LAND SOUTH OF CHISWELL, GREEN LANE, ST ALBANS (REF: 05/2022/0927)

Response to comments by RAB on behalf of St Albans District Council

1.0 Introduction

1.1 This note has been prepared by Glanville Consultants in response to comments made by RAB on behalf of St Albans District Council in respect of planning application ref. 05/2022/0927. The comments follow a review of the application by RAB from a flooding and drainage perspective.

1.2 A copy of RAB's response is provided at Appendix A. RAB's comments are replicated below in red and the response on behalf of the applicant is provided below each point.

2.0 Comments & Responses

Groundwater Protection

2.1 In line with the Environment Agency position statement G13 (The Environment Agency's approach to groundwater protection document published in 2018), a robust treatment train must be present prior to discharging surface water run-off (from roads, car parks, and public or amenity areas). The proposed design has utilised permeable pavement, but not for all road surfacing.

In addition, the FRA produced by Glanville and dated March 2022 states that: *Due to the surface water disposal from the infiltration basins via deep boreholes distributed at different locations of the base, it is concluded that pollutant mitigation measures from the infiltration basins could be comparable with those of 'detention' basins*.

Detention basins contain the water via detention whereas in this case the basins would infiltrate which poses a risk of pollutants migrating to the ground water. Given the extent of the development and the sensitivity (site within SPZ2) of the ground water table, the applicant should demonstrate a robust treatment train, which should consider the installation of proprietary treatment devices upstream of all inlets to the proposed basin(s) and for each drainage catchment. Such devices should offer a mitigation index higher than the site hazard index, in line with the 2015 CIRIA SuDS Manual.

The Environment Agency have stated:

In order to protect groundwater quality from further deterioration:

- *No infiltration based sustainable drainage systems should be constructed on land affected by contamination as contaminants can remobilise and cause groundwater pollution (e.g. soakaways act as preferential pathways for contaminants to migrate to groundwater and cause pollution).*
- *Piling or any other foundation designs using penetrative methods should not cause preferential pathways for contaminants to migrate to groundwater and cause pollution.*

2.2 It is accepted that a robust treatment train should be designed for this development in order to adequately protect groundwater.

2.3 As shown in the Flood Risk Assessment dated March 2022, at paragraphs 7.22 to 7.24 and Appendix J, the proposed shared surface streets and private drives will be constructed with permeable surfacing and a lined/tanked sub-base, whereby run-off will drain under the footprint into the porous sub-base before flowing towards the infiltration basins via perforated pipes. Run-off from the proposed major access roads (i.e. impermeable asphalt) will be drained towards kerb inlets established along the road edges and then discharged into tree pits and swales established alongside the roads, before discharging into the infiltration basins. These SuDS features will provide a first level of water quality treatment. Filter strips could also be accommodated alongside the access road to provide a further level of treatment, if required.

2.4 RAB also state that infiltration basins should not be compared with detention basins in terms of pollutant mitigation. However, infiltration basins could be designed and constructed to provide some degree of pollutant removal by adding a layer of dense vegetation underlain by a soil with good contaminant attenuation potential at least 300mm deep, as recommended by relevant design guidance in the SuDS Manual (Table 26.4). Such a layer could be located above the boreholes within the infiltration basins.

2.5 Therefore, a robust surface water drainage strategy has been designed for this scheme, in accordance with the SuDS Manual, by using different SuDS features established in 'cascade' (i.e. in-line) to provide a suitable SuDS management train, as well as ecological and biodiversity benefits to the proposed development. As such, there is no need for all road surfacing to be permeable to provide adequate groundwater protection.

Infiltration Testing

2.6 No results for deep infiltration (falling head tests but preferably a constant head test) testing at the proposed infiltration basin/deep bore soakaway locations have been provided in the FRA produced by Glanville (dated March 2022). A robust indication for the rate of infiltration at the proposed infiltration basin locations, or as close as reasonably possible, of the deep bore soakaways must be provided to demonstrate viability of the proposed method of discharge. The design has estimated a rate of infiltration that can be unreliable and may increase long-term flood risk at site level. Updated Microdrainage calculations are required using the revised deep infiltration rate at each relevant proposed infiltration basin location. This is in line with the Hertfordshire County Council LLFA Summary Guidance for Developers (updated August 2021).

2.7 Site investigation works carried out by BRD Environmental Ltd within the southern land parcel and provided in Appendix E of the Flood Risk Assessment dated March 2022, concluded that the disposal of collected surface water to infiltration devices into the clay-rich soils of the Kesgrave Catchment Subgroup will be marginally feasible and therefore recommended discharging into the underlying chalk bedrock using deep boreholes. A good infiltration rate in the order of 10^{-4}m/s (i.e. 0.1m/h) was recorded by BRD in the chalk bedrock through a BRE Digest 365 test, which is a falling head test – a higher discharge rate would be established by a constant head test. All infiltration basins are located within the southern land parcel where infiltration testing has been carried out, and the underlying geology is consistent, so the test result obtained is considered applicable to the drainage scheme for the entire development.

2.8 A conservative discharge rate of 1.0l/s has been assumed for each borehole soakaway within the infiltration basins proposed. Assuming an infiltration rate of 10^{-4}m/s, as established in the chalk bedrock by a BRE Digest 365 test, a 300mm diameter borehole taken 10m down into the chalk would be required to achieve a discharge rate of 1.0l/s

2.9 Falling head, or constant head tests will be undertaken within boreholes drilled into the underlying chalk bedrock at an appropriate time in the design and planning process to provide infiltration rates for detailed design purposes. A requirement for such testing could form part of an appropriately worded planning condition requiring approval of a detailed surface water drainage scheme prior to commencement of development.

2.10 In the unlikely event that these tests reveal discharge rates in boreholes are lower than anticipated, additional boreholes could be drilled so there are more outfalls per basin, the boreholes could be drilled deeper, or the diameter of the boreholes could be increased to ensure the discharge rate from each infiltration basin remains as required to ensure the storage volume provided is adequate.

Pipeline S10 to S13

2.11 The pipeline between proposed chambers S10 – S13 is shown outside the red line boundary. This would need to be located within the red line boundary extents or the applicant should provide evidence that this pipeline can be located outside of the red line boundary on third party land.

2.12 The pipeline between chambers S10 – S13 has been relocated further north to avoid any drainage feature being located outside the red line boundary.

MicroDrainage Calculations

2.13 Microdrainage calculations include overflow (offline) controls but it is unclear how this would work based on the drainage drawing included in the FRA submitted as part of this application. Pipe numbers 1.009 & 1.010 loop to pipe number 1.017 at a control rate of 6 l/s and 7 l/s, respectively. However, there is no pipe number 1.017 on the drawing; presumably this dummy pipe represents the losses to infiltration but applicant should confirm such an assumption. There are also pipe numbers with flow controls in the Microdrainage calculations (pipe number 20.007 & pipe number 23.003), but these are not shown on the drawing provided in the FRA produced by Glanville and dated March 2022. The applicant should provide further details of these pipes on the drawing and more clarity regarding the hydraulic model as a result of these comments.

