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Site:	Land South Of Barrow Green Road, Oxted
Prepared by:	Chris Gray
Approved by:	Neil Jaques
Date:	24 July 2025

1.0 Introduction

1.1 This Technical Note has been prepared by Motion on behalf of our client, Croudace Homes Limited. It is intended to resolve the Lead Local Flood Authority (LLFA) Objection to Tandridge District Council Planning Application Number 2025/245, which is for the residential development of up to 190 dwellings (including affordable homes) (Use Class C3), an extra care facility with up to up 80 beds (Use Class C2), together with the formation of vehicular access, landscaping, parking, open space, green and blue infrastructure, and all other associated development works. The full LLFA Consultation Letter Referenced LLFA-TA-25-0769 and dated 8 July 2025 is included in **Appendix A**.

2.0 Resolving LLFA Objection to Tandridge District Council Planning Application Number 2025/245

1) No detailed information has been provided about the diverted route including ground levels and finished floor levels to demonstrate that the overland surface flow will go through the proposed route and there will be no loss in flood storage. The proposed diverted surface water exceedance has not been presented in the drainage plan against the proposed development and SuDS features. Robust evidence should be presented to demonstrate that the proposed diversion will not interfere with the development and SuDS features, and it will not lead to a loss in flood storage which will lead to an increase of surface water flood risk to the site and surrounding area with will be contrary to NPPF.

2.1 Sections 6.1 and 6.2 of the Surface Water Hydraulic Modelling Report submitted for the planning application show the Surface Water Flood Model Development Platform, Lowered Surface Water Flood Model Conveyance Route, Surface Water Flood Model Ground Levels and Peak Surface Water Flood Depths and Levels.

2.2 Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B** now also shows the Surface Water Flood Model Development Platform, Lowered Surface Water Flood Model Conveyance Route and Peak Surface Water Flood Levels. This additional detail shows the proposed diversion will not lead to a loss in flood storage.

2.3 Section 6.3 of the Surface Water Hydraulic Modelling Report states 'The conveyance route was represented within the post-development scenario using a Z-shape. Additionally, a development platform was represented adjacent to this, raising ground levels above the peak modelled flood levels for the purposes of the modelling so the platform remains dry'.

2.4 Section 7.9 of the Surface Water Hydraulic Modelling Report states 'All residential development and SuDS features are located outside of the western flow path. It is recommended that the ground levels and SuDS features within the development platform, as well as residential finished floor levels, are set above the peak modelled flood levels during the 1% AEP plus climate change event with an appropriate freeboard'.

2.5 A note has now also been added to the updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] stating 'The Surface Water Model Development Platform is required to be set 150mm above peak flood levels along the surface water conveyance route, and all Finished Floor Levels are required to be set a minimum of 300mm above the peak modelled surface water flood levels during the 1% AEP plus climate change event. The Proposed Finished Floor Levels are required to be a minimum of 150mm above external

ground levels and 300mm above nearby proposed foul and surface water drainage system cover levels and proposed open SuDS top of banks'.

2) It is understood that the proposed drainage strategy will be based on infiltration because infiltration results appear to be acceptable. However, it is proposed to discharge surface water runoff from the site to an ordinary watercourse located in the western boundary of the site in two different locations. Detailed information should be provided about the proposed hybrid strategy and why it is proposed to discharge surface water runoff to the watercourse when infiltration is feasible at the site or how the proposed scheme will function if this is a combination between both. Different catchments within the site should be clearly identified.

2.6 With reference to Section 7.5 of the Flood Risk Assessment and Drainage Strategy submitted for the planning application, SuDS provide a flexible approach to drainage, with a wide range of components from soakaways to large-scale basins or ponds. The individual techniques should be used where possible in a management train that mimics the natural pre-developed pattern of drainage.

2.7 Following the above approach has resulted in a pond being proposed where targeted infiltration testing has confirmed low permeability ground conditions; attenuation basins being proposed where targeted ground investigation has confirmed groundwater levels to be higher; and soakaways being proposed where targeted infiltration testing has confirmed higher permeability ground conditions and lower groundwater levels.

2.8 Full main investigation ground investigation, infiltration testing and construction details for the SuDS are to be provided at the detailed design stage. Currently it has been assumed infiltration is not viable where infiltration testing was not undertaken during the exploratory investigation e.g. the approximate eastern third of the site.

2.9 With reference to Section 2.3 of the Flood Risk Assessment and Drainage Strategy submitted for the planning application, The site falls from a high point of around 111.50m Above Ordnance Datum (AOD) along the northeast boundary of the site, to a low point of around 95.00m AOD at the southwest corner of the site. The general slope from the high point to the low point is estimated to be around 1 in 25.

2.10 With reference to Section 4.0 of the Flood Risk Assessment and Drainage Strategy submitted for the planning application, there is a spring in the southwest of the site. Please see **Figure 2.1** below. Approximately where the spring originates is shown on the updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B**, and lines of evidence such as the topographic level where the spring originates, and the targeted groundwater investigation undertaken in this location, indicates that the maximum groundwater level is around 97.57m AOD.

Figure 2.1: Spring onsite

2.11 The site topography and spring location dictate that two outfalls are required to drain the proposed development site. The two proposed impermeable catchments areas within the site draining to the two outfalls

have been clearly identified using the colours green and blue in the updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B**.

3) Our guidance documents require that soakage test results should be completed to accompany both full and outline planning applications. If infiltration is proposed confirmation of ground water levels should be submitted; this must demonstrate that a 1m unsaturated zone between the base of the proposed soakaway and highest recorded groundwater level exist.

2.12 Please see Appendix D of the Flood Risk Assessment and Drainage Strategy submitted for the planning application for the Infiltration Testing and Ground Investigation Reports.

2.13 Infiltration testing was targeted to the locations of the proposed pond, two proposed soakaways and the proposed basin closest to the approximate low point of the site.

2.14 The proposed pond location was found to be underlain by CLAY to 2m bgl that does not permit infiltration. Three BRE365 infiltration tests were completed at 2.0m bgl in each of the two infiltration test pits in the location of the two proposed soakaways (TP1 and TP4). TP3 in the location of the proposed basin close to the approximate low point of the site was excavated to 1.6m bgl, however this test pit collapsed during the first test so soakage testing could not be undertaken. On the basis the same ground conditions were encountered in TP1, TP3 and TP4, the worst case infiltration rate from the six tests of 2.55×10^{-4} m/s with an additional factor of safety of 5 has been assumed in the location of the two proposed soakaways.

2.15 The targeted groundwater investigation in the spring location indicates that the maximum groundwater level is around 97.57m AOD (Section 2.10), however the investigation locations away from the spring location to the east and southeast confirm that the groundwater level becomes lower, indicating there is a relationship between the maximum groundwater level of the spring around 97.57m AOD, and the existing ordinary watercourse that flows along the western boundary of the site.

2.16 On the basis the ground level in the location of the borehole nearest to the proposed infiltration basin close to the approximate low point of the site (WS1) is around 96.61m AOD, and the highest groundwater level during the three winter tests was 0.7m bgl, the groundwater level away from the spring location is taken to be around 95.91m AOD. This is significantly lower than the proposed soakaway invert levels of 102.15 and 98.50m AOD.

2.17 The proposed basin invert level closest to the approximate low point of the site was 96.40m AOD, which was 0.5m higher than the groundwater level away from the spring location which is taken to be around 95.91m AOD. With reference to Table 26.4 of CIRIA SuDS Manual 2015 (C753), this groundwater depth was considered sufficient to ensure a 'A layer of dense vegetation underlain by a soil with good contaminant attenuation potential[1] of at least 300 mm in depth[2]' could be provided as part of a proposed infiltration basin design. However, it was considered likely there would be times when infiltration would be less effective, therefore a controlled outfall was also proposed as part of the design.

2.18 After discussion with the LLFA, on the basis a 1m unsaturated zone between the base of the proposed basin closest to the approximate low point of the site and the highest recorded groundwater level cannot be achieved, this basin will now be an attenuation Basin with Impermeable Liner due to high groundwater. Please see in the updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] for more information.

[1] For example as recommended in Sniffer (2008a and 2008b), Scott Wilson (2010) or other appropriate guidance

[2] Alternative depths may be considered where it can be demonstrated that the combination of the proposed depth and soil characteristics will provide equivalent protection to the underlying groundwater – see note 1.

4) areas where ground conditions are not suitable to infiltrate, surface water can be discharged to suitable nearby watercourse. The discharge location should aim to mirror the greenfield hydrological situation. It is proposed to discharge surface water runoff from the site into the watercourse in two different locations. Evidence should be provided that the receiving watercourse has onward connectivity, capacity to receive flows from the site and a gravity connection can be achieved. There is no information about why two different outfalls into the watercourse will be required and what are the proposed discharge rates.

2.19 The Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B** provides a darker coloured outline for the topographical survey so the reader can clearly see the watercourse including bed and bank levels.

2.20 The Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B** provides a darker coloured outline for the topographical survey so the reader can clearly see the watercourse is accessible to discharge surface water runoff from the site.

2.21 Please see Sections 2.9 to 2.11 for why two different outfalls into the watercourse will be required.

2.22 The two proposed outfalls from the site to the ordinary watercourse will be Glass reinforced cement headwalls for a 150mmØ pipe and a 225mmØ pipe installed in accordance with manufacturers requirements. In the past, when sought, ordinary watercourse consent has not been required for the proposed Glass reinforced cement headwall outfall as the profile of the watercourse is not affected. However, Motion will still go through the process of applying to the LLFA for consent at the appropriate time.

2.23 With reference to Section 7.7 of the Flood Risk Assessment and Drainage Strategy submitted for the planning application, the FEH QMED Method was used to derive a QMED value of 10.1 l/s. The discharge rates for the two Hydro-Brake Flow Control Chamber outlets in the MicroDrainage Calculations for the 1 in 100-year + 45% cc critical rainfall event in Appendix I of the Flood Risk Assessment and Drainage Strategy were 9.0 and 1.0 l/s respectively.

2.24 Please see **Appendix C** for the Updated Greenfield Rate Results for the 1 in 2, 1 in 30 and 1 in 100 events and Updated MicroDrainage Calculations Using a Staged Discharge Approach.

5) The watercourse should be clearly presented in the drawing plan including bed and bank levels.

2.25 Please see Sections 2.19 and 2.20 above.

6) It is not clear if the watercourse is within the western boundary of the site and therefore accessible to discharge surface water runoff from the site. It the watercourse is outside the red line boundary of the application; third party permission should be sought and evidenced at the planning application stage.

2.26 Please see Sections 2.19 and 2.20 above.

7) Evidence must be provided to establish the greenfield runoff rate for the site. Surface water should be discharged using a staged discharge approach with flows limited to the greenfield Q1, Q30 and Q100 rates for the corresponding storm events. The greenfield Q1 and QBAR rural rate could also be used as the fixed discharge rates for the impermeable areas of the site. No greenfield rate results for the 1 in 1, 1 in 30 and 1 in 100 events have been provided.

2.27 Please see **Appendix C** for the Updated Greenfield Rate Results for the 1 in 2, 1 in 30 and 1 in 100 events and Updated MicroDrainage Calculations Using a Staged Discharge Approach. The reason greenfield Q2 has been modelled rather than Q1 is because FEH22 Rainfall Data has been used.

2.28 The FEH statistical method has been used to derive 1 in 2, 1 in 30 and 1 in 100 greenfield runoff rate values of 11.1, 29.1 and 40.3 l/s respectively.

2.29 The discharge rates for the two Hydro-Brake Flow Control Chamber outlets in the MicroDrainage Calculations **Appendix C** are proportionate to the two catchment areas draining to the ordinary watercourse.

2.30 The two Hydro-Brake Flow Control Chamber outlets are now annotated with the 1 in 2, 1 in 30 and 1 in 100 greenfield runoff rates in Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B**.

8) On site attenuation should be provided for the 1 in 100 year + 45% allowance of climate change the site, up to and including the 1 in 30-year rainfall event including allowance for climate change, and the surface water up to the 1 in 100-year event including allowance for climate change must be safely contained on site. However, the results are showing FLOOD for those events.

2.31 The FLOOD status of pipe number 6.008 for the 1 in 30-year event in a communal soft landscaping area was because the swale volumes upstream of 48(HW) and 51(HW) had not been included in the hydraulic model in error. This has now been corrected in the updated model in **Appendix C**.

2.32 Pipe numbers 6.005-6.007 had also previously been modelled as 675mm diameter pipes in error, and these pipes have been reduced to 450mm diameter in the updated model in **Appendix C**.

2.33 In the updated drainage strategy and model, the cover level for MH63 has been raised by 100mm and the diameter of the pipe between HW19 and MH20 has been increased from 100mm diameter to 150mm diameter. The base areas of the open SuDS have been checked and amended where appropriate in the drainage strategy and model to ensure the base area offsets from the top of bank of the open SuDS more accurately reflect the depths and side slopes.

2.34 A smaller soakaway was previously proposed in an area that was not 5m from a road. This soakaway has been changed to geocellular storage in the updated drainage strategy and model.

2.35 The drainage network starting with pipe number 1.000 has been made deeper to incorporate deeper upstream geocelluar storage and a Hydro-Brake Flow Control Chamber. The invert level of the proposed basin closest to the approximate low point of the site has been lowered slightly from 96.40 to 96.33m AOD. The top of bank level of the proposed basin closest to the approximate low point of the site has been raised slightly from 97.40 to 97.43m AOD.

2.36 The diameter of one of the two outfall pipes has been increased to 225mm diameter to account for the increased Greenfield Runoff Rate Using the Staged Discharge Approach.

2.37 No changes have been made to the proposed top of bank areas/locations of the open SuDS; areas/locations/volumes of the two proposed soakaways; locations of the proposed manholes / routes of pipework; or the locations of the outfalls.

2.38 The negligible flooding remaining in the model for the 1 in 100-year event including a 45% allowance for climate change is located in communal soft landscaping areas. Only the SuDS included in the model have been annotated, and it can be seen in the updated drainage strategy that a lot of shallow swales; pervious pavement areas and geocellular storage are yet to be included in the model. Furthermore, when the network model becomes more detailed, there will be opportunities to model some of the pervious pavement areas as Type A total infiltration pervious pavements.

9) The development offers the opportunity to utilise a range of sustainable surface water management techniques which not only contribute to a reduction in discharge rates from the site, but provide amenity, biodiversity and water quality improvements and contribute to mitigating climate change by considering both drought and flood conditions. The applicant informed that the drainage strategy will look to use previous pavements, soakaways and open SuDS(swales, detention basins, infiltration basin and a pond) and it is also proposed the use of water butts for the 190. However, these features should be included and labelled in the plan as part of the drainage scheme that will be approved as part of the planning application.

2.39 The Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B** shows the required labels.

2.40 A note has now also been added to Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] stating 'Type 2 standard water butts are to installed on all houses. As 190 houses are proposed, this approximately equates to up to 39,900 litres (39.9m³) of surface water attenuation and recycled water on site'.

10) No evidence has been provided to demonstrate that exceedance events have been considered. The applicant has briefly mentioned it in the report and some arrows have been introduce in the drainage plan, but information is very limited. The design of the site must ensure that flows resulting from rainfall in excess of a 1 in 100 year (+Climate Change (CC) allowance) rainfall event are managed in exceedance routes that minimise the risks to people and property, and do not increase flood risk off site. Any predicted and/or designed flow routes, or areas where water will pool, should be set out in a clear drawing and provided within the management plan to the future site owner.

2.41 With reference to Section 10.6 of the Flood Risk Assessment and Drainage Strategy submitted for the planning application, overall, the intention is that site levels will continue to slope as existing, and the exceedance flow arrows on the Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B** show this.

2.42 With reference to Section 4.17 of the Flood Risk Assessment and Drainage Strategy submitted for the planning application, the proposed development platform ground levels will be approximately 700mm-1000mm higher than existing levels in the southwest of the site post development. However, overall, the intention is still that the proposed development platform ground levels will continue to slope as existing.

2.43 Where the proposed development platform will be elevated relative to the southern site boundary, there is a minimum 9m buffer strip of open space comprising of a footpath and trees and hedgerows that are protected.

2.44 It is envisaged that any further work required in this regard can be conditioned and/or demonstrated at the reserved matters stage.

11) Any proposed flow control device should be included in the drainage plan including discharge rates.

2.45 Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in Appendix H of the Flood Risk Assessment and Drainage Strategy submitted for the planning application showed the proposed flow control devices, however in the Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy] in **Appendix B** the two Hydro-Brake Flow Control Chamber outlets are now annotated with 1 in 2, 1 in 30 and 1 in 100 greenfield runoff rates.

12) Maintenance considerations have been identified for the drainage system. However, it is understood that there is a watercourse adjacent to the redline boundary of the site, future riparian access and maintenance should be considered within the design and detailed in the maintenance plan. If proposed structures into the watercourse maintenance arrangements should be identified for those for the lifetime of the development.

2.46 The Updated Drainage Management and Maintenance Plan has been updated and is included in **Appendix D**.

3.0 Conclusions

3.1 In conclusion, Motion has worked through LLFA Specific Comments and provided the information required to overturn the LLFA objection. As such, flood risk and surface water management should not form an impediment to the progress of the planning application for this development.

Appendix A

LLFA Consultation Letter Referenced LLFA-TA-25-0769 and dated 8 July 2025 for Tandridge District Council Planning Application Number 2025/245

[redacted]

From: Laura Moyano <Laura.Moyano@surreycc.gov.uk>
Sent: 08 July 2025 10:54
To: Cliff Thurlow
Cc: Statutory
Subject: LLFA-TA-25-0769 - Land South Of Barrow Green Road, Oxted
Attachments: LLFA-TA-25-0769 Land South of Barrow Green Road.pdf

Our ref: LLFA-TA-25-0769
Your ref: 2025/245
FAO Cliff Thurlow

Dear Cliff,

Hope you are well.

Please see attached our response regarding the application above, any queries please do not hesitate to contact me.

Laura Moyano
Flood and Climate Resilience Specialist
Environment, Property and Growth

SuDS

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Please consider the environment before printing this email

Case Officer: Laura Moyano
E-mail: SUDS@surreycc.gov.uk

Recommendation (mark one with X)

Further/amended information required	
No objection	
No objection – Subject to conditions	
Objection	**X**

SURREY COUNTY COUNCIL

Flood Risk, Planning, and
Consenting Team
Whitebeam Lodge
Merrow Lane
Guildford
Surrey
GU4 7BQ

Our ref: **LLFA-TA-25-0769**
Your ref: **2025/245**
Date: **08/07/2025**

Dear Planning Authority,

Land South Of Barrow Green Road, Oxted

Thank you for consulting Surrey County Council (SCC) as the Lead Local Flood Authority (LLFA) on the above Outline Planning Application. We have reviewed the surface water drainage strategy for the proposed development and assessed it against the requirements of the NPPF, its accompanying PPG and the Non-Statutory Technical Standards for sustainable drainage systems.

As part of our statutory consultee role our advice relates to surface water flood risk and surface water drainage only, the Environment Agency should be contacted for advice in relation to fluvial flood risk.

Consultation request date: **19/06/2025**
The following documents submitted as part of the above application have been reviewed and should be referred to as part of any future submissions:

- Flood Risk Assessment and Drainage Strategy, February 2025, Rev C, Motion;
- Hydraulic Modelling Report, December 2024, REPORT REF. 2404420-ACE-XX-XX-RP-C-0501AA, ARDENT;
- Hydrological Sequential Test, January 2025, ENV-21564 Report 2 V0, rps group;

We object to the proposed development. The proposed surface water drainage scheme does not meet the requirements set out in the NPPF, its accompanying PPG and the Non-Statutory Technical Standards for sustainable drainage systems.
Insufficient information has been provided / significant issues have been identified, to overcome this, the following changes and information are required:

The application site comprises 9.70 ha of land therefore is classified as 'Major' Development. Any planning application classified as Major Development will need to include a detailed drainage strategy. As per the NPPF, all 'major' planning applications being determined must include full details about surface water drainage and sustainable drainage systems, which is a material consideration.

Paragraph 181 (Feb 2025) of NPPF states:

'*When determining any planning applications, local planning authorities should ensure that flood risk is not increased elsewhere. Where appropriate, applications should be supported by a site-specific flood-risk assessment. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

a) within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;

b) the development is appropriately flood resistant and resilient such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;

c) it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;

d) any residual risk can be safely managed; and

e) safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

Paragraph 182 (Feb 2025) of NPPF states:

'*Applications which could affect drainage on or around the site should incorporate sustainable drainage systems to control flow rates and reduce volumes of runoff, and which are proportionate to the nature and scale of the proposal. These should provide multifunctional benefits wherever possible, through facilitating improvements in water quality and biodiversity, as well as benefits for amenity. Sustainable drainage systems provided as part of proposals for major development should:*

a) take account of advice from the Lead Local Flood Authority;

b) have appropriate proposed minimum operational standards; and

c) have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development.

NPPF requires that proposed developments do not increase flood risk elsewhere and where possible reduce flood risk overall.

The application site is susceptible to surface water flooding through a high-risk surface water overland flow route which flows from the northwest of the site towards the southwest of the site. Any overland flow route within the site should be retained as any changes may lead to an increase of surface water flood risk to the site and surrounding area. However, a diversion of the existing overland flow route has been proposed to allow the proposed development to be located where the existing overland flow route is currently flowing.

A specific hydrological assessment should be carried out to determine the impact of diverting the existing surface water route and to demonstrate that the proposed flood route will not increase the surface flood risk to the site and surrounding area. It should be demonstrated that the proposed change of levels at the site would not lead to a loss in surface water flood storage.

The applicant has carried out a Hydraulic Modelling to assess the impact that the proposed diversion and development will have on surface water flood risk, but insufficient information has been provided.

No detailed information has been provided about the diverted route including ground levels and finished floor levels to demonstrate that the overland surface flow will go through the proposed route and there will be no loss in flood storage. The proposed diverted surface water exceedance route has not been presented in the drainage plan against the proposed development and SuDS

features. Robust evidence should be presented to demonstrate that the proposed diversion will not interfere with the development and SuDS features, and it will not lead to a loss in flood storage which will lead to an increase of surface water flood risk to the site and surrounding area with will be contrary to NPPF.

The applicant has not demonstrated that the surface water will be managed and discharged from the site in accordance with the drainage hierarchy.

It is understood that the proposed drainage strategy will be based on infiltration because infiltration results appear to be acceptable. However, it is proposed to discharge surface water runoff from the site to an ordinary watercourse located in the western boundary of the site in two different locations. Detailed information should be provided about the proposed hybrid strategy and why it is proposed to discharge surface water runoff to the watercourse when infiltration is feasible at the site or how the proposed scheme will function if this is a combination between both. Different catchments within the site should be clearly identified.

Our guidance documents require that soakage test results should be completed to accompany both full and outline planning applications. If infiltration is proposed confirmation of ground water levels should be submitted; this must demonstrate that a 1m unsaturated zone between the base of the proposed soakaway and highest recorded groundwater level exist.

In areas where ground conditions are not suitable to infiltrate, surface water can be discharged to suitable nearby watercourse. The discharge location should aim to mirror the greenfield hydrological situation. It is proposed to discharge surface water runoff from the site into the watercourse in two different locations. Evidence should be provided that the receiving watercourse has onward connectivity, capacity to receive flows from the site and a gravity connection can be achieved. There is no information about why two different outfalls into the watercourse will be required and what are the proposed discharge rates.

The watercourse should be clearly presented in the drawing plan including bed and bank levels.

It is not clear if the watercourse is within the western boundary of the site and therefore accessible to discharge surface water runoff from the site. It the watercourse is outside the red line boundary of the application; third party permission should be sought and evidenced at the planning application stage.

In accordance with **Technical Standard S2:**
'For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event should never exceed the peak greenfield runoff rate for the same event.'
No evidence has been provided which confirms how the Technical Standard has been met.

Evidence must be provided to establish the greenfield runoff rate for the site. Surface water should be discharged using a staged discharge approach with flows limited to the greenfield Q1, Q30 and Q100 rates for the corresponding storm events. The greenfield Q1 and QBAR rural rate could also be used as the fixed discharge rates for the impermeable areas of the site. No greenfield rate results for the 1 in 1, 1 in 30 and 1 in 100 events have been provided.

The FEH QMED Method has been used to derive a QMED value, but no explanation has been provided why QMED has been used. If a fixed discharge rate is proposed Q1 or QBAR can be used, there is no evidence that the proposed rate will not exceed the peak runoff rate for the same event, therefore there is no evidence that the Technical Standard S2 has been met.

On site attenuation should be provided for the 1 in 100 year + 45% allowance of climate change. The preliminary hydraulic calculations need to show that no above ground flooding will occur within

the site, up to and including the 1 in 30-year rainfall event including allowance for climate change, and the surface water up to the 1 in 100-year event including allowance for climate change must be safely contained on site. However, the results are showing FLOOD for those events.

