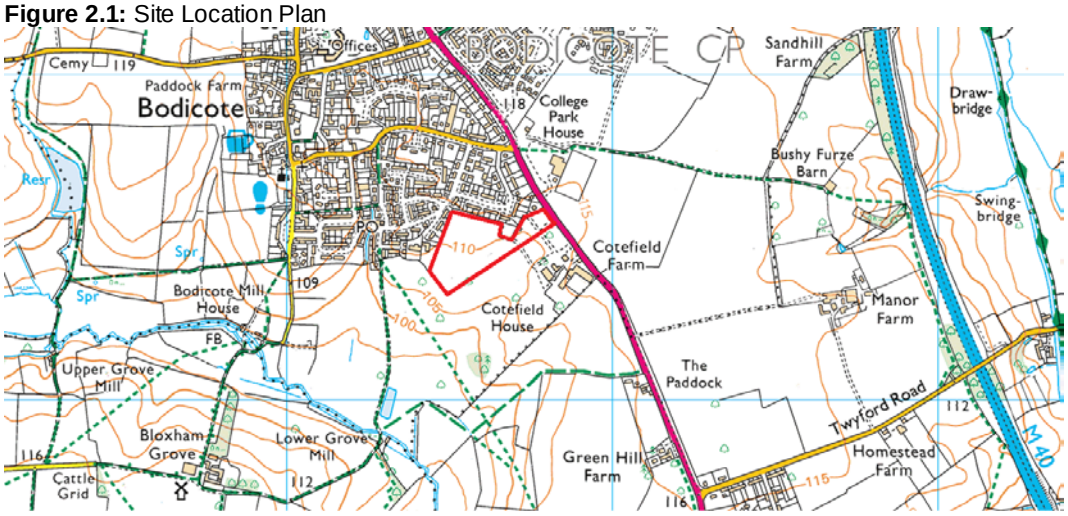
1.8.2 It was proposed that the majority of the required attenuation storage would be provided within below ground attenuation tanks.

2 EXISTING CONDITIONS

2.1 Site Location

2.1.1 The Site is located to the southeast of the village of Bodicote in Oxfordshire, at approximate National Grid Reference 446579,237477 and post code OX15 4BD. The Site is shown outlined in red in Figure 2.1 below.

Figure 2.1: Site Location Plan



2.2 Site Description

2.2.1 The Greenfield Site has a total area of approximately 3.7 hectares.

2.2.2 The Site is bounded to the north by residential dwellings, to the east by Cotefield Farm buildings and beyond by Oxford Road and Banbury Rugby Club, and to the west and south by agricultural land.

2.2.3 The Site generally falls from north to south from approximately 116mAOD to 112mAOD. Topographical levels are shown on the drawings presented in Appendix II.

2.3 Local Watercourses

2.3.1 The nearest open watercourse is the Sor Brook which is located approximately 500m to the southwest of the Site.

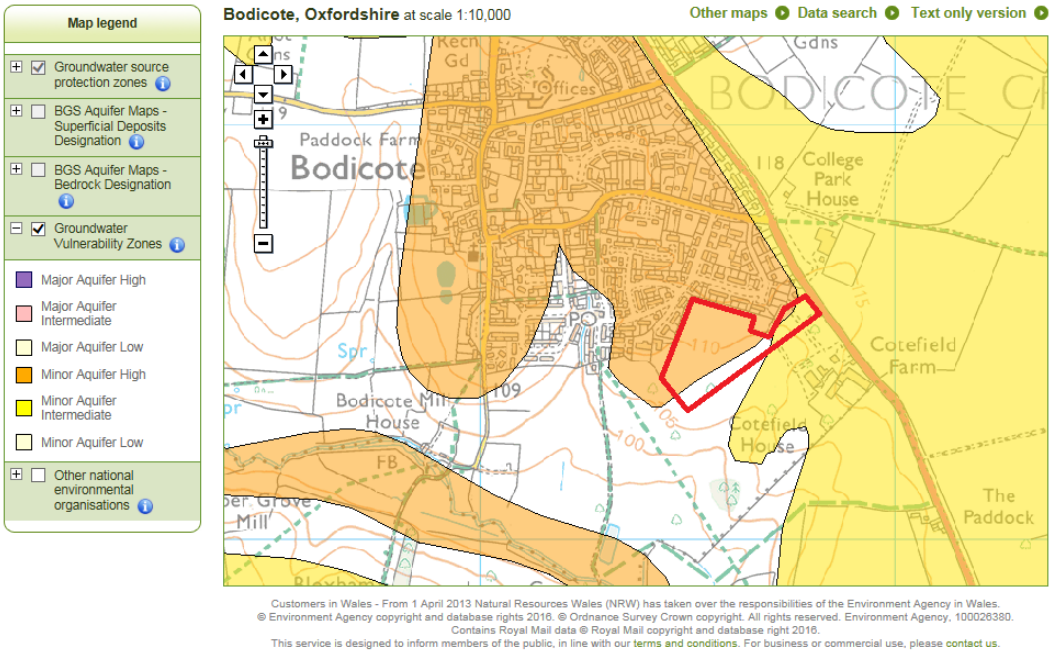
2.3.2 A man made reservoir, which receives surface water from the Banbury Rugby Club, is located approximately 385m to the southwest of the Site.

2.4 Underlying Geology

2.4.1 The 1:50,000 British Geological Survey maps have been analysed to establish the underlying geology of the area and show the Site to be underlain by the Marlstone Rock Formation – Ferruginous Limestone and Ironstone.

2.4.2 The 1:10,000 Environment Agency Groundwater Vulnerability Zone map for the area, shown in Figure 2.4 below, shows the Site is partially underlain by a Secondary Aquifer.

Figure 2.4: Environment Agency Groundwater Vulnerability Map



2.5 Groundwater

2.5.1 An additional Site Investigation was undertaken within the Site by 'The Brownfield Consultancy' in June/July 2016 with eleven trial pits excavated. It was reported that the material encountered were consistent with that of the previous investigation.

2.5.2 Groundwater was encountered within one trial pit, located towards the eastern boundary of the Site, at a depth of 3.5m below ground level.

2.5.3 The Site is not located within a Groundwater Source Protection Zone.

2.6 Existing Drainage

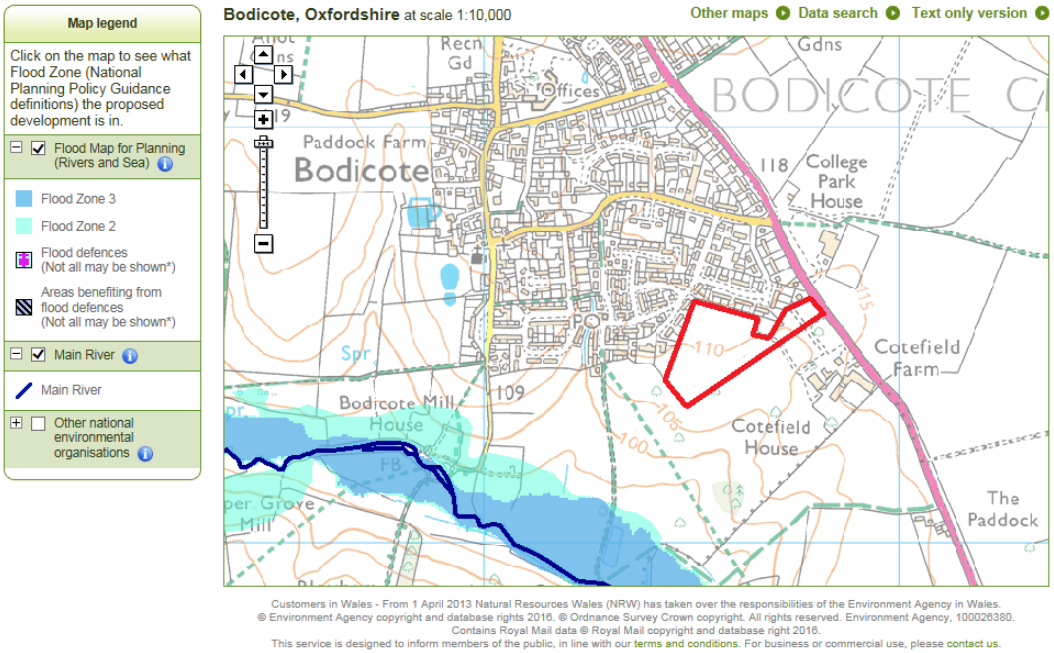
2.6.1 The Site is not served by any positive drainage systems.

3 ASSESSMENT OF FLOOD RISK

3.1 Fluvial Flooding

3.1.1 The Environment Agency's Flood Zone Map for the Site is shown in Figure 3.1 below. The map shows that the Site is situated entirely within Flood Zone 1 – Low Probability.

Figure 3.1: Environment Agency Flood Zone Map



3.1.2 The definitions of each flood zone are as follows:

Table 3.1: Flood Zone Definitions

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	**This zone comprises land where water has to flow or be stored in times of flood.** (Not separately distinguished from Zone 3a on the Flood Map.

3.2 Groundwater Flooding

3.2.1 Based upon the additional Site Investigation undertaken by 'The Brownfield Consultancy' the Site is not considered to be at risk of groundwater flooding.

3.3 Urban Drainage Flooding

3.3.1 The Site is considered to be at very low risk of flooding from existing drainage systems.

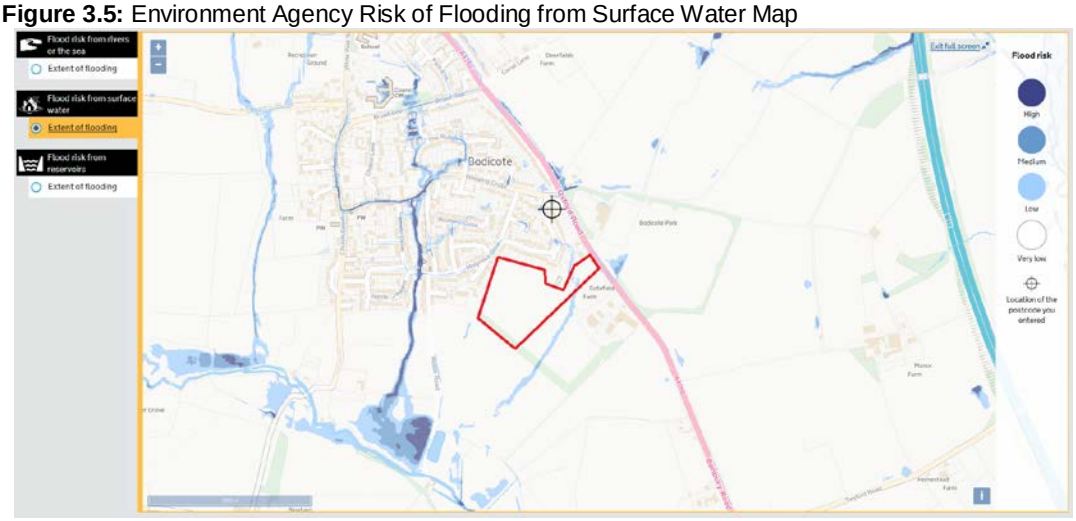
3.4 Reservoir Flooding

3.4.1 From inspection of the Environment Agency's Indicative Maps the site is not at risk from reservoir flooding.

3.5 Pluvial Flooding

3.5.1 The Environment Agency's 'Risk of Flooding from Surface Water' Map is shown in Figure 3.5 below. The Site is considered to be at a 'Very Low' risk of flooding from Surface Water.

Figure 3.5: Environment Agency Risk of Flooding from Surface Water Map



3.5.2 It should be noted that the Surface Water Flood Map has been created from the Environment Agency's nationally produced surface water flood mapping and, where appropriate, locally produced mapping from Lead Local Flood Authorities.

3.5.3 Due to the modelling techniques used the surface water mapping identifies depressions in the ground surface.

3.6 Potential Sources of Flooding

3.6.1 The most likely potential source of flooding to the Site is from the surface water runoff generated by the development; this is considered in more detail in Section 5.

3.7 Sequential Test

3.7.1 The Sequential Test ensures that a sequential approach is followed to steer new development to areas with the lowest probability of flooding. The aim is to steer new development to Flood Zone 1.

3.7.2 The Site is considered to be entirely within Flood Zone 1 and therefore the Site is considered to have passed the Sequential Test.

3.8 Exception Test

3.8.1 The Exception Test does not need to be applied for the proposed development.

4 THE DEVELOPMENT PROPOSALS

4.1 Proposed Layout

4.1.1 The Site will provide 86 dwellings as depicted on the Proposed Layout Drawing presented in Appendix II.

4.2 Proposed Levels

4.2.1 Proposed ground levels will closely resemble existing levels to minimise the import and export of materials as far as reasonably possible.

4.3 Area Take-off

4.3.1 The Site is Greenfield. Table 4.3 summarises the preliminary area take-off for the existing and proposed Sites.

Table 4.3: Area Take-Off.

Category	Area Take-off	
	Existing (ha)	Site (ha)
Impermeable Area (Draining to Watercourse)	0.00	1.26
Permeable Area	3.70	2.44
Site Area	3.70	3.70

4.3.2 The above area take-off is based on the Banners Gate Drainage Strategy plan presented in Appendix II.

5 SURFACE WATER DRAINAGE

5.1 Introduction

5.1.1 This section relates to surface water run-off resulting from rainfall over the post-developed Site and the methods of disposing of that surface water. It is also concerned with the risk of flooding due to the capacity of the post-development internal drainage.

5.1.2 The drainage calculations attached to this Assessment including calculations of discharge rate, attenuation storage and the proposed methods of providing attenuation are for assessing the level of risk and general feasibility and are therefore indicative only.

5.2 Greenfield Rates of Runoff

5.2.1 Different methodologies have been used within the previously completed Flood Risk Assessments to calculate the Greenfield runoff rates.

5.2.2 Following the publication of CIRIA Report C753 'The SuDS Manual' in 2015, which includes a table of acceptable runoff estimation methods, the methodology used within this Assessment is based on the newer ReFH2 method. The estimated Greenfield equivalent rates are summarised in the following table; calculations presented in Appendix I.

Table 5.2: Greenfield equivalent Runoff Rates – ReFH2 Method

Return Period (years)	Greenfield Rate of Runoff (l/s)
1	4.7
2	5.1
30	11.1
100	15.2

5.2.3 For the purposes of this Assessment, to provide a conservative drainage solution, it is recommended that storm events up to and including the 1 in 100 year, plus climate change, return period are restricted to the 2 year Greenfield rate.

5.3 Disposal Options

5.3.1 In accordance with the requirements of Part H of the Building Regulations the disposal of surface water shall be to one of the following, listed in order of priority:

- Infiltration to the ground, or where that is not reasonably practicable,
- A watercourse, or where that is not reasonably practicable,
- A sewer.

5.3.2 Based upon the previously completed investigations the use of infiltration techniques is considered a viable drainage solution for part of the Site.

5.3.3 For the areas where the use of infiltration techniques are not considered appropriate a restricted discharge to the Sor Brook is proposed.

5.4 Attenuation Storage Estimate

5.4.1 It will be necessary to provide on-site surface water attenuation storage solution to contain and control surface water runoff from storm events up to and including the 1 in 100 year, including an allowance for climate change, return period.

5.4.2 The calculated volumes of storage required are summarised in Table 5.4, calculations presented in Appendix I.

Table 5.4: Attenuation Storage Estimate

Return Period (years)	Climate change allowance	Attenuation Storage Estimate (m^3)
100	20%	717
	40%	870

5.5 Sustainable Drainage Systems (SuDS)

5.5.1 In accordance with national and local guidance it is a requirement for any new development to include sustainable surface water drainage systems as a technique to manage surface water regimes sustainably.