2.14 MicroDrainage calculations have been modified as shown in Appendices B and C. Outflow controls have been established within the northern catchment, as follows:

- A 'Weir' unit has been established within chamber S42, located at the immediate downstream side of Infiltration Basin 1. The invert level of the weir unit is located 1.35m above the invert level of the chamber. Once the water level within Infiltration Basin 1 exceeds 1.35m deep, water will overflow into Infiltration Basin 2, located downstream, via this weir unit.

- A 'Hydro-Brake Optimum' unit has been established within chamber S53, located at the immediate downstream side of Attenuation Basin 1. Surface water run-off from the north-western side of the site will be attenuated at a maximum restricted outflow rate of 3.0l/s and then discharged into Infiltration Basin 2 located downstream, via this control unit.

- A second 'Weir' unit has been established within chamber S54, immediately downstream of Infiltration Basin 2. The invert level of the weir unit is located 1.2m above the invert level of the chamber. This control unit follows the same procedure as the weir unit in chamber S42. Once the water level within Infiltration Basin 2 exceeds 1.2m deep, water will overflow into the following 'Attenuation Basin (2)', located at the downstream side, via this weir unit.

- A second 'Hydro-Brake Optimum' unit has been established within chamber S55, immediately downstream of Infiltration Basin 2. Exceedance flows from the northern catchment will be attenuated at a maximum restricted outflow rate of 7.4l/s and then discharged into the downstream drainage system allocated within the southern catchment, via this control unit.

2.15 Infiltration losses via the borehole soakaways established within the proposed infiltration basins have been replicated in the MicroDrainage model by using "Depth/Flow Relationship" units. These units will extract a constant flow rate based on the number of borehole soakaways within each infiltration basin and remove these from the system via 'dummy' pipes. A total number of five 'Depth/Flow Relationship' units (i.e. 5 No. infiltration basins) have been used in the model as shown as follows:

- Depth/Flow Relationship unit in chamber S42 – a total of six borehole soakaway units have been established within Infiltration Basin 1. Pipe number 1.012, located at the downstream side of chamber S42, loop to pipe number 1.020, associated with a 'dummy' pipe located at the downstream side of Infiltration Basin 3, located to the south-east corner of the site, where a constant flow rate of 6.0l/s has been removed from the system.

- Depth/Flow Relationship unit in chamber S54 – a total of seven borehole soakaway units have been established within Infiltration Basin 2. Pipe number 1.013, located at the downstream side of chamber S54, also loop to pipe number 1.020, associated with a 'dummy' pipe located at the downstream side of Infiltration Basin 3, where a constant flow rate of 7.0l/s has been removed from the system.

- Depth/Flow Relationship unit in chamber S74 – a total of seven borehole soakaway units have been established within Infiltration Basin 3. A constant flow rate of 7.0l/s has been removed from the system via the 'dummy' pipe number 1.019, which also connects to the immediate downstream 'dummy' pipe number 1.020.

- Depth/Flow Relationship unit in chamber S86 – a total of five borehole soakaway units have been established within Infiltration Basin 4. A constant flow rate of 5.0l/s has been removed from the system via the 'dummy' pipe number 19.007.

- Depth/Flow Relationship unit in chamber S90 – a total of two borehole soakaway units have been established within Infiltration Basin 5. A constant flow rate of 2.0l/s has been removed from the system via the 'dummy' pipe number 22.003.

2.16 The calculations shown in Appendix B demonstrate that the development of the site will not increase flow rates off-site, and therefore the risk of flooding from surface water will not increase due to the development.

2.17 Updated surface water drainage strategy drawings are presented in Appendix D.

Exceedance Flows

2.18 The drainage drawing does not identify exceedance flows and how exceedance will be managed at site level. The applicant should map exceedance routes on the drawing, identify and mitigate associated risk of flooding from exceedance events. This is in line with the Hertfordshire County Council LLFA Summary Guidance for Developers (Updated August 2021).

2.19 In the event of an exceedance storm greater than the design storm, eventually the drainage network will be overwhelmed, and aboveground flooding could occur at the infiltration basin locations.

2.20 In this scenario, overland flows from the infiltration basins to the south – i.e. Infiltration Basins 4 and 5 – would follow the natural contours of the ground to the south and into the open fields beyond the site.

2.21 While overland flows from the infiltration basins to the north – i.e. Infiltration Basins 1 and 2 – will be conveyed through the roads towards the Infiltration Basin 3, following the contours of the ground and then into the open fields. Raised kerbs will contain run-off within the roads and convey this to the south without increasing flood risk elsewhere.

2.22 Exceedance flows from isolated Infiltration Basin 3 to the south-east would follow the natural contours of the ground to the south-east and would be intercepted by the existing highway drainage in Forge End.

2.23 The anticipated exceedance flow routes are shown in the updated surface water drainage strategy drawings provided in Appendix D.

Appendix A

Local Planning Authority Response

SITE:	Land South Of Chiswell, Green Lane, St Albans, Hertfordshire
DESCRIPTION:	Outline application (access sought) - Demolition of existing structures and construction of up to 391 dwellings (Use Class C3), provision of land for a new 2FE primary school, open space provision and associated landscaping. Internal roads, parking, footpaths
APPLICATION NO:	05/2022/0927
GRID REFERENCE:	513089 204282
APPLICANT:	Alban Developments Ltd and Alban Peter Pearson, CALA Homes Ltd and Redington Capital Ltd
AGENT:	CARTER JONAS LLP
DATE OF THIS RESPONSE:	04/08/2022
RESPONSE BY:	RAB

Planning Authority Comments

This technical review has been carried out by RAB on behalf of St Albans District Council.