The development offers the opportunity to utilise a range of sustainable surface water management techniques which not only contribute to a reduction in discharge rates from the site, but provide amenity, biodiversity and water quality improvements and contribute to mitigating climate change by considering both drought and flood conditions. The applicant informed that the drainage strategy will look to use previous pavements, soakaways and open SuDS(swales, detention basins, infiltration basin and a pond) and it is also proposed the use of water butts for the 190. However, these features should be included and labelled in the plan as part of the drainage scheme that will be approved as part of the planning application.

In accordance with **Technical Standard S9**:*'The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.'* No evidence has been provided to demonstrate that exceedance events have been considered. The applicant has briefly mentioned it in the report and some arrows have been introduce in the drainage plan, but information is very limited. The design of the site must ensure that flows resulting from rainfall in excess of a 1 in 100 year (+Climate Change (CC) allowance) rainfall event are managed in exceedance routes that minimise the risks to people and property, and do not increase flood risk off site. Any predicted and/or designed flow routes, or areas where water will pool, should be set out in a clear drawing and provided within the management plan to the future site owners.

Any proposed flow control device should be included in the drainage plan including discharge rates.

Maintenance considerations have been identified for the drainage system. However, it is understood that there is a watercourse adjacent to the redline boundary of the site, future riparian access and maintenance should be considered within the design and detailed in the maintenance plan. If proposed structures into the watercourse maintenance arrangements should be identified for those for the lifetime of the development.

Should the Applicant wish to discuss our concerns in more detail we provide a pre-application advice service, details of which are available on our website:
Sustainable Drainage Systems (SuDS) planning advice - Surrey County Council

A full list of the information we expect to receive as part of Outline Planning Application can also be found using the above link.

We object to the development proposed as set out above; however, in the event that planning permission be granted by the Local Planning Authority against our recommendations, suitably worded conditions should be applied. Suggested conditions are below:

1) The development hereby permitted shall not commence until details of the design of a surface water drainage scheme have been submitted to and approved in writing by the planning authority. The design must satisfy the SuDS Hierarchy and be compliant with the national Non-Statutory Technical Standards for SuDS, NPPF and Ministerial Statement on SuDS. The required drainage details shall include:

a) The results of infiltration testing completed in accordance with BRE Digest: 365 and confirmation of groundwater levels. Where infiltration is proposed confirmation is required of a 1m unsaturated zone from the base of any proposed soakaway to the seasonal high groundwater level and confirmation of half-drain times.

b) Evidence that the receiving watercourse has onward connectivity and capacity to receive flows from the site.
c) Evidence that the proposed final solution will effectively manage the 1 in 30 (+35% allowance for climate change) & 1 in 100 (+45%. If infiltration is deemed unfeasible, associated discharge rates and storage volumes shall be provided using a maximum discharge rate of **equivalent to the pre-development Greenfield run-off including multifunctional sustainable drainage systems.**
d) Detailed design drawings for all sustainable drainage elements including cross sections and detailed drainage layout plan.
e) An exceedance flow routing plan demonstrating no increase in surface water flood risk on or off site. The plan must include proposed levels and flow directions.
f) Details of drainage management responsibilities and maintenance regimes for all drainage elements.
g) Details of how surface water will be managed during construction including measures to protect on site and downstream systems prior to the final drainage system being operational. Including details of how existing watercourse on and adjacent to the site will be protected.

Reason: To ensure the design meets the national Non-Statutory Technical Standards for SuDS and the final drainage design does not increase flood risk on or off site.

2) Prior to the first occupation of the development, a verification report must be submitted to and approved by the Local Planning Authority. This must demonstrate that the surface water drainage system has been constructed as per the agreed scheme (or detail any minor variations), confirming any defects have been rectified. Provide the details of any management company. Provide an 'As-Built' drainage layout and state the national grid reference of key drainage elements.

Reason: To ensure the Drainage System is designed to the National Non-Statutory Technical Standards for SuDS.

Informative
If proposed site works affect an Ordinary Watercourse, Surrey County Council as the Lead Local Flood Authority should be contacted to obtain prior written Consent.

If proposed works result in infiltration of surface water to ground within a Source Protection Zone the Environment Agency will require proof of surface water treatment to achieve water quality standards.

Sub ground structures should be designed so they do not have an adverse effect on groundwater.

If there are any further queries please contact the Flood Risk, Planning, and Consenting Team via SUDS@surreycc.gov.uk. Please use our reference number in any future correspondence.

Yours faithfully

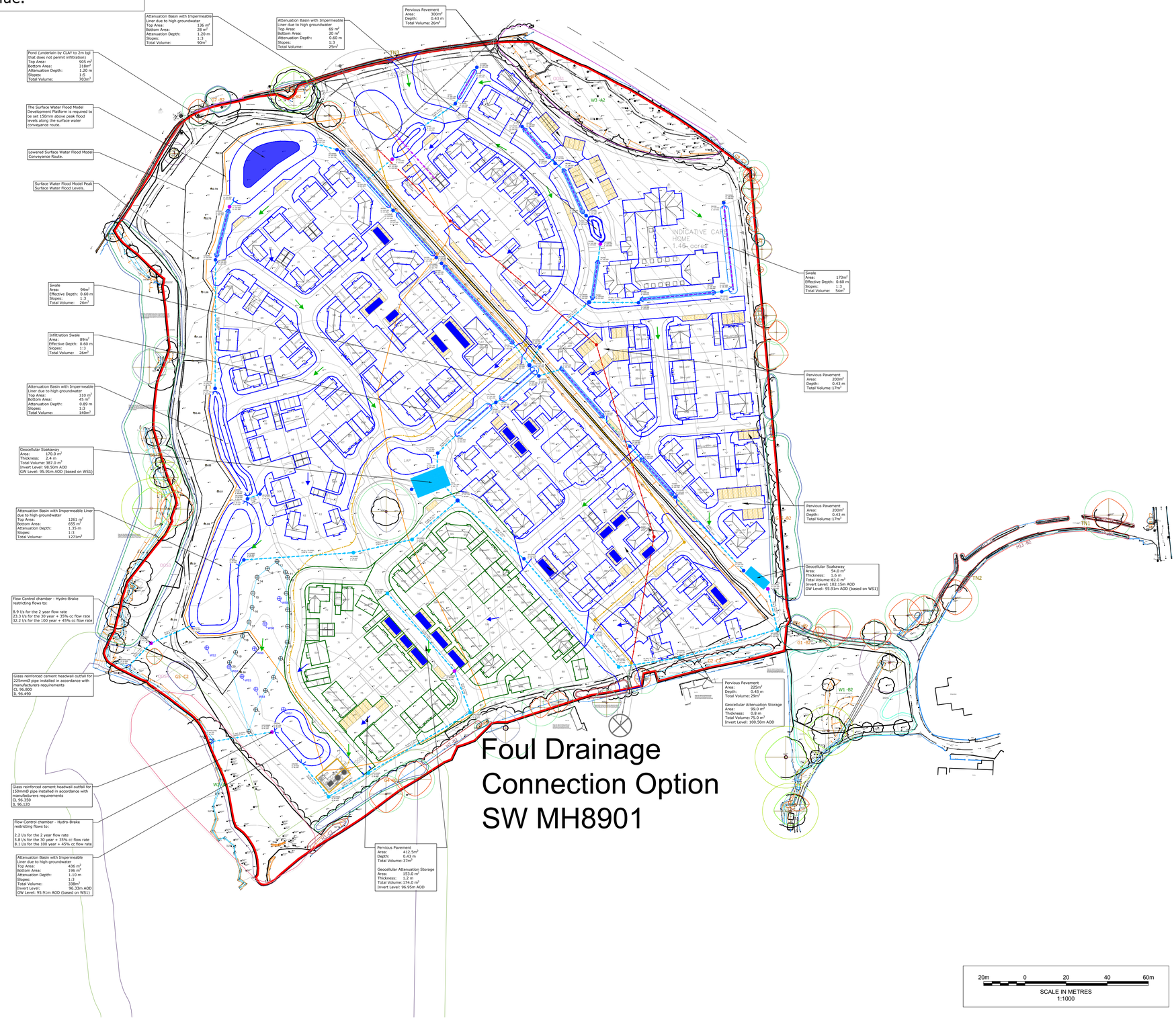
Laura Moyano
Flood Risk & Climate Resilience Specialist
For the Flood Risk, Planning, and Consenting Team

Appendix B

Updated Motion drawing number 2404081-0500-01 P06 [Drainage Strategy]

Notes: Type 2 standard water butts are to installed on all houses. As 190 houses are proposed, this approximately equates to up to 39,900 litres (39.9m³) of surface water attenuation and recycled water on site.

The two proposed impermeable catchments areas within the site draining to the two outfalls have been clearly identified using the colours green and blue.



Notes

1. All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
2. Any discrepancies shall be reported to the engineer immediately, so that clarification can be sought prior to the commencement of works.
3. This drawing shall be read in conjunction with all other relevant engineering details, drawings and specification.
4. The contractor is to keep a record of any variations made on site, including the relocation of sewers or drains, for their "as built" drawings to be prepared upon project completion.
5. All works to adopted systems are to be carried out in accordance with Sewerage Sector Guidance Appendix C, Approved Version 2.1, 25 May 2021. All works to private drainage systems are to be in accordance with the Building Regulations Approved Document Part "H" 2015 edition.
6. 350mm min cover to the pipe crown to be provided for private pipes laid in soft/paved areas. 900mm min cover to be provided for private pipes laid beneath agricultural land and public open space unless not practicable. 1200mm min cover to be provided for highways and parking areas with unrestricted access to vehicles with a gross vehicle weight in excess of 7.5 tonnes unless not practicable. Where unachievable, shallow private drains may require protection using concrete surround or paving slabs bridging the trench, subject to the NHBC inspector's requirements.
7. All pipes shall be laid soffit to soffit with outgoing pipes unless otherwise stated.
8. Manholes situated within areas accessible to motor vehicles are to be fitted with suitable strength covers and frames. Please refer to the manhole schedule for guidance on this.
9. This drawing has been based upon survey information supplied by Hook Survey and Motion cannot guarantee the accuracy of the data provided.
10. The Surface Water Flood Model Development Platform is required to be set 150mm above peak flood levels along the surface water conveyance route, and all Finished Floor Levels are required to be set a minimum of 300mm above the peak modelled surface water flood levels during the 1% AEP plus climate change event. The Proposed Finished Floor Levels are required to be a minimum of 150mm above external ground levels and 300mm above nearby proposed foul and surface water drainage system cover levels and proposed open SuDS top of banks.
11. Adjacent areas of hardstanding will comply with building regulations and divert water away from the buildings. The top surface of the pervious pavement should finish at least 150mm below any adjoining DPC level. Advice should always be sought from the manufacturer.
12. Gullys and linear drainage channels are required to convey surface water for up to the 100 year + 45% climate change critical flow rate. Construction details and supporting calculations are to be provided at the detailed design stage.
13. Full main investigation infiltration testing and construction details for the SuDS are to be provided at the detailed design stage. Currently it has been assumed infiltration is not viable where infiltration testing was not undertaken during the exploratory investigation e.g. the approximate eastern third of the site.
14. The Drainage Strategy is based on preliminary levels and is subject to detailed design.
15. The drainage strategy has been designed to connect to the foul water public sewer that crosses the site via new sewer manhole connection points. Some of the existing foul water public sewer drainage infrastructure that crosses the site will be required to be diverted prior to development commencing. This will need to be agreed with Southern Water beforehand.

Legend

- Site Boundary
- Pervious Pavement
- Geocellular Soakaway - Refer to MicroDrainage Calculations for Dimensions
- Indicative Surface Water Gully Location
- Proposed swale - Refer to MicroDrainage Calculations for Dimensions
- Approximate extent of wet ground associated with spring
- Coordinates obtained around the edge of the spring on 03/10/2024
- Geocellular Attenuation Storage - Refer to MicroDrainage Calculations for Dimensions
- Detention Basin/Infiltration Basin/Pond - Refer to MicroDrainage Calculations for Dimensions
- New Surface Water Gravity Pipe
- Indicative existing exceedance flow route
- New Surface Water Catchpit Chamber
- New Surface Water Manhole
- New Surface Water Hydro-Brake Flow Control Chamber - Refer to MicroDrainage Calculations for 100 + 45% climate change critical flow rate
- Existing Manhole
- New Surface Water Linear Drainage with Sump Unit
- Proposed exceedance flow route where different from existing
- Proposed Headwall
- New Surface Water Perforated Collector Pipe
- New Foul Water Gravity Pipe
- New Foul Water Manhole
- Indicative Route of Proposed Rising Main
- Indicative Location of Foul Water Pumping Station
- Existing Foul Water Gravity Pipe to be Removed
- Existing Foul Water Manhole to be Removed
- Windowless Sampler Boreholes Drilled on 03/12/2024 (WS)

P06	Sixth Issue	ST	CG	NJ	17/07/2025
P05	Fifth Issue	ST	CG	NJ	16/07/2025
P04	Fourth Issue	ST	CG	NJ	27/02/2025
P03	Third Issue	ST	CG	NJ	19/12/2024
P02	Second Issue	ST	CG	NJ	29/11/2024
P01	First Issue	ST	CG	NJ	27/11/24
Revision Notes:		Drn	Chk	App	Date

Drawing Status:
FOR PLANNING
NOT FOR CONSTRUCTION

motion
Guildford - Reading - London
www.motion.co.uk

Client:
Croudace Homes Limited

Project:
Land South of Barrow Green Road, Oxted

Title:
Drainage Strategy

Scale: 1:1000 | Size: A1 | Project No: 2404081

Drawing: 2404081-0500-01 | Revision: P06

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Appendix C

Updated Greenfield Rate Results for the 1 in 2, 1 in 30 and 1 in 100 events and Updated MicroDrainage Calculations Using a Staged Discharge Approach

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	15/07/2025
Calculated by	Chris Gray
Reference	1croxt 2404081
Model version	2.0.1

Location

Site name	Land South of Barrow Green Road
Site location	Oxted,

Site easting	538800
Site northing	153112

Site details

Total site area (ha)	3.526 ha

Greenfield runoff

Method

Method	FEH statistical

FEH statistical

	My value		Map value
SAAR (mm)	777 mm		777
BFIHOST	0.559		
QMed-QBar conversion	1.136		1.136
QMed (l/s)	11.1 l/s		
QBar (FEH statistical) (l/s)	12.6 l/s		

Growth curve factors

	My value		Map value
Hydrological region	6		6
1 year growth factor	0.85		
2 year growth factor	0.88		
10 year growth factor	1.62		
30 year growth factor	2.3		
100 year growth factor	3.19		
200 year growth factor	3.74		

Results

Method	FEH statistical
Flow rate 1 year (l/s)	10.7 l/s
Flow rate 2 year (l/s)	11.1 l/s
Flow rate 10 years (l/s)	20.5 l/s
Flow rate 30 years (l/s)	29.1 l/s
Flow rate 100 years (l/s)	40.3 l/s
Flow rate 200 years (l/s)	47.3 l/s

Disclaimer

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Mainline 1

Pipe Sizes Manhole Sizes

FEH Rainfall Model

Return Period (years)	100	Volumetric Runoff Coeff.	0.750
		PIMP (%)	100
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	45
Site Location	GB 538700 152900 TQ 38700 52900	Minimum Backdrop Height (m)	0.000
Data Type	Catchment	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	500	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	100

Designed with Level Soffits

Time Area Diagram for Mainline 1

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.230	4-8	0.377	8-12	0.038	12-16	0.038	16-20	0.027

Total Area Contributing (ha) = 0.709

Total Pipe Volume (m³) = 31.143

Network Design Table for Mainline 1

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	49.881	0.165	302.3	0.142	15.00	0.0	0.600	o	450	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	95.88	15.71	96.905	0.142	0.0	0.0	16.6	1.16	185.1	53.5

Network Design Table for Mainline 1

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.001	21.561	0.070	308.0	0.153	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.002	57.396	0.190	302.1	0.060	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.003	22.589	0.075	300.0	0.343	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.004	20.735	0.065	319.0	0.010	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.005	20.267	0.010	2026.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
1.006	1.468	0.010	146.8	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
1.007	29.010	0.200	145.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.001	94.95	16.03	96.740	0.295	0.0	0.0	34.2	1.15	183.4	110.2
1.002	92.59	16.85	96.670	0.356	0.0	0.0	40.1	1.16	185.2	129.3
1.003	91.69	17.17	96.480	0.699	0.0	0.0	78.1	1.17	185.8«	251.7
1.004	90.86	17.47	96.405	0.709	0.0	0.0	78.5	1.13	180.2«	253.0
1.005	88.85	18.24	96.340	0.709	0.0	0.0	78.5	0.44	70.4«	253.0
1.006	88.77	18.27	96.330	0.709	0.0	0.0	78.5	0.83	14.6«	253.0
1.007	96.28	15.58	96.320	0.000	1.0	0.0	0.3	0.83	14.7	1.0

Manhole Schedules for Mainline 1

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)
100	99.150	2.245	Open Manhole	1500	1.000	96.905	450				
101	98.800	2.060	Open Manhole	1500	1.001	96.740	450	1.000	96.740	450	
102	98.800	2.130	Open Manhole	1500	1.002	96.670	450	1.001	96.670	450	
103	97.600	1.120	Open Manhole	1500	1.003	96.480	450	1.002	96.480	450	
104	97.430	1.025	Open Manhole	1500	1.004	96.405	450	1.003	96.405	450	
105(HW)	97.430	1.090	Junction		1.005	96.340	450	1.004	96.340	450	
106(HW)	97.430	1.100	Junction		1.006	96.330	150	1.005	96.330	450	
106	97.430	1.110	Open Manhole	1500	1.007	96.320	150	1.006	96.320	150	
Outfall	96.350	0.230	Open Manhole	0		OUTFALL		1.007	96.120	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
100	538762.010	153032.289	538762.010	153032.289	Required	
101	538794.639	152994.561	538794.639	152994.561	Required	
102	538802.224	152974.378	538802.224	152974.378	Required	
103	538752.880	152945.060	538752.880	152945.060	Required	
104	538733.473	152933.500	538733.473	152933.500	Required	
105(HW)	538720.607	152949.761			No Entry	
106(HW)	538707.436	152965.165			No Entry	
106	538705.987	152964.929	538705.987	152964.929	Required	
Outfall	538677.342	152960.344			No Entry	

PIPELINE SCHEDULES for Mainline 1

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)
1.000	o	450	100	99.150	96.905	1.795	Open Manhole	1500
1.001	o	450	101	98.800	96.740	1.610	Open Manhole	1500
1.002	o	450	102	98.800	96.670	1.680	Open Manhole	1500
1.003	o	450	103	97.600	96.480	0.670	Open Manhole	1500
1.004	o	450	104	97.430	96.405	0.575	Open Manhole	1500
1.005	o	450	105(HW)	97.430	96.340	0.640	Junction	
1.006	o	150	106(HW)	97.430	96.330	0.950	Junction	
1.007	o	150	106	97.430	96.320	0.960	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)
1.000	49.881	302.3	101	98.800	96.740	1.610	Open Manhole	1500
1.001	21.561	308.0	102	98.800	96.670	1.680	Open Manhole	1500
1.002	57.396	302.1	103	97.600	96.480	0.670	Open Manhole	1500
1.003	22.589	300.0	104	97.430	96.405	0.575	Open Manhole	1500
1.004	20.735	319.0	105(HW)	97.430	96.340	0.640	Junction	
1.005	20.267	2026.7	106(HW)	97.430	96.330	0.650	Junction	
1.006	1.468	146.8	106	97.430	96.320	0.960	Open Manhole	1500
1.007	29.010	145.1	Outfall	96.350	96.120	0.080	Open Manhole	0

Area Summary for Mainline 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.096	0.096	0.096
	User	-	100	0.012	0.012	0.109
	User	-	100	0.024	0.024	0.133
	User	-	100	0.004	0.004	0.136
	User	-	100	0.006	0.006	0.142
1.001	User	-	100	0.064	0.064	0.064
	User	-	100	0.017	0.017	0.081
	User	-	100	0.017	0.017	0.098
	User	-	100	0.013	0.013	0.111
	User	-	100	0.008	0.008	0.120
	User	-	100	0.003	0.003	0.123
	User	-	100	0.015	0.015	0.137
	User	-	100	0.002	0.002	0.139
	User	-	100	0.011	0.011	0.150
	User	-	100	0.003	0.003	0.153
1.002	User	-	100	0.006	0.006	0.006
	User	-	100	0.004	0.004	0.010
	User	-	100	0.009	0.009	0.019
	User	-	100	0.007	0.007	0.026
	User	-	100	0.010	0.010	0.036
	User	-	100	0.004	0.004	0.040
	User	-	100	0.009	0.009	0.048
	User	-	100	0.001	0.001	0.049
	User	-	100	0.001	0.001	0.051
	User	-	100	0.002	0.002	0.052
	User	-	100	0.002	0.002	0.054
	User	-	100	0.006	0.006	0.060
1.003	User	-	100	0.111	0.111	0.111
	User	-	100	0.025	0.025	0.136
	User	-	100	0.015	0.015	0.150
	User	-	100	0.014	0.014	0.165
	User	-	100	0.058	0.058	0.222
	User	-	100	0.017	0.017	0.239
	User	-	100	0.012	0.012	0.251
	User	-	100	0.003	0.003	0.255
	User	-	100	0.007	0.007	0.262
	User	-	100	0.006	0.006	0.268
	User	-	100	0.004	0.004	0.271
	User	-	100	0.006	0.006	0.278
	User	-	100	0.005	0.005	0.283
	User	-	100	0.004	0.004	0.286
	User	-	100	0.009	0.009	0.296
	User	-	100	0.005	0.005	0.301
	User	-	100	0.004	0.004	0.305
	User	-	100	0.007	0.007	0.311
	User	-	100	0.005	0.005	0.316
	User	-	100	0.010	0.010	0.326
	User	-	100	0.001	0.001	0.327
	User	-	100	0.001	0.001	0.329

Area Summary for Mainline 1

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	100	0.002	0.002	0.331
	User	-	100	0.006	0.006	0.337
	User	-	100	0.006	0.006	0.343
1.004	User	-	100	0.010	0.010	0.010
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.709	0.709	0.709

Free Flowing Outfall Details for Mainline 1

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007	Outfall	96.350	96.120	0.000	0	0

Simulation Criteria for Mainline 1

Volumetric Runoff Coeff	0.750	Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000
Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	0.000	Run Time (mins)	60
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800	Output Interval (mins)	5

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 3 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model		FEH	Data Type	Catchment	Cv (Winter) 0.750
Return Period (years)		100	Summer Storms	No	Storm Duration (mins) 30
FEH Rainfall Version		2013	Winter Storms	Yes	
Site Location	GB 538700 152900 TQ 38700 52900		Cv (Summer)	1.000	

Online Controls for Mainline 1

Hydro-Brake® Optimum Manhole: 101, DS/PN: 1.001, Volume (m³): 11.3

Unit Reference	MD-SHE-0070-3000-2010-3000	Objective	Minimise upstream storage	Invert Level (m)	96.740
Design Head (m)	2.010	Application	Surface	Minimum Outlet Pipe Diameter (mm)	100
Design Flow (l/s)	3.0	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	70		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	2.010	3.0	Flush-Flo™	0.308	2.2	Kick-Flo®	0.629	1.8	Mean Flow over Head Range	-	2.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.8	0.500	2.1	1.200	2.4	2.000	3.0	3.000	3.6	5.000	4.6	7.000	5.4	9.000	6.0
0.200	2.1	0.600	1.9	1.400	2.5	2.200	3.1	3.500	3.9	5.500	4.8	7.500	5.5	9.500	6.2
0.300	2.2	0.800	2.0	1.600	2.7	2.400	3.3	4.000	4.1	6.000	5.0	8.000	5.7		
0.400	2.2	1.000	2.2	1.800	2.8	2.600	3.4	4.500	4.4	6.500	5.2	8.500	5.9		

Complex Manhole: 106, DS/PN: 1.007, Volume (m³): 2.0

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0078-2200-0480-2200	Objective	Minimise upstream storage	Invert Level (m)	96.320
Design Head (m)	0.480	Application	Surface	Minimum Outlet Pipe Diameter (mm)	100
Design Flow (l/s)	2.2	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	78		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.480	2.2	Flush-Flo™	0.144	2.2	Kick-Flo®	0.335	1.9	Mean Flow over Head Range	-	1.9

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.2	0.500	2.2	1.200	3.3	2.000	4.2	3.000	5.1	5.000	6.5	7.000	7.7	9.000	8.7
0.200	2.2	0.600	2.4	1.400	3.6	2.200	4.4	3.500	5.5	5.500	6.8	7.500	8.0	9.500	9.0
0.300	2.0	0.800	2.8	1.600	3.8	2.400	4.6	4.000	5.9	6.000	7.1	8.000	8.2		
0.400	2.0	1.000	3.1	1.800	4.0	2.600	4.8	4.500	6.2	6.500	7.4	8.500	8.5		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0094-3200-0300-3200	Objective	Minimise upstream storage	Invert Level (m)	96.800
Design Head (m)	0.300	Application	Surface	Minimum Outlet Pipe Diameter (mm)	150
Design Flow (l/s)	3.2	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	94		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.300	3.2	Flush-Flo™	0.136	3.2	Kick-Flo®	0.239	2.9	Mean Flow over Head Range	-	2.5