5.5.2 The Environment Agency has published "A Practical Guide" to assist in the design of SuDS. The guide lists various SuDS techniques which are described as varying from the most to the least sustainable. It is worth noting that all of the techniques shown offer the benefit of flood reduction. The techniques offering benefits of Pollution Reduction and Wildlife Benefit determine those described as "Most Sustainable."

Table 5.5: SuDS Techniques

Most Sustainable ↑ / ↓ Least Sustainable	SuDS Technique	Flood Reduction	Pollution Reduction	Landscape & Wildlife Benefit
	Living Roofs	✓	✓	✓
	Basins and Ponds - Constructed Wetlands - Balancing Ponds - Detention Basins - Retention Ponds	✓	✓	✓
	Filter strips and Swales	✓	✓	✓
	Infiltration Devices - Soakaways - Infiltration Trenches and Basins	✓	✓	✓
	Pervious surfaces and filter drains - Gravelled areas - Solid Paving Blocks - Porous Paviours	✓	✓	
	Tanked Systems - Over-sized pipes/tanks - Storm cells	✓		

5.5.3 Infiltration techniques will be used where appropriate in the form of soakaways and pervious paving.

5.5.4 The previously consented drainage strategy incorporated large below ground box culverts to provide attenuation storage. However an agreement has subsequently been made with an adjacent landowner to construct an open attenuation pond for attenuation storage purposes. This is considered an improvement on the previously consented scheme.

5.5.5 Due to the topography of the land on which the pond is to be constructed it is not possible to excavate the attenuation pond below natural ground level and so an earthen embankment dam will be constructed. As the proposed reservoir will not be capable of holding 25,000 cubic metres or more of water above natural ground level it will not need to be registered with the Environment Agency. The detailed design stage must ensure that the embankment is properly designed and it is recommended that the advice of a Geotechnical Engineer is sought in this respect.

5.6 Water Quality

5.6.1 In accordance with Table 26.2 of CIRIA Report C753 'The SuDS Manual' the pollution hazard level for the proposed residential development is 'Low' and therefore a simple index approach has been applied to ensure minimum water quality requirements are achieved.

5.6.2 The pollution hazard indices for the proposed development are summarised in Table 5.6.1.

Land Use	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential	0.5	0.4	0.4

Table 5.6.1: Pollution Hazard Indices (CIRIA Report C753 Table 26.2)

5.6.3 The indicative SuDS mitigation indices for discharges to surface waters for ponds and groundwater for pervious paving are summarised in Table 5.6.2.

Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Pond	0.7	0.7	0.5
Pervious Paving	0.7	0.6	0.7

Table 5.6.2: Indicative SuDS mitigation Indices for discharges to surface waters and groundwater (CIRIA Report C753 Tables 26.3 and 26.4)

5.6.4 As the proposed mitigation indices exceed the land use pollution hazard the proposed SuDS components are considered sufficient in providing pollution risk mitigation.

5.7 Surface Water Exceedance Flow Routes

5.7.1 In the event of a drainage network failure or the system being overwhelmed during extreme events flood water will generally be routed along the estate roads towards the pond.

5.8 SuDS Management

5.8.1 The ownership and responsibility of the proposed reservoir will be transferred on completion to a Management Company who will provide long-term management and maintenance for an annual management charge.

6 CONCLUSIONS

6.1 This Flood Risk Assessment has been prepared in support of amendments to a proposed residential development on land at Cotefield Field Farm which is located to the southeast of the village of Bodicote in Oxfordshire.

6.2 The Greenfield Site is characterised as Flood Zone 1 'Low Probability' and is considered to be at a low risk of flooding from all sources.

6.3 The use of infiltration techniques, as a method to dispose of surface water runoff, is considered viable for parts of the Site.

6.4 For areas where the use of infiltration techniques are not considered appropriate a restricted discharge to the Sor Brook is proposed.

6.5 It is proposed that surface water attenuation is provided within an off-site reservoir.

6.6 The proposed drainage scheme will comply with current guidance and promote the use of sustainable drainage systems as far as is reasonably possible.

6.7 The proposed development will not impede flood flow, will not result in a net loss of floodplain and will not have an adverse impact on flood risk within or external to the Site.

7 RECOMMENDATIONS

7.1 Based on the work carried out in the preparation of this report the following recommendations are made:

7.1 A Geotechnical Engineer should be consulted with respect to the construction detail of the proposed earthen dam.

7.2 Infiltration testing, in full accordance with BRE Digest 365, should be undertaken at various locations throughout the Site to inform the detailed design stage.

APPENDIX I – CALCULATIONS

UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:13:44 AM by Scott
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

Site details Checksum: A446-8834

Site name: 15031_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [0.55]*

Using plot scale calculations: Yes

Site description: None

Model run: 1 year

Summary of results

Rainfall - FEH 1999 (mm):	17.81	Total runoff (ML):	0.06
Total Rainfall (mm):	11.32	Total flow (ML):	0.12
Peak Rainfall (mm):	3.82	Peak flow (m³/s):	0.00

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	1	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.4601	0.0000	0.1821	0.0000	0.000584	0.000584
00:30:00	1.0298	0.0000	0.4099	0.0000	0.000576	0.000599
01:00:00	2.2579	0.0000	0.9093	0.0001	0.00057	0.00069
01:30:00	3.8242	0.0000	1.5734	0.0004	0.000565	0.000948
02:00:00	2.2579	0.0000	0.9486	0.0010	0.000567	0.00153
02:30:00	1.0298	0.0000	0.4375	0.0018	0.000579	0.00241
03:00:00	0.4601	0.0000	0.1964	0.0028	0.000603	0.00338
03:30:00	0.0000	0.0000	0.0000	0.0036	0.000639	0.00423
04:00:00	0.0000	0.0000	0.0000	0.0040	0.000683	0.00468
04:30:00	0.0000	0.0000	0.0000	0.0039	0.000729	0.00459
05:00:00	0.0000	0.0000	0.0000	0.0034	0.000769	0.00418
05:30:00	0.0000	0.0000	0.0000	0.0028	0.000802	0.00364
06:00:00	0.0000	0.0000	0.0000	0.0023	0.000827	0.00312
06:30:00	0.0000	0.0000	0.0000	0.0018	0.000844	0.00269
07:00:00	0.0000	0.0000	0.0000	0.0015	0.000856	0.00234
07:30:00	0.0000	0.0000	0.0000	0.0012	0.000863	0.00203
08:00:00	0.0000	0.0000	0.0000	0.0009	0.000865	0.00173
08:30:00	0.0000	0.0000	0.0000	0.0006	0.000864	0.00144
09:00:00	0.0000	0.0000	0.0000	0.0003	0.000858	0.00118
09:30:00	0.0000	0.0000	0.0000	0.0001	0.00085	0.00099
10:00:00	0.0000	0.0000	0.0000	0.0000	0.000839	0.000888
10:30:00	0.0000	0.0000	0.0000	0.0000	0.000828	0.00084
11:00:00	0.0000	0.0000	0.0000	0.0000	0.000817	0.000818
11:30:00	0.0000	0.0000	0.0000	0.0000	0.000806	0.000806
12:00:00	0.0000	0.0000	0.0000	0.0000	0.000795	0.000795
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000785	0.000785
13:00:00	0.0000	0.0000	0.0000	0.0000	0.000774	0.000774
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000763	0.000763
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000753	0.000753
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000743	0.000743
15:00:00	0.0000	0.0000	0.0000	0.0000	0.000733	0.000733
15:30:00	0.0000	0.0000	0.0000	0.0000	0.000723	0.000723
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000713	0.000713
16:30:00	0.0000	0.0000	0.0000	0.0000	0.000703	0.000703
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000694	0.000694

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000684	0.000684
18:00:00	0.0000	0.0000	0.0000	0.0000	0.000675	0.000675
18:30:00	0.0000	0.0000	0.0000	0.0000	0.000666	0.000666
19:00:00	0.0000	0.0000	0.0000	0.0000	0.000657	0.000657
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000648	0.000648
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000639	0.000639
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00063	0.00063
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000622	0.000622
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000613	0.000613
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000605	0.000605
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000597	0.000597
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000589	0.000589

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km²)	0.01 [0.55]	**Yes**
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	**Yes**
DPLBAR (km)	0.71	No
DPSBAR (mkm-¹)	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	**Yes**
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km²)	0 [0.01]	**Yes**
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:14:01 AM by Scott
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

Site details Checksum: A446-8834

Site name: 15031_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [0.55]*

Using plot scale calculations: Yes

Site description: None

Model run: 2 year

Summary of results

Rainfall - FEH 1999 (mm):	19.67	Total runoff (ML):	0.06
Total Rainfall (mm):	12.50	Total flow (ML):	0.13
Peak Rainfall (mm):	4.22	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	1	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	0.5080	0.0000	0.2012	0.0000	0.000584	0.000584
00:30:00	1.1370	0.0000	0.4529	0.0000	0.000576	0.000602
01:00:00	2.4931	0.0000	1.0060	0.0001	0.00057	0.000702
01:30:00	4.2225	0.0000	1.7445	0.0004	0.000566	0.000989
02:00:00	2.4931	0.0000	1.0539	0.0011	0.000568	0.00163
02:30:00	1.1370	0.0000	0.4866	0.0020	0.000582	0.00261
03:00:00	0.5080	0.0000	0.2186	0.0031	0.00061	0.00369
03:30:00	0.0000	0.0000	0.0000	0.0040	0.000651	0.00463
04:00:00	0.0000	0.0000	0.0000	0.0044	0.0007	0.00514
04:30:00	0.0000	0.0000	0.0000	0.0043	0.000751	0.00504
05:00:00	0.0000	0.0000	0.0000	0.0038	0.000797	0.00458
05:30:00	0.0000	0.0000	0.0000	0.0032	0.000835	0.00399
06:00:00	0.0000	0.0000	0.0000	0.0025	0.000863	0.0034
06:30:00	0.0000	0.0000	0.0000	0.0021	0.000883	0.00293
07:00:00	0.0000	0.0000	0.0000	0.0016	0.000897	0.00255
07:30:00	0.0000	0.0000	0.0000	0.0013	0.000905	0.0022
08:00:00	0.0000	0.0000	0.0000	0.0010	0.000908	0.00186
08:30:00	0.0000	0.0000	0.0000	0.0006	0.000907	0.00155
09:00:00	0.0000	0.0000	0.0000	0.0004	0.000902	0.00126
09:30:00	0.0000	0.0000	0.0000	0.0002	0.000893	0.00105
10:00:00	0.0000	0.0000	0.0000	0.0001	0.000882	0.000936
10:30:00	0.0000	0.0000	0.0000	0.0000	0.000871	0.000884
11:00:00	0.0000	0.0000	0.0000	0.0000	0.000859	0.00086
11:30:00	0.0000	0.0000	0.0000	0.0000	0.000848	0.000848
12:00:00	0.0000	0.0000	0.0000	0.0000	0.000836	0.000836
12:30:00	0.0000	0.0000	0.0000	0.0000	0.000825	0.000825
13:00:00	0.0000	0.0000	0.0000	0.0000	0.000813	0.000813
13:30:00	0.0000	0.0000	0.0000	0.0000	0.000802	0.000802
14:00:00	0.0000	0.0000	0.0000	0.0000	0.000792	0.000792
14:30:00	0.0000	0.0000	0.0000	0.0000	0.000781	0.000781
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00077	0.00077
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00076	0.00076
16:00:00	0.0000	0.0000	0.0000	0.0000	0.000749	0.000749
16:30:00	0.0000	0.0000	0.0000	0.0000	0.000739	0.000739
17:00:00	0.0000	0.0000	0.0000	0.0000	0.000729	0.000729

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.000719	0.000719
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00071	0.00071
18:30:00	0.0000	0.0000	0.0000	0.0000	0.0007	0.0007
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00069	0.00069
19:30:00	0.0000	0.0000	0.0000	0.0000	0.000681	0.000681
20:00:00	0.0000	0.0000	0.0000	0.0000	0.000672	0.000672
20:30:00	0.0000	0.0000	0.0000	0.0000	0.000663	0.000663
21:00:00	0.0000	0.0000	0.0000	0.0000	0.000654	0.000654
21:30:00	0.0000	0.0000	0.0000	0.0000	0.000645	0.000645
22:00:00	0.0000	0.0000	0.0000	0.0000	0.000636	0.000636
22:30:00	0.0000	0.0000	0.0000	0.0000	0.000627	0.000627
23:00:00	0.0000	0.0000	0.0000	0.0000	0.000619	0.000619
23:30:00	0.0000	0.0000	0.0000	0.0000	0.000611	0.000611
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000602	0.000602
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000594	0.000594

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km²)	0.01 [0.55]	**Yes**
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	**Yes**
DPLBAR (km)	0.71	No
DPSBAR (mkm-¹)	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	**Yes**
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km²)	0 [0.01]	**Yes**
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:14:15 AM by Scott
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

Site details Checksum: A446-8834

Site name: 15031_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [0.55]*

Using plot scale calculations: Yes

Site description: None

Model run: 30 year

Summary of results

Rainfall - FEH 1999 (mm):	44.27	Total runoff (ML):	0.15
Total Rainfall (mm):	28.13	Total flow (ML):	0.30
Peak Rainfall (mm):	9.50	Peak flow (m³/s):	0.01

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	0.97	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	1.1433	0.0000	0.4390	0.0000	0.000584	0.000584
00:30:00	2.5590	0.0000	0.9962	0.0001	0.000577	0.000632
01:00:00	5.6108	0.0000	2.2498	0.0003	0.000571	0.000862
01:30:00	9.5029	0.0000	4.0160	0.0009	0.000572	0.00151
02:00:00	5.6108	0.0000	2.4925	0.0024	0.000587	0.00295
02:30:00	2.5590	0.0000	1.1667	0.0046	0.000627	0.00519
03:00:00	1.1433	0.0000	0.5273	0.0070	0.000699	0.00769
03:30:00	0.0000	0.0000	0.0000	0.0091	0.000802	0.0099
04:00:00	0.0000	0.0000	0.0000	0.0102	0.000925	0.0111
04:30:00	0.0000	0.0000	0.0000	0.0099	0.00105	0.011
05:00:00	0.0000	0.0000	0.0000	0.0088	0.00117	0.00994
05:30:00	0.0000	0.0000	0.0000	0.0073	0.00126	0.00858
06:00:00	0.0000	0.0000	0.0000	0.0059	0.00134	0.00723
06:30:00	0.0000	0.0000	0.0000	0.0048	0.00139	0.00615
07:00:00	0.0000	0.0000	0.0000	0.0038	0.00143	0.00526
07:30:00	0.0000	0.0000	0.0000	0.0030	0.00146	0.00447
08:00:00	0.0000	0.0000	0.0000	0.0022	0.00148	0.00371
08:30:00	0.0000	0.0000	0.0000	0.0015	0.00149	0.00298
09:00:00	0.0000	0.0000	0.0000	0.0008	0.00148	0.00233
09:30:00	0.0000	0.0000	0.0000	0.0004	0.00147	0.00184
10:00:00	0.0000	0.0000	0.0000	0.0001	0.00145	0.00158
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00143	0.00147
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
11:30:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
13:00:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00132	0.00132
14:00:00	0.0000	0.0000	0.0000	0.0000	0.0013	0.0013
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00125	0.00125
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00123	0.00123
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
17:00:00	0.0000	0.0000	0.0000	0.0000	0.0012	0.0012