The application documents as submitted are insufficient for the Local Planning Authority to provide a detailed response at this stage. In order to provide a detailed response, the following information is required:

- In line with the Environment Agency position statement G13 (The Environment Agency's approach to groundwater protection document published in 2018), a robust treatment train must be present prior to discharging surface water runoff (from roads, car parks, and public or amenity areas). The proposed design has utilised permeable pavement, but not for all road surfacing. In addition, the FRA produced by Glanville and dated March 2022 states that *Due to the surface water disposal from the infiltration basins via deep boreholes distributed at different locations of the base, it is concluded that pollutant mitigation measures from the infiltration basins could be comparable with those of 'detention' basins*. Detention basins contain the water via detention whereas in this case the basins would infiltrate which poses a risk of pollutants migrating to the ground water. Given the extent of the development and the sensitivity (site within SPZ2) of the ground water

table, the applicant should demonstrate a robust treatment train, which should consider the installation of proprietary treatment devices upstream of all inlets to the proposed basin(s) and for each drainage catchment. Such devices should offer a mitigation index higher than the site hazard index, in line with the 2015 CIRIA SuDS Manual. The Environment Agency have stated: *In order to protect groundwater quality from further deterioration:*
    - *No infiltration based sustainable drainage systems should be constructed on land affected by contamination as contaminants can remobilise and cause groundwater pollution (e.g., soakaways act as preferential pathways for contaminants to migrate to groundwater and cause pollution).*
    - *Piling or any other foundation designs using penetrative methods should not cause preferential pathways for contaminants to migrate to groundwater and cause pollution.*
- No results for deep infiltration (falling head tests but preferably a constant head test) testing at the proposed infiltration basin/deep bore soakaway locations have been provided in the FRA produced by Glanville (dated March 2022). A robust indication for the rate of infiltration at the proposed infiltration basin locations, or as close as reasonably possible, of the deep bore soakaways must be provided to demonstrate viability of the proposed method of discharge. The design has estimated a rate of infiltration that can be unreliable and may increase long-term flood risk at site level. Updated Microdrainage calculations are required using the revised deep infiltration rate at each relevant proposed infiltration basin location. This is in line with the Hertfordshire County Council *LLFA Summary Guidance for developers* (Updated August 2021).
- The pipeline between proposed chambers S10 – S13 is shown outside the red line boundary. This would need to be located within the red line boundary extents or the applicant should provide evidence that this pipeline can be located outside of the red line boundary on third party land.
- Microdrainage calculations include overflow (offline) controls but it is unclear how this would work based on the drainage drawing included in the FRA submitted as part of this application. Pipe numbers 1.009 & 1.010 loop to pipe number 1.017 at a control rate of 6 l/s and 7 l/s, respectively, However, there is no pipe number 1.017 on the drawing; presumably this dummy pipe represents the losses to infiltration but applicant should confirm such an assumption. There are also pipe numbers with flow controls in the Microdrainage calculations (pipe number 20.007 & pipe number 23.003), but these are not shown on the drawing provided in the FRA produced by Glanville and dated March 2022. The applicant should provide further details of these pipes on the drawing and more clarity regarding the hydraulic model as a result of these comments.

- The drainage drawing does not identify exceedance flows and how exceedance will be managed at site level. The applicant should map exceedance routes on the drawing, identify and mitigate associated risk of flooding from exceedance events. This is in line with the Hertfordshire County Council *LLFA Summary Guidance for developers* (Updated August 2021).

Consequently, we advise that there is insufficient information for the Local Planning Authority to provide a detailed assessment of the proposals at this time. In order to satisfy the requirements of Local Planning Authority, the applicant should ensure that the details (as discussed in detail above) are submitted.

Appendix B

MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	5	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.418	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Time Area Diagram for Storm at outfall S (pipe S1.020)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	1.229	4-8	3.386	8-12	0.404

Total Area Contributing (ha) = 5.018

Total Pipe Volume (m³) = 275.013

Time Area Diagram at outfall S (pipe S19.007)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.542	4-8	0.498

Total Area Contributing (ha) = 1.040

Total Pipe Volume (m³) = 53.367

Time Area Diagram at outfall S (pipe S22.003)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.283	4-8	0.054

Total Area Contributing (ha) = 0.337

Total Pipe Volume (m³) = 7.474

Network Design Table for Storm

« - Indicates pipe capacity < flow

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	12.232	0.207	59.1	0.039	4.00	0.0	0.600	o	225	Pipe/Conduit	
S2.000	35.412	0.598	59.2	0.045	4.00	0.0	0.600	o	150	Pipe/Conduit	
S1.001	42.324	1.578	26.8	0.117	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.002	61.925	2.957	20.9	0.236	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.003	58.495	2.467	23.7	0.170	0.00	0.0	0.600	o	375	Pipe/Conduit	
S3.000	28.388	0.284	100.0	0.042	4.00	0.0	0.600	o	225	Pipe/Conduit	
S1.004	75.751	0.505	150.0	0.090	0.00	0.0	0.600	oo	375	Double Pipe	
S1.005	21.275	0.142	150.0	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S4.000	58.069	1.161	50.0	0.164	4.00	0.0	0.600	o	225	Pipe/Conduit	
S4.001	37.184	0.744	50.0	0.133	0.00	0.0	0.600	o	300	Pipe/Conduit	
S1.006	32.009	0.213	150.0	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S1.007	11.952	0.080	150.0	0.033	0.00	0.0	0.600	oo	375	Double Pipe	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	4.12	98.575	0.039	0.0	0.0	0.0	1.70	67.8	5.3
S2.000	50.00	4.45	99.058	0.045	0.0	0.0	0.0	1.31	23.1	6.1
S1.001	50.00	4.68	98.293	0.201	0.0	0.0	0.0	3.05	215.4	27.2
S1.002	50.00	4.98	96.715	0.437	0.0	0.0	0.0	3.45	243.9	59.2
S1.003	50.00	5.24	93.683	0.607	0.0	0.0	0.0	3.73	412.5	82.2
S3.000	50.00	4.36	92.237	0.042	0.0	0.0	0.0	1.31	52.0	5.7
S1.004	50.00	6.10	91.216	0.739	0.0	0.0	0.0	1.48	326.3	100.1
S1.005	50.00	6.34	90.711	0.739	0.0	0.0	0.0	1.48	326.3	100.1
S4.000	50.00	4.52	94.044	0.164	0.0	0.0	0.0	1.85	73.7	22.2
S4.001	50.00	4.80	92.808	0.297	0.0	0.0	0.0	2.23	157.5	40.2
S1.006	50.00	6.70	90.569	1.036	0.0	0.0	0.0	1.48	326.3	140.3
S1.007	50.00	6.83	90.356	1.069	0.0	0.0	0.0	1.48	326.3	144.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.008	10.763	0.072	150.0	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S1.009	42.190	0.281	150.0	0.091	0.00	0.0	0.600	oo	375	Double Pipe	
S1.010	46.852	0.982	47.7	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S1.011	43.024	0.846	50.9	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S5.000	55.103	0.930	59.3	0.097	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.001	50.776	0.537	94.6	0.154	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.002	15.335	0.629	24.4	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
S6.000	67.297	1.346	50.0	0.173	4.00	0.0	0.600	o	300	Pipe/Conduit	
S5.003	9.955	0.041	242.8	0.096	0.00	0.0	0.600	o	300	Pipe/Conduit	
S5.004	29.633	1.198	24.7	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.005	14.609	0.455	32.1	0.021	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.006	23.342	0.829	28.2	0.032	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.007	23.317	0.728	32.0	0.034	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.008	23.661	0.074	319.7	0.045	0.00	0.0	0.600	o	375	Pipe/Conduit	
S5.009	22.644	0.056	404.4	0.075	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.010	69.815	2.146	32.5	0.222	0.00	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)
S1.008	50.00	6.95	90.276	1.069	0.0	0.0	0.0	1.48	326.3	144.8
S1.009	50.00	7.43	90.204	1.160	0.0	0.0	0.0	1.48	326.3	157.1
S1.010	50.00	7.73	89.923	1.160	0.0	0.0	0.0	2.63	580.7	157.1
S1.011	50.00	8.01	88.941	1.160	0.0	0.0	0.0	2.55	562.4	157.1
S5.000	50.00	4.54	99.064	0.097	0.0	0.0	0.0	1.70	67.7	13.1
S5.001	50.00	5.06	98.059	0.251	0.0	0.0	0.0	1.62	114.3	34.0
S5.002	50.00	5.14	97.522	0.277	0.0	0.0	0.0	3.20	226.0	37.5
S6.000	50.00	4.50	96.926	0.173	0.0	0.0	0.0	2.23	157.5	23.4
S5.003	50.00	5.31	95.580	0.546	0.0	0.0	0.0	1.00	71.0«	73.9
S5.004	50.00	5.44	95.464	0.546	0.0	0.0	0.0	3.66	403.8	73.9
S5.005	50.00	5.52	94.266	0.567	0.0	0.0	0.0	3.21	354.3	76.8
S5.006	50.00	5.63	93.811	0.599	0.0	0.0	0.0	3.43	378.4	81.1
S5.007	50.00	5.75	92.982	0.633	0.0	0.0	0.0	3.21	354.7	85.7
S5.008	50.00	6.14	92.254	0.678	0.0	0.0	0.0	1.01	111.3	91.8
S5.009	50.00	6.52	92.105	0.753	0.0	0.0	0.0	1.00	159.8	102.0
S5.010	50.00	6.85	92.049	0.975	0.0	0.0	0.0	3.57	568.5	132.0