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	3.0	0.500	4.0	1.200	6.1	2.000	7.7	3.000	9.4	5.000	12.0	7.000	14.3	9.000	16.2
0.200	3.1	0.600	4.4	1.400	6.5	2.200	8.1	3.500	10.1	5.500	12.6	7.500	14.8	9.500	16.6
0.300	3.2	0.800	5.0	1.600	7.0	2.400	8.4	4.000	10.8	6.000	13.2	8.000	15.3		
0.400	3.7	1.000	5.6	1.800	7.4	2.600	8.8	4.500	11.4	6.500	13.7	8.500	15.7		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0063-1300-0280-1300	Objective	Minimise upstream storage	Invert Level (m)	97.100
Design Head (m)	0.280	Application	Surface	Minimum Outlet Pipe Diameter (mm)	100
Design Flow (l/s)	1.3	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	63		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.280	1.3	Flush-Flo™	0.093	1.3	Kick-Flo®	0.207	1.1	Mean Flow over Head Range	-	1.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.3	0.500	1.7	1.200	2.5	2.000	3.2	3.000	3.8	5.000	5.0	7.000	5.9	9.000	6.7
0.200	1.2	0.600	1.8	1.400	2.7	2.200	3.3	3.500	4.1	5.500	5.2	7.500	6.1	9.500	6.8
0.300	1.3	0.800	2.1	1.600	2.9	2.400	3.5	4.000	4.4	6.000	5.4	8.000	6.3		
0.400	1.5	1.000	2.3	1.800	3.0	2.600	3.6	4.500	4.7	6.500	5.7	8.500	6.5		

Storage Structures for Mainline 1

Complex Manhole: 101, DS/PN: 1.001

Cellular Storage

Invert Level (m) 96.950 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	153.0	153.0	1.200	153.0	282.6	1.201	0.0	282.6

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0	Width (m)	5.0	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	60.0	Evaporation (mm/day)	3
Max Percolation (l/s)	83.3	Invert Level (m)	98.370	Slope (1:X)	200.0	Membrane Depth (mm)	130

Porous Car Park Manhole: 103, DS/PN: 1.003

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0	Width (m)	5.0	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	22.5	Evaporation (mm/day)	3
Max Percolation (l/s)	31.3	Invert Level (m)	97.170	Slope (1:X)	200.0	Membrane Depth (mm)	130

Tank or Pond Manhole: 106(HW), DS/PN: 1.006

Invert Level (m) 96.330

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	196.0	1.100	436.0

Manhole Headloss for Mainline 1

PN	US/MH Name	US/MH Headloss
1.000	100	0.500
1.001	101	0.500
1.002	102	0.500
1.003	103	0.500
1.004	104	0.500
1.005	105(HW)	0.000
1.006	106(HW)	0.000
1.007	106	0.500

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	100	3.967	7.933	0.000	11.900
1.001	101	3.640	3.429	197.133	204.203
1.002	102	3.764	9.128	0.000	12.892
1.003	103	1.979	3.593	10.125	15.697
1.004	104	1.811	3.298	0.000	5.109
1.005	105(HW)	0.000	3.223	0.000	3.223
1.006	106(HW)	0.000	0.026	338.920	338.946
1.007	106	1.962	0.513	0.000	2.474
Total		17.124	31.143	546.179	594.446

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
1.000	100	3.967	7.695	0.000	11.662
1.001	101	3.640	3.191	197.133	203.964
1.002	102	3.764	8.890	0.000	12.654
1.003	103	1.979	3.354	10.125	15.458
1.004	104	1.811	3.178	0.000	4.990
1.005	105(HW)	0.000	3.223	0.000	3.223
1.006	106(HW)	0.000	0.013	338.920	338.933
1.007	106	1.962	0.499	0.000	2.461
Total		17.124	30.043	546.179	593.346

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 1

Simulation Criteria

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

Number of Input Hydrographs 0 | Number of Online Controls 2 | Number of Offline Controls 0 | Number of Storage Structures 3 | Number of Time/Area Diagrams 0 | Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH | Site Location GB 538700 152900 TQ 38700 52900 | Cv (Winter) 0.840
Return Period (years) 2 | Data Type Catchment
FEH Rainfall Version 2013 | Cv (Summer) 0.750

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Sensitivity flows(s) (%) 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	100	240 minute 2 year Winter Q+0%	99.150	97.145	-0.210	0.000			0.415	29.904		5.1	OK
1.001	101	240 minute 2 year Winter Q+0%	98.800	97.144	-0.046	0.000		0.000	34.715	57.670	174	2.2	OK
1.002	102	960 minute 2 year Winter Q+0%	98.800	96.793	-0.327	0.000			0.583	109.544		3.0	OK
1.003	103	960 minute 2 year Winter Q+0%	97.600	96.792	-0.138	0.000		0.000	4.676	216.248	317	7.5	OK
1.004	104	960 minute 2 year Winter Q+0%	97.430	96.791	-0.064	0.000			3.342	219.356		7.5	OK
1.005	105(HW)	960 minute 2 year Winter Q+0%	97.430	96.790	0.000	0.000			3.338	219.253		7.3	OK*
1.006	106(HW)	960 minute 2 year Winter Q+0%	97.430	96.789	0.309	0.000			113.071	209.094		2.4	SURCHARGED*
1.007	106	960 minute 2 year Winter Q+0%	97.430	96.791	0.321	0.000			0.836	208.976		2.2	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 1

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 3 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Site Location	GB 538700 152900 TQ 38700 52900	Cv (Winter)	0.840
Return Period (years)	30	Data Type	Catchment		
FEH Rainfall Version	2013	Cv (Summer)	0.750		

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Sensitivity flows(s) (%) 0, +35

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	100	360 minute 30 year Winter Q+35%	99.150	97.803	0.448	0.000			1.577	85.137		10.0	SURCHARGED
1.001	101	360 minute 30 year Winter Q+35%	98.800	97.803	0.613	0.000		0.000	133.502	85.220		2.2	SURCHARGED
1.002	102	15 minute 30 year Winter Q+35%	98.800	97.120	0.000	0.000			3.690	19.183		24.9	OK
1.003	103	960 minute 30 year Winter Q+35%	97.600	97.091	0.161	0.000		0.000	9.929	521.315	1171	15.6	SURCHARGED
1.004	104	960 minute 30 year Winter Q+35%	97.430	97.088	0.233	0.000			4.553	525.564		15.7	SURCHARGED
1.005	105(HW)	15 minute 30 year Summer Q+0%	97.430	96.790	0.000	0.000			3.366	62.613		113.2	SURCHARGED*
1.006	106(HW)	960 minute 30 year Winter Q+35%	97.430	97.084	0.604	0.000			207.207	409.881		6.0	SURCHARGED*
1.007	106	960 minute 30 year Winter Q+35%	97.430	97.086	0.616	0.000			1.358	409.058		5.8	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 1

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 3 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Site Location	GB 538700 152900 TQ 38700 52900	Cv (Winter)	0.840
Return Period (years)	100	Data Type	Catchment		
FEH Rainfall Version	2013	Cv (Summer)	0.750		

Margin for Flood Risk Warning (mm) 300.0 DTS Status ON Inertia Status ON

Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880

Sensitivity flows(s) (%) 0, +45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
1.000	100	480 minute 100 year Winter Q+45%	99.150	98.590	1.235	0.000			2.969	123.983		10.6	SURCHARGED
1.001	101	480 minute 100 year Winter Q+45%	98.800	98.590	1.400	0.000		0.000	192.691	244.467	774	2.5	FLOOD RISK
1.002	102	15 minute 100 year Winter Q+45%	98.800	97.396	0.276	0.000			4.464	23.137		32.5	SURCHARGED
1.003	103	15 minute 100 year Winter Q+45%	97.600	97.293	0.363	0.000		0.000	12.554	120.400	11	234.0	SURCHARGED
1.004	104	960 minute 100 year Winter Q+45%	97.430	97.269	0.414	0.000			4.872	658.286		20.1	FLOOD RISK
1.005	105 (HW)	15 minute 100 year Summer Q+0%	97.430	96.790	0.000	0.000			3.446	76.595		157.9	SURCHARGED*
1.006	106 (HW)	960 minute 100 year Winter Q+45%	97.430	97.263	0.783	0.000			273.847	533.705		8.6	FLOOD RISK*
1.007	106	960 minute 100 year Winter Q+45%	97.430	97.264	0.794	0.000			1.671	533.101		8.1	FLOOD RISK

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Mainline 2

Pipe Sizes Manhole Sizes

FEH Rainfall Model

Return Period (years)	100	Volumetric Runoff Coeff.	0.750
		PIMP (%)	100
FEH Rainfall Version	2013	Add Flow / Climate Change (%)	45
Site Location	GB 538700 152900 TQ 38700 52900	Minimum Backdrop Height (m)	0.000
Data Type	Catchment	Maximum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	500	Min Design Depth for Optimisation (m)	0.000
Maximum Time of Concentration (mins)	30	Min Vel for Auto Design only (m/s)	1.00
Foul Sewage (l/s/ha)	0.000	Min Slope for Optimisation (1:X)	100

Designed with Level Soffits

Time Area Diagram for Mainline 2

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.852	4-8	1.691	8-12	0.132	12-16	0.105	16-20	0.037	20-24	0.000

Total Area Contributing (ha) = 2.817

Total Pipe Volume (m³) = 105.985

Network Design Table for Mainline 2

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.000	1.431	0.010	143.1	0.006	15.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.000	97.99	15.02	104.250	0.006	0.0	0.0	0.8	1.31	92.8	2.4

Network Design Table for Mainline 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.001	16.310	0.590	27.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.002	2.718	0.010	271.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.003	18.531	0.390	47.5	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.004	21.018	0.650	32.3	0.076	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.005	1.496	0.015	99.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
2.006	16.170	0.615	26.3	0.028	0.00	0.0	0.600	o	150	Pipe/Conduit	
3.000	1.469	0.010	146.9	0.017	15.00	0.0	0.600	o	300	Pipe/Conduit	
3.001	27.183	0.090	302.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.002	2.454	0.010	245.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.003	2.245	0.010	224.5	0.042	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.004	17.172	0.065	264.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.007	19.281	0.070	275.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.008	1.681	0.010	168.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.009	10.409	0.040	260.2	0.040	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.010	48.669	0.050	973.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.011	3.495	0.270	12.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.012	1.474	0.050	29.5	0.010	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.013	23.786	0.320	74.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.001	97.71	15.11	104.240	0.006	0.0	0.0	0.8	3.00	212.2	2.4
2.002	97.57	15.16	103.650	0.006	0.0	0.0	0.8	0.95	67.1	2.4
2.003	97.16	15.29	103.640	0.033	0.0	0.0	3.9	2.29	161.6	12.5
2.004	96.77	15.42	103.250	0.109	0.0	0.0	12.9	2.77	196.1	41.5
2.005	96.70	15.44	102.600	0.109	0.0	0.0	12.9	1.01	17.8«	41.5
2.006	97.63	15.14	102.585	0.000	1.0	0.0	0.3	1.97	34.8	1.0
3.000	97.98	15.02	102.000	0.017	0.0	0.0	2.0	1.30	91.5	6.6
3.001	96.46	15.52	101.990	0.017	0.0	0.0	2.0	0.90	63.6	6.6
3.002	96.33	15.56	101.900	0.017	0.0	0.0	2.0	1.00	70.6	6.6
3.003	96.23	15.60	101.890	0.059	0.0	0.0	6.9	1.05	73.9	22.2
3.004	95.34	15.90	101.880	0.059	0.0	0.0	6.9	0.96	68.0	22.2
2.007	94.33	16.24	101.820	0.059	1.0	0.0	7.2	0.94	66.6	23.2
2.008	94.27	16.26	101.750	0.059	1.0	0.0	7.2	1.21	85.5	23.2
2.009	93.75	16.44	101.740	0.099	1.0	0.0	11.7	0.97	68.6	37.8
2.010	89.27	18.08	101.700	0.099	1.0	0.0	11.7	0.50	35.1«	37.8
2.011	89.24	18.09	101.650	0.099	1.0	0.0	11.7	4.39	310.5	37.8
2.012	98.02	15.01	101.380	0.000	0.4	0.0	0.1	2.91	205.5	0.4
2.013	97.36	15.23	101.330	0.000	0.4	0.0	0.2	1.83	129.0	0.6

Network Design Table for Mainline 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
2.014	1.448	0.010	144.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.015	62.449	1.300	48.0	0.097	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.016	1.492	0.010	149.2	0.036	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.017	52.930	1.030	51.4	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.018	1.650	0.070	23.6	0.274	0.00	0.0	0.600	o	150	Pipe/Conduit	
4.000	6.570	0.030	219.0	0.231	15.00	0.0	0.600	o	300	Pipe/Conduit	
2.019	1.570	0.010	157.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.020	65.865	1.180	55.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	1.374	0.010	137.4	0.124	15.00	0.0	0.600	o	300	Pipe/Conduit	
5.001	12.030	0.010	1203.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.002	1.383	0.010	138.3	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.003	20.204	0.505	40.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.004	49.556	0.575	86.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.005	29.773	0.925	32.2	0.046	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.006	19.796	0.325	60.9	0.009	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.007	50.007	0.625	80.0	0.238	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.008	42.989	1.890	22.7	0.161	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
2.014	97.30	15.24	101.010	0.000	0.4	0.0	0.2	1.30	92.2	0.6
2.015	95.92	15.70	101.000	0.097	0.4	0.0	11.6	2.27	160.7	37.3
2.016	95.86	15.72	99.700	0.133	0.4	0.0	15.7	1.28	90.8	50.7
2.017	94.67	16.12	99.690	0.133	0.4	0.0	15.7	2.20	155.4	50.7
2.018	94.63	16.14	98.660	0.407	0.4	0.0	47.2	2.08	36.8«	152.0
4.000	97.73	15.10	98.470	0.231	0.0	0.0	27.6	1.06	74.8«	88.8
2.019	94.57	16.16	98.440	0.639	0.4	0.0	73.8	1.25	88.5«	237.8
2.020	93.07	16.68	98.430	0.639	0.4	0.0	73.8	2.11	149.1«	237.8
5.000	97.99	15.02	103.435	0.124	0.0	0.0	14.8	1.34	94.7	47.7
5.001	96.62	15.47	103.425	0.124	0.0	0.0	14.8	0.44	31.4«	47.7
5.002	96.57	15.49	103.415	0.124	0.0	0.0	14.8	1.34	94.4	47.7
5.003	97.63	15.14	103.405	0.000	1.0	0.0	0.3	2.49	176.2	1.0
5.004	96.16	15.62	102.900	0.000	1.0	0.0	0.5	1.69	119.8	1.5
5.005	95.62	15.80	102.325	0.046	1.0	0.0	5.8	2.78	196.6	18.6
5.006	95.14	15.96	101.400	0.055	1.0	0.0	6.8	2.02	142.7	21.8
5.007	93.75	16.44	101.075	0.292	1.0	0.0	33.8	1.76	124.4	109.0
5.008	93.13	16.65	100.450	0.453	1.0	0.0	51.9	3.31	234.0	167.1

Network Design Table for Mainline 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
6.000	1.513	0.010	151.3	0.017	15.00	0.0	0.600	o	300	Pipe/Conduit	
6.001	50.853	0.190	267.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.002	13.032	0.050	260.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.000	1.456	0.010	145.6	0.000	15.00	0.0	0.600	o	300	Pipe/Conduit	
7.001	40.896	1.690	24.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.002	3.655	0.150	24.4	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.003	3.096	0.150	20.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.004	36.668	1.990	18.4	0.058	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.005	1.835	0.010	183.5	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.006	24.032	1.010	23.8	0.003	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.000	1.151	0.010	115.1	0.000	15.00	0.0	0.600	o	300	Pipe/Conduit	
8.001	19.118	0.070	273.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.002	3.745	0.020	187.3	0.014	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.003	4.773	0.020	238.7	0.014	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.004	23.710	0.410	57.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.005	1.732	0.010	173.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.006	1.721	0.010	172.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
6.000	97.98	15.02	101.750	0.017	0.0	0.0	2.0	1.28	90.2	6.5
6.001	95.31	15.91	101.740	0.017	0.0	0.0	2.0	0.96	67.6	6.5
6.002	94.65	16.13	101.550	0.017	0.0	0.0	2.0	0.97	68.5	6.5
7.000	97.99	15.02	108.000	0.000	0.0	0.0	0.0	1.30	92.0	0.0
7.001	97.34	15.23	107.990	0.000	0.0	0.0	0.0	3.21	226.9	0.0
7.002	97.28	15.25	106.300	0.017	0.0	0.0	2.1	3.20	226.1	6.6
7.003	97.24	15.26	106.150	0.017	0.0	0.0	2.1	3.48	245.7	6.6
7.004	96.73	15.43	106.000	0.075	0.0	0.0	8.9	3.68	260.1	28.7
7.005	96.65	15.46	104.010	0.102	0.0	0.0	12.0	1.16	81.8	38.6
7.006	96.28	15.58	104.000	0.105	0.0	0.0	12.3	3.24	228.8	39.8
8.000	98.00	15.01	104.620	0.000	0.0	0.0	0.0	1.46	103.5	0.0
8.001	96.98	15.35	104.610	0.000	0.0	0.0	0.0	0.95	66.9	0.0
8.002	96.82	15.40	104.540	0.014	0.0	0.0	1.7	1.15	81.0	5.5
8.003	96.58	15.48	104.520	0.029	0.0	0.0	3.4	1.01	71.6	10.9
8.004	96.00	15.67	104.500	0.029	0.0	0.0	3.4	2.07	146.4	10.9
8.005	95.93	15.70	104.090	0.029	0.0	0.0	3.4	1.19	84.2	10.9
8.006	95.86	15.72	104.080	0.029	0.0	0.0	3.4	1.20	84.5	10.9

Network Design Table for Mainline 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
8.007	12.955	0.070	185.1	0.048	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.008	1.050	0.010	105.0	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.009	8.202	0.190	43.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.010	19.203	0.800	24.0	0.014	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.011	2.020	0.010	202.0	0.020	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.007	32.210	0.790	40.8	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
7.008	10.270	0.700	14.7	0.285	0.00	0.0	0.600	o	300	Pipe/Conduit	
6.003	3.547	0.030	118.2	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.000	1.467	0.010	146.7	0.000	15.00	0.0	0.600	o	300	Pipe/Conduit	
9.001	23.676	0.140	169.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.002	7.903	0.250	31.6	0.028	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.003	18.964	0.600	31.6	0.184	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.004	31.366	1.400	22.4	0.025	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.005	10.803	0.900	12.0	0.081	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.006	1.486	0.010	148.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
9.007	2.081	0.020	104.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
8.007	95.30	15.91	104.070	0.077	0.0	0.0	9.0	1.15	81.5	28.8
8.008	95.27	15.92	104.000	0.077	0.0	0.0	9.0	1.53	108.5	28.8
8.009	97.87	15.06	103.990	0.000	1.0	0.0	0.3	2.40	169.6	1.0
8.010	97.57	15.16	103.800	0.014	1.0	0.0	2.1	3.22	227.8	6.8
8.011	97.48	15.19	103.000	0.034	1.0	0.0	4.5	1.10	77.9	14.4
7.007	95.63	15.80	102.990	0.139	1.0	0.0	16.6	2.47	174.6	53.6
7.008	95.50	15.84	102.200	0.424	1.0	0.0	49.7	4.13	291.6	160.3
6.003	94.53	16.17	101.500	0.440	1.0	0.0	51.2	1.44	102.1«	164.9
9.000	97.99	15.02	103.800	0.000	0.0	0.0	0.0	1.30	91.6	0.0
9.001	96.99	15.35	103.790	0.000	0.0	0.0	0.0	1.21	85.3	0.0
9.002	96.85	15.39	103.650	0.028	0.0	0.0	3.3	2.81	198.4	10.8
9.003	96.51	15.51	103.400	0.212	0.0	0.0	25.0	2.81	198.4	80.4
9.004	96.04	15.66	102.800	0.238	0.0	0.0	27.8	3.34	235.8	89.6
9.005	95.92	15.70	102.400	0.319	0.0	0.0	37.3	4.56	322.5	120.0
9.006	95.86	15.72	101.500	0.319	0.0	0.0	37.3	1.29	91.0«	120.0
9.007	95.79	15.74	101.490	0.319	0.0	0.0	37.3	1.54	108.9«	120.0

Network Design Table for Mainline 2

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
6.004	20.986	0.090	233.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.005	2.543	0.010	254.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.006	2.706	0.010	270.6	0.228	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.007	22.667	0.100	226.7	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.008	12.237	0.200	61.2	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.009	7.270	0.485	15.0	0.074	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.010	9.015	0.040	225.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
6.011	9.922	0.065	152.7	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
5.009	29.135	0.410	71.1	0.051	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.010	29.220	0.175	167.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.011	53.324	0.390	136.7	0.131	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.012	4.126	0.020	206.3	0.034	0.00	0.0	0.600	o	375	Pipe/Conduit	
5.013	36.898	0.240	153.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
2.021	21.156	0.140	151.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
2.022	14.955	0.620	24.1	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
6.004	93.76	16.43	101.320	0.759	1.0	0.0	87.2	1.33	211.1«	280.9
6.005	93.67	16.47	101.230	0.759	1.0	0.0	87.2	1.27	202.0«	280.9
6.006	93.56	16.50	101.220	0.987	1.0	0.0	113.0	1.23	195.8«	364.0
6.007	92.76	16.79	101.210	0.987	1.0	0.0	113.0	1.35	214.1«	364.0
6.008	92.54	16.86	101.110	0.987	1.0	0.0	113.0	2.60	414.0	364.0
6.009	92.48	16.89	100.910	1.061	1.0	0.0	120.0	5.27	838.5	386.8
6.010	92.17	17.00	100.425	1.061	1.0	0.0	120.0	1.35	214.7«	386.8
6.011	91.60	17.20	98.775	1.061	1.0	0.0	120.0	0.81	14.3«	386.8
5.009	90.99	17.43	98.485	1.565	2.0	0.0	174.4	2.15	237.7«	562.0
5.010	90.06	17.78	98.075	1.565	2.0	0.0	174.4	1.40	154.6«	562.0
5.011	88.56	18.35	97.900	1.696	2.0	0.0	184.0	1.55	170.9«	592.8
5.012	97.88	15.05	97.510	0.000	46.4	0.0	14.4	1.26	138.9	46.4
5.013	96.60	15.48	97.490	0.000	46.4	0.0	20.9	1.46	161.1	67.3
2.021	92.14	17.01	97.250	0.639	46.8	0.0	92.8	1.06	42.2«	299.0
2.022	97.76	15.09	97.110	0.000	9.3	0.0	2.9	2.68	106.4	9.3

Manhole Schedules for Mainline 2

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)
1	105.750	1.500	Open Manhole	1500	2.000	104.250	300				
2 (HW)	105.750	1.510	Junction		2.001	104.240	300	2.000	104.240	300	
3 (HW)	105.150	1.500	Junction		2.002	103.650	300	2.001	103.650	300	
4	105.150	1.510	Open Manhole	1500	2.003	103.640	300	2.002	103.640	300	
5 (HW)	104.450	1.200	Junction		2.004	103.250	300	2.003	103.250	300	
6 (HW)	103.800	1.200	Junction		2.005	102.600	150	2.004	102.600	300	
7	103.800	1.215	Open Manhole	1500	2.006	102.585	150	2.005	102.585	150	
24	103.300	1.300	Open Manhole	1500	3.000	102.000	300				
25 (HW)	103.300	1.310	Junction		3.001	101.990	300	3.000	101.990	300	
26 (HW)	103.180	1.280	Junction		3.002	101.900	300	3.001	101.900	300	
27	103.180	1.290	Open Manhole	1500	3.003	101.890	300	3.002	101.890	300	
28 (HW)	103.180	1.300	Junction		3.004	101.880	300	3.003	101.880	300	
8 (J)	103.150	1.335	Junction		2.007	101.820	300	2.006	101.970	150	
								3.004	101.815	300	
9 (HW)	103.250	1.500	Junction		2.008	101.750	300	2.007	101.750	300	
10	103.250	1.510	Open Manhole	1500	2.009	101.740	300	2.008	101.740	300	
11 (HW)	103.250	1.550	Junction		2.010	101.700	300	2.009	101.700	300	
12 (HW)	102.850	1.200	Junction		2.011	101.650	300	2.010	101.650	300	
13	102.850	1.470	Open Manhole	1500	2.012	101.380	300	2.011	101.380	300	
14 (HW)	102.850	1.520	Junction		2.013	101.330	300	2.012	101.330	300	
15 (HW)	102.600	1.590	Junction		2.014	101.010	300	2.013	101.010	300	
16	102.600	1.600	Open Manhole	1500	2.015	101.000	300	2.014	101.000	300	
17	100.750	1.050	Open Manhole	1500	2.016	99.700	300	2.015	99.700	300	
18 (HW)	100.750	1.060	Junction		2.017	99.690	300	2.016	99.690	300	
19 (HW)	99.550	0.890	Junction		2.018	98.660	150	2.017	98.660	300	
29	99.900	1.430	Open Manhole	1500	4.000	98.470	300				
20	99.550	1.110	Open Manhole	1500	2.019	98.440	300	2.018	98.590	150	
								4.000	98.440	300	
31 (HW)	99.550	1.120	Junction		2.020	98.430	300	2.019	98.430	300	
30	104.700	1.265	Open Manhole	1500	5.000	103.435	300				
31 (J)	104.700	1.275	Junction		5.001	103.425	300	5.000	103.425	300	
32 (J)	104.250	0.835	Junction		5.002	103.415	300	5.001	103.415	300	