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00115	0.00115
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00112	0.00112
20:00:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00109	0.00109
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00106	0.00106
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00103	0.00103
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
24:00:00	0.0000	0.0000	0.0000	0.0000	0.000992	0.000992
24:30:00	0.0000	0.0000	0.0000	0.0000	0.000979	0.000979
25:00:00	0.0000	0.0000	0.0000	0.0000	0.000965	0.000965
25:30:00	0.0000	0.0000	0.0000	0.0000	0.000952	0.000952
26:00:00	0.0000	0.0000	0.0000	0.0000	0.000939	0.000939
26:30:00	0.0000	0.0000	0.0000	0.0000	0.000927	0.000927
27:00:00	0.0000	0.0000	0.0000	0.0000	0.000914	0.000914
27:30:00	0.0000	0.0000	0.0000	0.0000	0.000902	0.000902
28:00:00	0.0000	0.0000	0.0000	0.0000	0.000889	0.000889
28:30:00	0.0000	0.0000	0.0000	0.0000	0.000877	0.000877
29:00:00	0.0000	0.0000	0.0000	0.0000	0.000865	0.000865
29:30:00	0.0000	0.0000	0.0000	0.0000	0.000854	0.000854
30:00:00	0.0000	0.0000	0.0000	0.0000	0.000842	0.000842
30:30:00	0.0000	0.0000	0.0000	0.0000	0.000831	0.000831
31:00:00	0.0000	0.0000	0.0000	0.0000	0.000819	0.000819
31:30:00	0.0000	0.0000	0.0000	0.0000	0.000808	0.000808
32:00:00	0.0000	0.0000	0.0000	0.0000	0.000797	0.000797
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000787	0.000787
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000776	0.000776
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000765	0.000765
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000755	0.000755
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000745	0.000745
35:00:00	0.0000	0.0000	0.0000	0.0000	0.000735	0.000735

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000725	0.000725
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000715	0.000715
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000705	0.000705
37:00:00	0.0000	0.0000	0.0000	0.0000	0.000696	0.000696
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000686	0.000686
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000677	0.000677
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000668	0.000668
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000659	0.000659
39:30:00	0.0000	0.0000	0.0000	0.0000	0.00065	0.00065
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000641	0.000641
40:30:00	0.0000	0.0000	0.0000	0.0000	0.000632	0.000632
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000624	0.000624
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000615	0.000615
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000607	0.000607
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000598	0.000598
43:00:00	0.0000	0.0000	0.0000	0.0000	0.00059	0.00059

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km²)	0.01 [0.55]	**Yes**
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	**Yes**
DPLBAR (km)	0.71	No
DPSBAR (mkm-¹)	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	**Yes**
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km²)	0 [0.01]	**Yes**
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

UK Design Flood Estimation

Generated on Friday, December 09, 2016 10:14:26 AM by Scott
Printed from the ReFH Flood Modelling software package, version 2.2.6029.28099

Summary of estimate using the Flood Estimation Handbook revitalised flood hydrograph method (ReFH)

Site details Checksum: A446-8834

Site name: 15031_FEH

Easting: 446250

Northing: 237450

Country: England, Wales or Northern Ireland

Catchment Area (km²): 0.01 [0.55]*

Using plot scale calculations: Yes

Site description: None

Model run: 100 year

Summary of results

Rainfall - FEH 1999 (mm):	61.38	Total runoff (ML):	0.21
Total Rainfall (mm):	39.00	Total flow (ML):	0.42
Peak Rainfall (mm):	13.18	Peak flow (m³/s):	0.02

Parameters

Where the user has overriden a system-generated value, this original value is shown in square brackets after the value used.
** Indicates that the user locked the duration/timestep*

Rainfall parameters (Rainfall - FEH 1999 model)

Name	Value	User-defined?
Duration (hh:mm:ss)	03:30:00	No
Timestep (hh:mm:ss)	00:30:00	No
SCF (Seasonal correction factor)	0.64	No
ARF (Areal reduction factor)	1 [0.99]	Yes
Seasonality	Winter	n/a

Loss model parameters

Name	Value	User-defined?
Cini (mm)	138.12	No
Cmax (mm)	349.45	No
Use alpha correction factor	Yes	No
Alpha correction factor	0.92	No

Routing model parameters

Name	Value	User-defined?
Tp (hr)	2.13 [1]	Yes
Up	0.65	No
Uk	0.8	No

Baseflow model parameters

Name	Value	User-defined?
BF0 (m^3/s)	0	No
BL (hr)	36.6 [27.87]	Yes
BR	1.02	No

Urbanisation parameters

Name	Value	User-defined?
Urban area (km^2)	0 [0.01]	Yes
Urbext 2000	0 [0.28]	Yes
Impervious runoff factor	0.7	No
Imperviousness factor	0.3	No
Tp scaling factor	0.5	No
Sewered area (km^2)	0.00	Yes
Sewer capacity (m^3/s)	0.00	Yes

Time series data

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
00:00:00	1.5852	0.0000	0.5829	0.0000	0.000584	0.000584
00:30:00	3.5481	0.0000	1.3308	0.0001	0.000577	0.00065
01:00:00	7.7796	0.0000	3.0439	0.0004	0.000572	0.000959
01:30:00	13.1762	0.0000	5.5506	0.0013	0.000576	0.00183
02:00:00	7.7796	0.0000	3.5104	0.0032	0.000599	0.00379
02:30:00	3.5481	0.0000	1.6586	0.0062	0.000656	0.00687
03:00:00	1.5852	0.0000	0.7527	0.0096	0.000757	0.0103
03:30:00	0.0000	0.0000	0.0000	0.0125	0.0009	0.0134
04:00:00	0.0000	0.0000	0.0000	0.0141	0.00107	0.0152
04:30:00	0.0000	0.0000	0.0000	0.0137	0.00125	0.015
05:00:00	0.0000	0.0000	0.0000	0.0122	0.00141	0.0136
05:30:00	0.0000	0.0000	0.0000	0.0102	0.00155	0.0117
06:00:00	0.0000	0.0000	0.0000	0.0082	0.00166	0.00985
06:30:00	0.0000	0.0000	0.0000	0.0066	0.00174	0.00835
07:00:00	0.0000	0.0000	0.0000	0.0053	0.0018	0.00712
07:30:00	0.0000	0.0000	0.0000	0.0042	0.00184	0.00602
08:00:00	0.0000	0.0000	0.0000	0.0031	0.00186	0.00497
08:30:00	0.0000	0.0000	0.0000	0.0021	0.00188	0.00397
09:00:00	0.0000	0.0000	0.0000	0.0012	0.00187	0.00307
09:30:00	0.0000	0.0000	0.0000	0.0005	0.00186	0.00239
10:00:00	0.0000	0.0000	0.0000	0.0002	0.00184	0.00202
10:30:00	0.0000	0.0000	0.0000	0.0000	0.00182	0.00186
11:00:00	0.0000	0.0000	0.0000	0.0000	0.00179	0.00179
11:30:00	0.0000	0.0000	0.0000	0.0000	0.00177	0.00177
12:00:00	0.0000	0.0000	0.0000	0.0000	0.00174	0.00174
12:30:00	0.0000	0.0000	0.0000	0.0000	0.00172	0.00172
13:00:00	0.0000	0.0000	0.0000	0.0000	0.0017	0.0017
13:30:00	0.0000	0.0000	0.0000	0.0000	0.00167	0.00167
14:00:00	0.0000	0.0000	0.0000	0.0000	0.00165	0.00165
14:30:00	0.0000	0.0000	0.0000	0.0000	0.00163	0.00163
15:00:00	0.0000	0.0000	0.0000	0.0000	0.00161	0.00161
15:30:00	0.0000	0.0000	0.0000	0.0000	0.00158	0.00158
16:00:00	0.0000	0.0000	0.0000	0.0000	0.00156	0.00156
16:30:00	0.0000	0.0000	0.0000	0.0000	0.00154	0.00154
17:00:00	0.0000	0.0000	0.0000	0.0000	0.00152	0.00152

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
17:30:00	0.0000	0.0000	0.0000	0.0000	0.0015	0.0015
18:00:00	0.0000	0.0000	0.0000	0.0000	0.00148	0.00148
18:30:00	0.0000	0.0000	0.0000	0.0000	0.00146	0.00146
19:00:00	0.0000	0.0000	0.0000	0.0000	0.00144	0.00144
19:30:00	0.0000	0.0000	0.0000	0.0000	0.00142	0.00142
20:00:00	0.0000	0.0000	0.0000	0.0000	0.0014	0.0014
20:30:00	0.0000	0.0000	0.0000	0.0000	0.00138	0.00138
21:00:00	0.0000	0.0000	0.0000	0.0000	0.00136	0.00136
21:30:00	0.0000	0.0000	0.0000	0.0000	0.00134	0.00134
22:00:00	0.0000	0.0000	0.0000	0.0000	0.00133	0.00133
22:30:00	0.0000	0.0000	0.0000	0.0000	0.00131	0.00131
23:00:00	0.0000	0.0000	0.0000	0.0000	0.00129	0.00129
23:30:00	0.0000	0.0000	0.0000	0.0000	0.00127	0.00127
24:00:00	0.0000	0.0000	0.0000	0.0000	0.00126	0.00126
24:30:00	0.0000	0.0000	0.0000	0.0000	0.00124	0.00124
25:00:00	0.0000	0.0000	0.0000	0.0000	0.00122	0.00122
25:30:00	0.0000	0.0000	0.0000	0.0000	0.00121	0.00121
26:00:00	0.0000	0.0000	0.0000	0.0000	0.00119	0.00119
26:30:00	0.0000	0.0000	0.0000	0.0000	0.00117	0.00117
27:00:00	0.0000	0.0000	0.0000	0.0000	0.00116	0.00116
27:30:00	0.0000	0.0000	0.0000	0.0000	0.00114	0.00114
28:00:00	0.0000	0.0000	0.0000	0.0000	0.00113	0.00113
28:30:00	0.0000	0.0000	0.0000	0.0000	0.00111	0.00111
29:00:00	0.0000	0.0000	0.0000	0.0000	0.0011	0.0011
29:30:00	0.0000	0.0000	0.0000	0.0000	0.00108	0.00108
30:00:00	0.0000	0.0000	0.0000	0.0000	0.00107	0.00107
30:30:00	0.0000	0.0000	0.0000	0.0000	0.00105	0.00105
31:00:00	0.0000	0.0000	0.0000	0.0000	0.00104	0.00104
31:30:00	0.0000	0.0000	0.0000	0.0000	0.00102	0.00102
32:00:00	0.0000	0.0000	0.0000	0.0000	0.00101	0.00101
32:30:00	0.0000	0.0000	0.0000	0.0000	0.000996	0.000996
33:00:00	0.0000	0.0000	0.0000	0.0000	0.000982	0.000982
33:30:00	0.0000	0.0000	0.0000	0.0000	0.000969	0.000969
34:00:00	0.0000	0.0000	0.0000	0.0000	0.000956	0.000956
34:30:00	0.0000	0.0000	0.0000	0.0000	0.000943	0.000943
35:00:00	0.0000	0.0000	0.0000	0.0000	0.00093	0.00093

Time (hh:mm:ss)	Rain (mm)	Sewer Loss (mm)	Net Rain (mm)	Runoff (m^3/s)	Baseflow (m^3/s)	Total Flow (m^3/s)
35:30:00	0.0000	0.0000	0.0000	0.0000	0.000917	0.000917
36:00:00	0.0000	0.0000	0.0000	0.0000	0.000905	0.000905
36:30:00	0.0000	0.0000	0.0000	0.0000	0.000892	0.000892
37:00:00	0.0000	0.0000	0.0000	0.0000	0.00088	0.00088
37:30:00	0.0000	0.0000	0.0000	0.0000	0.000868	0.000868
38:00:00	0.0000	0.0000	0.0000	0.0000	0.000857	0.000857
38:30:00	0.0000	0.0000	0.0000	0.0000	0.000845	0.000845
39:00:00	0.0000	0.0000	0.0000	0.0000	0.000834	0.000834
39:30:00	0.0000	0.0000	0.0000	0.0000	0.000822	0.000822
40:00:00	0.0000	0.0000	0.0000	0.0000	0.000811	0.000811
40:30:00	0.0000	0.0000	0.0000	0.0000	0.0008	0.0008
41:00:00	0.0000	0.0000	0.0000	0.0000	0.000789	0.000789
41:30:00	0.0000	0.0000	0.0000	0.0000	0.000778	0.000778
42:00:00	0.0000	0.0000	0.0000	0.0000	0.000768	0.000768
42:30:00	0.0000	0.0000	0.0000	0.0000	0.000757	0.000757
43:00:00	0.0000	0.0000	0.0000	0.0000	0.000747	0.000747
43:30:00	0.0000	0.0000	0.0000	0.0000	0.000737	0.000737
44:00:00	0.0000	0.0000	0.0000	0.0000	0.000727	0.000727
44:30:00	0.0000	0.0000	0.0000	0.0000	0.000717	0.000717
45:00:00	0.0000	0.0000	0.0000	0.0000	0.000707	0.000707
45:30:00	0.0000	0.0000	0.0000	0.0000	0.000698	0.000698
46:00:00	0.0000	0.0000	0.0000	0.0000	0.000688	0.000688
46:30:00	0.0000	0.0000	0.0000	0.0000	0.000679	0.000679
47:00:00	0.0000	0.0000	0.0000	0.0000	0.00067	0.00067
47:30:00	0.0000	0.0000	0.0000	0.0000	0.000661	0.000661
48:00:00	0.0000	0.0000	0.0000	0.0000	0.000652	0.000652
48:30:00	0.0000	0.0000	0.0000	0.0000	0.000643	0.000643
49:00:00	0.0000	0.0000	0.0000	0.0000	0.000634	0.000634
49:30:00	0.0000	0.0000	0.0000	0.0000	0.000626	0.000626
50:00:00	0.0000	0.0000	0.0000	0.0000	0.000617	0.000617
50:30:00	0.0000	0.0000	0.0000	0.0000	0.000609	0.000609
51:00:00	0.0000	0.0000	0.0000	0.0000	0.0006	0.0006
51:30:00	0.0000	0.0000	0.0000	0.0000	0.000592	0.000592

Appendix

Catchment descriptors *

Name	Value	User-defined value used?
Area (km²)	0.01 [0.55]	**Yes**
ALTBAR	118	No
ASPBAR	180	No
ASPVAR	0.74	No
BFIHOST	0.44 [0.83]	**Yes**
DPLBAR (km)	0.71	No
DPSBAR (mkm-¹)	18.1	No
FARL	1	No
LDP	1.44	No
PROPWET (mm)	0.32	No
RMED1H	10.5	No
RMED1D	32.1	No
RMED2D	39.9	No
SAAR (mm)	644	No
SAAR4170 (mm)	683	No
SPRHOST	16.86	No
Urbext2000	0 [0.28]	**Yes**
Urbext1990	0.31	No
URBCONC	0.89	No
URBLOC	0.78	No
Urban Area (km²)	0 [0.01]	**Yes**
DDF parameter C	-0.02	No
DDF parameter D1	0.31	No
DDF parameter D2	0.32	No
DDF parameter D3	0.25	No
DDF parameter E	0.3	No
DDF parameter F	2.49	No
DDF parameter C (1km grid value)	-0.02	No
DDF parameter D1 (1km grid value)	0.31	No
DDF parameter D2 (1km grid value)	0.32	No
DDF parameter D3 (1km grid value)	0.25	No
DDF parameter E (1km grid value)	0.3	No
DDF parameter F (1km grid value)	2.5	No

Values in square brackets are the original values loaded from the FEH Web Service or FEH CD-ROM

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 15031 - SWS NETWORK 1.SWS

Pipe Sizes 15031 - SWS NETWORK 1 Manhole Sizes 15031 - SWS NETWORK 1

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.415	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for 15031 - SWS NETWORK 1.SWS