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S7.000	34.547	0.535	64.6	0.084	4.00	0.0	0.600	o	225	Pipe/Conduit	
S5.011	26.924	0.220	122.4	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S5.012	28.644	0.946	30.3	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S8.000	48.609	0.324	150.0	0.168	4.00	0.0	0.600	o	300	Pipe/Conduit	
S9.000	20.716	0.350	59.2	0.055	4.00	0.0	0.600	o	150	Pipe/Conduit	
S9.001	23.981	0.413	58.1	0.064	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.001	28.936	0.207	139.8	0.071	0.00	0.0	0.600	o	300	Pipe/Conduit	
S10.000	32.444	0.649	50.0	0.078	4.00	0.0	0.600	o	300	Pipe/Conduit	
S8.002	29.280	0.610	48.0	0.092	0.00	0.0	0.600	o	375	Pipe/Conduit	
S8.003	30.112	1.247	24.1	0.096	0.00	0.0	0.600	o	375	Pipe/Conduit	
S11.000	35.855	0.600	59.8	0.140	4.00	0.0	0.600	o	225	Pipe/Conduit	
S8.004	32.447	1.392	23.3	0.017	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S7.000	50.00	4.35	89.796	0.084	0.0	0.0	0.0	1.63	64.8	11.4
S5.011	50.00	7.09	89.261	1.059	0.0	0.0	0.0	1.84	292.1	143.4
S5.012	50.00	7.22	89.041	1.059	0.0	0.0	0.0	3.71	589.3	143.4
S8.000	50.00	4.63	93.677	0.168	0.0	0.0	0.0	1.28	90.6	22.7
S9.000	50.00	4.26	95.384	0.055	0.0	0.0	0.0	1.31	23.1	7.4
S9.001	50.00	4.50	94.959	0.119	0.0	0.0	0.0	1.72	68.4	16.1
S8.001	50.00	5.00	93.353	0.358	0.0	0.0	0.0	1.33	93.9	48.5
S10.000	50.00	4.24	92.798	0.078	0.0	0.0	0.0	2.23	157.6	10.6
S8.002	50.00	5.18	92.074	0.528	0.0	0.0	0.0	2.62	289.5	71.5
S8.003	50.00	5.32	91.464	0.624	0.0	0.0	0.0	3.70	408.7	84.5
S11.000	50.00	4.35	90.883	0.140	0.0	0.0	0.0	1.70	67.4	19.0
S8.004	50.00	5.46	90.217	0.781	0.0	0.0	0.0	3.77	416.0	105.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S8.005	28.311	0.730	38.8	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.012	37.376	0.870	43.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S12.000	13.285	0.651	20.4	0.055	4.00	0.0	0.600	o	150	Pipe/Conduit	
S12.001	12.144	0.539	22.5	0.026	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.002	39.704	1.539	25.8	0.125	0.00	0.0	0.600	o	225	Pipe/Conduit	
S12.003	37.532	1.746	21.5	0.114	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.004	11.617	0.193	60.2	0.017	0.00	0.0	0.600	o	300	Pipe/Conduit	
S12.005	22.865	0.815	28.1	0.080	0.00	0.0	0.600	o	375	Pipe/Conduit	
S12.006	39.584	0.815	48.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S13.000	16.251	0.179	90.8	0.077	4.00	0.0	0.600	o	225	Pipe/Conduit	
S12.007	31.278	0.711	44.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S12.008	77.920	1.771	44.0	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S12.009	6.217	0.336	18.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.013	3.108	0.100	31.1	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
S1.014	36.811	0.490	75.1	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)
S8.005	50.00	5.62	88.825	0.781	0.0	0.0	0.0	2.92	322.2	105.8
S1.012	50.00	8.21	88.095	3.000	0.0	0.0	0.0	3.11	494.4	406.2
S12.000	50.00	4.10	96.528	0.055	0.0	0.0	0.0	2.24	39.6	7.4
S12.001	50.00	4.17	95.802	0.081	0.0	0.0	0.0	2.77	110.1	11.0
S12.002	50.00	4.43	95.263	0.206	0.0	0.0	0.0	2.59	102.8	27.9
S12.003	50.00	4.61	93.649	0.320	0.0	0.0	0.0	3.41	240.8	43.3
S12.004	50.00	4.71	91.903	0.337	0.0	0.0	0.0	2.03	143.5	45.6
S12.005	50.00	4.82	91.710	0.417	0.0	0.0	0.0	3.43	379.1	56.5
S12.006	50.00	5.07	90.895	0.417	0.0	0.0	0.0	2.61	287.8	56.5
S13.000	50.00	4.20	90.113	0.077	0.0	0.0	0.0	1.37	54.6	10.4
S12.007	50.00	5.26	89.925	0.494	0.0	0.0	0.0	2.74	302.4	66.9
S12.008	50.00	5.74	89.214	0.494	0.0	0.0	0.0	2.74	302.4	66.9
S12.009	50.00	5.76	87.442	0.494	0.0	0.0	0.0	4.23	467.1	66.9
S1.013	50.00	8.22	87.000	3.494	0.0	0.0	0.0	3.66	581.6	473.1
S1.014	50.00	8.56	86.000	3.494	0.0	0.0	0.0	1.82	128.4«	473.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S14.000	22.196	0.675	32.9	0.092	4.00	0.0	0.600	o	225	Pipe/Conduit	
S14.001	22.694	0.656	34.6	0.048	0.00	0.0	0.600	o	225	Pipe/Conduit	
S14.002	37.592	1.364	27.6	0.116	0.00	0.0	0.600	o	300	Pipe/Conduit	
S14.003	42.486	0.637	66.7	0.143	0.00	0.0	0.600	oo	375	Double Pipe	
S14.004	30.273	0.454	66.7	0.070	0.00	0.0	0.600	oo	375	Double Pipe	
S1.015	47.754	0.716	66.7	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S15.000	28.750	1.095	26.3	0.151	4.00	0.0	0.600	o	225	Pipe/Conduit	
S15.001	29.148	0.733	39.8	0.111	0.00	0.0	0.600	o	300	Pipe/Conduit	
S15.002	32.163	0.904	35.6	0.138	0.00	0.0	0.600	o	375	Pipe/Conduit	
S15.003	33.346	0.865	38.6	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.016	52.669	0.411	128.0	0.115	0.00	0.0	0.600	oo	375	Double Pipe	
S16.000	36.773	0.368	99.9	0.058	4.00	0.0	0.600	o	300	Pipe/Conduit	
S17.000	43.870	0.731	60.0	0.045	4.00	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)
S14.000	50.00	4.16	89.003	0.092	0.0	0.0	0.0	2.29	91.0	12.5
S14.001	50.00	4.33	88.328	0.140	0.0	0.0	0.0	2.23	88.7	19.0
S14.002	50.00	4.54	87.597	0.256	0.0	0.0	0.0	3.01	212.5	34.7
S14.003	50.00	4.86	86.233	0.399	0.0	0.0	0.0	2.22	490.7	54.0
S14.004	50.00	5.09	85.596	0.469	0.0	0.0	0.0	2.22	490.8	63.5
S1.015	50.00	8.92	85.142	3.963	0.0	0.0	0.0	2.22	490.7«	536.6
S15.000	50.00	4.19	88.180	0.151	0.0	0.0	0.0	2.56	101.9	20.4
S15.001	50.00	4.38	87.010	0.262	0.0	0.0	0.0	2.50	176.8	35.5
S15.002	50.00	4.56	86.202	0.400	0.0	0.0	0.0	3.05	336.5	54.2
S15.003	50.00	4.75	85.298	0.400	0.0	0.0	0.0	2.93	323.2	54.2
S1.016	50.00	9.47	84.426	4.478	0.0	0.0	0.0	1.60	353.4«	606.4
S16.000	50.00	4.39	87.178	0.058	0.0	0.0	0.0	1.57	111.2	7.9
S17.000	50.00	4.43	88.441	0.045	0.0	0.0	0.0	1.69	67.3	6.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S16.001	67.681	1.281	52.8	0.253	0.00	0.0	0.600	o	300	Pipe/Conduit	
S18.000	23.333	0.393	59.4	0.049	4.00	0.0	0.600	o	225	Pipe/Conduit	
S16.002	45.805	0.958	47.8	0.078	0.00	0.0	0.600	o	375	Pipe/Conduit	
S1.017	23.952	0.187	127.8	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S1.018	28.886	0.226	127.8	0.057	0.00	0.0	0.600	oo	375	Double Pipe	
S1.019	6.369	0.026	245.0	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S1.020	5.424	0.030	180.8	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S19.000	43.255	0.290	149.2	0.107	4.00	0.0	0.600	o	300	Pipe/Conduit	
S19.001	51.400	0.309	166.3	0.184	0.00	0.0	0.600	oo	375	Double Pipe	
S19.002	22.716	0.095	240.0	0.063	0.00	0.0	0.600	oo	375	Double Pipe	
S20.000	11.241	0.201	55.9	0.068	4.00	0.0	0.600	o	225	Pipe/Conduit	
S20.001	64.310	1.548	41.5	0.243	0.00	0.0	0.600	o	300	Pipe/Conduit	
S19.003	68.081	0.302	225.4	0.181	0.00	0.0	0.600	oo	375	Double Pipe	