Manhole Schedules for Mainline 2

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)
33	104.250	0.845	Open Manhole	1500	5.003	103.405	300	5.002	103.405	300	
34	104.100	1.200	Open Manhole	1500	5.004	102.900	300	5.003	102.900	300	
35	103.750	1.425	Open Manhole	1500	5.005	102.325	300	5.004	102.325	300	
36	102.900	1.500	Open Manhole	1500	5.006	101.400	300	5.005	101.400	300	
37	102.500	1.425	Open Manhole	1500	5.007	101.075	300	5.006	101.075	300	
38	101.950	1.500	Open Manhole	1500	5.008	100.450	300	5.007	100.450	300	
43	103.250	1.500	Open Manhole	1500	6.000	101.750	300				
44(HW)	103.250	1.510	Junction		6.001	101.740	300	6.000	101.740	300	
45(HW)	103.050	1.500	Junction		6.002	101.550	300	6.001	101.550	300	
55	109.500	1.500	Open Manhole	1500	7.000	108.000	300				
56(HW)	109.500	1.510	Junction		7.001	107.990	300	7.000	107.990	300	
57(HW)	107.800	1.500	Junction		7.002	106.300	300	7.001	106.300	300	
58	107.500	1.350	Open Manhole	1500	7.003	106.150	300	7.002	106.150	300	
59(HW)	107.500	1.500	Junction		7.004	106.000	300	7.003	106.000	300	
60(HW)	105.500	1.490	Junction		7.005	104.010	300	7.004	104.010	300	
61	105.500	1.500	Open Manhole	1500	7.006	104.000	300	7.005	104.000	300	
65	106.000	1.380	Open Manhole	1500	8.000	104.620	300				
62(HW)	106.000	1.390	Junction		8.001	104.610	300	8.000	104.610	300	
66(HW)	106.000	1.460	Junction		8.002	104.540	300	8.001	104.540	300	
67	106.000	1.480	Open Manhole	1500	8.003	104.520	300	8.002	104.520	300	
68(HW)	106.000	1.500	Junction		8.004	104.500	300	8.003	104.500	300	
69(HW)	105.590	1.500	Junction		8.005	104.090	300	8.004	104.090	300	
70	105.580	1.500	Open Manhole	1500	8.006	104.080	300	8.005	104.080	300	
71(HW)	105.570	1.500	Junction		8.007	104.070	300	8.006	104.070	300	
72(HW)	105.500	1.500	Junction		8.008	104.000	300	8.007	104.000	300	
73	105.500	1.510	Open Manhole	1500	8.009	103.990	300	8.008	103.990	300	
74(HW)	105.300	1.500	Junction		8.010	103.800	300	8.009	103.800	300	
75(HW)	104.500	1.500	Junction		8.011	103.000	300	8.010	103.000	300	
62	104.500	1.510	Open Manhole	1800	7.007	102.990	300	7.006	102.990	300	
								8.011	102.990	300	
63	103.800	1.600	Open Manhole	1500	7.008	102.200	300	7.007	102.200	300	
46	103.200	1.700	Open Manhole	1800	6.003	101.500	300	6.002	101.500	300	

Manhole Schedules for Mainline 2

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)
								7.008	101.500	300	
76	105.600	1.800	Open Manhole	1500	9.000	103.800	300				
77(HW)	105.600	1.810	Junction		9.001	103.790	300	9.000	103.790	300	
78(HW)	105.150	1.500	Junction		9.002	103.650	300	9.001	103.650	300	
79	104.900	1.500	Open Manhole	1500	9.003	103.400	300	9.002	103.400	300	
80(HW)	104.300	1.500	Junction		9.004	102.800	300	9.003	102.800	300	
81(HW)	103.900	2.500	Junction		9.005	102.400	300	9.004	101.400	300	
82	103.200	1.700	Open Manhole	1500	9.006	101.500	300	9.005	101.500	300	
83	103.200	1.710	Junction		9.007	101.490	300	9.006	101.490	300	
47(HW)	103.200	1.880	Junction		6.004	101.320	450	6.003	101.470	300	
								9.007	101.470	300	
48(HW)	102.350	1.120	Junction		6.005	101.230	450	6.004	101.230	450	
49	102.350	1.130	Open Manhole	1500	6.006	101.220	450	6.005	101.220	450	
50(HW)	102.350	1.140	Junction		6.007	101.210	450	6.006	101.210	450	
51(HW)	101.850	0.740	Junction		6.008	101.110	450	6.007	101.110	450	
52	101.850	0.940	Open Manhole	1500	6.009	100.910	450	6.008	100.910	450	
53(J)	101.400	0.975	Junction		6.010	100.425	450	6.009	100.425	450	
54J	101.400	2.625	Junction		6.011	98.775	150	6.010	100.385	450	1910
39	101.550	3.065	Open Manhole	1800	5.009	98.485	375	5.008	98.560	300	
								6.011	98.710	150	
84	99.650	1.575	Open Manhole	1500	5.010	98.075	375	5.009	98.075	375	
40	99.600	1.700	Open Manhole	1500	5.011	97.900	375	5.010	97.900	375	
41	98.800	1.290	Open Manhole	1500	5.012	97.510	375	5.011	97.510	375	
42(HW)	98.800	1.310	Junction		5.013	97.490	375	5.012	97.490	375	
22(HW)	98.600	1.350	Junction		2.021	97.250	225	2.020	97.250	300	
								5.013	97.250	375	
23	98.600	1.490	Open Manhole	1500	2.022	97.110	225	2.021	97.110	225	
Outfall	97.800	1.310	Open Manhole	0		OUTFALL		2.022	96.490	225	

Manhole Schedules for Mainline 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1	538805.464	153287.832	538805.464	153287.832	Required	
2(HW)	538804.771	153286.580			No Entry	
3(HW)	538796.478	153272.536			No Entry	
4	538795.050	153270.223	538795.050	153270.223	Required	
5(HW)	538779.985	153259.433			No Entry	
6(HW)	538765.507	153244.196			No Entry	
7	538764.389	153243.201	538764.389	153243.201	Required	
24	538785.798	153195.437	538785.798	153195.437	Required	
25(HW)	538784.872	153196.577			No Entry	
26(HW)	538766.732	153216.822			No Entry	
27	538764.807	153218.345	538764.807	153218.345	Required	
28(HW)	538763.315	153220.021			No Entry	
8(J)	538751.938	153232.884			No Entry	
9(HW)	538739.166	153247.328			No Entry	
10	538737.550	153247.791	538737.550	153247.791	Required	
11(HW)	538727.520	153250.575			No Entry	
12(HW)	538687.515	153222.858			No Entry	

Manhole Schedules for Mainline 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
13	538685.349	153220.115	538685.349	153220.115	Required	
14(HW)	538684.898	153218.712			No Entry	
15(HW)	538678.878	153195.700			No Entry	
16	538678.509	153194.300	538678.509	153194.300	Required	
17	538678.322	153131.851	538678.322	153131.851	Required	
18(HW)	538678.341	153130.359			No Entry	
19(HW)	538694.103	153079.830			No Entry	
29	538700.187	153080.539	538700.187	153080.539	Required	
20	538694.055	153078.181	538694.055	153078.181	Required	
31(HW)	538693.440	153076.736			No Entry	
30	538935.080	153043.333	538935.080	153043.333	Required	
31(J)	538936.194	153042.528			No Entry	
32(J)	538945.841	153035.340			No Entry	
33	538946.886	153034.435	538946.886	153034.435	Required	
34	538951.449	153014.753	538951.449	153014.753	Required	
35	538903.860	153000.930	538903.860	153000.930	Required	
36	538874.411	152996.549	538874.411	152996.549	Required	

Manhole Schedules for Mainline 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
37	538861.215	153011.304	538861.215	153011.304	Required	
38	538828.412	153049.048	538828.412	153049.048	Required	
43	538788.357	153192.621	538788.357	153192.621	Required	
44(HW)	538789.391	153191.516			No Entry	
45(HW)	538823.313	153153.630			No Entry	
55	538925.423	153222.007	538925.423	153222.007	Required	
56(HW)	538925.586	153220.561			No Entry	
57(HW)	538928.008	153179.736			No Entry	
58	538924.468	153178.825	538924.468	153178.825	Required	
59(HW)	538921.391	153178.486			No Entry	
60(HW)	538884.878	153175.114			No Entry	
61	538884.027	153173.488	538884.027	153173.488	Required	
65	538827.501	153259.048	538827.501	153259.048	Required	
62(HW)	538828.214	153258.145			No Entry	
66(HW)	538840.844	153243.793			No Entry	
67	538843.499	153241.152	538843.499	153241.152	Required	
68(HW)	538847.433	153238.449			No Entry	

Manhole Schedules for Mainline 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
69(HW)	538857.183	153216.836			No Entry	
70	538858.574	153215.805	538858.574	153215.805	Required	
71(HW)	538859.953	153214.774			No Entry	
72(HW)	538865.700	153203.164			No Entry	
73	538865.478	153202.138	538865.478	153202.138	Required	
74(HW)	538864.356	153194.013			No Entry	
75(HW)	538861.514	153175.022			No Entry	
62	538859.996	153173.690	538859.996	153173.690	Required	
63	538836.170	153152.015	538836.170	153152.015	Required	
46	538831.026	153143.126	538831.026	153143.126	Required	
76	538901.755	153079.041	538901.755	153079.041	Required	
77(HW)	538900.785	153080.141			No Entry	
78(HW)	538885.090	153097.868			No Entry	
79	538879.799	153103.738	538879.799	153103.738	Required	
80(HW)	538867.080	153117.805			No Entry	
81(HW)	538845.984	153141.017			No Entry	
82	538835.640	153137.904	538835.640	153137.904	Required	

Manhole Schedules for Mainline 2

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
83	538834.467	153138.815			No Entry	
47(HW)	538832.789	153140.047			No Entry	
48(HW)	538816.976	153126.249			No Entry	
49	538814.731	153125.055	538814.731	153125.055	Required	
50(HW)	538812.285	153123.897			No Entry	
51(HW)	538795.228	153108.968			No Entry	
52	538786.482	153100.410	538786.482	153100.410	Required	
53(J)	538786.131	153093.149			No Entry	
54J	538789.438	153084.762			No Entry	
39	538796.127	153077.434	538796.127	153077.434	Required	
84	538774.029	153058.446	538774.029	153058.446	Required	
40	538745.516	153052.057	538745.516	153052.057	Required	
41	538692.307	153048.562	538692.307	153048.562	Required	
42(HW)	538689.768	153045.310			No Entry	
22(HW)	538666.614	153016.581			No Entry	
23	538647.249	153008.061	538647.249	153008.061	Required	
Outfall	538636.805	152997.357			No Entry	

PIPELINE SCHEDULES for Mainline 2

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)
2.000	o	300	1	105.750	104.250	1.200	Open Manhole	1500
2.001	o	300	2(HW)	105.750	104.240	1.210	Junction	
2.002	o	300	3(HW)	105.150	103.650	1.200	Junction	
2.003	o	300	4	105.150	103.640	1.210	Open Manhole	1500
2.004	o	300	5(HW)	104.450	103.250	0.900	Junction	
2.005	o	150	6(HW)	103.800	102.600	1.050	Junction	
2.006	o	150	7	103.800	102.585	1.065	Open Manhole	1500
3.000	o	300	24	103.300	102.000	1.000	Open Manhole	1500
3.001	o	300	25(HW)	103.300	101.990	1.010	Junction	
3.002	o	300	26(HW)	103.180	101.900	0.980	Junction	
3.003	o	300	27	103.180	101.890	0.990	Open Manhole	1500
3.004	o	300	28(HW)	103.180	101.880	1.000	Junction	
2.007	o	300	8(J)	103.150	101.820	1.030	Junction	
2.008	o	300	9(HW)	103.250	101.750	1.200	Junction	
2.009	o	300	10	103.250	101.740	1.210	Open Manhole	1500
2.010	o	300	11(HW)	103.250	101.700	1.250	Junction	
2.011	o	300	12(HW)	102.850	101.650	0.900	Junction	

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)
2.000	1.431	143.1	2(HW)	105.750	104.240	1.210	Junction	
2.001	16.310	27.6	3(HW)	105.150	103.650	1.200	Junction	
2.002	2.718	271.8	4	105.150	103.640	1.210	Open Manhole	1500
2.003	18.531	47.5	5(HW)	104.450	103.250	0.900	Junction	
2.004	21.018	32.3	6(HW)	103.800	102.600	0.900	Junction	
2.005	1.496	99.7	7	103.800	102.585	1.065	Open Manhole	1500
2.006	16.170	26.3	8(J)	103.150	101.970	1.030	Junction	
3.000	1.469	146.9	25(HW)	103.300	101.990	1.010	Junction	
3.001	27.183	302.0	26(HW)	103.180	101.900	0.980	Junction	
3.002	2.454	245.4	27	103.180	101.890	0.990	Open Manhole	1500
3.003	2.245	224.5	28(HW)	103.180	101.880	1.000	Junction	
3.004	17.172	264.2	8(J)	103.150	101.815	1.035	Junction	
2.007	19.281	275.4	9(HW)	103.250	101.750	1.200	Junction	
2.008	1.681	168.1	10	103.250	101.740	1.210	Open Manhole	1500
2.009	10.409	260.2	11(HW)	103.250	101.700	1.250	Junction	
2.010	48.669	973.4	12(HW)	102.850	101.650	0.900	Junction	
2.011	3.495	12.9	13	102.850	101.380	1.170	Open Manhole	1500

PIPELINE SCHEDULES for Mainline 2

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)
2.012	o	300	13	102.850	101.380	1.170	Open Manhole	1500
2.013	o	300	14(HW)	102.850	101.330	1.220	Junction	
2.014	o	300	15(HW)	102.600	101.010	1.290	Junction	
2.015	o	300	16	102.600	101.000	1.300	Open Manhole	1500
2.016	o	300	17	100.750	99.700	0.750	Open Manhole	1500
2.017	o	300	18(HW)	100.750	99.690	0.760	Junction	
2.018	o	150	19(HW)	99.550	98.660	0.740	Junction	
4.000	o	300	29	99.900	98.470	1.130	Open Manhole	1500
2.019	o	300	20	99.550	98.440	0.810	Open Manhole	1500
2.020	o	300	31(HW)	99.550	98.430	0.820	Junction	
5.000	o	300	30	104.700	103.435	0.965	Open Manhole	1500
5.001	o	300	31(J)	104.700	103.425	0.975	Junction	
5.002	o	300	32(J)	104.250	103.415	0.535	Junction	
5.003	o	300	33	104.250	103.405	0.545	Open Manhole	1500
5.004	o	300	34	104.100	102.900	0.900	Open Manhole	1500
5.005	o	300	35	103.750	102.325	1.125	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)
2.012	1.474	29.5	14(HW)	102.850	101.330	1.220	Junction	
2.013	23.786	74.3	15(HW)	102.600	101.010	1.290	Junction	
2.014	1.448	144.8	16	102.600	101.000	1.300	Open Manhole	1500
2.015	62.449	48.0	17	100.750	99.700	0.750	Open Manhole	1500
2.016	1.492	149.2	18(HW)	100.750	99.690	0.760	Junction	
2.017	52.930	51.4	19(HW)	99.550	98.660	0.590	Junction	
2.018	1.650	23.6	20	99.550	98.590	0.810	Open Manhole	1500
4.000	6.570	219.0	20	99.550	98.440	0.810	Open Manhole	1500
2.019	1.570	157.0	31(HW)	99.550	98.430	0.820	Junction	
2.020	65.865	55.8	22(HW)	98.600	97.250	1.050	Junction	
5.000	1.374	137.4	31(J)	104.700	103.425	0.975	Junction	
5.001	12.030	1203.0	32(J)	104.250	103.415	0.535	Junction	
5.002	1.383	138.3	33	104.250	103.405	0.545	Open Manhole	1500
5.003	20.204	40.0	34	104.100	102.900	0.900	Open Manhole	1500
5.004	49.556	86.2	35	103.750	102.325	1.125	Open Manhole	1500
5.005	29.773	32.2	36	102.900	101.400	1.200	Open Manhole	1500

PIPELINE SCHEDULES for Mainline 2

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)
5.006	o	300	36	102.900	101.400	1.200	Open Manhole	1500
5.007	o	300	37	102.500	101.075	1.125	Open Manhole	1500
5.008	o	300	38	101.950	100.450	1.200	Open Manhole	1500
6.000	o	300	43	103.250	101.750	1.200	Open Manhole	1500
6.001	o	300	44(HW)	103.250	101.740	1.210	Junction	
6.002	o	300	45(HW)	103.050	101.550	1.200	Junction	
7.000	o	300	55	109.500	108.000	1.200	Open Manhole	1500
7.001	o	300	56(HW)	109.500	107.990	1.210	Junction	
7.002	o	300	57(HW)	107.800	106.300	1.200	Junction	
7.003	o	300	58	107.500	106.150	1.050	Open Manhole	1500
7.004	o	300	59(HW)	107.500	106.000	1.200	Junction	
7.005	o	300	60(HW)	105.500	104.010	1.190	Junction	
7.006	o	300	61	105.500	104.000	1.200	Open Manhole	1500
8.000	o	300	65	106.000	104.620	1.080	Open Manhole	1500
8.001	o	300	62(HW)	106.000	104.610	1.090	Junction	
8.002	o	300	66(HW)	106.000	104.540	1.160	Junction	

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)
5.006	19.796	60.9	37	102.500	101.075	1.125	Open Manhole	1500
5.007	50.007	80.0	38	101.950	100.450	1.200	Open Manhole	1500
5.008	42.989	22.7	39	101.550	98.560	2.690	Open Manhole	1800
6.000	1.513	151.3	44(HW)	103.250	101.740	1.210	Junction	
6.001	50.853	267.6	45(HW)	103.050	101.550	1.200	Junction	
6.002	13.032	260.6	46	103.200	101.500	1.400	Open Manhole	1800
7.000	1.456	145.6	56(HW)	109.500	107.990	1.210	Junction	
7.001	40.896	24.2	57(HW)	107.800	106.300	1.200	Junction	
7.002	3.655	24.4	58	107.500	106.150	1.050	Open Manhole	1500
7.003	3.096	20.6	59(HW)	107.500	106.000	1.200	Junction	
7.004	36.668	18.4	60(HW)	105.500	104.010	1.190	Junction	
7.005	1.835	183.5	61	105.500	104.000	1.200	Open Manhole	1500
7.006	24.032	23.8	62	104.500	102.990	1.210	Open Manhole	1800
8.000	1.151	115.1	62(HW)	106.000	104.610	1.090	Junction	
8.001	19.118	273.1	66(HW)	106.000	104.540	1.160	Junction	
8.002	3.745	187.3	67	106.000	104.520	1.180	Open Manhole	1500

PIPELINE SCHEDULES for Mainline 2

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)
8.003	o	300	67	106.000	104.520	1.180	Open Manhole	1500
8.004	o	300	68(HW)	106.000	104.500	1.200	Junction	
8.005	o	300	69(HW)	105.590	104.090	1.200	Junction	
8.006	o	300	70	105.580	104.080	1.200	Open Manhole	1500
8.007	o	300	71(HW)	105.570	104.070	1.200	Junction	
8.008	o	300	72(HW)	105.500	104.000	1.200	Junction	
8.009	o	300	73	105.500	103.990	1.210	Open Manhole	1500
8.010	o	300	74(HW)	105.300	103.800	1.200	Junction	
8.011	o	300	75(HW)	104.500	103.000	1.200	Junction	
7.007	o	300	62	104.500	102.990	1.210	Open Manhole	1800
7.008	o	300	63	103.800	102.200	1.300	Open Manhole	1500
6.003	o	300	46	103.200	101.500	1.400	Open Manhole	1800
9.000	o	300	76	105.600	103.800	1.500	Open Manhole	1500
9.001	o	300	77(HW)	105.600	103.790	1.510	Junction	
9.002	o	300	78(HW)	105.150	103.650	1.200	Junction	
9.003	o	300	79	104.900	103.400	1.200	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)
8.003	4.773	238.7	68(HW)	106.000	104.500	1.200	Junction	
8.004	23.710	57.8	69(HW)	105.590	104.090	1.200	Junction	
8.005	1.732	173.2	70	105.580	104.080	1.200	Open Manhole	1500
8.006	1.721	172.1	71(HW)	105.570	104.070	1.200	Junction	
8.007	12.955	185.1	72(HW)	105.500	104.000	1.200	Junction	
8.008	1.050	105.0	73	105.500	103.990	1.210	Open Manhole	1500
8.009	8.202	43.2	74(HW)	105.300	103.800	1.200	Junction	
8.010	19.203	24.0	75(HW)	104.500	103.000	1.200	Junction	
8.011	2.020	202.0	62	104.500	102.990	1.210	Open Manhole	1800
7.007	32.210	40.8	63	103.800	102.200	1.300	Open Manhole	1500
7.008	10.270	14.7	46	103.200	101.500	1.400	Open Manhole	1800
6.003	3.547	118.2	47(HW)	103.200	101.470	1.430	Junction	
9.000	1.467	146.7	77(HW)	105.600	103.790	1.510	Junction	
9.001	23.676	169.1	78(HW)	105.150	103.650	1.200	Junction	
9.002	7.903	31.6	79	104.900	103.400	1.200	Open Manhole	1500
9.003	18.964	31.6	80(HW)	104.300	102.800	1.200	Junction	

PIPELINE SCHEDULES for Mainline 2

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)
9.004	o	300	80(HW)	104.300	102.800	1.200	Junction	
9.005	o	300	81(HW)	103.900	102.400	1.200	Junction	
9.006	o	300	82	103.200	101.500	1.400	Open Manhole	1500
9.007	o	300	83	103.200	101.490	1.410	Junction	
6.004	o	450	47(HW)	103.200	101.320	1.430	Junction	
6.005	o	450	48(HW)	102.350	101.230	0.670	Junction	
6.006	o	450	49	102.350	101.220	0.680	Open Manhole	1500
6.007	o	450	50(HW)	102.350	101.210	0.690	Junction	
6.008	o	450	51(HW)	101.850	101.110	0.290	Junction	
6.009	o	450	52	101.850	100.910	0.490	Open Manhole	1500
6.010	o	450	53(J)	101.400	100.425	0.525	Junction	
6.011	o	150	54J	101.400	98.775	2.475	Junction	
5.009	o	375	39	101.550	98.485	2.690	Open Manhole	1800
5.010	o	375	84	99.650	98.075	1.200	Open Manhole	1500
5.011	o	375	40	99.600	97.900	1.325	Open Manhole	1500
5.012	o	375	41	98.800	97.510	0.915	Open Manhole	1500
5.013	o	375	42(HW)	98.800	97.490	0.935	Junction	

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)
9.004	31.366	22.4	81(HW)	103.900	101.400	2.200	Junction	
9.005	10.803	12.0	82	103.200	101.500	1.400	Open Manhole	1500
9.006	1.486	148.6	83	103.200	101.490	1.410	Junction	
9.007	2.081	104.1	47(HW)	103.200	101.470	1.430	Junction	
6.004	20.986	233.2	48(HW)	102.350	101.230	0.670	Junction	
6.005	2.543	254.3	49	102.350	101.220	0.680	Open Manhole	1500
6.006	2.706	270.6	50(HW)	102.350	101.210	0.690	Junction	
6.007	22.667	226.7	51(HW)	101.850	101.110	0.290	Junction	
6.008	12.237	61.2	52	101.850	100.910	0.490	Open Manhole	1500
6.009	7.270	15.0	53(J)	101.400	100.425	0.525	Junction	
6.010	9.015	225.4	54J	101.400	100.385	0.565	Junction	
6.011	9.922	152.7	39	101.550	98.710	2.690	Open Manhole	1800
5.009	29.135	71.1	84	99.650	98.075	1.200	Open Manhole	1500
5.010	29.220	167.0	40	99.600	97.900	1.325	Open Manhole	1500
5.011	53.324	136.7	41	98.800	97.510	0.915	Open Manhole	1500
5.012	4.126	206.3	42(HW)	98.800	97.490	0.935	Junction	
5.013	36.898	153.7	22(HW)	98.600	97.250	0.975	Junction	

PIPELINE SCHEDULES for Mainline 2

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)
2.021	o	225	22 (HW)	98.600	97.250	1.125	Junction	
2.022	o	225	23	98.600	97.110	1.265	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)
2.021	21.156	151.1	23	98.600	97.110	1.265	Open Manhole	1500
2.022	14.955	24.1	Outfall	97.800	96.490	1.085	Open Manhole	0