« - Indicates pipe capacity < flow

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)	Auto Design
S1.000	15.917	0.096	165.8	0.023	6.00	0.0	0.600		o	225	
S1.001	23.213	0.139	167.0	0.024	0.00	0.0	0.600		o	225	
S2.000	17.584	0.985	17.9	0.034	6.00	0.0	0.600		o	225	
S3.000	11.509	0.685	16.8	0.019	6.00	0.0	0.600		o	225	
S1.002	19.036	0.114	167.0	0.013	0.00	0.0	0.600		o	300	
S1.003	50.257	0.801	62.7	0.050	0.00	0.0	0.600		o	300	
S1.004	14.704	0.356	41.3	0.010	0.00	0.0	0.600		o	300	
S1.005	25.186	0.894	28.2	0.020	0.00	0.0	0.600		o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.21	6.26	113.400	0.023	0.0	0.0	0.0	1.01	40.3	3.1
S1.001	48.77	6.65	113.304	0.047	0.0	0.0	0.0	1.01	40.1	6.2
S2.000	50.87	6.09	114.150	0.034	0.0	0.0	0.0	3.11	123.7	4.7
S3.000	51.01	6.06	113.850	0.019	0.0	0.0	0.0	3.21	127.6	2.6
S1.002	47.84	6.91	113.090	0.113	0.0	0.0	0.0	1.21	85.8	14.6
S1.003	46.42	7.33	112.976	0.163	0.0	0.0	0.0	1.99	140.5	20.5
S1.004	46.10	7.43	112.175	0.173	0.0	0.0	0.0	2.45	173.4	21.6
S1.005	45.71	7.55	111.744	0.193	0.0	0.0	0.0	3.43	378.3	23.9

Network Design Table for 15031 - SWS NETWORK 1.SWS

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)	Auto Design
S1.006	17.298	0.850	20.4	0.061	0.00	0.0	0.600		o	375	
S1.007	22.140	0.071	311.8	0.072	0.00	0.0	0.600		o	375	
S1.008	19.772	0.063	313.8	0.038	0.00	0.0	0.600		o	375	
S1.009	18.847	0.060	314.1	0.038	0.00	0.0	0.600		o	375	
S4.000	6.834	0.837	8.2	0.042	6.00	0.0	0.600		o	225	
S4.001	12.759	2.127	6.0	0.009	0.00	0.0	0.600		o	225	
S1.010	19.837	0.063	314.9	0.014	0.00	0.0	0.600		o	375	
S1.011	13.678	0.044	310.9	0.009	0.00	0.0	0.600		o	375	
S1.012	27.821	2.933	9.5	0.083	0.00	0.0	0.600		o	375	
S5.000	22.624	0.873	25.9	0.056	6.00	0.0	0.600		o	225	
S5.001	34.708	3.419	10.2	0.027	0.00	0.0	0.600		o	225	
S6.000	8.097	0.240	33.7	0.034	6.00	0.0	0.600		o	225	
S6.001	8.524	0.250	34.1	0.025	0.00	0.0	0.600		o	225	
S6.002	33.930	2.242	15.1	0.065	0.00	0.0	0.600		o	225	
S5.002	20.655	0.351	58.8	0.017	0.00	0.0	0.600		o	300	
S5.003	41.833	1.670	25.0	0.071	0.00	0.0	0.600		o	300	
S5.004	9.195	0.412	22.3	0.021	0.00	0.0	0.600		o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	45.49	7.62	110.850	0.254	0.0	0.0	0.0	4.03	445.3	31.3
S1.007	44.39	7.98	110.000	0.326	0.0	0.0	0.0	1.02	112.7	39.2
S1.008	43.46	8.31	109.929	0.364	0.0	0.0	0.0	1.02	112.4	42.8
S1.009	42.63	8.62	109.866	0.402	0.0	0.0	0.0	1.02	112.3	46.4
S4.000	51.15	6.02	112.920	0.042	0.0	0.0	0.0	4.61	183.2	5.8
S4.001	50.99	6.06	112.083	0.051	0.0	0.0	0.0	5.38	213.8	7.0
S1.010	41.82	8.94	109.806	0.467	0.0	0.0	0.0	1.02	112.2	52.9
S1.011	41.29	9.16	109.743	0.476	0.0	0.0	0.0	1.02	112.9	53.2
S1.012	41.11	9.24	109.699	0.559	0.0	0.0	0.0	5.91	653.0	62.2
S5.000	50.67	6.15	114.250	0.056	0.0	0.0	0.0	2.58	102.6	7.7
S5.001	50.12	6.29	113.377	0.083	0.0	0.0	0.0	4.13	164.2	11.3
S6.000	51.01	6.06	112.690	0.034	0.0	0.0	0.0	2.26	89.9	4.7
S6.001	50.76	6.12	112.450	0.059	0.0	0.0	0.0	2.25	89.4	8.1
S6.002	50.10	6.29	112.200	0.124	0.0	0.0	0.0	3.38	134.4	16.8
S5.002	49.46	6.46	109.883	0.224	0.0	0.0	0.0	2.05	145.2	30.0
S5.003	48.65	6.68	109.532	0.295	0.0	0.0	0.0	3.15	223.0	38.9
S5.004	48.48	6.72	107.862	0.316	0.0	0.0	0.0	3.34	236.3	41.5

Network Design Table for 15031 - SWS NETWORK 1.SWS

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)	Auto Design
S7.000	32.291	2.584	12.5	0.033	6.00	0.0	0.600		o	225	
S7.001	25.012	1.416	17.7	0.030	0.00	0.0	0.600		o	225	
S7.002	35.845	0.192	186.7	0.027	0.00	0.0	0.600		o	225	
S7.003	20.469	0.175	117.0	0.013	0.00	0.0	0.600		o	225	
S5.005	35.787	0.093	384.8	0.055	0.00	0.0	0.600		o	450	
S5.006	26.879	0.070	384.0	0.028	0.00	0.0	0.600		o	450	
S5.007	40.810	0.106	385.0	0.026	0.00	0.0	0.600		o	450	
S5.008	8.857	0.286	31.0	0.040	0.00	0.0	0.600		o	450	
S8.000	15.524	2.587	6.0	0.020	6.00	0.0	0.600		o	225	
S5.009	20.636	0.054	382.1	0.026	0.00	0.0	0.600		o	450	
S1.013	10.758	0.024	455.0	0.040	0.00	0.0	0.600		o	525	
S1.014	55.377	0.122	453.9	0.020	0.00	0.0	0.600		o	525	
S1.015	9.351	0.021	445.3	0.020	0.00	0.0	0.600		o	525	
S1.016	8.024	0.018	445.8	0.005	0.00	0.0	0.600		o	525	
S1.017	65.052	1.431	45.5	0.000	0.00	0.0	0.600		o	525	
S1.018	68.320	3.750	18.2	0.000	0.00	0.0	0.600		o	525	
S1.019	91.176	1.500	60.8	0.000	0.00	0.0		0.045	3 \=/	1000	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.000	50.67	6.14	111.892	0.033	0.0	0.0	0.0	3.72	148.0	4.5
S7.001	50.15	6.28	109.308	0.063	0.0	0.0	0.0	3.13	124.4	8.6
S7.002	47.85	6.90	107.892	0.090	0.0	0.0	0.0	0.95	37.9	11.7
S7.003	46.88	7.19	107.700	0.103	0.0	0.0	0.0	1.21	48.0	13.1
S5.005	45.04	7.77	107.300	0.474	0.0	0.0	0.0	1.03	163.9	57.8
S5.006	43.77	8.20	107.207	0.502	0.0	0.0	0.0	1.03	164.0	59.5
S5.007	42.02	8.86	107.137	0.528	0.0	0.0	0.0	1.03	163.8	60.1
S5.008	41.92	8.90	107.031	0.568	0.0	0.0	0.0	3.66	582.7	64.5
S8.000	51.06	6.05	109.557	0.020	0.0	0.0	0.0	5.38	213.8	2.8
S5.009	41.13	9.23	106.745	0.614	0.0	0.0	0.0	1.03	164.4	68.4
S1.013	40.71	9.42	106.616	1.213	0.0	0.0	0.0	1.04	225.9	133.8
S1.014	38.82	10.30	106.592	1.233	0.0	0.0	0.0	1.04	226.2	133.8
S1.015	38.52	10.45	106.470	1.253	0.0	0.0	0.0	1.05	228.4	133.8
S1.016	38.27	10.57	106.449	1.258	0.0	0.0	0.0	1.05	228.2	133.8
S1.017	37.64	10.90	106.431	1.258	0.0	0.0	0.0	3.33	720.6	133.8
S1.018	37.24	11.12	105.000	1.258	0.0	0.0	0.0	5.27	1139.8	133.8
S1.019	33.49	13.41	101.000	1.258	0.0	0.0	0.0	0.66	143.7	133.8

Network Design Table for 15031 - SWS NETWORK 1.SWS

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)	Auto Design
S1.020	37.385	0.100	373.9	0.000	0.00	0.0		0.045	3 \=/	1000	
S1.021	83.489	2.900	28.8	0.000	0.00	0.0	0.600		o	300	
S1.022	93.762	2.200	42.6	0.000	0.00	0.0	0.600		o	300	
S1.023	85.665	0.500	171.3	0.000	0.00	0.0	0.600		o	300	
S1.024	15.465	0.070	220.9	0.000	0.00	0.0	0.600		o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.020	30.47	15.75	97.100	1.258	0.0	0.0	0.0	0.27	57.9«	133.8
S1.021	29.93	16.23	95.500	1.258	0.0	0.0	0.0	2.94	207.9	133.8
S1.022	29.24	16.87	92.600	1.258	0.0	0.0	0.0	2.42	170.7	133.8
S1.023	28.04	18.07	90.400	1.258	0.0	0.0	0.0	1.20	84.7«	133.8
S1.024	27.81	18.31	89.900	1.258	0.0	0.0	0.0	1.05	74.5«	133.8

Manhole Schedules for 15031 - SWS NETWORK 1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S2	115.054	1.654	Open Manhole	1200	S1.000	113.400	225				
S4	115.266	1.962	Open Manhole	1200	S1.001	113.304	225	S1.000	113.304	225	
S6	115.742	1.592	Open Manhole	1200	S2.000	114.150	225				
S8	115.459	1.609	Open Manhole	1200	S3.000	113.850	225				
S10	115.326	2.236	Open Manhole	1200	S1.002	113.090	300	S1.001	113.165	225	
								S2.000	113.165	225	
								S3.000	113.165	225	
S12	114.872	1.896	Open Manhole	1200	S1.003	112.976	300	S1.002	112.976	300	
S14	113.671	1.496	Open Manhole	1200	S1.004	112.175	300	S1.003	112.175	300	
S16	113.319	1.575	Open Manhole	1500	S1.005	111.744	375	S1.004	111.819	300	
S18	112.654	1.804	Open Manhole	1500	S1.006	110.850	375	S1.005	110.850	375	
S20	112.599	2.599	Open Manhole	1500	S1.007	110.000	375	S1.006	110.000	375	
S22	113.099	3.170	Open Manhole	1500	S1.008	109.929	375	S1.007	109.929	375	
S24	113.554	3.688	Open Manhole	1500	S1.009	109.866	375	S1.008	109.866	375	
S26	114.360	1.440	Open Manhole	1200	S4.000	112.920	225				
S28	114.226	2.143	Open Manhole	1200	S4.001	112.083	225	S4.000	112.083	225	
S30	113.702	3.896	Open Manhole	1500	S1.010	109.806	375	S1.009	109.806	375	
								S4.001	109.956	225	
S32	114.385	4.642	Open Manhole	1500	S1.011	109.743	375	S1.010	109.743	375	
S34	114.181	4.482	Open Manhole	1500	S1.012	109.699	375	S1.011	109.699	375	
S36	115.765	1.515	Open Manhole	1200	S5.000	114.250	225				
S38	114.848	1.471	Open Manhole	1200	S5.001	113.377	225	S5.000	113.377	225	
S40	114.126	1.436	Open Manhole	1200	S6.000	112.690	225				
S42	113.928	1.478	Open Manhole	1200	S6.001	112.450	225	S6.000	112.450	225	
S44	113.762	1.562	Open Manhole	1200	S6.002	112.200	225	S6.001	112.200	225	
S46	113.126	3.243	Open Manhole	1200	S5.002	109.883	300	S5.001	109.958	225	
								S6.002	109.958	225	
S48	112.651	3.119	Open Manhole	1200	S5.003	109.532	300	S5.002	109.532	300	
S50	110.137	2.275	Open Manhole	1200	S5.004	107.862	300	S5.003	107.862	300	
SHD1	113.125	1.233	Open Manhole	1200	S7.000	111.892	225				
SHD2	110.923	1.615	Open Manhole	1200	S7.001	109.308	225	S7.000	109.308	225	
SHD3	109.976	2.084	Open Manhole	1200	S7.002	107.892	225	S7.001	107.892	225	
SHD4	109.102	1.402	Open Manhole	1200	S7.003	107.700	225	S7.002	107.700	225	
S52	109.770	2.470	Open Manhole	1500	S5.005	107.300	450	S5.004	107.450	300	
								S7.003	107.525	225	
S54	110.794	3.587	Open Manhole	1500	S5.006	107.207	450	S5.005	107.207	450	
S56	111.248	4.111	Open Manhole	1500	S5.007	107.137	450	S5.006	107.137	450	
S58	112.501	5.470	Open Manhole	1500	S5.008	107.031	450	S5.007	107.031	450	

Manhole Schedules for 15031 - SWS NETWORK 1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S60	113.328	3.771	Open Manhole	1200	S8.000	109.557	225				
S62	112.508	5.763	Open Manhole	1500	S5.009	106.745	450	S5.008	106.745	450	
								S8.000	106.970	225	
S64	113.122	6.506	Open Manhole	1500	S1.013	106.616	525	S1.012	106.766	375	
								S5.009	106.691	450	
S66	112.833	6.241	Open Manhole	1500	S1.014	106.592	525	S1.013	106.592	525	
S68	112.222	5.752	Open Manhole	1500	S1.015	106.470	525	S1.014	106.470	525	
S70	111.881	5.432	Open Manhole	1500	S1.016	106.449	525	S1.015	106.449	525	
S72	111.229	4.798	Open Manhole	1500	S1.017	106.431	525	S1.016	106.431	525	
S74	107.723	2.723	Open Manhole	1500	S1.018	105.000	525	S1.017	105.000	525	
S76	103.000	2.000	Open Manhole		S1.019	101.000	1000	S1.018	101.250	525	625
SPOND	99.850	2.750	Junction	0	S1.020	97.100	1000	S1.019	99.500	1000	2400
S78	99.850	4.350	Open Manhole	2100	S1.021	95.500	300	S1.020	97.000	1000	1350
S80	94.128	1.528	Open Manhole	1200	S1.022	92.600	300	S1.021	92.600	300	
S82	91.984	1.584	Open Manhole	1200	S1.023	90.400	300	S1.022	90.400	300	
S84	91.400	1.500	Open Manhole	1200	S1.024	89.900	300	S1.023	89.900	300	
SOF3	90.750	0.920	Open Manhole	1200		OUTFALL		S1.024	89.830	300	