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)
S16.001	50.00	4.95	86.810	0.356	0.0	0.0	0.0	2.17	153.2	48.2
S18.000	50.00	4.23	85.885	0.049	0.0	0.0	0.0	1.70	67.6	6.6
S16.002	50.00	5.24	85.454	0.483	0.0	0.0	0.0	2.63	290.0	65.4
S1.017	50.00	9.72	84.015	4.961	0.0	0.0	0.0	1.60	353.7«	671.8
S1.018	50.00	10.02	83.828	5.018	0.0	0.0	0.0	1.60	353.7«	679.5
S1.019	50.00	10.11	83.500	5.018	0.0	0.0	0.0	1.15	254.7«	679.5
S1.020	50.00	10.18	83.099	5.018	0.0	0.0	0.0	1.34	296.9«	679.5
S19.000	50.00	4.56	85.008	0.107	0.0	0.0	0.0	1.29	90.8	14.5
S19.001	50.00	5.17	84.643	0.291	0.0	0.0	0.0	1.40	309.7	39.4
S19.002	50.00	5.50	84.334	0.354	0.0	0.0	0.0	1.17	257.4	47.9
S20.000	50.00	4.11	86.100	0.068	0.0	0.0	0.0	1.75	69.7	9.2
S20.001	50.00	4.55	85.824	0.311	0.0	0.0	0.0	2.45	172.9	42.1
S19.003	50.00	6.44	84.126	0.846	0.0	0.0	0.0	1.20	265.6	114.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S21.000	48.821	1.000	48.8	0.139	4.00	0.0	0.600	o	225	Pipe/Conduit	
S19.004	18.189	0.124	146.7	0.019	0.00	0.0	0.600	oo	375	Double Pipe	
S19.005	18.354	0.125	146.8	0.036	0.00	0.0	0.600	oo	375	Double Pipe	
S19.006	10.568	0.148	71.4	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S19.007	7.057	0.018	392.1	0.000	0.00	0.0	0.600	oo	375	Double Pipe	
S22.000	54.827	1.746	31.4	0.242	4.00	0.0	0.600	o	300	Pipe/Conduit	
S22.001	30.903	0.996	31.0	0.095	0.00	0.0	0.600	o	300	Pipe/Conduit	
S22.002	13.160	0.219	60.1	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
S22.003	6.849	0.028	244.6	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)
S21.000	50.00	4.43	84.974	0.139	0.0	0.0	0.0	1.88	74.6	18.8
S19.004	50.00	6.64	83.824	1.004	0.0	0.0	0.0	1.49	330.0	136.0
S19.005	50.00	6.85	83.700	1.040	0.0	0.0	0.0	1.49	329.8	140.8
S19.006	50.00	6.93	83.575	1.040	0.0	0.0	0.0	2.15	474.2	140.8
S19.007	50.00	7.06	83.427	1.040	0.0	0.0	0.0	0.91	200.8	140.8
S22.000	50.00	4.32	87.816	0.242	0.0	0.0	0.0	2.82	199.0	32.8
S22.001	50.00	4.51	86.070	0.337	0.0	0.0	0.0	2.83	200.2	45.6
S22.002	50.00	4.61	85.074	0.337	0.0	0.0	0.0	2.03	143.6	45.6
S22.003	50.00	4.73	84.855	0.337	0.0	0.0	0.0	1.00	70.7	45.6