Area Summary for Mainline 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
2.000	User	-	100	0.006	0.006	0.006
2.001	-	-	100	0.000	0.000	0.000
2.002	-	-	100	0.000	0.000	0.000
2.003	User	-	100	0.018	0.018	0.018
	User	-	100	0.009	0.009	0.026
2.004	User	-	100	0.039	0.039	0.039
	User	-	100	0.037	0.037	0.076
2.005	-	-	100	0.000	0.000	0.000
2.006	User	-	100	0.028	0.028	0.028
3.000	User	-	100	0.006	0.006	0.006
	User	-	100	0.011	0.011	0.017
3.001	-	-	100	0.000	0.000	0.000
3.002	-	-	100	0.000	0.000	0.000
3.003	User	-	100	0.009	0.009	0.009
	User	-	100	0.011	0.011	0.019
	User	-	100	0.006	0.006	0.026
	User	-	100	0.010	0.010	0.036
	User	-	100	0.006	0.006	0.042
3.004	-	-	100	0.000	0.000	0.000
2.007	-	-	100	0.000	0.000	0.000
2.008	-	-	100	0.000	0.000	0.000
2.009	User	-	100	0.040	0.040	0.040
2.010	-	-	100	0.000	0.000	0.000
2.011	-	-	100	0.000	0.000	0.000
2.012	User	-	100	0.010	0.010	0.010
2.013	-	-	100	0.000	0.000	0.000
2.014	-	-	100	0.000	0.000	0.000
2.015	User	-	100	0.067	0.067	0.067
	User	-	100	0.010	0.010	0.077
	User	-	100	0.010	0.010	0.087
	User	-	100	0.010	0.010	0.097
2.016	User	-	100	0.010	0.010	0.010
	User	-	100	0.010	0.010	0.020
	User	-	100	0.009	0.009	0.030
	User	-	100	0.006	0.006	0.036
2.017	-	-	100	0.000	0.000	0.000
2.018	User	-	100	0.274	0.274	0.274
4.000	User	-	100	0.041	0.041	0.041
	User	-	100	0.009	0.009	0.049
	User	-	100	0.004	0.004	0.054
	User	-	100	0.005	0.005	0.059
	User	-	100	0.007	0.007	0.066
	User	-	100	0.006	0.006	0.072
	User	-	100	0.010	0.010	0.082
	User	-	100	0.006	0.006	0.089
	User	-	100	0.006	0.006	0.095
	User	-	100	0.007	0.007	0.102
	User	-	100	0.006	0.006	0.108
	User	-	100	0.011	0.011	0.119

Area Summary for Mainline 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	100	0.009	0.009	0.128
	User	-	100	0.006	0.006	0.134
	User	-	100	0.007	0.007	0.141
	User	-	100	0.006	0.006	0.147
	User	-	100	0.012	0.012	0.159
	User	-	100	0.009	0.009	0.168
	User	-	100	0.012	0.012	0.181
	User	-	100	0.010	0.010	0.190
	User	-	100	0.012	0.012	0.203
	User	-	100	0.007	0.007	0.210
	User	-	100	0.009	0.009	0.219
	User	-	100	0.008	0.008	0.227
	User	-	100	0.005	0.005	0.231
2.019	-	-	100	0.000	0.000	0.000
2.020	-	-	100	0.000	0.000	0.000
5.000	User	-	100	0.021	0.021	0.021
	User	-	100	0.056	0.056	0.077
	User	-	100	0.007	0.007	0.084
	User	-	100	0.009	0.009	0.093
	User	-	100	0.016	0.016	0.109
	User	-	100	0.004	0.004	0.113
	User	-	100	0.011	0.011	0.124
5.001	-	-	100	0.000	0.000	0.000
5.002	-	-	100	0.000	0.000	0.000
5.003	-	-	100	0.000	0.000	0.000
5.004	-	-	100	0.000	0.000	0.000
5.005	User	-	100	0.027	0.027	0.027
	User	-	100	0.012	0.012	0.040
	User	-	100	0.006	0.006	0.046
5.006	User	-	100	0.009	0.009	0.009
5.007	User	-	100	0.083	0.083	0.083
	User	-	100	0.011	0.011	0.095
	User	-	100	0.040	0.040	0.135
	User	-	100	0.006	0.006	0.141
	User	-	100	0.020	0.020	0.161
	User	-	100	0.005	0.005	0.167
	User	-	100	0.008	0.008	0.175
	User	-	100	0.006	0.006	0.181
	User	-	100	0.005	0.005	0.186
	User	-	100	0.023	0.023	0.208
	User	-	100	0.029	0.029	0.238
5.008	User	-	100	0.006	0.006	0.006
	User	-	100	0.003	0.003	0.010
	User	-	100	0.070	0.070	0.080
	User	-	100	0.054	0.054	0.134
	User	-	100	0.011	0.011	0.145
	User	-	100	0.008	0.008	0.153
	User	-	100	0.008	0.008	0.161
6.000	User	-	100	0.006	0.006	0.006

Area Summary for Mainline 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	100	0.011	0.011	0.017
6.001	-	-	100	0.000	0.000	0.000
6.002	-	-	100	0.000	0.000	0.000
7.000	-	-	100	0.000	0.000	0.000
7.001	-	-	100	0.000	0.000	0.000
7.002	User	-	100	0.017	0.017	0.017
7.003	-	-	100	0.000	0.000	0.000
7.004	User	-	100	0.025	0.025	0.025
	User	-	100	0.033	0.033	0.058
7.005	User	-	100	0.026	0.026	0.026
7.006	User	-	100	0.003	0.003	0.003
8.000	-	-	100	0.000	0.000	0.000
8.001	-	-	100	0.000	0.000	0.000
8.002	User	-	100	0.014	0.014	0.014
8.003	User	-	100	0.014	0.014	0.014
8.004	-	-	100	0.000	0.000	0.000
8.005	-	-	100	0.000	0.000	0.000
8.006	-	-	100	0.000	0.000	0.000
8.007	User	-	100	0.035	0.035	0.035
	User	-	100	0.014	0.014	0.048
8.008	-	-	100	0.000	0.000	0.000
8.009	-	-	100	0.000	0.000	0.000
8.010	User	-	100	0.014	0.014	0.014
8.011	User	-	100	0.020	0.020	0.020
7.007	-	-	100	0.000	0.000	0.000
7.008	User	-	100	0.023	0.023	0.023
	User	-	100	0.170	0.170	0.192
	User	-	100	0.055	0.055	0.248
	User	-	100	0.010	0.010	0.258
	User	-	100	0.017	0.017	0.274
	User	-	100	0.006	0.006	0.281
	User	-	100	0.004	0.004	0.285
6.003	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.000	0.000	0.000
9.001	-	-	100	0.000	0.000	0.000
9.002	User	-	100	0.019	0.019	0.019
	User	-	100	0.009	0.009	0.028
9.003	User	-	100	0.055	0.055	0.055
	User	-	100	0.011	0.011	0.066
	User	-	100	0.062	0.062	0.128
	User	-	100	0.011	0.011	0.138
	User	-	100	0.011	0.011	0.150
	User	-	100	0.011	0.011	0.160
	User	-	100	0.007	0.007	0.167
	User	-	100	0.005	0.005	0.172
	User	-	100	0.012	0.012	0.184
9.004	User	-	100	0.012	0.012	0.012
	User	-	100	0.011	0.011	0.023
	User	-	100	0.002	0.002	0.025

Area Summary for Mainline 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
9.005	User	-	100	0.007	0.007	0.007
	User	-	100	0.038	0.038	0.045
	User	-	100	0.008	0.008	0.053
	User	-	100	0.007	0.007	0.060
	User	-	100	0.003	0.003	0.063
	User	-	100	0.007	0.007	0.070
	User	-	100	0.011	0.011	0.081
9.006	-	-	100	0.000	0.000	0.000
9.007	-	-	100	0.000	0.000	0.000
6.004	-	-	100	0.000	0.000	0.000
6.005	-	-	100	0.000	0.000	0.000
6.006	User	-	100	0.062	0.062	0.062
	User	-	100	0.018	0.018	0.079
	User	-	100	0.023	0.023	0.103
	User	-	100	0.021	0.021	0.124
	User	-	100	0.080	0.080	0.204
	User	-	100	0.011	0.011	0.215
	User	-	100	0.013	0.013	0.228
6.007	-	-	100	0.000	0.000	0.000
6.008	-	-	100	0.000	0.000	0.000
6.009	User	-	100	0.035	0.035	0.035
	User	-	100	0.008	0.008	0.043
	User	-	100	0.011	0.011	0.054
	User	-	100	0.009	0.009	0.063
	User	-	100	0.011	0.011	0.074
6.010	-	-	100	0.000	0.000	0.000
6.011	-	-	100	0.000	0.000	0.000
5.009	User	-	100	0.011	0.011	0.011
	User	-	100	0.009	0.009	0.020
	User	-	100	0.011	0.011	0.030
	User	-	100	0.020	0.020	0.051
5.010	-	-	100	0.000	0.000	0.000
5.011	User	-	100	0.082	0.082	0.082
	User	-	100	0.009	0.009	0.091
	User	-	100	0.002	0.002	0.094
	User	-	100	0.006	0.006	0.100
	User	-	100	0.004	0.004	0.103
	User	-	100	0.012	0.012	0.116
	User	-	100	0.006	0.006	0.122
	User	-	100	0.008	0.008	0.129
	User	-	100	0.002	0.002	0.131
5.012	User	-	100	0.010	0.010	0.010
	User	-	100	0.012	0.012	0.022
	User	-	100	0.002	0.002	0.024
	User	-	100	0.010	0.010	0.034
5.013	-	-	100	0.000	0.000	0.000
2.021	-	-	100	0.000	0.000	0.000
2.022	-	-	100	0.000	0.000	0.000
				Total	Total	Total

Area Summary for Mainline 2

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
				2.817	2.817	2.817

Network Classifications for Mainline 2

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type	PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
2.000	1	300	1.200	1.210	Unclassified	1500	0	1.200	Unclassified	7.003	58	300	1.050	1.200	Unclassified	1500	0	1.050	Unclassified
2.001	2(HW)	300	1.200	1.210	Unclassified				Junction	7.004	59(HW)	300	1.190	1.200	Unclassified				Junction
2.002	3(HW)	300	1.200	1.210	Unclassified				Junction	7.005	60(HW)	300	1.190	1.200	Unclassified				Junction
2.003	4	300	0.900	1.210	Unclassified	1500	0	1.210	Unclassified	7.006	61	300	1.200	1.210	Unclassified	1500	0	1.200	Unclassified
2.004	5(HW)	300	0.900	0.900	Unclassified				Junction	8.000	65	300	1.080	1.090	Unclassified	1500	0	1.080	Unclassified
2.005	6(HW)	150	1.050	1.065	Unclassified				Junction	8.001	62(HW)	300	1.090	1.160	Unclassified				Junction
2.006	7	150	1.030	1.065	Unclassified	1500	0	1.065	Unclassified	8.002	66(HW)	300	1.160	1.180	Unclassified				Junction
3.000	24	300	1.000	1.010	Unclassified	1500	0	1.000	Unclassified	8.003	67	300	1.180	1.200	Unclassified	1500	0	1.180	Unclassified
3.001	25(HW)	300	0.980	1.010	Unclassified				Junction	8.004	68(HW)	300	1.200	1.200	Unclassified				Junction
3.002	26(HW)	300	0.980	0.990	Unclassified				Junction	8.005	69(HW)	300	1.200	1.200	Unclassified				Junction
3.003	27	300	0.990	1.000	Unclassified	1500	0	0.990	Unclassified	8.006	70	300	1.200	1.200	Unclassified	1500	0	1.200	Unclassified
3.004	28(HW)	300	1.000	1.035	Unclassified				Junction	8.007	71(HW)	300	1.200	1.200	Unclassified				Junction
2.007	8(J)	300	1.030	1.200	Unclassified				Junction	8.008	72(HW)	300	1.200	1.210	Unclassified				Junction
2.008	9(HW)	300	1.200	1.210	Unclassified				Junction	8.009	73	300	1.200	1.210	Unclassified	1500	0	1.210	Unclassified
2.009	10	300	1.210	1.250	Unclassified	1500	0	1.210	Unclassified	8.010	74(HW)	300	1.200	1.200	Unclassified				Junction
2.010	11(HW)	300	0.900	1.250	Unclassified				Junction	8.011	75(HW)	300	1.200	1.210	Unclassified				Junction
2.011	12(HW)	300	0.900	1.170	Unclassified				Junction	7.007	62	300	1.210	1.300	Unclassified	1800	0	1.210	Unclassified
2.012	13	300	1.170	1.220	Unclassified	1500	0	1.170	Unclassified	7.008	63	300	1.300	1.400	Unclassified	1500	0	1.300	Unclassified
2.013	14(HW)	300	1.220	1.290	Unclassified				Junction	6.003	46	300	1.400	1.430	Unclassified	1800	0	1.400	Unclassified
2.014	15(HW)	300	1.290	1.300	Unclassified				Junction	9.000	76	300	1.500	1.510	Unclassified	1500	0	1.500	Unclassified
2.015	16	300	0.750	1.300	Unclassified	1500	0	1.300	Unclassified	9.001	77(HW)	300	1.200	1.510	Unclassified				Junction
2.016	17	300	0.750	0.760	Unclassified	1500	0	0.750	Unclassified	9.002	78(HW)	300	1.200	1.200	Unclassified				Junction
2.017	18(HW)	300	0.590	0.760	Unclassified				Junction	9.003	79	300	1.200	1.200	Unclassified	1500	0	1.200	Unclassified
2.018	19(HW)	150	0.740	0.810	Unclassified				Junction	9.004	80(HW)	300	1.200	2.200	Unclassified				Junction
4.000	29	300	0.810	1.130	Unclassified	1500	0	1.130	Unclassified	9.005	81(HW)	300	1.200	1.400	Unclassified				Junction
2.019	20	300	0.810	0.820	Unclassified	1500	0	0.810	Unclassified	9.006	82	300	1.400	1.410	Unclassified	1500	0	1.400	Unclassified
2.020	31(HW)	300	0.820	1.050	Unclassified				Junction	9.007	83	300	1.410	1.430	Unclassified				Junction
5.000	30	300	0.965	0.975	Unclassified	1500	0	0.965	Unclassified	6.004	47(HW)	450	0.670	1.430	Unclassified				Junction
5.001	31(J)	300	0.535	0.975	Unclassified				Junction	6.005	48(HW)	450	0.670	0.680	Unclassified				Junction
5.002	32(J)	300	0.535	0.545	Unclassified				Junction	6.006	49	450	0.680	0.690	Unclassified	1500	0	0.680	Unclassified
5.003	33	300	0.545	0.900	Unclassified	1500	0	0.545	Unclassified	6.007	50(HW)	450	0.290	0.690	Unclassified				Junction
5.004	34	300	0.900	1.125	Unclassified	1500	0	0.900	Unclassified	6.008	51(HW)	450	0.290	0.490	Unclassified				Junction
5.005	35	300	1.125	1.200	Unclassified	1500	0	1.125	Unclassified	6.009	52	450	0.490	0.525	Unclassified	1500	0	0.490	Unclassified
5.006	36	300	1.125	1.200	Unclassified	1500	0	1.200	Unclassified	6.010	53(J)	450	0.525	0.565	Unclassified				Junction
5.007	37	300	1.125	1.200	Unclassified	1500	0	1.125	Unclassified	6.011	54J	150	2.475	2.690	Unclassified				Junction
5.008	38	300	1.200	2.690	Unclassified	1500	0	1.200	Unclassified	5.009	39	375	1.200	2.690	Unclassified	1800	0	2.690	Unclassified
6.000	43	300	1.200	1.210	Unclassified	1500	0	1.200	Unclassified	5.010	84	375	1.200	1.325	Unclassified	1500	0	1.200	Unclassified
6.001	44(HW)	300	1.200	1.210	Unclassified				Junction	5.011	40	375	0.915	1.325	Unclassified	1500	0	1.325	Unclassified
6.002	45(HW)	300	1.200	1.400	Unclassified				Junction	5.012	41	375	0.915	0.935	Unclassified	1500	0	0.915	Unclassified
7.000	55	300	1.200	1.210	Unclassified	1500	0	1.200	Unclassified	5.013	42(HW)	375	0.935	0.975	Unclassified				Junction
7.001	56(HW)	300	1.200	1.210	Unclassified				Junction	2.021	22(HW)	225	1.125	1.265	Unclassified				Junction
7.002	57(HW)	300	1.050	1.200	Unclassified				Junction	2.022	23	225	1.085	1.265	Unclassified	1500	0	1.265	Unclassified

Free Flowing Outfall Details for Mainline 2

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
2.022	Outfall	97.800	96.490	0.000	0	0

Simulation Criteria for Mainline 2

Volumetric Runoff Coeff	0.750	Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000
Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	0.000	Run Time (mins)	60
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800	Output Interval (mins)	5

Number of Input Hydrographs 0 Number of Online Controls 5 Number of Offline Controls 1 Number of Storage Structures 16 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	Data Type	Catchment	Cv (Winter)	0.750
Return Period (years)	100	Summer Storms	No	Storm Duration (mins)	30
FEH Rainfall Version	2013	Winter Storms	Yes		
Site Location	GB 538700 152900 TQ 38700 52900	Cv (Summer)	1.000		

Online Controls for Mainline 2

Hydro-Brake® Optimum Manhole: 7, DS/PN: 2.006, Volume (m³): 2.2

Unit Reference	MD-CHE-0044-1000-1165-1000	Objective	Minimise upstream storage	Invert Level (m)	102.585
Design Head (m)	1.165	Application	Surface	Minimum Outlet Pipe Diameter (mm)	75
Design Flow (l/s)	1.0	Sump Available	No	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	44		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.165	1.0	Flush-Flo™	0.104	0.6	Kick-Flo®	0.150	0.4	Mean Flow over Head Range	-	0.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.6	0.500	0.7	1.200	1.0	2.000	1.3	3.000	1.6	5.000	2.0	7.000	2.4	9.000	2.7
0.200	0.4	0.600	0.7	1.400	1.1	2.200	1.4	3.500	1.7	5.500	2.1	7.500	2.5	9.500	2.8
0.300	0.5	0.800	0.8	1.600	1.2	2.400	1.4	4.000	1.8	6.000	2.2	8.000	2.6		
0.400	0.6	1.000	0.9	1.800	1.2	2.600	1.5	4.500	1.9	6.500	2.3	8.500	2.7		

Hydro-Brake® Optimum Manhole: 13, DS/PN: 2.012, Volume (m³): 2.8

Unit Reference	MD-CHE-0026-4000-1420-4000	Objective	Minimise upstream storage	Invert Level (m)	101.380
Design Head (m)	1.420	Application	Surface	Minimum Outlet Pipe Diameter (mm)	75
Design Flow (l/s)	0.4	Sump Available	No	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	26		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.420	0.4	Flush-Flo™	0.060	0.2	Kick-Flo®	0.088	0.1	Mean Flow over Head Range	-	0.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.1	0.500	0.2	1.200	0.4	2.000	0.5	3.000	0.6	5.000	0.7	7.000	0.9	9.000	1.0
0.200	0.2	0.600	0.3	1.400	0.4	2.200	0.5	3.500	0.6	5.500	0.8	7.500	0.9	9.500	1.0
0.300	0.2	0.800	0.3	1.600	0.4	2.400	0.5	4.000	0.7	6.000	0.8	8.000	0.9		
0.400	0.2	1.000	0.3	1.800	0.5	2.600	0.5	4.500	0.7	6.500	0.8	8.500	1.0		

Hydro-Brake® Optimum Manhole: 33, DS/PN: 5.003, Volume (m³): 1.5

Unit Reference	MD-CHE-0030-4000-0795-4000	Objective	Minimise upstream storage	Invert Level (m)	103.405
Design Head (m)	0.795	Application	Surface	Minimum Outlet Pipe Diameter (mm)	75
Design Flow (l/s)	0.4	Sump Available	No	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	30		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.795	0.4	Flush-Flo™	0.070	0.2	Kick-Flo®	0.103	0.2	Mean Flow over Head Range	-	0.3

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.2	0.500	0.3	1.200	0.5	2.000	0.6	3.000	0.8	5.000	1.0	7.000	1.2	9.000	1.3
0.200	0.2	0.600	0.3	1.400	0.5	2.200	0.7	3.500	0.8	5.500	1.0	7.500	1.2	9.500	1.4
0.300	0.2	0.800	0.4	1.600	0.6	2.400	0.7	4.000	0.9	6.000	1.1	8.000	1.2		
0.400	0.3	1.000	0.4	1.800	0.6	2.600	0.7	4.500	0.9	6.500	1.1	8.500	1.3		

Hydro-Brake® Optimum Manhole: 73, DS/PN: 8.009, Volume (m³): 2.7

Unit Reference	MD-CHE-0041-1000-1460-1000	Objective	Minimise upstream storage	Invert Level (m)	103.990
Design Head (m)	1.460	Application	Surface	Minimum Outlet Pipe Diameter (mm)	75
Design Flow (l/s)	1.0	Sump Available	No	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	41		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.460	1.0	Flush-Flo™	0.099	0.5	Kick-Flo®	0.143	0.3	Mean Flow over Head Range	-	0.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.5	0.500	0.6	1.200	0.9	2.000	1.2	3.000	1.4	5.000	1.8	7.000	2.2	9.000	2.4
0.200	0.4	0.600	0.6	1.400	1.0	2.200	1.2	3.500	1.5	5.500	1.9	7.500	2.2	9.500	2.5
0.300	0.5	0.800	0.7	1.600	1.0	2.400	1.3	4.000	1.6	6.000	2.0	8.000	2.3		
0.400	0.5	1.000	0.8	1.800	1.1	2.600	1.3	4.500	1.7	6.500	2.1	8.500	2.4		

Complex Manhole: 23, DS/PN: 2.022, Volume (m³): 3.4

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0144-8900-0550-8900	Objective	Minimise upstream storage	Invert Level (m)	97.110
Design Head (m)	0.550	Application	Surface	Minimum Outlet Pipe Diameter (mm)	225
Design Flow (l/s)	8.9	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	144		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.550	8.9	Flush-Flo™	0.223	8.9	Kick-Flo®	0.422	7.9	Mean Flow over Head Range	-	7.2

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.2	0.500	8.5	1.200	12.9	2.000	16.4	3.000	19.9	5.000	25.4	7.000	29.9	9.000	33.9
0.200	8.9	0.600	9.3	1.400	13.8	2.200	17.2	3.500	21.4	5.500	26.6	7.500	31.0	9.500	34.9
0.300	8.8	0.800	10.6	1.600	14.7	2.400	17.9	4.000	22.8	6.000	27.6	8.000	32.0		
0.400	8.2	1.000	11.8	1.800	15.6	2.600	18.6	4.500	24.2	6.500	28.8	8.500	33.0		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0159-1180-0890-1180	Objective	Minimise upstream storage	Invert Level (m)	97.660
Design Head (m)	0.890	Application	Surface	Minimum Outlet Pipe Diameter (mm)	225
Design Flow (l/s)	11.8	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	159		

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.890	11.8	Flush-Flo™	0.286	11.8	Kick-Flo®	0.627	10.0	Mean Flow over Head Range	-	10.0

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.7	0.500	11.3	1.200	13.6	2.000	17.3	3.000	21.0	5.000	26.9	7.000	31.6	9.000	35.5
0.200	11.5	0.600	10.4	1.400	14.6	2.200	18.1	3.500	22.6	5.500	28.1	7.500	32.7	9.500	36.5
0.300	11.8	0.800	11.2	1.600	15.6	2.400	18.9	4.000	24.1	6.000	29.3	8.000	33.7		
0.400	11.6	1.000	12.5	1.800	16.5	2.600	19.6	4.500	25.5	6.500	30.5	8.500	34.7		

Hydro-Brake® Optimum

Unit Reference	MD-SHE-0135-7200-0290-7200	Objective	Minimise upstream storage	Invert Level (m)	98.260
Design Head (m)	0.290	Application	Surface	Minimum Outlet Pipe Diameter (mm)	150
Design Flow (l/s)	7.2	Sump Available	Yes	Suggested Manhole Diameter (mm)	1200
Flush-Flo™	Calculated	Diameter (mm)	135		

Hydro-Brake® Optimum

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.290	7.2	Flush-Flo™	0.181	7.2	Kick-Flo®	0.259	6.8	Mean Flow over Head Range	-	5.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.8	0.500	9.3	1.200	14.1	2.000	17.9	3.000	21.6	5.000	28.0	7.000	33.2	9.000	37.7
0.200	7.2	0.600	10.1	1.400	15.1	2.200	18.8	3.500	23.3	5.500	29.4	7.500	34.3	9.500	38.7
0.300	7.3	0.800	11.6	1.600	16.1	2.400	19.6	4.000	25.0	6.000	30.7	8.000	35.5		
0.400	8.4	1.000	12.9	1.800	17.1	2.600	20.3	4.500	26.5	6.500	32.0	8.500	36.6		