PIPELINE SCHEDULES for 15031 - SWS NETWORK 1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S2	115.054	113.400	1.429	Open Manhole	1200
S1.001	o	225	S4	115.266	113.304	1.737	Open Manhole	1200
S2.000	o	225	S6	115.742	114.150	1.367	Open Manhole	1200
S3.000	o	225	S8	115.459	113.850	1.384	Open Manhole	1200
S1.002	o	300	S10	115.326	113.090	1.936	Open Manhole	1200
S1.003	o	300	S12	114.872	112.976	1.596	Open Manhole	1200
S1.004	o	300	S14	113.671	112.175	1.196	Open Manhole	1200
S1.005	o	375	S16	113.319	111.744	1.200	Open Manhole	1500
S1.006	o	375	S18	112.654	110.850	1.429	Open Manhole	1500
S1.007	o	375	S20	112.599	110.000	2.224	Open Manhole	1500
S1.008	o	375	S22	113.099	109.929	2.795	Open Manhole	1500
S1.009	o	375	S24	113.554	109.866	3.313	Open Manhole	1500
S4.000	o	225	S26	114.360	112.920	1.215	Open Manhole	1200
S4.001	o	225	S28	114.226	112.083	1.918	Open Manhole	1200
S1.010	o	375	S30	113.702	109.806	3.521	Open Manhole	1500
S1.011	o	375	S32	114.385	109.743	4.267	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	15.917	165.8	S4	115.266	113.304	1.737	Open Manhole	1200
S1.001	23.213	167.0	S10	115.326	113.165	1.936	Open Manhole	1200
S2.000	17.584	17.9	S10	115.326	113.165	1.936	Open Manhole	1200
S3.000	11.509	16.8	S10	115.326	113.165	1.936	Open Manhole	1200
S1.002	19.036	167.0	S12	114.872	112.976	1.596	Open Manhole	1200
S1.003	50.257	62.7	S14	113.671	112.175	1.196	Open Manhole	1200
S1.004	14.704	41.3	S16	113.319	111.819	1.200	Open Manhole	1500
S1.005	25.186	28.2	S18	112.654	110.850	1.429	Open Manhole	1500
S1.006	17.298	20.4	S20	112.599	110.000	2.224	Open Manhole	1500
S1.007	22.140	311.8	S22	113.099	109.929	2.795	Open Manhole	1500
S1.008	19.772	313.8	S24	113.554	109.866	3.313	Open Manhole	1500
S1.009	18.847	314.1	S30	113.702	109.806	3.521	Open Manhole	1500
S4.000	6.834	8.2	S28	114.226	112.083	1.918	Open Manhole	1200
S4.001	12.759	6.0	S30	113.702	109.956	3.521	Open Manhole	1500
S1.010	19.837	314.9	S32	114.385	109.743	4.267	Open Manhole	1500
S1.011	13.678	310.9	S34	114.181	109.699	4.107	Open Manhole	1500

PIPELINE SCHEDULES for 15031 - SWS NETWORK 1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.012	o	375	S34	114.181	109.699	4.107	Open Manhole	1500
S5.000	o	225	S36	115.765	114.250	1.290	Open Manhole	1200
S5.001	o	225	S38	114.848	113.377	1.246	Open Manhole	1200
S6.000	o	225	S40	114.126	112.690	1.211	Open Manhole	1200
S6.001	o	225	S42	113.928	112.450	1.253	Open Manhole	1200
S6.002	o	225	S44	113.762	112.200	1.337	Open Manhole	1200
S5.002	o	300	S46	113.126	109.883	2.943	Open Manhole	1200
S5.003	o	300	S48	112.651	109.532	2.819	Open Manhole	1200
S5.004	o	300	S50	110.137	107.862	1.975	Open Manhole	1200
S7.000	o	225	SHD1	113.125	111.892	1.008	Open Manhole	1200
S7.001	o	225	SHD2	110.923	109.308	1.390	Open Manhole	1200
S7.002	o	225	SHD3	109.976	107.892	1.859	Open Manhole	1200
S7.003	o	225	SHD4	109.102	107.700	1.177	Open Manhole	1200
S5.005	o	450	S52	109.770	107.300	2.020	Open Manhole	1500
S5.006	o	450	S54	110.794	107.207	3.137	Open Manhole	1500
S5.007	o	450	S56	111.248	107.137	3.661	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.012	27.821	9.5	S64	113.122	106.766	5.981	Open Manhole	1500
S5.000	22.624	25.9	S38	114.848	113.377	1.246	Open Manhole	1200
S5.001	34.708	10.2	S46	113.126	109.958	2.943	Open Manhole	1200
S6.000	8.097	33.7	S42	113.928	112.450	1.253	Open Manhole	1200
S6.001	8.524	34.1	S44	113.762	112.200	1.337	Open Manhole	1200
S6.002	33.930	15.1	S46	113.126	109.958	2.943	Open Manhole	1200
S5.002	20.655	58.8	S48	112.651	109.532	2.819	Open Manhole	1200
S5.003	41.833	25.0	S50	110.137	107.862	1.975	Open Manhole	1200
S5.004	9.195	22.3	S52	109.770	107.450	2.020	Open Manhole	1500
S7.000	32.291	12.5	SHD2	110.923	109.308	1.390	Open Manhole	1200
S7.001	25.012	17.7	SHD3	109.976	107.892	1.859	Open Manhole	1200
S7.002	35.845	186.7	SHD4	109.102	107.700	1.177	Open Manhole	1200
S7.003	20.469	117.0	S52	109.770	107.525	2.020	Open Manhole	1500
S5.005	35.787	384.8	S54	110.794	107.207	3.137	Open Manhole	1500
S5.006	26.879	384.0	S56	111.248	107.137	3.661	Open Manhole	1500
S5.007	40.810	385.0	S58	112.501	107.031	5.020	Open Manhole	1500

PIPELINE SCHEDULES for 15031 - SWS NETWORK 1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.008	o	450	S58	112.501	107.031	5.020	Open Manhole	1500
S8.000	o	225	S60	113.328	109.557	3.546	Open Manhole	1200
S5.009	o	450	S62	112.508	106.745	5.313	Open Manhole	1500
S1.013	o	525	S64	113.122	106.616	5.981	Open Manhole	1500
S1.014	o	525	S66	112.833	106.592	5.716	Open Manhole	1500
S1.015	o	525	S68	112.222	106.470	5.227	Open Manhole	1500
S1.016	o	525	S70	111.881	106.449	4.907	Open Manhole	1500
S1.017	o	525	S72	111.229	106.431	4.273	Open Manhole	1500
S1.018	o	525	S74	107.723	105.000	2.198	Open Manhole	1500
S1.019	3 \=/	1000	S76	103.000	101.000	1.850	Open Manhole	1
S1.020	3 \=/	1000	SPOND	99.850	97.100	2.600	Junction	
S1.021	o	300	S78	99.850	95.500	4.050	Open Manhole	2100
S1.022	o	300	S80	94.128	92.600	1.228	Open Manhole	1200
S1.023	o	300	S82	91.984	90.400	1.284	Open Manhole	1200
S1.024	o	300	S84	91.400	89.900	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.008	8.857	31.0	S62	112.508	106.745	5.313	Open Manhole	1500
S8.000	15.524	6.0	S62	112.508	106.970	5.313	Open Manhole	1500
S5.009	20.636	382.1	S64	113.122	106.691	5.981	Open Manhole	1500
S1.013	10.758	455.0	S66	112.833	106.592	5.716	Open Manhole	1500
S1.014	55.377	453.9	S68	112.222	106.470	5.227	Open Manhole	1500
S1.015	9.351	445.3	S70	111.881	106.449	4.907	Open Manhole	1500
S1.016	8.024	445.8	S72	111.229	106.431	4.273	Open Manhole	1500
S1.017	65.052	45.5	S74	107.723	105.000	2.198	Open Manhole	1500
S1.018	68.320	18.2	S76	103.000	101.250	1.225	Open Manhole	1
S1.019	91.176	60.8	SPOND	99.850	99.500	0.200	Junction	
S1.020	37.385	373.9	S78	99.850	97.000	2.700	Open Manhole	2100
S1.021	83.489	28.8	S80	94.128	92.600	1.228	Open Manhole	1200
S1.022	93.762	42.6	S82	91.984	90.400	1.284	Open Manhole	1200
S1.023	85.665	171.3	S84	91.400	89.900	1.200	Open Manhole	1200
S1.024	15.465	220.9	SOF3	90.750	89.830	0.620	Open Manhole	1200

Area Summary for 15031 - SWS NETWORK 1.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.024	0.024	0.024
2.000	-	-	100	0.034	0.034	0.034
3.000	-	-	100	0.019	0.019	0.019
1.002	-	-	100	0.013	0.013	0.013
1.003	-	-	100	0.050	0.050	0.050
1.004	-	-	100	0.010	0.010	0.010
1.005	-	-	100	0.020	0.020	0.020
1.006	-	-	100	0.061	0.061	0.061
1.007	-	-	100	0.072	0.072	0.072
1.008	-	-	100	0.038	0.038	0.038
1.009	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.042	0.042	0.042
4.001	-	-	100	0.009	0.009	0.009
1.010	-	-	100	0.014	0.014	0.014
1.011	-	-	100	0.009	0.009	0.009
1.012	-	-	100	0.083	0.083	0.083
5.000	-	-	100	0.056	0.056	0.056
5.001	-	-	100	0.027	0.027	0.027
6.000	-	-	100	0.034	0.034	0.034
6.001	-	-	100	0.025	0.025	0.025
6.002	-	-	100	0.065	0.065	0.065
5.002	-	-	100	0.017	0.017	0.017
5.003	-	-	100	0.071	0.071	0.071
5.004	-	-	100	0.021	0.021	0.021
7.000	-	-	100	0.033	0.033	0.033
7.001	-	-	100	0.030	0.030	0.030
7.002	-	-	100	0.027	0.027	0.027
7.003	-	-	100	0.013	0.013	0.013
5.005	-	-	100	0.055	0.055	0.055
5.006	-	-	100	0.028	0.028	0.028
5.007	-	-	100	0.026	0.026	0.026
5.008	-	-	100	0.040	0.040	0.040
8.000	-	-	100	0.020	0.020	0.020
5.009	-	-	100	0.026	0.026	0.026
1.013	-	-	100	0.040	0.040	0.040
1.014	-	-	100	0.020	0.020	0.020
1.015	-	-	100	0.020	0.020	0.020
1.016	-	-	100	0.005	0.005	0.005
1.017	-	-	100	0.000	0.000	0.000
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.000	0.000	0.000
1.024	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.258	1.258	1.258

Free Flowing Outfall Details for 15031 - SWS NETWORK 1.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.024	SOF3	90.750	89.830	0.000	1200	0

Simulation Criteria for 15031 - SWS NETWORK 1.SWS

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for 15031 - SWS NETWORK 1.SWS

Hydroslide Manhole: S78, DS/PN: S1.021, Volume (m³): 939.3

Design Head (m)	3.800	Invert Level (m)	95.500
Design Flow (l/s)	5.1	Maximum Head (m)	4.000
Range	Combi	Minimum Pipe Diameter (mm)	150
Application	Stormwater	Minimum Manhole Diameter (mm)	1200
Model	DR 150 C		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	5.1	3.000	4.6	7.000	7.0
0.200	5.1	1.400	5.1	3.500	5.0	7.500	7.3
0.300	5.1	1.600	5.1	4.000	5.3	8.000	7.5
0.400	5.1	1.800	5.1	4.500	5.6	8.500	7.7
0.500	5.1	2.000	5.1	5.000	5.9	9.000	8.0
0.600	5.1	2.200	5.1	5.500	6.2	9.500	8.2
0.800	5.1	2.400	5.1	6.000	6.5		
1.000	5.1	2.600	5.1	6.500	6.8		

Storage Structures for 15031 - SWS NETWORK 1.SWS

Tank or Pond Manhole: SPOND, DS/PN: S1.020

Invert Level (m) 97.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2.0	0.700	554.0	1.400	1536.0	2.100	2671.0
0.100	32.0	0.800	680.0	1.500	1681.0	2.200	2842.0
0.200	87.0	0.900	821.0	1.600	1835.0	2.300	3020.0
0.300	163.0	1.000	943.0	1.700	1997.0	2.400	3204.0
0.400	258.0	1.100	1074.0	1.800	2168.0	2.500	3371.0
0.500	344.0	1.200	1217.0	1.900	2348.0	2.600	3543.0
0.600	442.0	1.300	1371.0	2.000	2506.0	2.750	3721.0

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.384
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S2	15 Winter	30	+0%					113.466
S1.001	S4	15 Winter	30	+0%					113.403
S2.000	S6	15 Winter	30	+0%					114.195
S3.000	S8	15 Winter	30	+0%					113.883
S1.002	S10	15 Winter	30	+0%					113.234
S1.003	S12	15 Winter	30	+0%					113.105
S1.004	S14	15 Winter	30	+0%					112.300
S1.005	S16	15 Winter	30	+0%					111.851
S1.006	S18	15 Winter	30	+0%					110.969
S1.007	S20	15 Winter	30	+0%	30/15 Summer				110.507
S1.008	S22	15 Winter	30	+0%	30/15 Summer				110.424
S1.009	S24	15 Winter	30	+0%	30/15 Summer				110.343
S4.000	S26	15 Winter	30	+0%					112.967
S4.001	S28	15 Winter	30	+0%					112.126
S1.010	S30	15 Winter	30	+0%	30/15 Summer				110.263
S1.011	S32	15 Winter	30	+0%	30/15 Summer				110.157
S1.012	S34	15 Winter	30	+0%					109.825
S5.000	S36	15 Winter	30	+0%					114.313

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2	-0.159	0.000	0.19		6.8	OK	
S1.001	S4	-0.126	0.000	0.39		14.3	OK	
S2.000	S6	-0.180	0.000	0.09		10.0	OK	
S3.000	S8	-0.192	0.000	0.05		5.6	OK	
S1.002	S10	-0.156	0.000	0.46		34.1	OK	
S1.003	S12	-0.171	0.000	0.37		49.5	OK	
S1.004	S14	-0.175	0.000	0.36		52.5	OK	
S1.005	S16	-0.268	0.000	0.18		58.5	OK	
S1.006	S18	-0.256	0.000	0.21		76.7	OK	
S1.007	S20	0.132	0.000	0.95		90.9	SURCHARGED	
S1.008	S22	0.120	0.000	1.05		98.4	SURCHARGED	
S1.009	S24	0.102	0.000	1.14		106.6	SURCHARGED	
S4.000	S26	-0.178	0.000	0.10		12.4	OK	
S4.001	S28	-0.182	0.000	0.08		15.1	OK	
S1.010	S30	0.082	0.000	1.29		121.4	SURCHARGED	
S1.011	S32	0.039	0.000	1.41		122.9	SURCHARGED	
S1.012	S34	-0.249	0.000	0.24		136.5	OK	
S5.000	S36	-0.162	0.000	0.18		16.5	OK	

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S5.001	S38	15 Winter	30	+0%					113.438
S6.000	S40	15 Winter	30	+0%					112.747
S6.001	S42	15 Winter	30	+0%					112.528
S6.002	S44	15 Winter	30	+0%					112.288
S5.002	S46	15 Winter	30	+0%					110.046
S5.003	S48	15 Winter	30	+0%					109.676
S5.004	S50	15 Winter	30	+0%					108.037
S7.000	SHD1	15 Winter	30	+0%					111.931
S7.001	SHD2	15 Winter	30	+0%					109.371
S7.002	SHD3	15 Winter	30	+0%					108.047
S7.003	SHD4	15 Winter	30	+0%					107.921
S5.005	S52	15 Winter	30	+0%	30/15 Winter				107.838
S5.006	S54	15 Winter	30	+0%	30/15 Summer				107.733
S5.007	S56	15 Winter	30	+0%	30/15 Summer				107.688
S5.008	S58	15 Winter	30	+0%	30/15 Summer				107.631
S8.000	S60	15 Winter	30	+0%					109.583
S5.009	S62	15 Winter	30	+0%	30/15 Summer				107.461
S1.013	S64	15 Winter	30	+0%	30/15 Summer				107.411
S1.014	S66	15 Winter	30	+0%	30/15 Summer				107.332
S1.015	S68	15 Winter	30	+0%	30/15 Summer				107.154
S1.016	S70	15 Winter	30	+0%	30/15 Summer				107.043
S1.017	S72	15 Winter	30	+0%					106.655
S1.018	S74	15 Winter	30	+0%					105.175
S1.019	S76	15 Winter	30	+0%					101.203
S1.020	SPOND	480 Winter	30	+0%					97.997
S1.021	S78	480 Winter	30	+0%	1/15 Summer				97.997
S1.022	S80	480 Winter	30	+0%					92.634
S1.023	S82	960 Winter	30	+0%					90.448
S1.024	S84	480 Winter	30	+0%					89.957