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	o	225	S1	100.000	98.575	1.200	Open Manhole	1200
S2.000	o	150	S2	100.408	99.058	1.200	Open Manhole	1200
S1.001	o	300	S3	99.426	98.293	0.833	Open Manhole	1200
S1.002	o	300	S4	98.215	96.715	1.200	Open Manhole	1200
S1.003	o	375	S5	95.358	93.683	1.300	Open Manhole	1350
S3.000	o	225	S6	93.350	92.237	0.888	Open Manhole	1200
S1.004	oo	375	S7	93.400	91.216	1.809	Open Manhole	1800
S1.005	oo	375	S8	93.381	90.711	2.295	Open Manhole	1800
S4.000	o	225	S9	95.469	94.044	1.200	Open Manhole	1200
S4.001	o	300	S10	95.390	92.808	2.282	Open Manhole	1200
S1.006	oo	375	S11	93.852	90.569	2.908	Open Manhole	1800
S1.007	oo	375	S12	94.050	90.356	3.319	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	12.232	59.1	S3	99.426	98.368	0.833	Open Manhole	1200
S2.000	35.412	59.2	S3	99.426	98.460	0.816	Open Manhole	1200
S1.001	42.324	26.8	S4	98.215	96.715	1.200	Open Manhole	1200
S1.002	61.925	20.9	S5	95.358	93.758	1.300	Open Manhole	1350
S1.003	58.495	23.7	S7	93.400	91.216	1.809	Open Manhole	1800
S3.000	28.388	100.0	S7	93.400	91.953	1.222	Open Manhole	1800
S1.004	75.751	150.0	S8	93.381	90.711	2.295	Open Manhole	1800
S1.005	21.275	150.0	S11	93.852	90.569	2.908	Open Manhole	1800
S4.000	58.069	50.0	S10	95.390	92.883	2.282	Open Manhole	1200
S4.001	37.184	50.0	S11	93.852	92.064	1.488	Open Manhole	1800
S1.006	32.009	150.0	S12	94.050	90.356	3.319	Open Manhole	1800
S1.007	11.952	150.0	S13	93.576	90.276	2.925	Open Manhole	1800

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.008	oo	375	S13	93.576	90.276	2.925	Open Manhole	1800
S1.009	oo	375	S14	93.413	90.204	2.834	Open Manhole	1800
S1.010	oo	375	S15	92.266	89.923	1.968	Open Manhole	1800
S1.011	oo	375	S16	90.563	88.941	1.247	Open Manhole	1800
S5.000	o	225	S17	100.489	99.064	1.200	Open Manhole	1200
S5.001	o	300	S18	101.008	98.059	2.649	Open Manhole	1200
S5.002	o	300	S19	99.022	97.522	1.200	Open Manhole	1200
S6.000	o	300	S20	98.351	96.926	1.125	Open Manhole	1200
S5.003	o	300	S21	98.393	95.580	2.513	Open Manhole	1200
S5.004	o	375	S22	97.923	95.464	2.084	Open Manhole	1350
S5.005	o	375	S23	96.663	94.266	2.022	Open Manhole	1350
S5.006	o	375	S24	96.288	93.811	2.102	Open Manhole	1350
S5.007	o	375	S25	95.403	92.982	2.046	Open Manhole	1350
S5.008	o	375	S26	94.651	92.254	2.022	Open Manhole	1350
S5.009	o	450	S27	94.636	92.105	2.081	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.008	10.763	150.0	S14	93.413	90.204	2.834	Open Manhole	1800
S1.009	42.190	150.0	S15	92.266	89.923	1.968	Open Manhole	1800
S1.010	46.852	47.7	S16	90.563	88.941	1.247	Open Manhole	1800
S1.011	43.024	50.9	S42	89.800	88.095	1.330	Open Manhole	1800
S5.000	55.103	59.3	S18	101.008	98.134	2.649	Open Manhole	1200
S5.001	50.776	94.6	S19	99.022	97.522	1.200	Open Manhole	1200
S5.002	15.335	24.4	S21	98.393	96.893	1.200	Open Manhole	1200
S6.000	67.297	50.0	S21	98.393	95.580	2.513	Open Manhole	1200
S5.003	9.955	242.8	S22	97.923	95.539	2.084	Open Manhole	1350
S5.004	29.633	24.7	S23	96.663	94.266	2.022	Open Manhole	1350
S5.005	14.609	32.1	S24	96.288	93.811	2.102	Open Manhole	1350
S5.006	23.342	28.2	S25	95.403	92.982	2.046	Open Manhole	1350
S5.007	23.317	32.0	S26	94.651	92.254	2.022	Open Manhole	1350
S5.008	23.661	319.7	S27	94.636	92.180	2.081	Open Manhole	1350
S5.009	22.644	404.4	S28	94.941	92.049	2.442	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.010	o	450	S28	94.941	92.049	2.442	Open Manhole	1350
S7.000	o	225	S29	91.221	89.796	1.200	Open Manhole	1200
S5.011	o	450	S30	92.017	89.261	2.306	Open Manhole	1350
S5.012	o	450	S31	90.864	89.041	1.373	Open Manhole	1350
S8.000	o	300	S32	95.177	93.677	1.200	Open Manhole	1200
S9.000	o	150	S33	96.734	95.384	1.200	Open Manhole	1200
S9.001	o	225	S34	96.323	94.959	1.139	Open Manhole	1200
S8.001	o	300	S35	95.971	93.353	2.318	Open Manhole	1200
S10.000	o	300	S36	94.298	92.798	1.200	Open Manhole	1200
S8.002	o	375	S37	94.646	92.074	2.197	Open Manhole	1350
S8.003	o	375	S38	93.364	91.464	1.525	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S5.010	69.815	32.5	S30	92.017	89.903	1.664	Open Manhole	1350
S7.000	34.547	64.6	S30	92.017	89.261	2.531	Open Manhole	1350
S5.011	26.924	122.4	S31	90.864	89.041	1.373	Open Manhole	1350
S5.012	28.644	30.3	S42	89.800	88.095	1.255	Open Manhole	1800
S8.000	48.609	150.0	S35	95.971	93.353	2.318	Open Manhole	1200
S9.000	20.716	59.2	S34	96.323	95.034	1.139	Open Manhole	1200
S9.001	23.981	58.1	S35	95.971	94.546	1.200	Open Manhole	1200
S8.001	28.936	139.8	S37	94.646	93.146	1.200	Open Manhole	1350
S10.000	32.444	50.0	S37	94.646	92.149	2.197	Open Manhole	1350
S8.002	29.280	48.0	S38	93.364	91.464	1.525	Open Manhole	1350
S8.003	30.112	24.1	S40	92.190	90.217	1.598	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	o	225	S39	92.308	90.883	1.200	Open Manhole	1200
S8.004	o	375	S40	92.190	90.217	1.598	Open Manhole	1350
S8.005	o	375	S41	90.801	88.825	1.601	Open Manhole	1350
S1.012	o	450	S42	89.800	88.095	1.255	Open Manhole	1800
S12.000	o	150	S43	97.773	96.528	1.095	Open Manhole	1200
S12.001	o	225	S44	97.227	95.802	1.200	Open Manhole	1200
S12.002	o	225	S45	96.688	95.263	1.200	Open Manhole	1200
S12.003	o	300	S46	95.149	93.649	1.200	Open Manhole	1200
S12.004	o	300	S47	93.400	91.903	1.197	Open Manhole	1200
S12.005	o	375	S48	93.397	91.710	1.312	Open Manhole	1350
S12.006	o	375	S49	92.467	90.895	1.197	Open Manhole	1350
S13.000	o	225	S50	91.538	90.113	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S11.000	35.855	59.8	S40	92.190	90.283	1.682	Open Manhole	1350
S8.004	32.447	23.3	S41	90.801	88.825	1.601	Open Manhole	1350
S8.005	28.311	38.8	S42	89.800	88.095	1.330	Open Manhole	1800
S1.012	37.376	43.0	S54	88.400	87.225	0.725	Open Manhole	1200
S12.000	13.285	20.4	S44	97.227	95.877	1.200	Open Manhole	1200
S12.001	12.144	22.5	S45	96.688	95.263	1.200	Open Manhole	1200
S12.002	39.704	25.8	S46	95.149	93.724	1.200	Open Manhole	1200
S12.003	37.532	21.5	S47	93.400	91.903	1.197	Open Manhole	1200
S12.004	11.617	60.2	S48	93.397	91.710	1.387	Open Manhole	1350
S12.005	22.865	28.1	S49	92.467	90.895	1.197	Open Manhole	1350
S12.006	39.584	48.6	S51	91.200	90.080	0.745	Open Manhole	1350
S13.000	16.251	90.8	S51	91.200	89.934	1.041	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.007	o	375	S51	91.200	89.925	0.900	Open Manhole	1350
S12.008	o	375	S52	90.562	89.214	0.973	Open Manhole	1350
S12.009	o	375	S53	88.536	87.442	0.719	Open Manhole	1200
S1.013	o	450	S54	88.400	87.000	0.950	Open Manhole	1200
S1.014	o	300	S55	87.400	86.000	1.100	Open Manhole	1350
S14.000	o	225	S56	90.428	89.003	1.200	Open Manhole	1200
S14.001	o	225	S57	89.753	88.328	1.200	Open Manhole	1200
S14.002	o	300	S58	89.097	87.597	1.200	Open Manhole	1200
S14.003	oo	375	S59	88.000	86.233	1.392	Open Manhole	1800
S14.004	oo	375	S60	87.700	85.596	1.729	Open Manhole	1800
S1.015	oo	375	S61	87.300	85.142	1.783	Open Manhole	1800
S15.000	o	225	S62	89.605	88.180	1.200	Open Manhole	1200
S15.001	o	300	S63	88.510	87.010	1.200	Open Manhole	1200
S15.002	o	375	S64	87.877	86.202	1.300	Open Manhole	1350