Offline Controls for Mainline 2

Pipe Manhole: 76, DS/PN: 9.000, Loop to PN: 5.000

Diameter (m)	0.300	Slope (1:X)	133.8	Roughness k (mm)	0.600	Coefficient of Contraction	0.600
Section Type	Pipe/Conduit	Length (m)	48.846	Entry Loss Coefficient	0.500	Upstream Invert Level (m)	103.800

Storage Structures for Mainline 2

Tank or Pond Manhole: 6(HW), DS/PN: 2.005

Invert Level (m) 102.600

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	28.0	1.200	136.0

Tank or Pond Manhole: 12(HW), DS/PN: 2.011

Invert Level (m) 101.650

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	318.0	1.200	905.1

Tank or Pond Manhole: 19(HW), DS/PN: 2.018

Invert Level (m) 98.660

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	45.0	0.890	310.3

Porous Car Park Manhole: 30, DS/PN: 5.000

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	1.0	Width (m)	5.0	Depression Storage (mm)	0
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	40.0	Evaporation (mm/day)	3
Max Percolation (l/s)	55.6	Invert Level (m)	104.270	Slope (1:X)	200.0	Membrane Depth (mm)	130

Cellular Storage Manhole: 32(J), DS/PN: 5.002

Invert Level (m)	102.150	Infiltration Coefficient Side (m/hr)	0.91800	Porosity	0.95		
Infiltration Coefficient Base (m/hr)	0.91800	Safety Factor	5.0				

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	54.0	54.0	1.600	54.0	106.8	1.601	0.0	106.8

Complex Manhole: 38, DS/PN: 5.008

Cellular Storage

Invert Level (m) 100.500 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	99.0	99.0	0.800	99.0	156.6	0.801	0.0	156.6

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	2.0	Width (m)	5.0	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	45.0	Evaporation (mm/day)	3
Max Percolation (l/s)	62.5	Invert Level (m)	101.520	Slope (1:X)	0.0	Membrane Depth (mm)	0

Swale Manhole: 57(HW), DS/PN: 7.002

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00	Length (m)	39.7	Cap Volume Depth (m)	0.000
Infiltration Coefficient Side (m/hr)	0.00000	Invert Level (m)	107.200	Side Slope (1:X)	3.0	Cap Infiltration Depth (m)	0.000
Safety Factor	2.0	Base Width (m)	0.5	Slope (1:X)	0.0	Include Swale Volume	Yes

Porous Car Park Manhole: 66(HW), DS/PN: 8.002

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	1.0	Width (m)	5.0	Depression Storage (mm)	0
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	10.0	Evaporation (mm/day)	3
Max Percolation (l/s)	13.9	Invert Level (m)	105.570	Slope (1:X)	200.0	Membrane Depth (mm)	130

Porous Car Park Manhole: 67, DS/PN: 8.003

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	1.0	Width (m)	5.0	Depression Storage (mm)	0
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	10.0	Evaporation (mm/day)	3
Max Percolation (l/s)	13.9	Invert Level (m)	105.570	Slope (1:X)	200.0	Membrane Depth (mm)	130

Porous Car Park Manhole: 71(HW), DS/PN: 8.007

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	1.0	Width (m)	5.0	Depression Storage (mm)	0
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	40.0	Evaporation (mm/day)	3
Max Percolation (l/s)	55.6	Invert Level (m)	105.140	Slope (1:X)	200.0	Membrane Depth (mm)	130

Tank or Pond Manhole: 72(HW), DS/PN: 8.008

Invert Level (m) 104.900

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	20.0	0.600	69.0

Porous Car Park Manhole: 81(HW), DS/PN: 9.005

Infiltration Coefficient Base (m/hr)	0.00000	Safety Factor	1.0	Width (m)	5.0	Depression Storage (mm)	0
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	40.0	Evaporation (mm/day)	3
Max Percolation (l/s)	55.6	Invert Level (m)	103.470	Slope (1:X)	200.0	Membrane Depth (mm)	130

Swale Manhole: 48(HW), DS/PN: 6.005

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00	Length (m)	19.4	Cap Volume Depth (m)	0.000
Infiltration Coefficient Side (m/hr)	0.00000	Invert Level (m)	101.750	Side Slope (1:X)	3.0	Cap Infiltration Depth (m)	0.000
Safety Factor	2.0	Base Width (m)	0.5	Slope (1:X)	0.0	Include Swale Volume	Yes

Swale Manhole: 51(HW), DS/PN: 6.008

Warning:- Volume should always be included unless the upstream pipe is being used for storage and/or as a carrier

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	1.00	Length (m)	19.4	Cap Volume Depth (m)	0.000
Infiltration Coefficient Side (m/hr)	0.00000	Invert Level (m)	101.250	Side Slope (1:X)	3.0	Cap Infiltration Depth (m)	0.000
Safety Factor	5.0	Base Width (m)	0.5	Slope (1:X)	0.0	Include Swale Volume	Yes

Cellular Storage Manhole: 54J, DS/PN: 6.011

Invert Level (m)	98.500	Infiltration Coefficient Side (m/hr)	0.91800	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.91800	Safety Factor	5.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	170.0	170.0	2.400	170.0	299.6	2.401	0.0	299.6

Tank or Pond Manhole: 22(HW), DS/PN: 2.021

Invert Level (m) 97.250

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	655.0	1.350	1261.1

Manhole Headloss for Mainline 2

PN	US/MH Name	US/MH Headloss
2.000	1	0.500
2.001	2(HW)	0.000
2.002	3(HW)	0.000
2.003	4	0.500
2.004	5(HW)	0.000
2.005	6(HW)	0.000
2.006	7	0.500
3.000	24	0.500
3.001	25(HW)	0.000
3.002	26(HW)	0.000
3.003	27	0.500
3.004	28(HW)	0.000
2.007	8(J)	0.000
2.008	9(HW)	0.000
2.009	10	0.500
2.010	11(HW)	0.000
2.011	12(HW)	0.000
2.012	13	0.500
2.013	14(HW)	0.000
2.014	15(HW)	0.000
2.015	16	0.500
2.016	17	0.500
2.017	18(HW)	0.000
2.018	19(HW)	0.000
4.000	29	0.500
2.019	20	0.500
2.020	31(HW)	0.000
5.000	30	0.500
5.001	31(J)	0.000
5.002	32(J)	0.000
5.003	33	0.500
5.004	34	0.500
5.005	35	0.500
5.006	36	0.500
5.007	37	0.500
5.008	38	0.500
6.000	43	0.500
6.001	44(HW)	0.000
6.002	45(HW)	0.000
7.000	55	0.500
7.001	56(HW)	0.000
7.002	57(HW)	0.000
7.003	58	0.500
7.004	59(HW)	0.000
7.005	60(HW)	0.000
7.006	61	0.500
8.000	65	0.500
8.001	62(HW)	0.000
8.002	66(HW)	0.000

Manhole Headloss for Mainline 2

PN	US/MH Name	US/MH Headloss
8.003	67	0.500
8.004	68(HW)	0.000
8.005	69(HW)	0.000
8.006	70	0.500
8.007	71(HW)	0.000
8.008	72(HW)	0.000
8.009	73	0.500
8.010	74(HW)	0.000
8.011	75(HW)	0.000
7.007	62	0.500
7.008	63	0.500
6.003	46	0.500
9.000	76	0.500
9.001	77(HW)	0.000
9.002	78(HW)	0.000
9.003	79	0.500
9.004	80(HW)	0.000
9.005	81(HW)	0.000
9.006	82	0.500
9.007	83	0.000
6.004	47(HW)	0.000
6.005	48(HW)	0.000
6.006	49	0.500
6.007	50(HW)	0.000
6.008	51(HW)	0.000
6.009	52	0.500
6.010	53(J)	0.000
6.011	54J	0.000
5.009	39	0.500
5.010	84	0.500
5.011	40	0.500
5.012	41	0.500
5.013	42(HW)	0.000
2.021	22(HW)	0.000
2.022	23	0.500

Volume Summary (Static)

Length Calculations based on Centre-Centre

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
2.000	1	2.651	0.101	0.000	2.752
2.001	2(HW)	0.000	1.153	0.000	1.153
2.002	3(HW)	0.000	0.192	0.000	0.192
2.003	4	2.668	1.310	0.000	3.978
2.004	5(HW)	0.000	1.486	0.000	1.486
2.005	6(HW)	0.000	0.026	90.284	90.310
2.006	7	2.147	0.286	0.000	2.433
3.000	24	2.297	0.104	0.000	2.401
3.001	25(HW)	0.000	1.921	0.000	1.921
3.002	26(HW)	0.000	0.173	0.000	0.173
3.003	27	2.280	0.159	0.000	2.438
3.004	28(HW)	0.000	1.214	0.000	1.214
2.007	8(J)	0.000	1.363	0.000	1.363
2.008	9(HW)	0.000	0.119	0.000	0.119
2.009	10	2.668	0.736	0.000	3.404
2.010	11(HW)	0.000	3.440	0.000	3.440
2.011	12(HW)	0.000	0.247	703.836	704.083
2.012	13	2.598	0.104	0.000	2.702
2.013	14(HW)	0.000	1.681	0.000	1.681
2.014	15(HW)	0.000	0.102	0.000	0.102
2.015	16	2.827	4.414	0.000	7.242
2.016	17	1.856	0.105	0.000	1.961
2.017	18(HW)	0.000	3.741	0.000	3.741
2.018	19(HW)	0.000	0.029	140.477	140.506
4.000	29	2.527	0.464	0.000	2.991
2.019	20	1.962	0.111	0.000	2.073
2.020	31(HW)	0.000	4.656	0.000	4.656
5.000	30	2.235	0.097	17.265	19.598
5.001	31(J)	0.000	0.850	0.000	0.850
5.002	32(J)	0.000	0.098	82.097	82.195
5.003	33	1.493	1.428	0.000	2.921
5.004	34	2.121	3.503	0.000	5.623
5.005	35	2.518	2.105	0.000	4.623
5.006	36	2.651	1.399	0.000	4.050
5.007	37	2.518	3.535	0.000	6.053
5.008	38	2.651	3.039	104.296	109.986
6.000	43	2.651	0.107	0.000	2.758
6.001	44(HW)	0.000	3.595	0.000	3.595
6.002	45(HW)	0.000	0.921	0.000	0.921
7.000	55	2.651	0.103	0.000	2.754
7.001	56(HW)	0.000	2.891	0.000	2.891
7.002	57(HW)	0.000	0.258	54.786	55.044
7.003	58	2.386	0.219	0.000	2.604
7.004	59(HW)	0.000	2.592	0.000	2.592
7.005	60(HW)	0.000	0.130	0.000	0.130
7.006	61	2.651	1.699	0.000	4.349

Volume Summary (Static)

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
8.000	65	2.439	0.081	0.000	2.520
8.001	62(HW)	0.000	1.351	0.000	1.351
8.002	66(HW)	0.000	0.265	4.500	4.765
8.003	67	2.615	0.337	4.500	7.453
8.004	68(HW)	0.000	1.676	0.000	1.676
8.005	69(HW)	0.000	0.122	0.000	0.122
8.006	70	2.651	0.122	0.000	2.772
8.007	71(HW)	0.000	0.916	17.265	18.181
8.008	72(HW)	0.000	0.074	25.230	25.304
8.009	73	2.668	0.580	0.000	3.248
8.010	74(HW)	0.000	1.357	0.000	1.357
8.011	75(HW)	0.000	0.143	0.000	0.143
7.007	62	3.842	2.277	0.000	6.119
7.008	63	2.827	0.726	0.000	3.553
6.003	46	4.326	0.251	0.000	4.577
9.000	76	3.181	0.104	0.000	3.285
9.001	77(HW)	0.000	1.674	0.000	1.674
9.002	78(HW)	0.000	0.559	0.000	0.559
9.003	79	2.651	1.341	0.000	3.991
9.004	80(HW)	0.000	2.217	0.000	2.217
9.005	81(HW)	0.000	0.764	17.265	18.029
9.006	82	3.004	0.105	0.000	3.109
9.007	83	0.000	0.147	0.000	0.147
6.004	47(HW)	0.000	3.338	0.000	3.338
6.005	48(HW)	0.000	0.404	26.772	27.176
6.006	49	1.997	0.430	0.000	2.427
6.007	50(HW)	0.000	3.605	0.000	3.605
6.008	51(HW)	0.000	1.946	26.772	28.718
6.009	52	1.661	1.156	0.000	2.817
6.010	53(J)	0.000	1.434	0.000	1.434
6.011	54J	0.000	0.175	387.654	387.829
5.009	39	7.799	3.218	0.000	11.017
5.010	84	2.783	3.227	0.000	6.011
5.011	40	3.004	5.889	0.000	8.894
5.012	41	2.280	0.456	0.000	2.735
5.013	42(HW)	0.000	4.075	0.000	4.075
2.021	22(HW)	0.000	0.841	1271.239	1272.080
2.022	23	2.633	0.595	0.000	3.228
Total		105.368	105.985	2974.238	3185.590

Volume Summary (Static)

Length Calculations based on True Length

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
2.000	1	2.651	0.048	0.000	2.699
2.001	2(HW)	0.000	1.153	0.000	1.153
2.002	3(HW)	0.000	0.139	0.000	0.139
2.003	4	2.668	1.257	0.000	3.925
2.004	5(HW)	0.000	1.486	0.000	1.486
2.005	6(HW)	0.000	0.013	90.284	90.297
2.006	7	2.147	0.272	0.000	2.420
3.000	24	2.297	0.051	0.000	2.348
3.001	25(HW)	0.000	1.921	0.000	1.921
3.002	26(HW)	0.000	0.120	0.000	0.120
3.003	27	2.280	0.106	0.000	2.385
3.004	28(HW)	0.000	1.214	0.000	1.214
2.007	8(J)	0.000	1.363	0.000	1.363
2.008	9(HW)	0.000	0.066	0.000	0.066
2.009	10	2.668	0.683	0.000	3.351
2.010	11(HW)	0.000	3.440	0.000	3.440
2.011	12(HW)	0.000	0.194	703.836	704.030
2.012	13	2.598	0.051	0.000	2.649
2.013	14(HW)	0.000	1.681	0.000	1.681
2.014	15(HW)	0.000	0.049	0.000	0.049
2.015	16	2.827	4.308	0.000	7.136
2.016	17	1.856	0.052	0.000	1.908
2.017	18(HW)	0.000	3.741	0.000	3.741
2.018	19(HW)	0.000	0.016	140.477	140.493
4.000	29	2.527	0.358	0.000	2.885
2.019	20	1.962	0.058	0.000	2.020
2.020	31(HW)	0.000	4.656	0.000	4.656
5.000	30	2.235	0.044	17.265	19.545
5.001	31(J)	0.000	0.850	0.000	0.850
5.002	32(J)	0.000	0.045	82.097	82.142
5.003	33	1.493	1.322	0.000	2.815
5.004	34	2.121	3.397	0.000	5.517
5.005	35	2.518	1.998	0.000	4.517
5.006	36	2.651	1.293	0.000	3.944
5.007	37	2.518	3.429	0.000	5.947
5.008	38	2.651	2.922	104.296	109.869
6.000	43	2.651	0.054	0.000	2.705
6.001	44(HW)	0.000	3.595	0.000	3.595
6.002	45(HW)	0.000	0.858	0.000	0.858
7.000	55	2.651	0.050	0.000	2.701
7.001	56(HW)	0.000	2.891	0.000	2.891
7.002	57(HW)	0.000	0.205	54.786	54.991
7.003	58	2.386	0.166	0.000	2.551
7.004	59(HW)	0.000	2.592	0.000	2.592
7.005	60(HW)	0.000	0.077	0.000	0.077
7.006	61	2.651	1.582	0.000	4.233

Volume Summary (Static)

Pipe Number	USMH Name	Manhole Volume (m³)	Pipe Volume (m³)	Storage Structure Volume (m³)	Total Volume (m³)
8.000	65	2.439	0.028	0.000	2.467
8.001	62(HW)	0.000	1.351	0.000	1.351
8.002	66(HW)	0.000	0.212	4.500	4.712
8.003	67	2.615	0.284	4.500	7.400
8.004	68(HW)	0.000	1.676	0.000	1.676
8.005	69(HW)	0.000	0.069	0.000	0.069
8.006	70	2.651	0.069	0.000	2.719
8.007	71(HW)	0.000	0.916	17.265	18.181
8.008	72(HW)	0.000	0.021	25.230	25.251
8.009	73	2.668	0.527	0.000	3.195
8.010	74(HW)	0.000	1.357	0.000	1.357
8.011	75(HW)	0.000	0.079	0.000	0.079
7.007	62	3.842	2.160	0.000	6.003
7.008	63	2.827	0.609	0.000	3.437
6.003	46	4.326	0.187	0.000	4.513
9.000	76	3.181	0.051	0.000	3.232
9.001	77(HW)	0.000	1.674	0.000	1.674
9.002	78(HW)	0.000	0.506	0.000	0.506
9.003	79	2.651	1.287	0.000	3.938
9.004	80(HW)	0.000	2.217	0.000	2.217
9.005	81(HW)	0.000	0.711	17.265	17.976
9.006	82	3.004	0.052	0.000	3.056
9.007	83	0.000	0.147	0.000	0.147
6.004	47(HW)	0.000	3.338	0.000	3.338
6.005	48(HW)	0.000	0.285	26.772	27.057
6.006	49	1.997	0.311	0.000	2.308
6.007	50(HW)	0.000	3.605	0.000	3.605
6.008	51(HW)	0.000	1.827	26.772	28.599
6.009	52	1.661	1.037	0.000	2.698
6.010	53(J)	0.000	1.434	0.000	1.434
6.011	54J	0.000	0.159	387.654	387.813
5.009	39	7.799	3.036	0.000	10.835
5.010	84	2.783	3.062	0.000	5.845
5.011	40	3.004	5.724	0.000	8.728
5.012	41	2.280	0.373	0.000	2.652
5.013	42(HW)	0.000	4.075	0.000	4.075
2.021	22(HW)	0.000	0.811	1271.239	1272.050
2.022	23	2.633	0.565	0.000	3.198
Total		105.368	101.700	2974.238	3181.305

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 5 Number of Offline Controls 1 Number of Storage Structures 16 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 538700 152900 TQ 38700 52900 Cv (Winter) 0.840
Return Period (years) 2 Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Sensitivity flows(s) (%) 0

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000	1	30 minute 2 year Winter Q+0%	105.750	104.263	-0.287	0.000			0.015	0.591		0.5	OK
2.001	2(HW)	30 minute 2 year Winter Q+0%	105.750	104.244	-0.296	0.000			0.000	0.590		0.5	OK*
2.002	3(HW)	15 minute 2 year Winter Q+0%	105.150	103.674	-0.276	0.000			0.024	0.450		0.6	OK*
2.003	4	15 minute 2 year Winter Q+0%	105.150	103.673	-0.267	0.000			0.056	2.342		3.8	OK
2.004	5(HW)	15 minute 2 year Winter Q+0%	104.450	103.302	-0.248	0.000			0.065	7.799		13.6	OK*
2.005	6(HW)	360 minute 2 year Winter Q+0%	103.800	103.070	0.320	0.000			21.498	16.957		0.7	SURCHARGED*
2.006	7	360 minute 2 year Winter Q+0%	103.800	103.071	0.336	0.000			0.863	23.318		0.7	SURCHARGED
3.000	24	30 minute 2 year Winter Q+0%	103.300	102.032	-0.268	0.000			0.048	1.599		1.4	OK
3.001	25(HW)	30 minute 2 year Winter Q+0%	103.300	102.020	-0.270	0.000			0.028	1.599		1.4	OK*
3.002	26(HW)	15 minute 2 year Winter Q+0%	103.180	101.958	-0.242	0.000			0.190	1.220		1.7	OK*
3.003	27	15 minute 2 year Winter Q+0%	103.180	101.958	-0.232	0.000			0.125	4.193		6.1	OK
3.004	28(HW)	15 minute 2 year Winter Q+0%	103.180	101.943	-0.237	0.000			0.069	4.193		6.1	OK*
2.007	8(J)	15 minute 2 year Winter Q+0%	103.150	101.887	-0.233	0.000			0.205	5.724		6.4	OK*
2.008	9(HW)	15 minute 2 year Winter Q+0%	103.250	101.840	-0.210	0.000			0.276	5.704		6.5	OK*
2.009	10	2880 minute 2 year Winter Q+0%	103.250	101.840	-0.200	0.000			0.178	99.286		1.2	OK
2.010	11(HW)	2880 minute 2 year Winter Q+0%	103.250	101.840	-0.160	0.000			0.353	99.200		1.2	OK*
2.011	12(HW)	2880 minute 2 year Winter Q+0%	102.850	101.840	-0.110	0.000			69.028	65.579		2.0	OK*
2.012	13	2160 minute 2 year Winter Q+0%	102.850	101.877	0.197	0.000			1.059	53.847		0.2	SURCHARGED
2.013	14(HW)	2160 minute 2 year Winter Q+0%	102.850	101.333	-0.297	0.000			0.000	53.841		0.2	OK*
2.014	15(HW)	15 minute 2 year Winter Q+0%	102.600	101.058	-0.252	0.000			0.071	0.581		0.4	OK*
2.015	16	15 minute 2 year Winter Q+0%	102.600	101.058	-0.242	0.000			0.099	7.540		12.7	OK
2.016	17	15 minute 2 year Winter Q+0%	100.750	99.814	-0.186	0.000			0.249	10.076		17.3	OK
2.017	18(HW)	15 minute 2 year Winter Q+0%	100.750	99.756	-0.234	0.000			0.067	10.072		17.0	OK*
2.018	19(HW)	30 minute 2 year Winter Q+0%	99.550	98.892	0.082	0.000			16.016	37.689		25.0	SURCHARGED*
4.000	29	30 minute 2 year Winter Q+0%	99.900	98.651	-0.119	0.000			0.312	21.704		19.1	OK
2.019	20	30 minute 2 year Winter Q+0%	99.550	98.642	-0.098	0.000			0.555	59.358		43.9	OK