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.001	S38	-0.164	0.000	0.16		25.2	OK	
S6.000	S40	-0.168	0.000	0.15		10.0	OK	
S6.001	S42	-0.147	0.000	0.26		18.2	OK	
S6.002	S44	-0.137	0.000	0.32		40.3	OK	
S5.002	S46	-0.137	0.000	0.56		70.8	OK	
S5.003	S48	-0.156	0.000	0.46		94.6	OK	
S5.004	S50	-0.125	0.000	0.63		101.1	OK	
S7.000	SHD1	-0.186	0.000	0.07		9.7	OK	
S7.001	SHD2	-0.162	0.000	0.17		19.6	OK	
S7.002	SHD3	-0.070	0.000	0.78		27.9	OK	
S7.003	SHD4	-0.004	0.000	0.73		32.0	OK	
S5.005	S52	0.088	0.000	0.99		142.5	SURCHARGED	
S5.006	S54	0.076	0.000	1.00		138.4	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.007	S56	0.101	0.000	0.91		132.2	SURCHARGED	
S5.008	S58	0.150	0.000	0.39		116.2	SURCHARGED	
S8.000	S60	-0.199	0.000	0.03		5.9	OK	
S5.009	S62	0.266	0.000	0.94		125.2	SURCHARGED	
S1.013	S64	0.270	0.000	2.08		256.9	SURCHARGED	
S1.014	S66	0.215	0.000	1.25		254.3	SURCHARGED	
S1.015	S68	0.159	0.000	2.08		253.2	SURCHARGED	
S1.016	S70	0.069	0.000	1.97		254.1	SURCHARGED	
S1.017	S72	-0.301	0.000	0.38		252.4	OK	
S1.018	S74	-0.350	0.000	0.24		251.9	OK	
S1.019	S76	-1.797	0.000	0.01		253.4	OK	
S1.020	SPOND	-1.853	0.000	0.00		15.2	OK	
S1.021	S78	2.197	0.000	0.03		5.1	SURCHARGED	
S1.022	S80	-0.266	0.000	0.03		5.1	OK	
S1.023	S82	-0.252	0.000	0.06		5.1	OK	
S1.024	S84	-0.243	0.000	0.08		5.1	OK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for 15031 - SWS NETWORK 1.SWS

Pipe Sizes 15031 - SWS NETWORK 1 Manhole Sizes 15031 - SWS NETWORK 1

FSR Rainfall Model - England and Wales

Return Period (years)	1	Add Flow / Climate Change (%)	0
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	0.000
Ratio R	0.415	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	100	Min Design Depth for Optimisation (m)	1.200
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	0.75
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	500
Volumetric Runoff Coeff.	0.750		

Designed with Level Soffits

Network Design Table for 15031 - SWS NETWORK 1.SWS

« - Indicates pipe capacity < flow

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)	Auto Design
S1.000	15.917	0.096	165.8	0.023	6.00	0.0	0.600		o	225	
S1.001	23.213	0.139	167.0	0.024	0.00	0.0	0.600		o	225	
S2.000	17.584	0.985	17.9	0.034	6.00	0.0	0.600		o	225	
S3.000	11.509	0.685	16.8	0.019	6.00	0.0	0.600		o	225	
S1.002	19.036	0.114	167.0	0.013	0.00	0.0	0.600		o	300	
S1.003	50.257	0.801	62.7	0.050	0.00	0.0	0.600		o	300	
S1.004	14.704	0.356	41.3	0.010	0.00	0.0	0.600		o	300	
S1.005	25.186	0.894	28.2	0.020	0.00	0.0	0.600		o	375	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.21	6.26	113.400	0.023	0.0	0.0	0.0	1.01	40.3	3.1
S1.001	48.77	6.65	113.304	0.047	0.0	0.0	0.0	1.01	40.1	6.2
S2.000	50.87	6.09	114.150	0.034	0.0	0.0	0.0	3.11	123.7	4.7
S3.000	51.01	6.06	113.850	0.019	0.0	0.0	0.0	3.21	127.6	2.6
S1.002	47.84	6.91	113.090	0.113	0.0	0.0	0.0	1.21	85.8	14.6
S1.003	46.42	7.33	112.976	0.163	0.0	0.0	0.0	1.99	140.5	20.5
S1.004	46.10	7.43	112.175	0.173	0.0	0.0	0.0	2.45	173.4	21.6
S1.005	45.71	7.55	111.744	0.193	0.0	0.0	0.0	3.43	378.3	23.9

Network Design Table for 15031 - SWS NETWORK 1.SWS

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)	Auto Design
S1.006	17.298	0.850	20.4	0.061	0.00	0.0	0.600		o	375	
S1.007	22.140	0.071	311.8	0.072	0.00	0.0	0.600		o	375	
S1.008	19.772	0.063	313.8	0.038	0.00	0.0	0.600		o	375	
S1.009	18.847	0.060	314.1	0.038	0.00	0.0	0.600		o	375	
S4.000	6.834	0.837	8.2	0.042	6.00	0.0	0.600		o	225	
S4.001	12.759	2.127	6.0	0.009	0.00	0.0	0.600		o	225	
S1.010	19.837	0.063	314.9	0.014	0.00	0.0	0.600		o	375	
S1.011	13.678	0.044	310.9	0.009	0.00	0.0	0.600		o	375	
S1.012	27.821	2.933	9.5	0.083	0.00	0.0	0.600		o	375	
S5.000	22.624	0.873	25.9	0.056	6.00	0.0	0.600		o	225	
S5.001	34.708	3.419	10.2	0.027	0.00	0.0	0.600		o	225	
S6.000	8.097	0.240	33.7	0.034	6.00	0.0	0.600		o	225	
S6.001	8.524	0.250	34.1	0.025	0.00	0.0	0.600		o	225	
S6.002	33.930	2.242	15.1	0.065	0.00	0.0	0.600		o	225	
S5.002	20.655	0.351	58.8	0.017	0.00	0.0	0.600		o	300	
S5.003	41.833	1.670	25.0	0.071	0.00	0.0	0.600		o	300	
S5.004	9.195	0.412	22.3	0.021	0.00	0.0	0.600		o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.006	45.49	7.62	110.850	0.254	0.0	0.0	0.0	4.03	445.3	31.3
S1.007	44.39	7.98	110.000	0.326	0.0	0.0	0.0	1.02	112.7	39.2
S1.008	43.46	8.31	109.929	0.364	0.0	0.0	0.0	1.02	112.4	42.8
S1.009	42.63	8.62	109.866	0.402	0.0	0.0	0.0	1.02	112.3	46.4
S4.000	51.15	6.02	112.920	0.042	0.0	0.0	0.0	4.61	183.2	5.8
S4.001	50.99	6.06	112.083	0.051	0.0	0.0	0.0	5.38	213.8	7.0
S1.010	41.82	8.94	109.806	0.467	0.0	0.0	0.0	1.02	112.2	52.9
S1.011	41.29	9.16	109.743	0.476	0.0	0.0	0.0	1.02	112.9	53.2
S1.012	41.11	9.24	109.699	0.559	0.0	0.0	0.0	5.91	653.0	62.2
S5.000	50.67	6.15	114.250	0.056	0.0	0.0	0.0	2.58	102.6	7.7
S5.001	50.12	6.29	113.377	0.083	0.0	0.0	0.0	4.13	164.2	11.3
S6.000	51.01	6.06	112.690	0.034	0.0	0.0	0.0	2.26	89.9	4.7
S6.001	50.76	6.12	112.450	0.059	0.0	0.0	0.0	2.25	89.4	8.1
S6.002	50.10	6.29	112.200	0.124	0.0	0.0	0.0	3.38	134.4	16.8
S5.002	49.46	6.46	109.883	0.224	0.0	0.0	0.0	2.05	145.2	30.0
S5.003	48.65	6.68	109.532	0.295	0.0	0.0	0.0	3.15	223.0	38.9
S5.004	48.48	6.72	107.862	0.316	0.0	0.0	0.0	3.34	236.3	41.5

Network Design Table for 15031 - SWS NETWORK 1.SWS

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)	Auto Design
S7.000	32.291	2.584	12.5	0.033	6.00	0.0	0.600		o	225	
S7.001	25.012	1.416	17.7	0.030	0.00	0.0	0.600		o	225	
S7.002	35.845	0.192	186.7	0.027	0.00	0.0	0.600		o	225	
S7.003	20.469	0.175	117.0	0.013	0.00	0.0	0.600		o	225	
S5.005	35.787	0.093	384.8	0.055	0.00	0.0	0.600		o	450	
S5.006	26.879	0.070	384.0	0.028	0.00	0.0	0.600		o	450	
S5.007	40.810	0.106	385.0	0.026	0.00	0.0	0.600		o	450	
S5.008	8.857	0.286	31.0	0.040	0.00	0.0	0.600		o	450	
S8.000	15.524	2.587	6.0	0.020	6.00	0.0	0.600		o	225	
S5.009	20.636	0.054	382.1	0.026	0.00	0.0	0.600		o	450	
S1.013	10.758	0.024	455.0	0.040	0.00	0.0	0.600		o	525	
S1.014	55.377	0.122	453.9	0.020	0.00	0.0	0.600		o	525	
S1.015	9.351	0.021	445.3	0.020	0.00	0.0	0.600		o	525	
S1.016	8.024	0.018	445.8	0.005	0.00	0.0	0.600		o	525	
S1.017	65.052	1.431	45.5	0.000	0.00	0.0	0.600		o	525	
S1.018	68.320	3.750	18.2	0.000	0.00	0.0	0.600		o	525	
S1.019	91.176	1.500	60.8	0.000	0.00	0.0		0.045	3 \=/	1000	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.000	50.67	6.14	111.892	0.033	0.0	0.0	0.0	3.72	148.0	4.5
S7.001	50.15	6.28	109.308	0.063	0.0	0.0	0.0	3.13	124.4	8.6
S7.002	47.85	6.90	107.892	0.090	0.0	0.0	0.0	0.95	37.9	11.7
S7.003	46.88	7.19	107.700	0.103	0.0	0.0	0.0	1.21	48.0	13.1
S5.005	45.04	7.77	107.300	0.474	0.0	0.0	0.0	1.03	163.9	57.8
S5.006	43.77	8.20	107.207	0.502	0.0	0.0	0.0	1.03	164.0	59.5
S5.007	42.02	8.86	107.137	0.528	0.0	0.0	0.0	1.03	163.8	60.1
S5.008	41.92	8.90	107.031	0.568	0.0	0.0	0.0	3.66	582.7	64.5
S8.000	51.06	6.05	109.557	0.020	0.0	0.0	0.0	5.38	213.8	2.8
S5.009	41.13	9.23	106.745	0.614	0.0	0.0	0.0	1.03	164.4	68.4
S1.013	40.71	9.42	106.616	1.213	0.0	0.0	0.0	1.04	225.9	133.8
S1.014	38.82	10.30	106.592	1.233	0.0	0.0	0.0	1.04	226.2	133.8
S1.015	38.52	10.45	106.470	1.253	0.0	0.0	0.0	1.05	228.4	133.8
S1.016	38.27	10.57	106.449	1.258	0.0	0.0	0.0	1.05	228.2	133.8
S1.017	37.64	10.90	106.431	1.258	0.0	0.0	0.0	3.33	720.6	133.8
S1.018	37.24	11.12	105.000	1.258	0.0	0.0	0.0	5.27	1139.8	133.8
S1.019	33.49	13.41	101.000	1.258	0.0	0.0	0.0	0.66	143.7	133.8

Network Design Table for 15031 - SWS NETWORK 1.SWS

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)	Auto Design
S1.020	37.385	0.100	373.9	0.000	0.00	0.0		0.045	3 \=/	1000	
S1.021	83.489	2.900	28.8	0.000	0.00	0.0	0.600		o	300	
S1.022	93.762	2.200	42.6	0.000	0.00	0.0	0.600		o	300	
S1.023	85.665	0.500	171.3	0.000	0.00	0.0	0.600		o	300	
S1.024	15.465	0.070	220.9	0.000	0.00	0.0	0.600		o	300	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.020	30.47	15.75	97.100	1.258	0.0	0.0	0.0	0.27	57.9«	133.8
S1.021	29.93	16.23	95.500	1.258	0.0	0.0	0.0	2.94	207.9	133.8
S1.022	29.24	16.87	92.600	1.258	0.0	0.0	0.0	2.42	170.7	133.8
S1.023	28.04	18.07	90.400	1.258	0.0	0.0	0.0	1.20	84.7«	133.8
S1.024	27.81	18.31	89.900	1.258	0.0	0.0	0.0	1.05	74.5«	133.8

Manhole Schedules for 15031 - SWS NETWORK 1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S2	115.054	1.654	Open Manhole	1200	S1.000	113.400	225				
S4	115.266	1.962	Open Manhole	1200	S1.001	113.304	225	S1.000	113.304	225	
S6	115.742	1.592	Open Manhole	1200	S2.000	114.150	225				
S8	115.459	1.609	Open Manhole	1200	S3.000	113.850	225				
S10	115.326	2.236	Open Manhole	1200	S1.002	113.090	300	S1.001	113.165	225	
								S2.000	113.165	225	
								S3.000	113.165	225	
S12	114.872	1.896	Open Manhole	1200	S1.003	112.976	300	S1.002	112.976	300	
S14	113.671	1.496	Open Manhole	1200	S1.004	112.175	300	S1.003	112.175	300	
S16	113.319	1.575	Open Manhole	1500	S1.005	111.744	375	S1.004	111.819	300	
S18	112.654	1.804	Open Manhole	1500	S1.006	110.850	375	S1.005	110.850	375	
S20	112.599	2.599	Open Manhole	1500	S1.007	110.000	375	S1.006	110.000	375	
S22	113.099	3.170	Open Manhole	1500	S1.008	109.929	375	S1.007	109.929	375	
S24	113.554	3.688	Open Manhole	1500	S1.009	109.866	375	S1.008	109.866	375	
S26	114.360	1.440	Open Manhole	1200	S4.000	112.920	225				
S28	114.226	2.143	Open Manhole	1200	S4.001	112.083	225	S4.000	112.083	225	
S30	113.702	3.896	Open Manhole	1500	S1.010	109.806	375	S1.009	109.806	375	
								S4.001	109.956	225	
S32	114.385	4.642	Open Manhole	1500	S1.011	109.743	375	S1.010	109.743	375	
S34	114.181	4.482	Open Manhole	1500	S1.012	109.699	375	S1.011	109.699	375	
S36	115.765	1.515	Open Manhole	1200	S5.000	114.250	225				
S38	114.848	1.471	Open Manhole	1200	S5.001	113.377	225	S5.000	113.377	225	
S40	114.126	1.436	Open Manhole	1200	S6.000	112.690	225				
S42	113.928	1.478	Open Manhole	1200	S6.001	112.450	225	S6.000	112.450	225	
S44	113.762	1.562	Open Manhole	1200	S6.002	112.200	225	S6.001	112.200	225	
S46	113.126	3.243	Open Manhole	1200	S5.002	109.883	300	S5.001	109.958	225	
								S6.002	109.958	225	
S48	112.651	3.119	Open Manhole	1200	S5.003	109.532	300	S5.002	109.532	300	
S50	110.137	2.275	Open Manhole	1200	S5.004	107.862	300	S5.003	107.862	300	
SHD1	113.125	1.233	Open Manhole	1200	S7.000	111.892	225				
SHD2	110.923	1.615	Open Manhole	1200	S7.001	109.308	225	S7.000	109.308	225	
SHD3	109.976	2.084	Open Manhole	1200	S7.002	107.892	225	S7.001	107.892	225	
SHD4	109.102	1.402	Open Manhole	1200	S7.003	107.700	225	S7.002	107.700	225	
S52	109.770	2.470	Open Manhole	1500	S5.005	107.300	450	S5.004	107.450	300	
								S7.003	107.525	225	
S54	110.794	3.587	Open Manhole	1500	S5.006	107.207	450	S5.005	107.207	450	
S56	111.248	4.111	Open Manhole	1500	S5.007	107.137	450	S5.006	107.137	450	
S58	112.501	5.470	Open Manhole	1500	S5.008	107.031	450	S5.007	107.031	450	