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S12.007	31.278	44.0	S52	90.562	89.214	0.973	Open Manhole	1350
S12.008	77.920	44.0	S53	88.536	87.443	0.718	Open Manhole	1200
S12.009	6.217	18.5	S54	88.400	87.106	0.919	Open Manhole	1200
S1.013	3.108	31.1	S55	87.400	86.900	0.050	Open Manhole	1350
S1.014	36.811	75.1	S61	87.300	85.510	1.490	Open Manhole	1800
S14.000	22.196	32.9	S57	89.753	88.328	1.200	Open Manhole	1200
S14.001	22.694	34.6	S58	89.097	87.672	1.200	Open Manhole	1200
S14.002	37.592	27.6	S59	88.000	86.233	1.467	Open Manhole	1800
S14.003	42.486	66.7	S60	87.700	85.596	1.729	Open Manhole	1800
S14.004	30.273	66.7	S61	87.300	85.142	1.783	Open Manhole	1800
S1.015	47.754	66.7	S66	86.700	84.426	1.899	Open Manhole	1800
S15.000	28.750	26.3	S63	88.510	87.085	1.200	Open Manhole	1200
S15.001	29.148	39.8	S64	87.877	86.277	1.300	Open Manhole	1350
S15.002	32.163	35.6	S65	87.531	85.298	1.858	Open Manhole	1350

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.003	o	375	S65	87.531	85.298	1.858	Open Manhole	1350
S1.016	oo	375	S66	86.700	84.426	1.899	Open Manhole	1800
S16.000	o	300	S67	88.678	87.178	1.200	Open Manhole	1200
S17.000	o	225	S68	89.866	88.441	1.200	Open Manhole	1200
S16.001	o	300	S69	89.149	86.810	2.039	Open Manhole	1200
S18.000	o	225	S70	87.310	85.885	1.200	Open Manhole	1200
S16.002	o	375	S71	87.050	85.454	1.221	Open Manhole	1350
S1.017	oo	375	S72	85.850	84.015	1.460	Open Manhole	1800
S1.018	oo	375	S73	85.800	83.828	1.597	Open Manhole	1800
S1.019	oo	375	S74	85.000	83.500	1.125	Open Manhole	1800
S1.020	oo	375	S75	85.000	83.099	1.526	Open Manhole	1800