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.020	31(HW)	30 minute 2 year Winter Q+0%	99.550	98.541	-0.189	0.000			0.118	59.339		43.8	OK*
5.000	30	30 minute 2 year Winter Q+0%	104.700	103.544	-0.191	0.000		0.000	0.184	11.624	12	10.3	OK
5.001	31(J)	30 minute 2 year Winter Q+0%	104.700	103.542	-0.183	0.000			0.122	11.626		10.3	OK*
5.002	32(J)	120 minute 2 year Winter Q+0%	104.250	102.302	-1.413	0.000		20.316	7.954	0.000	43	0.0	OK*
5.003	33	15 minute 2 year Summer Q+0%	104.250	103.405	-0.300	0.000			0.000	0.000		0.0	OK
5.004	34	15 minute 2 year Summer Q+0%	104.100	102.900	-0.300	0.000			0.000	0.000		0.0	OK
5.005	35	15 minute 2 year Winter Q+0%	103.750	102.361	-0.264	0.000			0.076	3.258		5.9	OK
5.006	36	15 minute 2 year Winter Q+0%	102.900	101.446	-0.254	0.000			0.084	3.896		7.0	OK
5.007	37	15 minute 2 year Winter Q+0%	102.500	101.193	-0.182	0.000			0.273	20.872		37.6	OK
5.008	38	15 minute 2 year Winter Q+0%	101.950	100.550	-0.200	0.000		0.000	4.921	31.246	6	52.5	OK
6.000	43	30 minute 2 year Winter Q+0%	103.250	101.782	-0.268	0.000			0.047	1.582		1.4	OK
6.001	44(HW)	15 minute 2 year Winter Q+0%	103.250	101.770	-0.270	0.000			0.027	1.206		1.3	OK*
6.002	45(HW)	15 minute 2 year Winter Q+0%	103.050	101.716	-0.134	0.000			0.963	1.207		4.6	OK*
7.000	55	15 minute 2 year Summer Q+0%	109.500	108.000	-0.300	0.000			0.000	0.000		0.0	OK
7.001	56(HW)	15 minute 2 year Summer Q+0%	109.500	107.990	-0.300	0.000			0.000	0.000		0.0	OK*
7.002	57(HW)	15 minute 2 year Winter Q+0%	107.800	106.331	-0.269	0.000		0.000	0.031	1.240	6	2.3	OK*
7.003	58	15 minute 2 year Winter Q+0%	107.500	106.181	-0.269	0.000			0.051	1.240		2.2	OK
7.004	59(HW)	15 minute 2 year Winter Q+0%	107.500	106.038	-0.262	0.000			0.037	5.391		9.7	OK*
7.005	60(HW)	15 minute 2 year Winter Q+0%	105.500	104.105	-0.205	0.000			0.104	7.275		13.1	OK*
7.006	61	15 minute 2 year Winter Q+0%	105.500	104.051	-0.249	0.000			0.088	7.517		13.6	OK
8.000	65	240 minute 2 year Winter Q+0%	106.000	104.727	-0.193	0.000			0.180	0.000		0.1	OK
8.001	62(HW)	240 minute 2 year Winter Q+0%	106.000	104.727	-0.183	0.000			0.118	0.001		0.1	OK*
8.002	66(HW)	240 minute 2 year Winter Q+0%	106.000	104.727	-0.113	0.000		0.000	0.844	3.062	75	0.5	OK*
8.003	67	240 minute 2 year Winter Q+0%	106.000	104.727	-0.093	0.000		0.000	0.481	6.077	89	1.1	OK
8.004	68(HW)	240 minute 2 year Winter Q+0%	106.000	104.727	-0.073	0.000			0.410	6.078		1.0	OK*
8.005	69(HW)	15 minute 2 year Summer Q+0%	105.590	104.390	0.000	0.000			1.097	1.246		1.5	SURCHARGED*
8.006	70	240 minute 2 year Winter Q+0%	105.580	104.727	0.347	0.000			1.204	5.924		0.6	SURCHARGED
8.007	71(HW)	240 minute 2 year Winter Q+0%	105.570	104.727	0.357	0.000		0.000	0.720	16.057	188	1.3	SURCHARGED*
8.008	72(HW)	240 minute 2 year Winter Q+0%	105.500	104.726	0.426	0.000			1.637	15.684		1.0	SURCHARGED*
8.009	73	240 minute 2 year Winter Q+0%	105.500	104.726	0.436	0.000			1.313	15.426		0.7	SURCHARGED
8.010	74(HW)	15 minute 2 year Winter Q+0%	105.300	103.814	-0.286	0.000			0.012	2.790		2.2	OK*
8.011	75(HW)	15 minute 2 year Winter Q+0%	104.500	103.062	-0.238	0.000			0.069	4.196		4.7	OK*
7.007	62	15 minute 2 year Winter Q+0%	104.500	103.058	-0.232	0.000			0.181	11.700		18.4	OK
7.008	63	15 minute 2 year Winter Q+0%	103.800	102.305	-0.195	0.000			0.209	32.028		54.8	OK
6.003	46	15 minute 2 year Winter Q+0%	103.200	101.716	-0.084	0.000			1.136	33.196		52.5	OK
9.000	76	15 minute 2 year Summer Q+0%	105.600	103.800	-0.300	0.000	0.000		0.000	0.000		0.0	OK
9.001	77(HW)	15 minute 2 year Summer Q+0%	105.600	103.790	-0.300	0.000			0.000	0.000		0.0	OK*
9.002	78(HW)	15 minute 2 year Winter Q+0%	105.150	103.684	-0.266	0.000			0.071	2.023		3.7	OK*
9.003	79	15 minute 2 year Winter Q+0%	104.900	103.480	-0.220	0.000			0.152	15.170		27.5	OK
9.004	80(HW)	15 minute 2 year Winter Q+0%	104.300	102.872	-0.228	0.000			0.085	16.987		30.6	OK*
9.005	81(HW)	15 minute 2 year Winter Q+0%	103.900	102.484	-0.216	0.000		0.000	2.553	20.169		41.2	OK*
9.006	82	15 minute 2 year Winter Q+0%	103.200	101.695	-0.105	0.000			0.380	20.169		41.5	OK
9.007	83	15 minute 2 year Winter Q+0%	103.200	101.671	-0.119	0.000			0.201	20.169		41.5	OK*
6.004	47(HW)	15 minute 2 year Winter Q+0%	103.200	101.615	-0.155	0.000			0.403	53.354		93.1	OK*
6.005	48(HW)	15 minute 2 year Winter Q+0%	102.350	101.578	-0.102	0.000		0.000	2.660	53.345	7	93.2	OK*
6.006	49	15 minute 2 year Winter Q+0%	102.350	101.570	-0.100	0.000			0.809	69.600		119.3	OK
6.007	50(HW)	15 minute 2 year Winter Q+0%	102.350	101.480	-0.180	0.000			0.417	69.590		118.3	OK*

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
6.008	51(HW)	15 minute 2 year Winter Q+0%	101.850	101.326	-0.234	0.000		0.000	2.457	69.588	6	118.2	OK*
6.009	52	15 minute 2 year Winter Q+0%	101.850	101.085	-0.275	0.000			0.548	74.904		125.4	OK
6.010	53(J)	15 minute 2 year Winter Q+0%	101.400	100.716	-0.159	0.000			0.468	74.902		124.8	OK*
6.011	54J	120 minute 2 year Winter Q+0%	101.400	99.009	0.084	0.000		114.978	82.682	62.294	67	22.2	SURCHARGED*
5.009	39	15 minute 2 year Winter Q+0%	101.550	98.620	-0.240	0.000			0.341	43.101		58.0	OK
5.010	84	15 minute 2 year Winter Q+0%	99.650	98.246	-0.204	0.000			0.544	43.100		58.2	OK
5.011	40	15 minute 2 year Winter Q+0%	99.600	98.077	-0.198	0.000			0.926	52.497		70.6	OK
5.012	41	15 minute 2 year Winter Q+0%	98.800	97.794	-0.091	0.000			1.993	54.974		73.8	OK
5.013	42(HW)	15 minute 2 year Winter Q+0%	98.800	97.668	-0.197	0.000			0.297	54.983		73.1	OK*
2.021	22(HW)	240 minute 2 year Winter Q+0%	98.600	97.604	0.129	0.000			259.885	204.609		12.5	SURCHARGED*
2.022	23	240 minute 2 year Winter Q+0%	98.600	97.628	0.293	0.000			1.719	203.169		8.9	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 5 Number of Offline Controls 1 Number of Storage Structures 16 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH Site Location GB 538700 152900 TQ 38700 52900 Cv (Winter) 0.840
Return Period (years) 30 Data Type Catchment
FEH Rainfall Version 2013 Cv (Summer) 0.750

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Sensitivity flows(s) (%) 0, +35

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000	1	30 minute 30 year Winter Q+35%	105.750	104.284	-0.266	0.000			0.051	1.870		1.7	OK
2.001	2(HW)	30 minute 30 year Winter Q+35%	105.750	104.252	-0.288	0.000			0.008	1.869		1.7	OK*
2.002	3(HW)	15 minute 30 year Winter Q+35%	105.150	103.705	-0.245	0.000			0.062	1.382		1.6	OK*
2.003	4	15 minute 30 year Winter Q+35%	105.150	103.704	-0.236	0.000			0.119	7.189		14.3	OK
2.004	5(HW)	960 minute 30 year Winter Q+35%	104.450	103.550	0.000	0.000			0.817	82.683		3.6	SURCHARGED*
2.005	6(HW)	480 minute 30 year Winter Q+35%	103.800	103.589	0.839	0.000			66.725	28.178		1.0	FLOOD RISK*
2.006	7	480 minute 30 year Winter Q+35%	103.800	103.589	0.854	0.000			1.780	45.213		0.9	FLOOD RISK
3.000	24	2880 minute 30 year Winter Q+35%	103.300	102.104	-0.196	0.000			0.175	16.698		0.2	OK
3.001	25(HW)	2880 minute 30 year Winter Q+35%	103.300	102.104	-0.186	0.000			0.120	16.600		0.2	OK*
3.002	26(HW)	2880 minute 30 year Winter Q+35%	103.180	102.104	-0.096	0.000			1.195	15.536		0.2	OK*
3.003	27	2880 minute 30 year Winter Q+35%	103.180	102.104	-0.086	0.000			0.444	56.338		0.8	OK
3.004	28(HW)	2880 minute 30 year Winter Q+35%	103.180	102.104	-0.076	0.000			0.288	56.158		0.8	OK*
2.007	8(J)	2880 minute 30 year Winter Q+35%	103.150	102.104	-0.016	0.000			1.378	191.108		1.6	OK*
2.008	9(HW)	2880 minute 30 year Summer Q+35%	103.250	102.050	0.000	0.000			1.570	169.630		1.9	SURCHARGED*
2.009	10	2880 minute 30 year Winter Q+35%	103.250	102.104	0.064	0.000			0.700	228.649		2.1	SURCHARGED
2.010	11(HW)	2880 minute 30 year Summer Q+35%	103.250	102.000	0.000	0.000			1.017	203.745		2.6	SURCHARGED*
2.011	12(HW)	2880 minute 30 year Winter Q+35%	102.850	102.105	0.155	0.000			189.328	99.386		2.1	SURCHARGED*
2.012	13	2880 minute 30 year Winter Q+35%	102.850	102.143	0.463	0.000			1.534	88.208		0.3	SURCHARGED
2.013	14(HW)	2880 minute 30 year Winter Q+35%	102.850	101.333	-0.297	0.000			0.000	88.208		0.3	OK*
2.014	15(HW)	15 minute 30 year Winter Q+35%	102.600	101.116	-0.194	0.000			0.169	0.662		0.7	OK*
2.015	16	15 minute 30 year Summer Q+35%	102.600	101.116	-0.184	0.000			0.208	19.741		48.7	OK
2.016	17	15 minute 30 year Summer Q+35%	100.750	100.057	0.057	0.000			1.292	26.707		62.3	SURCHARGED
2.017	18(HW)	15 minute 30 year Winter Q+35%	100.750	99.829	-0.161	0.000			0.151	29.841		65.0	OK*
2.018	19(HW)	30 minute 30 year Winter Q+35%	99.550	99.284	0.474	0.000			74.584	108.345		42.7	FLOOD RISK*
4.000	29	30 minute 30 year Winter Q+35%	99.900	98.948	0.178	0.000			0.835	68.407		60.6	SURCHARGED
2.019	20	30 minute 30 year Winter Q+35%	99.550	98.875	0.135	0.000			1.134	176.221		100.0	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.020	31(HW)	30 minute 30 year Winter Q+35%	99.550	98.610	-0.120	0.000			0.203	175.453		100.0	OK*
5.000	30	30 minute 30 year Winter Q+35%	104.700	103.792	0.057	0.000		0.000	0.623	36.774	8	32.2	SURCHARGED
5.001	31(J)	30 minute 30 year Winter Q+35%	104.700	103.707	-0.018	0.000			0.315	36.774		31.6	OK*
5.002	32(J)	120 minute 30 year Winter Q+35%	104.250	102.851	-0.864	0.000		45.780	36.670	0.000	103	0.0	OK*
5.003	33	15 minute 30 year Summer Q+0%	104.250	103.405	-0.300	0.000			0.000	0.000		0.0	OK
5.004	34	15 minute 30 year Summer Q+0%	104.100	102.900	-0.300	0.000			0.000	0.000		0.0	OK
5.005	35	15 minute 30 year Winter Q+35%	103.750	102.396	-0.229	0.000			0.164	10.005		22.9	OK
5.006	36	15 minute 30 year Winter Q+35%	102.900	101.652	-0.048	0.000			0.659	11.964		28.3	OK
5.007	37	15 minute 30 year Winter Q+35%	102.500	101.619	0.244	0.000			2.196	64.087		136.3	SURCHARGED
5.008	38	15 minute 30 year Winter Q+35%	101.950	100.683	-0.067	0.000		0.000	18.116	97.905	4	185.0	OK
6.000	43	15 minute 30 year Winter Q+35%	103.250	102.880	0.830	0.000			1.988	3.702		9.5	SURCHARGED
6.001	44(HW)	15 minute 30 year Summer Q+0%	103.250	102.040	0.000	0.000			0.761	2.442		7.2	SURCHARGED*
6.002	45(HW)	15 minute 30 year Summer Q+0%	103.050	101.850	0.000	0.000			4.492	2.442		24.1	SURCHARGED*
7.000	55	15 minute 30 year Summer Q+0%	109.500	108.000	-0.300	0.000			0.000	0.000		0.0	OK
7.001	56(HW)	15 minute 30 year Summer Q+0%	109.500	107.990	-0.300	0.000			0.000	0.000		0.0	OK*
7.002	57(HW)	15 minute 30 year Winter Q+35%	107.800	106.360	-0.240	0.000		0.000	0.067	3.807	5	8.7	OK*
7.003	58	15 minute 30 year Summer Q+35%	107.500	106.211	-0.239	0.000			0.108	3.400		8.7	OK
7.004	59(HW)	15 minute 30 year Summer Q+35%	107.500	106.076	-0.224	0.000			0.081	14.782		37.9	OK*
7.005	60(HW)	15 minute 30 year Winter Q+35%	105.500	104.220	-0.090	0.000			0.292	22.342		51.2	OK*
7.006	61	15 minute 30 year Winter Q+35%	105.500	104.103	-0.197	0.000			0.188	23.085		52.8	OK
8.000	65	240 minute 30 year Winter Q+35%	106.000	105.275	0.355	0.000			1.149	-0.788		0.0	SURCHARGED
8.001	62(HW)	2880 minute 30 year Summer Q+35%	106.000	104.910	0.000	0.000			0.370	0.003		0.1	SURCHARGED*
8.002	66(HW)	240 minute 30 year Winter Q+35%	106.000	105.275	0.435	0.000		0.000	2.082	4.838		0.8	SURCHARGED*
8.003	67	240 minute 30 year Winter Q+35%	106.000	105.275	0.455	0.000		0.000	1.538	11.531		1.9	SURCHARGED
8.004	68(HW)	2880 minute 30 year Summer Q+35%	106.000	104.800	0.000	0.000			0.737	25.399		0.4	SURCHARGED*
8.005	69(HW)	15 minute 30 year Summer Q+0%	105.590	104.390	0.000	0.000			2.363	0.236		1.2	SURCHARGED*
8.006	70	240 minute 30 year Winter Q+35%	105.580	105.275	0.895	0.000			2.173	6.224		1.5	SURCHARGED
8.007	71(HW)	240 minute 30 year Winter Q+35%	105.570	105.275	0.905	0.000		0.000	4.008	31.735	107	5.8	FLOOD RISK*
8.008	72(HW)	240 minute 30 year Winter Q+35%	105.500	105.274	0.974	0.000			14.388	25.312		1.4	FLOOD RISK*
8.009	73	240 minute 30 year Winter Q+35%	105.500	105.282	0.992	0.000			2.296	23.387		0.9	FLOOD RISK
8.010	74(HW)	15 minute 30 year Winter Q+35%	105.300	103.836	-0.264	0.000			0.041	5.742		7.7	OK*
8.011	75(HW)	30 minute 30 year Summer Q+35%	104.500	103.300	0.000	0.000			0.543	11.515		15.7	SURCHARGED*
7.007	62	15 minute 30 year Winter Q+35%	104.500	103.534	0.244	0.000			2.060	33.140		61.5	SURCHARGED
7.008	63	15 minute 30 year Winter Q+35%	103.800	103.363	0.863	0.000			4.201	95.569		177.1	SURCHARGED
6.003	46	15 minute 30 year Winter Q+35%	103.200	102.890	1.090	0.000			4.992	99.206		158.1	SURCHARGED
9.000	76	15 minute 30 year Summer Q+0%	105.600	103.800	-0.300	0.000	0.000		0.000	0.000		0.0	OK
9.001	77(HW)	15 minute 30 year Winter Q+35%	105.600	103.795	-0.295	0.000			0.000	0.000		0.0	OK*
9.002	78(HW)	15 minute 30 year Winter Q+35%	105.150	103.798	-0.152	0.000			0.527	6.212		14.2	OK*
9.003	79	15 minute 30 year Winter Q+35%	104.900	103.796	0.096	0.000			1.120	46.583		103.1	SURCHARGED
9.004	80(HW)	30 minute 30 year Winter Q+35%	104.300	103.100	0.000	0.000			1.404	70.532		87.0	SURCHARGED*
9.005	81(HW)	15 minute 30 year Winter Q+35%	103.900	103.284	0.584	0.000		0.000	4.096	67.330		136.1	SURCHARGED*
9.006	82	15 minute 30 year Winter Q+35%	103.200	102.969	1.169	0.000			3.297	67.330		130.3	FLOOD RISK
9.007	83	15 minute 30 year Summer Q+0%	103.200	101.790	0.000	0.000			0.912	43.532		104.7	SURCHARGED*
6.004	47(HW)	15 minute 30 year Summer Q+0%	103.200	101.770	0.000	0.000			1.214	109.532		226.2	SURCHARGED*
6.005	48(HW)	15 minute 30 year Winter Q+35%	102.350	102.296	0.616	0.000		0.000	27.046	166.496	6	249.9	FLOOD RISK*
6.006	49	15 minute 30 year Winter Q+35%	102.350	102.114	0.444	0.000			1.857	216.418		292.3	FLOOD RISK
6.007	50(HW)	15 minute 30 year Summer Q+0%	102.350	101.660	0.000	0.000			0.828	142.416		245.1	SURCHARGED*

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
6.008	51(HW)	15 minute 30 year Winter Q+35%	101.850	101.595	0.035	0.000		0.000	14.226	216.383	5	280.2	FLOOD RISK*
6.009	52	15 minute 30 year Winter Q+35%	101.850	101.339	-0.021	0.000			2.120	232.704		288.3	OK
6.010	53(J)	15 minute 30 year Summer Q+0%	101.400	100.875	0.000	0.000			1.332	153.159		251.5	SURCHARGED*
6.011	54J	60 minute 30 year Winter Q+35%	101.400	100.120	1.195	0.000		75.406	263.207	255.656	49	63.3	SURCHARGED*
5.009	39	15 minute 30 year Winter Q+35%	101.550	99.414	0.554	0.000			3.592	212.666		164.3	SURCHARGED
5.010	84	15 minute 30 year Winter Q+35%	99.650	99.204	0.754	0.000			5.022	211.813		165.4	SURCHARGED
5.011	40	15 minute 30 year Winter Q+35%	99.600	98.983	0.708	0.000			4.967	239.277		202.1	SURCHARGED
5.012	41	240 minute 30 year Winter Q+35%	98.800	98.390	0.505	0.000			7.270	753.979		107.2	SURCHARGED
5.013	42(HW)	15 minute 30 year Summer Q+0%	98.800	97.865	0.000	0.000			0.714	159.890		166.6	SURCHARGED*
2.021	22(HW)	360 minute 30 year Winter Q+35%	98.600	98.265	0.790	0.000			886.299	780.512		27.0	SURCHARGED*
2.022	23	360 minute 30 year Winter Q+35%	98.600	98.285	0.950	0.000			2.879	778.383		23.3	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

Simulation Criteria

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

Number of Input Hydrographs 0 | Number of Online Controls 5 | Number of Offline Controls 1 | Number of Storage Structures 16 | Number of Time/Area Diagrams 0 | Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH | Site Location GB 538700 152900 TQ 38700 52900 | Cv (Winter) 0.840
Return Period (years) 100 | Data Type Catchment
FEH Rainfall Version 2013 | Cv (Summer) 0.750

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

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880
Sensitivity flows(s) (%) 0, +45

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.000	1	30 minute 100 year Winter Q+45%	105.750	104.289	-0.261	0.000			0.060	2.581		2.3	OK
2.001	2(HW)	30 minute 100 year Winter Q+45%	105.750	104.257	-0.283	0.000			0.013	2.581		2.3	OK*
2.002	3(HW)	720 minute 100 year Winter Q+45%	105.150	103.804	-0.146	0.000			0.220	6.079		0.4	OK*
2.003	4	720 minute 100 year Winter Q+45%	105.150	103.804	-0.136	0.000			0.339	31.617		1.9	OK
2.004	5(HW)	2880 minute 100 year Summer Q+45%	104.450	103.550	0.000	0.000			1.196	134.889		3.0	SURCHARGED*
2.005	6(HW)	720 minute 100 year Winter Q+45%	103.800	103.803	1.053	0.000			93.362	48.759		1.3	FLOOD
2.006	7	720 minute 100 year Winter Q+45%	103.800	103.802	1.067	2.486			4.637	74.572		1.0	FLOOD
3.000	24	2880 minute 100 year Winter Q+45%	103.300	102.242	-0.058	0.000			0.418	23.215		0.3	OK
3.001	25(HW)	2880 minute 100 year Winter Q+45%	103.300	102.242	-0.048	0.000			0.285	22.987		0.3	OK*
3.002	26(HW)	2880 minute 100 year Winter Q+45%	103.180	102.200	0.000	0.000			2.132	20.967		0.3	SURCHARGED*
3.003	27	2880 minute 100 year Winter Q+45%	103.180	102.242	0.052	0.000			0.729	77.850		1.2	SURCHARGED
3.004	28(HW)	2880 minute 100 year Summer Q+45%	103.180	102.180	0.000	0.000			0.402	69.658		1.6	SURCHARGED*
2.007	8(J)	2880 minute 100 year Summer Q+45%	103.150	102.120	0.000	0.000			1.617	238.268		2.5	SURCHARGED*
2.008	9(HW)	2880 minute 100 year Summer Q+45%	103.250	102.050	0.000	0.000			1.795	236.548		2.4	SURCHARGED*
2.009	10	2880 minute 100 year Winter Q+45%	103.250	102.242	0.202	0.000			0.944	319.134		2.8	SURCHARGED
2.010	11(HW)	2880 minute 100 year Summer Q+45%	103.250	102.000	0.000	0.000			1.165	284.273		3.5	SURCHARGED*
2.011	12(HW)	2880 minute 100 year Winter Q+45%	102.850	102.242	0.292	0.000			263.118	97.761		2.1	SURCHARGED*
2.012	13	2880 minute 100 year Winter Q+45%	102.850	102.261	0.581	0.000			1.743	94.947		0.3	SURCHARGED
2.013	14(HW)	2880 minute 100 year Winter Q+45%	102.850	101.334	-0.296	0.000			0.000	94.941		0.3	OK*
2.014	15(HW)	15 minute 100 year Winter Q+45%	102.600	101.139	-0.171	0.000			0.249	0.687		1.2	OK*
2.015	16	15 minute 100 year Winter Q+45%	102.600	101.139	-0.161	0.000			0.252	29.866		66.5	OK
2.016	17	15 minute 100 year Winter Q+45%	100.750	100.108	0.108	0.000			1.553	40.517		90.3	SURCHARGED
2.017	18(HW)	15 minute 100 year Winter Q+45%	100.750	99.855	-0.135	0.000			0.183	40.514		89.5	OK*
2.018	19(HW)	60 minute 100 year Winter Q+45%	99.550	99.459	0.649	0.000			117.179	217.032		49.7	FLOOD RISK*
4.000	29	30 minute 100 year Winter Q+45%	99.900	99.079	0.309	0.000			1.067	94.012		83.6	SURCHARGED
2.019	20	30 minute 100 year Winter Q+45%	99.550	98.968	0.228	0.000			1.298	221.683		125.6	SURCHARGED