Manhole Schedules for 15031 - SWS NETWORK 1.SWS

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
S60	113.328	3.771	Open Manhole	1200	S8.000	109.557	225				
S62	112.508	5.763	Open Manhole	1500	S5.009	106.745	450	S5.008	106.745	450	
								S8.000	106.970	225	
S64	113.122	6.506	Open Manhole	1500	S1.013	106.616	525	S1.012	106.766	375	
								S5.009	106.691	450	
S66	112.833	6.241	Open Manhole	1500	S1.014	106.592	525	S1.013	106.592	525	
S68	112.222	5.752	Open Manhole	1500	S1.015	106.470	525	S1.014	106.470	525	
S70	111.881	5.432	Open Manhole	1500	S1.016	106.449	525	S1.015	106.449	525	
S72	111.229	4.798	Open Manhole	1500	S1.017	106.431	525	S1.016	106.431	525	
S74	107.723	2.723	Open Manhole	1500	S1.018	105.000	525	S1.017	105.000	525	
S76	103.000	2.000	Open Manhole		S1.019	101.000	1000	S1.018	101.250	525	625
SPOND	99.850	2.750	Junction	0	S1.020	97.100	1000	S1.019	99.500	1000	2400
S78	99.850	4.350	Open Manhole	2100	S1.021	95.500	300	S1.020	97.000	1000	1350
S80	94.128	1.528	Open Manhole	1200	S1.022	92.600	300	S1.021	92.600	300	
S82	91.984	1.584	Open Manhole	1200	S1.023	90.400	300	S1.022	90.400	300	
S84	91.400	1.500	Open Manhole	1200	S1.024	89.900	300	S1.023	89.900	300	
SOF3	90.750	0.920	Open Manhole	1200		OUTFALL		S1.024	89.830	300	

PIPELINE SCHEDULES for 15031 - SWS NETWORK 1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S2	115.054	113.400	1.429	Open Manhole	1200
S1.001	o	225	S4	115.266	113.304	1.737	Open Manhole	1200
S2.000	o	225	S6	115.742	114.150	1.367	Open Manhole	1200
S3.000	o	225	S8	115.459	113.850	1.384	Open Manhole	1200
S1.002	o	300	S10	115.326	113.090	1.936	Open Manhole	1200
S1.003	o	300	S12	114.872	112.976	1.596	Open Manhole	1200
S1.004	o	300	S14	113.671	112.175	1.196	Open Manhole	1200
S1.005	o	375	S16	113.319	111.744	1.200	Open Manhole	1500
S1.006	o	375	S18	112.654	110.850	1.429	Open Manhole	1500
S1.007	o	375	S20	112.599	110.000	2.224	Open Manhole	1500
S1.008	o	375	S22	113.099	109.929	2.795	Open Manhole	1500
S1.009	o	375	S24	113.554	109.866	3.313	Open Manhole	1500
S4.000	o	225	S26	114.360	112.920	1.215	Open Manhole	1200
S4.001	o	225	S28	114.226	112.083	1.918	Open Manhole	1200
S1.010	o	375	S30	113.702	109.806	3.521	Open Manhole	1500
S1.011	o	375	S32	114.385	109.743	4.267	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	15.917	165.8	S4	115.266	113.304	1.737	Open Manhole	1200
S1.001	23.213	167.0	S10	115.326	113.165	1.936	Open Manhole	1200
S2.000	17.584	17.9	S10	115.326	113.165	1.936	Open Manhole	1200
S3.000	11.509	16.8	S10	115.326	113.165	1.936	Open Manhole	1200
S1.002	19.036	167.0	S12	114.872	112.976	1.596	Open Manhole	1200
S1.003	50.257	62.7	S14	113.671	112.175	1.196	Open Manhole	1200
S1.004	14.704	41.3	S16	113.319	111.819	1.200	Open Manhole	1500
S1.005	25.186	28.2	S18	112.654	110.850	1.429	Open Manhole	1500
S1.006	17.298	20.4	S20	112.599	110.000	2.224	Open Manhole	1500
S1.007	22.140	311.8	S22	113.099	109.929	2.795	Open Manhole	1500
S1.008	19.772	313.8	S24	113.554	109.866	3.313	Open Manhole	1500
S1.009	18.847	314.1	S30	113.702	109.806	3.521	Open Manhole	1500
S4.000	6.834	8.2	S28	114.226	112.083	1.918	Open Manhole	1200
S4.001	12.759	6.0	S30	113.702	109.956	3.521	Open Manhole	1500
S1.010	19.837	314.9	S32	114.385	109.743	4.267	Open Manhole	1500
S1.011	13.678	310.9	S34	114.181	109.699	4.107	Open Manhole	1500

PIPELINE SCHEDULES for 15031 - SWS NETWORK 1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.012	o	375	S34	114.181	109.699	4.107	Open Manhole	1500
S5.000	o	225	S36	115.765	114.250	1.290	Open Manhole	1200
S5.001	o	225	S38	114.848	113.377	1.246	Open Manhole	1200
S6.000	o	225	S40	114.126	112.690	1.211	Open Manhole	1200
S6.001	o	225	S42	113.928	112.450	1.253	Open Manhole	1200
S6.002	o	225	S44	113.762	112.200	1.337	Open Manhole	1200
S5.002	o	300	S46	113.126	109.883	2.943	Open Manhole	1200
S5.003	o	300	S48	112.651	109.532	2.819	Open Manhole	1200
S5.004	o	300	S50	110.137	107.862	1.975	Open Manhole	1200
S7.000	o	225	SHD1	113.125	111.892	1.008	Open Manhole	1200
S7.001	o	225	SHD2	110.923	109.308	1.390	Open Manhole	1200
S7.002	o	225	SHD3	109.976	107.892	1.859	Open Manhole	1200
S7.003	o	225	SHD4	109.102	107.700	1.177	Open Manhole	1200
S5.005	o	450	S52	109.770	107.300	2.020	Open Manhole	1500
S5.006	o	450	S54	110.794	107.207	3.137	Open Manhole	1500
S5.007	o	450	S56	111.248	107.137	3.661	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.012	27.821	9.5	S64	113.122	106.766	5.981	Open Manhole	1500
S5.000	22.624	25.9	S38	114.848	113.377	1.246	Open Manhole	1200
S5.001	34.708	10.2	S46	113.126	109.958	2.943	Open Manhole	1200
S6.000	8.097	33.7	S42	113.928	112.450	1.253	Open Manhole	1200
S6.001	8.524	34.1	S44	113.762	112.200	1.337	Open Manhole	1200
S6.002	33.930	15.1	S46	113.126	109.958	2.943	Open Manhole	1200
S5.002	20.655	58.8	S48	112.651	109.532	2.819	Open Manhole	1200
S5.003	41.833	25.0	S50	110.137	107.862	1.975	Open Manhole	1200
S5.004	9.195	22.3	S52	109.770	107.450	2.020	Open Manhole	1500
S7.000	32.291	12.5	SHD2	110.923	109.308	1.390	Open Manhole	1200
S7.001	25.012	17.7	SHD3	109.976	107.892	1.859	Open Manhole	1200
S7.002	35.845	186.7	SHD4	109.102	107.700	1.177	Open Manhole	1200
S7.003	20.469	117.0	S52	109.770	107.525	2.020	Open Manhole	1500
S5.005	35.787	384.8	S54	110.794	107.207	3.137	Open Manhole	1500
S5.006	26.879	384.0	S56	111.248	107.137	3.661	Open Manhole	1500
S5.007	40.810	385.0	S58	112.501	107.031	5.020	Open Manhole	1500

PIPELINE SCHEDULES for 15031 - SWS NETWORK 1.SWS

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.008	o	450	S58	112.501	107.031	5.020	Open Manhole	1500
S8.000	o	225	S60	113.328	109.557	3.546	Open Manhole	1200
S5.009	o	450	S62	112.508	106.745	5.313	Open Manhole	1500
S1.013	o	525	S64	113.122	106.616	5.981	Open Manhole	1500
S1.014	o	525	S66	112.833	106.592	5.716	Open Manhole	1500
S1.015	o	525	S68	112.222	106.470	5.227	Open Manhole	1500
S1.016	o	525	S70	111.881	106.449	4.907	Open Manhole	1500
S1.017	o	525	S72	111.229	106.431	4.273	Open Manhole	1500
S1.018	o	525	S74	107.723	105.000	2.198	Open Manhole	1500
S1.019	3 \=/	1000	S76	103.000	101.000	1.850	Open Manhole	1
S1.020	3 \=/	1000	SPOND	99.850	97.100	2.600	Junction	
S1.021	o	300	S78	99.850	95.500	4.050	Open Manhole	2100
S1.022	o	300	S80	94.128	92.600	1.228	Open Manhole	1200
S1.023	o	300	S82	91.984	90.400	1.284	Open Manhole	1200
S1.024	o	300	S84	91.400	89.900	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.008	8.857	31.0	S62	112.508	106.745	5.313	Open Manhole	1500
S8.000	15.524	6.0	S62	112.508	106.970	5.313	Open Manhole	1500
S5.009	20.636	382.1	S64	113.122	106.691	5.981	Open Manhole	1500
S1.013	10.758	455.0	S66	112.833	106.592	5.716	Open Manhole	1500
S1.014	55.377	453.9	S68	112.222	106.470	5.227	Open Manhole	1500
S1.015	9.351	445.3	S70	111.881	106.449	4.907	Open Manhole	1500
S1.016	8.024	445.8	S72	111.229	106.431	4.273	Open Manhole	1500
S1.017	65.052	45.5	S74	107.723	105.000	2.198	Open Manhole	1500
S1.018	68.320	18.2	S76	103.000	101.250	1.225	Open Manhole	1
S1.019	91.176	60.8	SPOND	99.850	99.500	0.200	Junction	
S1.020	37.385	373.9	S78	99.850	97.000	2.700	Open Manhole	2100
S1.021	83.489	28.8	S80	94.128	92.600	1.228	Open Manhole	1200
S1.022	93.762	42.6	S82	91.984	90.400	1.284	Open Manhole	1200
S1.023	85.665	171.3	S84	91.400	89.900	1.200	Open Manhole	1200
S1.024	15.465	220.9	SOF3	90.750	89.830	0.620	Open Manhole	1200

Area Summary for 15031 - SWS NETWORK 1.SWS

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.023	0.023	0.023
1.001	-	-	100	0.024	0.024	0.024
2.000	-	-	100	0.034	0.034	0.034
3.000	-	-	100	0.019	0.019	0.019
1.002	-	-	100	0.013	0.013	0.013
1.003	-	-	100	0.050	0.050	0.050
1.004	-	-	100	0.010	0.010	0.010
1.005	-	-	100	0.020	0.020	0.020
1.006	-	-	100	0.061	0.061	0.061
1.007	-	-	100	0.072	0.072	0.072
1.008	-	-	100	0.038	0.038	0.038
1.009	-	-	100	0.038	0.038	0.038
4.000	-	-	100	0.042	0.042	0.042
4.001	-	-	100	0.009	0.009	0.009
1.010	-	-	100	0.014	0.014	0.014
1.011	-	-	100	0.009	0.009	0.009
1.012	-	-	100	0.083	0.083	0.083
5.000	-	-	100	0.056	0.056	0.056
5.001	-	-	100	0.027	0.027	0.027
6.000	-	-	100	0.034	0.034	0.034
6.001	-	-	100	0.025	0.025	0.025
6.002	-	-	100	0.065	0.065	0.065
5.002	-	-	100	0.017	0.017	0.017
5.003	-	-	100	0.071	0.071	0.071
5.004	-	-	100	0.021	0.021	0.021
7.000	-	-	100	0.033	0.033	0.033
7.001	-	-	100	0.030	0.030	0.030
7.002	-	-	100	0.027	0.027	0.027
7.003	-	-	100	0.013	0.013	0.013
5.005	-	-	100	0.055	0.055	0.055
5.006	-	-	100	0.028	0.028	0.028
5.007	-	-	100	0.026	0.026	0.026
5.008	-	-	100	0.040	0.040	0.040
8.000	-	-	100	0.020	0.020	0.020
5.009	-	-	100	0.026	0.026	0.026
1.013	-	-	100	0.040	0.040	0.040
1.014	-	-	100	0.020	0.020	0.020
1.015	-	-	100	0.020	0.020	0.020
1.016	-	-	100	0.005	0.005	0.005
1.017	-	-	100	0.000	0.000	0.000
1.018	-	-	100	0.000	0.000	0.000
1.019	-	-	100	0.000	0.000	0.000
1.020	-	-	100	0.000	0.000	0.000
1.021	-	-	100	0.000	0.000	0.000
1.022	-	-	100	0.000	0.000	0.000
1.023	-	-	100	0.000	0.000	0.000
1.024	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				1.258	1.258	1.258

Free Flowing Outfall Details for 15031 - SWS NETWORK 1.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.024	SOF3	90.750	89.830	0.000	1200	0

Simulation Criteria for 15031 - SWS NETWORK 1.SWS

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.400	Storm Duration (mins)	30
Ratio R	0.400		

Online Controls for 15031 - SWS NETWORK 1.SWS

Hydroslide Manhole: S78, DS/PN: S1.021, Volume (m³): 939.3

Design Head (m)	3.800	Invert Level (m)	95.500
Design Flow (l/s)	5.1	Maximum Head (m)	4.000
Range	Combi	Minimum Pipe Diameter (mm)	150
Application	Stormwater	Minimum Manhole Diameter (mm)	1200
Model	DR 150 C		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.1	1.200	5.1	3.000	4.6	7.000	7.0
0.200	5.1	1.400	5.1	3.500	5.0	7.500	7.3
0.300	5.1	1.600	5.1	4.000	5.3	8.000	7.5
0.400	5.1	1.800	5.1	4.500	5.6	8.500	7.7
0.500	5.1	2.000	5.1	5.000	5.9	9.000	8.0
0.600	5.1	2.200	5.1	5.500	6.2	9.500	8.2
0.800	5.1	2.400	5.1	6.000	6.5		
1.000	5.1	2.600	5.1	6.500	6.8		

Storage Structures for 15031 - SWS NETWORK 1.SWS

Tank or Pond Manhole: SPOND, DS/PN: S1.020

Invert Level (m) 97.100

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	2.0	0.700	554.0	1.400	1536.0	2.100	2671.0
0.100	32.0	0.800	680.0	1.500	1681.0	2.200	2842.0
0.200	87.0	0.900	821.0	1.600	1835.0	2.300	3020.0
0.300	163.0	1.000	943.0	1.700	1997.0	2.400	3204.0
0.400	258.0	1.100	1074.0	1.800	2168.0	2.500	3371.0
0.500	344.0	1.200	1217.0	1.900	2348.0	2.600	3543.0
0.600	442.0	1.300	1371.0	2.000	2506.0	2.750	3721.0

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.384
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

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

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S2	15 Winter	100	+40%					113.492
S1.001	S4	15 Winter	100	+40%					113.448
S2.000	S6	15 Winter	100	+40%					114.211
S3.000	S8	15 Winter	100	+40%					113.896
S1.002	S10	15 Winter	100	+40%					113.301
S1.003	S12	15 Winter	100	+40%					113.160
S1.004	S14	15 Winter	100	+40%					112.353
S1.005	S16	15 Winter	100	+40%					111.891
S1.006	S18	15 Winter	100	+40%	100/15 Summer				111.573
S1.007	S20	15 Winter	100	+40%	100/15 Summer				111.285
S1.008	S22	15 Winter	100	+40%	100/15 Summer				111.092
S1.009	S24	15 Winter	100	+40%	100/15 Summer				110.895
S4.000	S26	15 Winter	100	+40%					112.983
S4.001	S28	15 Winter	100	+40%					112.141
S1.010	S30	15 Winter	100	+40%	100/15 Summer				110.668
S1.011	S32	15 Winter	100	+40%	100/15 Summer				110.351
S1.012	S34	15 Winter	100	+40%					109.873
S5.000	S36	15 Winter	100	+40%					114.337

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S2	-0.133	0.000	0.35		12.3	OK	
S1.001	S4	-0.081	0.000	0.71		26.0	OK	
S2.000	S6	-0.164	0.000	0.16		18.2	OK	
S3.000	S8	-0.179	0.000	0.09		10.2	OK	
S1.002	S10	-0.089	0.000	0.83		61.8	OK	
S1.003	S12	-0.116	0.000	0.67		89.3	OK	
S1.004	S14	-0.122	0.000	0.65		94.8	OK	
S1.005	S16	-0.228	0.000	0.32		105.6	OK	
S1.006	S18	0.348	0.000	0.34		124.3	SURCHARGED	
S1.007	S20	0.910	0.000	1.60		153.8	SURCHARGED	
S1.008	S22	0.788	0.000	1.77		166.9	SURCHARGED	
S1.009	S24	0.654	0.000	1.92		179.5	SURCHARGED	
S4.000	S26	-0.162	0.000	0.17		22.5	OK	
S4.001	S28	-0.167	0.000	0.15		27.4	OK	
S1.010	S30	0.487	0.000	2.22		208.7	SURCHARGED	
S1.011	S32	0.233	0.000	2.43		211.7	SURCHARGED	
S1.012	S34	-0.201	0.000	0.43		244.3	OK	
S5.000	S36	-0.138	0.000	0.32		29.9	OK	

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.
S5.001	S38	15 Winter	100	+40%				
S6.000	S40	15 Winter	100	+40%				
S6.001	S42	15 Winter	100	+40%				
S6.002	S44	15 Winter	100	+40%				
S5.002	S46	15 Winter	100	+40%	100/15 Winter			
S5.003	S48	15 Winter	100	+40%	100/15 Summer			
S5.004	S50	15 Winter	100	+40%	100/15 Summer			
S7.000	SHD1	15 Winter	100	+40%				
S7.001	SHD2	15 Winter	100	+40%				
S7.002	SHD3	15 Winter	100	+40%	100/15 Summer			
S7.003	SHD4	15 Winter	100	+40%	100/15 Summer	100/15 Summer		
S5.005	S52	15 Winter	100	+40%	100/15 Summer			
S5.006	S54	15 Winter	100	+40%	100/15 Summer			
S5.007	S56	15 Winter	100	+40%	100/15 Summer			
S5.008	S58	15 Winter	100	+40%	100/15 Summer			
S8.000	S60	15 Winter	100	+40%				
S5.009	S62	15 Winter	100	+40%	100/15 Summer			
S1.013	S64	15 Winter	100	+40%	100/15 Summer			
S1.014	S66	15 Winter	100	+40%	100/15 Summer			
S1.015	S68	15 Winter	100	+40%	100/15 Summer			
S1.016	S70	15 Winter	100	+40%	100/15 Summer			
S1.017	S72	15 Winter	100	+40%				
S1.018	S74	15 Winter	100	+40%				
S1.019	S76	15 Winter	100	+40%				
S1.020	SPOND	720 Winter	100	+40%				
S1.021	S78	720 Winter	100	+40%	100/15 Summer			
S1.022	S80	1440 Winter	100	+40%				
S1.023	S82	1440 Winter	100	+40%				
S1.024	S84	1440 Winter	100	+40%				

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.001	S38	113.461	-0.141	0.000	0.30		45.7	OK	
S6.000	S40	112.768	-0.147	0.000	0.26		18.2	OK	
S6.001	S42	112.559	-0.116	0.000	0.47		33.0	OK	
S6.002	S44	112.324	-0.101	0.000	0.58		73.0	OK	
S5.002	S46	110.278	0.095	0.000	1.00		126.8	SURCHARGED	
S5.003	S48	110.077	0.245	0.000	0.80		165.9	SURCHARGED	
S5.004	S50	109.483	1.321	0.000	0.94		151.1	SURCHARGED	
S7.000	SHD1	111.945	-0.172	0.000	0.13		17.6	OK	
S7.001	SHD2	109.412	-0.121	0.000	0.31		35.7	OK	
S7.002	SHD3	109.348	1.231	0.000	1.11		39.8	SURCHARGED	
S7.003	SHD4	109.111	1.186	8.927	1.69		73.5	FLOOD	4
S5.005	S52	109.202	1.452	0.000	1.34		193.3	SURCHARGED	
S5.006	S54	109.122	1.465	0.000	1.35		187.6	SURCHARGED	

Summary of Critical Results by Maximum Level (Rank 1) for 15031 - SWS NETWORK 1.SWS

PN	US/MH Name	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S5.007	S56	109.031	1.444	0.000	1.27		185.8	SURCHARGED	
S5.008	S58	108.878	1.397	0.000	0.64		193.8	SURCHARGED	
S8.000	S60	109.591	-0.191	0.000	0.06		10.7	OK	
S5.009	S62	108.702	1.507	0.000	1.55		207.8	SURCHARGED	
S1.013	S64	108.576	1.435	0.000	3.67		454.4	SURCHARGED	
S1.014	S66	108.237	1.120	0.000	2.20		447.9	SURCHARGED	
S1.015	S68	107.631	0.636	0.000	3.72		452.1	SURCHARGED	
S1.016	S70	107.280	0.306	0.000	3.51		452.7	SURCHARGED	
S1.017	S72	106.752	-0.204	0.000	0.68		449.9	OK	
S1.018	S74	105.241	-0.284	0.000	0.43		451.3	OK	
S1.019	S76	101.261	-1.739	0.000	0.01		451.5	OK	
S1.020	SPOND	98.346	-1.504	0.000	0.00		16.2	OK	
S1.021	S78	98.346	2.546	0.000	0.03		5.1	SURCHARGED	
S1.022	S80	92.634	-0.266	0.000	0.03		5.1	OK	
S1.023	S82	90.448	-0.252	0.000	0.06		5.1	OK	
S1.024	S84	89.957	-0.243	0.000	0.08		5.1	OK	

APPENDIX II – DRAWINGS

The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully conversant with the contents and requirements of the site investigation report before work starts. The Contractor is to comply in all respects with current building legislation, British Standard Specifications, Building Regulations etc.,whether or not specifically stated on this drawing.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

GENERAL NOTES

1. This drawing is to be read in conjunction with relevant architectural and engineering drawings.

2. Levels indicated in blocks are Finished floor levels and are 150mm above adjacent finished ground levels unless otherwise shown.

3. Levels of the existing road at the point of tie-in with proposed site road must be checked prior to commencement of works.

4. Any discrepancies between the details shown and actual on site conditions to be reported immediately to the engineer prior to commencement of works.

ADOPTABLE ROADS AND SEWERS

1. Roads, footways and parking bays which form part of the highway to be adopted under Section 38 of the Highways Act 1980 shall comply with the requirements of the Adopting Authority.

2. Sewers to be adopted under Section 104 of the Water Industries Act 1991 shall comply with the Water Authorities Association "Sewers for Adoption 6th Edition" with any amendments specified by the Adopting Water Authority.

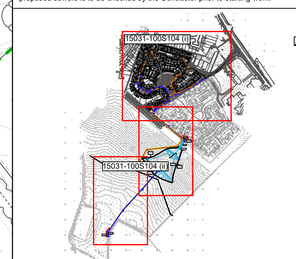
3. All pipes to be used in adoptable sewerage shall be either clayware to BS EN 295 or concrete to BS EN 1916 and BS 5911: Part 1 with Class S bedding unless otherwise stated. With approval of the Adopting Authority solid wall concentric external rib reinforced uPVC pipes complying with the relevant provisions of BS EN 13476 may be used.

4. Where cover to a pipe is more than 1200mm under adoptable carriageway the trench shall be filled to formation of the carriageway with well compacted DTp Type 1 material.

5. Where cover to a pipe is less than 1200mm under adoptable carriageway it shall be provided with concrete protection in accordance with the specification of the adopting authority and back filled to formation of the carriageway with well compacted DTp Type 1 material. Where concrete bed and surround is specified flexibility of joints is to be maintained by using compressible bitumen impregnated fibreboard at each pipe joint.

6. All existing drainage invert levels, diameters and locations are to be checked by the Contractor prior to the commencement of any proposed drainage work. Any difference between actual and drawn details is to be reported to the Engineer immediately.

7. Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed sewers is to be checked by the Contractor prior to starting work.



CONSTRUCTION

Please note while these drawings may be used for tender purposes, drawings are subject to Thames Water approval as part of ongoing consultations and design check. Amendments may therefore be requested

Rev.	Description	Date	By
D	S104 plan has been amended to suit revised drainage strategy using two ponds as means of storage adoptable drainage has been amended to suit.	23.09.16	LJ
C	Cover levels amended to adoptable manholes in raised 75mm shared surface areas.	18.08.16	LJ
B	SS4-S68 amended to suit as-built highway drainage and manholes renumbered to suit the addition of new manhole.	10.08.16	LJ
A	S104 drainage amended to suit new drainage strategy, layout changes and client comments.	31.07.16	LJ
-	First issue.	04.06.16	LJ

Client

CALA HOMES

Project

Cotefield Farm
Bodicote

Title

Section 104 Agreement Plan
Sheet 1 of 2

SECTION 104 LEGEND:

- Proposed S104 Storm Sewer & MH.
- Proposed S104 Foul Sewer & MH.
- Proposed S104 Hydrobrake Chamber.
- Proposed S38 Storm Sewer & MH.
- Proposed S38 Gully & Connection.
- Existing Infrastructure Foul Sewer.
- Proposed S104 Drainage Easement.
- Ground profile to be Raised Locally to Provide Sufficient Cover.
- Boundary of Site Ownership TBC.

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Scale	1:500 @ A1	Drawn	LJ
Date	June 2016	Checked	JB
File	15031/dwgs/civils/current	Drawing	15031 - 100S104 (i) D

Timber Trip Rail Fence added to section off access to pond, minimum distance 1m away from extents of ponds.

Attenuation Pond
Bed Level 97.10
Top of Bank Level 99.85
Water Level in 100yr + 40% Storm 98.35 (Based on impermeable area of 1.258ha)
Max Volume of Water At Top Water Level 830m³

Total Discharge Rate of 5.1 l/s has been derived from area of 1.258ha using greenfield run-off rate.

Base of Swale to be lined with Stone Pitching to direct flow of water to Attenuation Pond

Timber Trip Rail Fence added to section off access to pond, minimum distance 1m away from extents of ponds.

Emergency Spillway level to be set at 99.75 to provide route of run-off in the event Control Chamber fails, to be lined with Reno Mattress (for Specific detail refer to dwg no 15031 - 317.

Max Top of Embankment Level 99.85

Trn Wide Swale With 1 in 3 Banks

Existing Ground profile to be raised by 800mm to provide sufficient cover to proposed MH & Outfall.

IL & CL TBC prior to any connection being made Thames Water to be Notified

Exg Thames Water Sewer

Ground profile to be raised to provide sufficient cover to outfall & SWS

Extents of Ditchcourse TBC prior to installation of Headwall

Outfall & Drainage Legend:

- Proposed S104 Storm Sewer & MH.
- Proposed S104 Foul Sewer & MH.
- Proposed S104 Hydroslide Chamber.
- Proposed S38 Storm Sewer & MH.
- Proposed S38 Gully & Connection.
- Existing Infrastructure Foul Sewer.
- Ground profile to be Raised Locally to Provide Sufficient Cover.
- Boundary of Site Ownership TBC.

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Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

GENERAL NOTES

1. This drawing is to be read in conjunction with relevant architectural and engineering drawings.

2. Levels indicated in blocks are Finished floor levels and are 150mm above adjacent finished ground levels unless otherwise shown.

3. Levels of the existing road at the point of tie-in with proposed site road must be checked prior to commencement of works.

4. Any discrepancies between the details shown and actual on site conditions to be reported immediately to the engineer prior to commencement of works.

ADOPTABLE ROADS AND SEWERS

1. Roads, footways and parking bays which form part of the highway to be adopted under Section 38 of the Highways Act 1980 shall comply with the requirements of the Adopting Authority.

2. Sewers to be adopted under Section 104 of the Water Industries Act 1991 shall comply with the Water Authorities Association "Sewers for Adoption 6th Edition" with any amendments specified by the Adopting Water Authority.

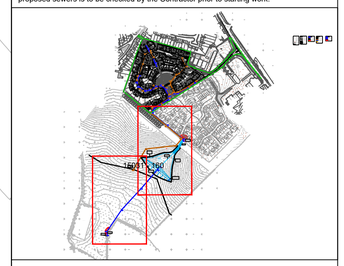
3. All pipes to be used in adoptable sewerage shall be either clayware to BS EN 295 or concrete to BS EN 1916 and BS 5911: Part 1 with Class S bedding unless otherwise stated. With approval of the Adopting Authority solid wall concentric external rib reinforced uPVC pipes complying with the relevant provisions of BS EN 13476 may be used.

4. Where cover to a pipe is more than 1200mm under adoptable carriageway the trench shall be filled to formation of the carriageway with well compacted DTp Type 1 material.

5. Where cover to a pipe is less than 1200mm under adoptable carriageway it shall be provided with concrete protection in accordance with the specification of the adopting authority and back filled to formation of the carriageway with well compacted DTp Type 1 material. Where concrete bed and surround is specified flexibility of joints is to be maintained by using compressible bitumen impregnated fibreboard at each pipe joint.

6. All existing drainage invert levels, diameters and locations are to be checked by the Contractor prior to the commencement of any proposed drainage work. Any difference between actual and drawn details is to be reported to the Engineer immediately.

7. Positions of existing services/statutory undertakers apparatus adjacent to or crossing proposed sewers is to be checked by the Contractor prior to starting work.



CONSTRUCTION

Please note while these drawings may be used for tender purposes, drawings are subject to Thames Water approval as part of ongoing consultations and design check. Amendments may therefore be requested

Rev.	Description	Date	By
-	First issue.	09.12.16	LJ

Client

CALA HOMES

Project

Cotefield Farm
Bodicote

Title

Outfall & Drainage Information

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Date	December 2016	Checked	SM
File	15031/dwgs/civils/current	Drawing	15031 - 160