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
2.020	31(HW)	30 minute 100 year Winter Q+45%	99.550	98.642	-0.088	0.000			0.242	220.572		125.6	OK*
5.000	30	15 minute 100 year Summer Q+45%	104.700	103.931	0.196	0.000		0.000	0.868	36.813	13	56.8	SURCHARGED
5.001	31(J)	30 minute 100 year Winter Q+45%	104.700	103.725	0.000	0.000			0.365	53.514		56.2	SURCHARGED*
5.002	32(J)	120 minute 100 year Winter Q+45%	104.250	103.186	-0.529	0.000		51.980	54.186	0.000	122	0.0	OK*
5.003	33	15 minute 100 year Summer Q+0%	104.250	103.405	-0.300	0.000			0.000	0.000		0.0	OK
5.004	34	15 minute 100 year Summer Q+0%	104.100	102.900	-0.300	0.000			0.000	0.000		0.0	OK
5.005	35	15 minute 100 year Winter Q+45%	103.750	102.409	-0.216	0.000			0.196	13.654		31.3	OK
5.006	36	15 minute 100 year Winter Q+45%	102.900	102.294	0.594	0.000			3.170	16.328		44.4	SURCHARGED
5.007	37	15 minute 100 year Winter Q+45%	102.500	102.257	0.882	0.000			3.373	87.446		176.3	FLOOD RISK
5.008	38	15 minute 100 year Winter Q+45%	101.950	100.866	0.116	0.000		0.000	36.549	134.036	5	184.9	SURCHARGED
6.000	43	15 minute 100 year Winter Q+45%	103.250	103.217	1.167	0.000			2.583	5.052		12.5	FLOOD RISK
6.001	44(HW)	15 minute 100 year Summer Q+0%	103.250	102.040	0.000	0.000			1.045	3.109		10.1	SURCHARGED*
6.002	45(HW)	15 minute 100 year Summer Q+0%	103.050	101.850	0.000	0.000			4.776	3.109		20.0	SURCHARGED*
7.000	55	15 minute 100 year Summer Q+0%	109.500	108.000	-0.300	0.000			0.000	0.000		0.0	OK
7.001	56(HW)	15 minute 100 year Summer Q+0%	109.500	107.990	-0.300	0.000			0.000	0.000		0.0	OK*
7.002	57(HW)	15 minute 100 year Winter Q+45%	107.800	106.369	-0.231	0.000		0.000	0.078	5.195	5	11.9	OK*
7.003	58	15 minute 100 year Summer Q+45%	107.500	106.220	-0.230	0.000			0.125	4.640		11.9	OK
7.004	59(HW)	15 minute 100 year Summer Q+45%	107.500	106.091	-0.209	0.000			0.097	20.173		51.8	OK*
7.005	60(HW)	15 minute 100 year Winter Q+45%	105.500	104.310	0.000	0.000			0.658	30.488		70.4	SURCHARGED*
7.006	61	15 minute 100 year Winter Q+45%	105.500	104.234	-0.066	0.000			0.457	31.503		68.9	OK
8.000	65	360 minute 100 year Winter Q+45%	106.000	105.394	0.474	0.000			1.360	-1.014		0.0	SURCHARGED
8.001	62(HW)	15 minute 100 year Summer Q+0%	106.000	104.910	0.000	0.000			0.342	-0.619		0.2	SURCHARGED*
8.002	66(HW)	360 minute 100 year Winter Q+45%	106.000	105.395	0.555	0.000		0.000	2.201	8.181		1.1	SURCHARGED*
8.003	67	360 minute 100 year Winter Q+45%	106.000	105.395	0.575	0.000		0.000	1.748	18.419		2.3	SURCHARGED
8.004	68(HW)	15 minute 100 year Summer Q+0%	106.000	104.800	0.000	0.000			0.709	1.761		10.8	SURCHARGED*
8.005	69(HW)	15 minute 100 year Summer Q+0%	105.590	104.390	0.000	0.000			2.511	-0.661		1.5	SURCHARGED*
8.006	70	360 minute 100 year Winter Q+45%	105.580	105.394	1.014	0.000			2.383	12.640		2.0	FLOOD RISK
8.007	71(HW)	360 minute 100 year Winter Q+45%	105.570	105.394	1.024	0.000		0.000	10.650	50.254	206	5.8	FLOOD RISK*
8.008	72(HW)	360 minute 100 year Winter Q+45%	105.500	105.393	1.093	0.000			20.769	39.237		1.3	FLOOD RISK*
8.009	73	240 minute 100 year Winter Q+45%	105.500	105.400	1.110	0.000			2.505	24.829		1.0	FLOOD RISK
8.010	74(HW)	15 minute 100 year Summer Q+45%	105.300	104.100	0.000	0.000			0.761	6.520		10.6	SURCHARGED*
8.011	75(HW)	60 minute 100 year Summer Q+45%	104.500	103.300	0.000	0.000			1.413	21.918		16.1	SURCHARGED*
7.007	62	15 minute 100 year Winter Q+45%	104.500	104.109	0.819	0.000			4.380	44.433		87.1	SURCHARGED
7.008	63	15 minute 100 year Winter Q+45%	103.800	103.806	1.306	5.933			10.912	129.636		207.4	FLOOD
6.003	46	15 minute 100 year Winter Q+45%	103.200	103.204	1.404	3.889			9.595	134.617		184.1	FLOOD
9.000	76	15 minute 100 year Winter Q+45%	105.600	104.078	-0.022	0.000	5.019		0.482	-4.947		0.0	OK
9.001	77(HW)	15 minute 100 year Summer Q+45%	105.600	104.090	0.000	0.000			0.407	-3.585		0.3	SURCHARGED*
9.002	78(HW)	30 minute 100 year Summer Q+45%	105.150	103.950	0.000	0.000			2.182	7.546		17.0	SURCHARGED*
9.003	79	15 minute 100 year Winter Q+45%	104.900	104.293	0.593	0.000			2.075	58.629		114.9	SURCHARGED
9.004	80(HW)	15 minute 100 year Summer Q+0%	104.300	103.100	0.000	0.000			1.683	43.704		99.2	SURCHARGED*
9.005	81(HW)	15 minute 100 year Winter Q+45%	103.900	103.594	0.894	0.000		0.000	6.698	87.893	7	153.7	SURCHARGED*
9.006	82	15 minute 100 year Winter Q+45%	103.200	103.203	1.403	3.368			6.914	87.893		142.5	FLOOD
9.007	83	15 minute 100 year Summer Q+0%	103.200	101.790	0.000	0.000			1.182	55.986		122.0	SURCHARGED*
6.004	47(HW)	15 minute 100 year Summer Q+0%	103.200	101.770	0.000	0.000			1.401	139.401		268.5	SURCHARGED*
6.005	48(HW)	60 minute 100 year Summer Q+45%	102.350	102.350	0.670	0.000		0.000	35.926	364.439	7	248.1	FLOOD
6.006	49	30 minute 100 year Winter Q+45%	102.350	102.334	0.664	0.000			2.245	401.500		314.8	FLOOD RISK
6.007	50(HW)	15 minute 100 year Summer Q+0%	102.350	101.660	0.000	0.000			0.881	181.202		275.4	SURCHARGED*

Summary of Critical Results by Maximum Level (Rank 1) for Mainline 2

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Overflow Vol (m³)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Half Drain Time (mins)	Pipe Flow (l/s)	Status
6.008	51(HW)	30 minute 100 year Winter Q+45%	101.850	101.733	0.173	0.000		0.000	22.519	401.464	8	305.2	FLOOD RISK*
6.009	52	60 minute 100 year Winter Q+45%	101.850	101.593	0.233	0.586			3.022	568.979		302.6	FLOOD
6.010	53(J)	15 minute 100 year Summer Q+0%	101.400	100.875	0.000	0.000			1.436	194.850		271.9	SURCHARGED*
6.011	54J	60 minute 100 year Winter Q+45%	101.400	100.901	1.976	0.000		85.897	391.669	335.617	55	83.2	SURCHARGED*
5.009	39	60 minute 100 year Winter Q+45%	101.550	99.853	0.993	0.000			5.386	601.528		185.0	SURCHARGED
5.010	84	60 minute 100 year Winter Q+45%	99.650	99.532	1.082	0.000			5.602	596.875		185.1	FLOOD RISK
5.011	40	15 minute 100 year Winter Q+45%	99.600	99.319	1.044	0.000			5.560	311.054		222.3	FLOOD RISK
5.012	41	360 minute 100 year Winter Q+45%	98.800	98.694	0.809	0.000			7.808	1138.063		114.1	FLOOD RISK
5.013	42(HW)	15 minute 100 year Summer Q+0%	98.800	97.865	0.000	0.000			0.839	206.686		194.7	SURCHARGED*
2.021	22(HW)	360 minute 100 year Winter Q+45%	98.600	98.571	1.096	0.000			1244.690	938.962		32.2	FLOOD RISK*
2.022	23	360 minute 100 year Winter Q+45%	98.600	98.488	1.153	0.000			3.239	936.279		32.2	FLOOD RISK

Appendix D

Updated Drainage Management and Maintenance Plan

Stoneyfields, Oxted,
RH8 0NN

Drainage Management & Maintenance Plan

For

Croudace Homes Limited

motion

Document Control Sheet

Stoneyfields, Oxted,
RH8 0NN

Croudace Homes Limited

This document has been issued and amended as follows:

Date	Issue	Prepared by	Approved by
27/11/2024	Draft	Chris Gray	Neil Jaques
29/11/2024	Final	Chris Gray	Neil Jaques
19/12/2024	Final B	Chris Gray	Neil Jaques
17/07/2025	Final C	Chris Gray	Neil Jaques

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Contents

1.0 Introduction

1.1 This document sets out the principles for the long-term management and maintenance of the proposed surface water drainage system at the Land South of Barrow Green Road development.

1.2 The purpose of this document is to ensure that the site management company or their agents have a robust inspection and maintenance plan going forwards. This ensures the optimum operation of the surface water drainage system and that it will be continually maintained for the lifetime of the development. This will contribute to reducing the risk of surface water flooding both on- and off-site.

1.3 All those responsible for maintenance should follow relevant health and safety legislation for all activities listed within this report (including lone working, if relevant). Method statements and risk assessments should always be undertaken and made available, if requested.

1.4 This document has been produced by Motion on behalf of their client, Croudace Homes Limited. This document describes the typical management and maintenance tasks that are known at the outline design stage (maintenance frequencies and typical tasks, for example). These have been drawn from industry guidance such as CIRIA C753 - The SuDS Manual – and manufacturer's own guidance.

1.5 Maintenance is considered as a construction activity under the CDM Regulations 2015. Under the CDM Regulations, it is a requirement that a competent person be appointed to carry out a required role. CDM defines a competent person as an individual with sufficient knowledge of the specific tasks to be undertaken, as well as sufficient experience and ability to carry out their duties in relation to the task in a way that secures health and safety on site.

1.6 In recognition of the requirements of the CDM Regulations 2015, this surface water management and maintenance plan expects that the maintenance work will be carried out by a competent person who must have prior knowledge of the drainage components and SuDS systems on site.

1.7 There are limitations on what this document can prescribe at this time. At this stage this document cannot name the specific individuals who will carry out the maintenance and what equipment is to be used. Related to this, this document is unable to provide method statements for exactly how maintenance practices will be carried out. These can only be determined at the time of the maintenance being carried out and the exact maintenance need. Therefore, this is to be the responsibility of the site management company and/or the individuals carrying out the work. We urge those who are carrying out the maintenance to record this information and make it available to the Local Planning Authority (LPA), if required to do so. This drainage management and maintenance plan needs to be a living document that is owned and maintained by the adopting site management company. The intention of the report is to set out the principles for the long-term management and maintenance of the proposed surface water drainage system at the Land South of Barrow Green Road development.

2.0 Maintenance Categories

2.1 There are three categories of maintenance activities referred to in this report. These are:

Regular maintenance (including inspections and monitoring)

- Regular maintenance consists of basic tasks done on a frequent and predictable schedule, including inspections, vegetation management, and litter, silt and debris removal.

Occasional maintenance

- Occasional maintenance comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).

Remedial maintenance

- Remedial maintenance comprises of intermittent tasks that may be required to rectify faults associated with the system. The likelihood of faults can be minimised by correct installation, regular inspection and timely maintenance. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events and, as such, timings are difficult to predict.
- This document should be read in conjunction with the design drawings of the drainage system, so that the location and type of each feature can be recognised and understood.

3.0 The Surface Water Drainage System

3.1 The proposed surface water drainage system is made up of a number of components. These include:

- Permeable paving
- Geocellular attenuation storage/Soakaway
- Swale/Detention Basin
- Pond
- Catchpit manholes/Silt traps
- Hydrobrake/Flow Control
- Water Butts
- Manholes
- Pipes
- Receiving ordinary watercourse flowing through and adjacent to the application site.

3.2 All components should be installed in accordance with the manufacturer's instructions and to the levels/arrangement as defined on the designer's drawings. Not doing so will invalidate any warranty provided by the manufacturer.

3.3 All maintenance and cleaning must be carried out in accordance with manufacturer's recommendations and by competent and suitably qualified staff, as defined in the CDM regulations 2015.

4.0 General Maintenance Principles

4.1 All surface water drainage systems, whether piped gravity systems, Sustainable Drainage Systems (SuDS), or flow control devices and pumps, require regular maintenance to keep them working at optimum efficiency and capacity. The maintenance of the surface water drainage system on the development should be carried out alongside other regular maintenance tasks on site.

4.2 Timely and adequate maintenance will increase the lifespan of all the drainage components. Inadequate maintenance will do the reverse. Therefore, the projected lifespan and anticipated replacement date of each drainage component cannot be forecast at the time of this document being produced.

4.3 The site management company and/or their agents are responsible for the maintenance of the surface water drainage system.

4.4 Construction activities can create and discharge significant quantities of sediment that will quickly clog the surface water drainage system. Therefore, construction-stage sediment removal is required immediately post-construction. This may require several cleans of the system during the first year after installation. The construction site manager should assess this and carry out cleaning as necessary.

4.5 Catchpit manholes/silt traps will be specified upstream of the SuDS. They will remove gross solids and the majority of silts. It is important that any debris build-up in the catchpit manholes/silt traps is removed at regular intervals. This will reduce the risk of the permeable paving becoming silted up. It will maintain its design capacity and function.

4.6 Cleaning should also take place after large storms when there have been increased surface water flows and visible entrainment and deposition of debris.

4.7 An increased frequency of inspection and maintenance should be programmed into the autumn and winter months in acknowledgement that:

- Leaf fall from deciduous trees in autumn will result in an increased amount of leaf litter and an elevated blockage risk of drainage infrastructure.
- Increased rainfall during winter months will result in greater quantities of water moving through the drainage system and a greater input of silt and other debris.

4.8 Table 4.1, below, gives an overview of typical maintenance tasks and the frequency with which they need to be undertaken. Section 5 – Inspection and Maintenance Frequency of Components – will assign typical maintenance frequencies and tasks to the specific components used within the surface water drainage system used on the development.

Table 4.1: Typical maintenance tasks and frequencies

Activity	Indicative Frequency	Typical Tasks
Routine/regular maintenance	Monthly to annually	▸ Litter picking ▸ Silt removal ▸ Inspection of all inlets, outlets and control structures ▸ Weed removal and invasive plant control
Occasional maintenance	Annually up to 25 years	▸ Silt control around components ▸ Vegetation management around components ▸ Sweeping of pavement areas to remove surface silt ▸ Silt removal from catchpits, cellular storage structures
Remedial maintenance	As required	▸ Inlet/outlet repairs ▸ Erosion repairs ▸ Reinstatement of edgings ▸ Reinstatement following pollution ▸ Removal of silt build-up and leaf litter after storms ▸ Repair of vandalism ▸ Replacement of any blocked filter ▸ membranes/materials

5.0 Inspection and Maintenance Frequency of Components

5.1 Table 5.1 below lists each of the components used within the site's surface water drainage system. It suggests an indicative maintenance frequency for each component and ascribes typical maintenance tasks to them.

5.2 This list is not exhaustive, nor is it prescriptive. As mentioned in Section 3, additional, unscheduled maintenance may be required following adverse weather conditions or after autumn leaf falls. Additional maintenance tasks may be required to adequately clean and maintain individual components.

5.3 The list of components should be cross-referenced with the designer's drawings so that the location of each component can be identified.

5.4 It is the responsibility of the site management company and/or their agents to ensure that all necessary maintenance activities are carried out in a timely manner and that the design performance of each drainage component is preserved.

5.5 If there is any uncertainty regarding the correct and safe methods of cleaning, or what equipment should be used, the manufacturer should be consulted.

5.6 Upon completion of maintenance activities, a record should be kept of the work carried out. This should be retained and an annual maintenance report should be compiled, which should include the following:

- Observations resulting from inspections
- Maintenance and operation activities undertaken during the year
- Recommendations for inspections and maintenance programmes for the following year

5.7 On the last page is a table with suggested information should be recorded and included with the maintenance plan. As mentioned in the introduction to this document, this should be a living document and regularly updated, as required.

5.8 The Local Planning Authority Tandridge District Council (TDC) may request to check and sign off any maintenance activities. Therefore, it is recommended that the LPA is contacted prior to any scheduled routine maintenance. Also, with reference to Table 5.1, the annual maintenance report, including a completed version of the table on the last page, should be offered to the LPA for their records and approval.

Table 5.1: Maintenance Frequency and Task for Drainage Components

Activity	Indicative Frequency	Anticipated Tasks
Pipes	As required	▸ Identify any pipes that may not be operating properly and employ a competent, qualified contractor to inspect using CCTV. ▸ If the pipe is blocked with silt or debris, the pipe should be jetted clean from an upstream access point. All silt and debris should be captured and removed at a downstream access point. ▸ Inspect once clean. ▸ If any other defects are encountered (cracks, displaced joints, root ingress), appropriate solutions should be discussed with a competent and qualified contractor. These services are usually provided by the same

		companies that offer CCTV surveys and pipe jetting services.
Manholes	Annually	▸ Inspect/identify any damage or areas that are not operating correctly ▸ Remove silt, litter, leaves and other detritus. ▸ Inspect once clean.
Catchpit Manholes/Silt Traps	Twice a year, before and after autumn/winter	▸ Inspect/identify any damage or areas that are not operating correctly ▸ Remove silt, litter, leaves and other detritus. ▸ Inspect once clean.
Geocellular attenuation storage/Soakaway	Every three months for the first year, then annually thereafter	▸ Contact manufacturer for instruction on approved and safe inspection and maintenance practices ▸ Inspect/identify any areas that are not operating correctly ▸ Remove debris from catchment surface ▸ Remove sediment from pre-treatment structures ▸ Check for silt build-up and flush and remove as required (in accordance with manufacturer's instructions). ▸ Inspect once clean. ▸ See Table 21.3 of CIRIA C753 for more information. ▸ Most geocellular units have a 60 year creep limited life expectancy, so they should be planned for replacement by 2081 (approx.).
Swale/Detention Basin	Monthly in Summer, as required in Winter	▸ Responsibility should be with landscape contractors. ▸ Maintenance tasks are not that different from standard public open space. ▸ Adequate access needs to be provided to the area. ▸ Regular mowing should take place across maintenance access routes, amenity areas, across embankments and the main storage area. Remaining areas can remain as 'meadow'. Mowed grass lengths of 75 – 100mm are appropriate. ▸ Grass clippings should be disposed of off-site. ▸ Any dead growth should be cleared before the start of the growing season. ▸ Any permanently wet areas with emergent aquatic vegetation should be managed as ponds or wetlands. ▸ Remove any sediment build-up as required. ▸ Check any inlets and outlets for blockages and clear as required. ▸ Check any flow control devices, if present.
Pond	As required	▸ Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and or physical damage / monthly

		▸ Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays / Every 5 years, or as required ▸ Repair erosion or other damage, Replant, where necessary, Aerate pond when signs of eutrophication are detected, Realign rip-rap or repair other damage, Repair / rehabilitate inlets, outlets and overfows / as required
Hydrobrake chamber	Every three months for the first year, then annually thereafter	▸ Contact manufacturer for instruction on approved and safe inspection and maintenance practices. ▸ Inspect Hydrobrake and check functionality. Remove any detritus as required. ▸ Inspect once clean.
Water Butts	Annually in Autumn to Winter	▸ Remove falling leaves and seeds from guttering or those that have found their way into the water butt. ▸ Water may stagnate slightly. If so, use a water butt cleaning disc into the tank. ▸ In autumn and winter, drain water off every 10 days (or less) to make sure that water butts don't overflow and that water is kept moving. This will stop larvae and flies from using the water butt. ▸ Use safe products such as vinegar to clean the outside of the tank and the inside of the lid and be careful not to contaminate water with chemicals. ▸ At least once a year, completely empty the water butt and scrub it out with warm soapy water and then rinse thoroughly. This is best done at a time when the water butt is already nearly empty (end of summer) or when it can readily refill (winter).
Permeable paving	Once a year after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations.	▸ Agitate surface by means of mechanical sweeping or vacuuming to ensure no vegetation or moss is allowed to establish and grow in the joints. ▸ Mechanical sweeping of paviours and refilling of joints with the correct aggregate need only be carried out at intervals of 5 years or so ▸ Remove weeds from the surface through the application of glyphosate-based weed killers ▸ Stabilise and mow contributing and adjacent areas. ▸ Inspect once clean. ▸ See Table 20.15 of CIRIA C753 for more information. ▸ Permeable paving has a nominal 25 year lifespan, if correctly and regularly maintained.

		▸ When subjected to low level oil drips permeable paviours can continue to biodegrade hydrocarbons indefinitely. ▸ Major oil spills have the potential to contaminate the surface and the underlying crushed stone. In the event of a major oil spill, the area of block paviours and crushed stone that is affected should be removed, cleaned and reinstalled.
Receiving ordinary watercourse flowing through and adjacent to the application site	With reference to Surrey County Council Good Practice for Watercourse Maintenance A guide for landowners showing good practice for maintaining watercourses on or adjacent to your land (Revision 4)[1], please see below • Ensure that you undertake the majority of your clearance works after the vegetation has begun to die back in late September/October. At this time of year, there is also less likely to be wildlife nesting or breeding in or near ditches. • You should try and carry out the works when the water level is at its lowest i.e. following low tide in tide locked areas or when there has been little rainfall. • Plan your maintenance to ensure that stretches of habitat are left intact, for example by trimming alternate banks or lengths of ditch each year. This ensures that there is always a healthily vegetated area where wildlife disturbed by maintenance can move to without being forced to leave the ditches. • If protected species have been recorded in your ditches you must ensure their habitats are not adversely affected. • Trash / weed screens and grilles should regularly be checked all year round, but, especially at times of anticipated high flow. • Debris in ditches should be removed as soon as it starts to build up. • In culverted watercourses,	With reference to Surrey County Council Good Practice for Watercourse Maintenance A guide for landowners showing good practice for maintaining watercourses on or adjacent to your land (Revision 4)[2], please see below OPEN SECTIONS OF WATERCOURSE ▸ When trimming vegetation it is important to consider any impact on biodiversity. Mowing of banks around ditches should be minimised during the animal spawning season of March to mid-July. ▸ Some trees may have tree protection orders (TPOs) on them so if in doubt check with your local planning authority. ▸ It is recommended to cut only up to just above the water level on one side of the watercourse, leaving the fringe of the bank uncut, thereby maintaining some habitat as well as enabling a free flow of water in the ditch. ▸ Cuttings from any clearance work should be removed from the channel to avoid it causing blockages downstream. Putting removed material too close to the top of the bank can lead to it falling back in during times of flooding. ▸ Remove any physical obstructions such as large rocks, rubble, fallen trees and branches and other waste materials (litter, grass cuttings etc) so that water can flow freely. ▸ All non-organic waste should be completely removed off site and disposed of in an appropriate manner. ▸ Any green waste resulting from the maintenance of ditches can be left a safe distance from the bank for a few days to allow any organisms to move back into the watercourse, after which the green waste

[1] https://www.surreycc.gov.uk/__data/assets/pdf_file/0018/104184/Good-Practice-for-Watercourse-Maintenance-Rev-4.pdf
[2] https://www.surreycc.gov.uk/__data/assets/pdf_file/0018/104184/Good-Practice-for-Watercourse-Maintenance-Rev-4.pdf

	your program should inspect the culvert for blockages or signs of collapse. If such problems are identified before a total obstruction to the watercourse occurs, it reduces the likelihood of flooding incidents. Many drainage companies will undertake jet cleaning or camera surveys within culverts at a cost, or you can rod the culverts to check for blockages.	should be removed so it doesn't wash back into the watercourse. ▸ Ensure that any disturbed debris does not end up flowing downstream and causing problems for other landowners. ▸ Do not store anything alongside the watercourse which may interfere with maintenance, affect the stability of the bank or get washed into the channel. ▸ Silt should be removed along the length of the ditch to ensure it flows properly in the right direction. ▸ If there are any pipes into or out of the ditch you should remove silt to the same level or below the bottom of the pipe(s). ▸ Where possible, try to maintain the original slope and cross section of the ditch when de-silting. If the slope of the ditch is altered it can change the flow pattern, cause erosion or increase flood risk either upstream or downstream. ▸ As long as the silt is non–hazardous you can put it on the bank of the watercourse. Depositing silt on top of the banks of the watercourse allows for any organisms to move back into the ditch. However; o It is essential that this material does not then block any other ditches or nearby roads, or stop water draining into the ditch if it would normally do so (eg from higher ground into the ditch) o The silt must be deposited as close as possible to where it was dredged from either: on the bank of the waters from where it was taken or on land directly next to the watercourse. ▸ If you think that the material may be hazardous – for instance if it contains oils or other waste – please see guidance online for methods of disposal[3] or contact the Environment Agency for advice. PIPED/CULVERTED SECTIONS OF WATERCOURSE ▸ Blockages within the pipe or at the pipe entrance can cause flooding problems. These blockages can be reduced by regular inspection and the removal of debris. ▸ Either you or a qualified drainage company should carry out regular inspections and clear any blockages or silt build up as soon as they

[3] https://www.gov.uk/guidance/d1-waste-exemption-depositing-waste-from-dredging-inland-waters

		occur. There are many drainage companies that can inspect and clear culverts. ▸ Culvert entrances and exits often have protective grilles to prevent debris entering the pipe and causing blockages. These should be inspected and cleared regularly, especially during the winter or periods of heavy rainfall when debris can accumulate very quickly. ▸ The design of screens must be agreed with the Lead Local Flood Authority or the Environment Agency and permission given prior to installation, as poorly designed screens can cause an obstruction themselves. ▸ Health and Safety must be your top priority when carrying out culvert maintenance, and you should never enter any large culvert without seeking advice. STAYING SAFE Due to the range of risks posed by both open and culverted watercourses, landowners should assess this on a case-by-case basis. In particular you should consider the risks posed by working: ▸ in deep silt or mud. ▸ on slippery banks near water. ▸ in/near deep or fast flowing water. ▸ near roads. ▸ with plant or machinery. ▸ around culverts and enclosed spaces. ▸ cutting down or working near trees. You should always make sure you follow these rules to help protect your health: ▸ Wear protective footwear and clothing such as gloves. ▸ Cover any open wounds such as cuts and scratches with waterproof plasters. ▸ Carefully clean any cuts or scratches obtained during the work near water. ▸ Wash thoroughly and as soon as possible if you have entered the water. ▸ See a doctor if you start to feel unwell after working near water.

		LOOKING AFTER WILDLIFE ▸ Please see Pages 7-9 of Surrey County Council Good Practice for Watercourse Maintenance (Revision 4) for more information.

Date	Component requiring maintenance	Issues prompting maintenance	Scheduled maintenance (Y/N)	Maintenance carried out	Additional works required (Y/N). If yes, please detail	Next scheduled date of inspection and maintenance