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.003	33.346	38.6	S66	86.700	84.433	1.892	Open Manhole	1800
S1.016	52.669	128.0	S72	85.850	84.015	1.460	Open Manhole	1800
S16.000	36.773	99.9	S69	89.149	86.810	2.039	Open Manhole	1200
S17.000	43.870	60.0	S69	89.149	87.710	1.214	Open Manhole	1200
S16.001	67.681	52.8	S71	87.050	85.529	1.221	Open Manhole	1350
S18.000	23.333	59.4	S71	87.050	85.492	1.333	Open Manhole	1350
S16.002	45.805	47.8	S72	85.850	84.496	0.979	Open Manhole	1800
S1.017	23.952	127.8	S73	85.800	83.828	1.597	Open Manhole	1800
S1.018	28.886	127.8	S74	85.000	83.602	1.023	Open Manhole	1800
S1.019	6.369	245.0	S75	85.000	83.474	1.151	Open Manhole	1800
S1.020	5.424	180.8	S	85.000	83.069	1.556	Open Manhole	0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S19.000	o	300	S76	86.471	85.008	1.163	Open Manhole	1200
S19.001	oo	375	S77	86.232	84.643	1.214	Open Manhole	1800
S19.002	oo	375	S78	86.121	84.334	1.412	Open Manhole	1800
S20.000	o	225	S79	87.525	86.100	1.200	Open Manhole	1200
S20.001	o	300	S80	87.377	85.824	1.253	Open Manhole	1200
S19.003	oo	375	S81	86.060	84.126	1.559	Open Manhole	1800
S21.000	o	225	S82	86.399	84.974	1.200	Open Manhole	1200
S19.004	oo	375	S83	85.531	83.824	1.332	Open Manhole	1800
S19.005	oo	375	S84	85.500	83.700	1.425	Open Manhole	1800
S19.006	oo	375	S85	85.500	83.575	1.550	Open Manhole	1800
S19.007	oo	375	S86	85.016	83.427	1.214	Open Manhole	1800
S22.000	o	300	S87	89.316	87.816	1.200	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S19.000	43.255	149.2	S77	86.232	84.718	1.214	Open Manhole	1800
S19.001	51.400	166.3	S78	86.121	84.334	1.412	Open Manhole	1800
S19.002	22.716	240.0	S81	86.060	84.239	1.446	Open Manhole	1800
S20.000	11.241	55.9	S80	87.377	85.899	1.253	Open Manhole	1200
S20.001	64.310	41.5	S81	86.060	84.276	1.484	Open Manhole	1800
S19.003	68.081	225.4	S83	85.531	83.824	1.332	Open Manhole	1800
S21.000	48.821	48.8	S83	85.531	83.974	1.332	Open Manhole	1800
S19.004	18.189	146.7	S84	85.500	83.700	1.425	Open Manhole	1800
S19.005	18.354	146.8	S85	85.500	83.575	1.550	Open Manhole	1800
S19.006	10.568	71.4	S86	85.016	83.427	1.214	Open Manhole	1800
S19.007	7.057	392.1	S	85.000	83.409	1.216	Open Manhole	0
S22.000	54.827	31.4	S88	87.570	86.070	1.200	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S22.001	o	300	S88	87.570	86.070	1.200	Open Manhole	1200
S22.002	o	300	S89	86.574	85.074	1.200	Open Manhole	1200
S22.003	o	300	S90	85.855	84.855	0.700	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S22.001	30.903	31.0	S89	86.574	85.074	1.200	Open Manhole	1200
S22.002	13.160	60.1	S90	85.855	84.855	0.700	Open Manhole	1200
S22.003	6.849	244.6	S	85.855	84.827	0.728	Open Manhole	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.020	S	85.000	83.069	83.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S19.007	S	85.000	83.409	83.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S22.003	S	85.855	84.827	84.500	0	0

Online Controls for Storm

Weir Manhole: S42, DS/PN: S1.012, Volume (m³): 20.7

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 89.445

Hydro-Brake® Optimum Manhole: S53, DS/PN: S12.009, Volume (m³): 9.7

Unit Reference	MD-SHE-0082-3000-1000-3000
Design Head (m)	1.000
Design Flow (l/s)	3.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	82
Invert Level (m)	87.442
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.0	Kick-Flo®	0.623	2.4
Flush-Flo™	0.297	3.0	Mean Flow over Head Range	-	2.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.4	1.200	3.3	3.000	5.0	7.000	7.4
0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7
0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9
0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2
0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4
0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6
0.800	2.7	2.400	4.5	6.000	6.9		
1.000	3.0	2.600	4.7	6.500	7.2		

Weir Manhole: S54, DS/PN: S1.013, Volume (m³): 7.8

Discharge Coef 0.544 Width (m) 1.000 Invert Level (m) 88.200

Hydro-Brake® Optimum Manhole: S55, DS/PN: S1.014, Volume (m³): 2.3

Unit Reference	MD-SHE-0121-7000-1200-7000
Design Head (m)	1.200
Design Flow (l/s)	7.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	121
Invert Level (m)	86.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	7.0	Kick-Flo®	0.755	5.6
Flush-Flo™	0.351	7.0	Mean Flow over Head Range	-	6.1

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	4.3	1.200	7.0	3.000	10.8	7.000	16.1
0.200	6.6	1.400	7.5	3.500	11.6	7.500	16.7
0.300	7.0	1.600	8.0	4.000	12.4	8.000	17.2
0.400	7.0	1.800	8.5	4.500	13.1	8.500	17.7
0.500	6.8	2.000	8.9	5.000	13.7	9.000	18.2
0.600	6.6	2.200	9.3	5.500	14.4	9.500	18.7
0.800	5.8	2.400	9.7	6.000	15.0		
1.000	6.4	2.600	10.1	6.500	15.6		

Depth/Flow Relationship Manhole: S74, DS/PN: S1.019, Volume (m³): 9.8

Invert Level (m) 83.500

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.0000	0.900	7.0000	1.700	7.0000	2.500	7.0000
0.200	7.0000	1.000	7.0000	1.800	7.0000	2.600	7.0000
0.300	7.0000	1.100	7.0000	1.900	7.0000	2.700	7.0000
0.400	7.0000	1.200	7.0000	2.000	7.0000	2.800	7.0000
0.500	7.0000	1.300	7.0000	2.100	7.0000	2.900	7.0000
0.600	7.0000	1.400	7.0000	2.200	7.0000	3.000	7.0000
0.700	7.0000	1.500	7.0000	2.300	7.0000		
0.800	7.0000	1.600	7.0000	2.400	7.0000		

Depth/Flow Relationship Manhole: S86, DS/PN: S19.007, Volume (m³): 6.0

Invert Level (m) 83.427

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.0000	0.900	5.0000	1.700	5.0000	2.500	5.0000
0.200	5.0000	1.000	5.0000	1.800	5.0000	2.600	5.0000
0.300	5.0000	1.100	5.0000	1.900	5.0000	2.700	5.0000
0.400	5.0000	1.200	5.0000	2.000	5.0000	2.800	5.0000
0.500	5.0000	1.300	5.0000	2.100	5.0000	2.900	5.0000
0.600	5.0000	1.400	5.0000	2.200	5.0000	3.000	5.0000
0.700	5.0000	1.500	5.0000	2.300	5.0000		
0.800	5.0000	1.600	5.0000	2.400	5.0000		

Depth/Flow Relationship Manhole: S90, DS/PN: S22.003, Volume (m³): 2.0

Invert Level (m) 84.855

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0000	0.900	2.0000	1.700	2.0000	2.500	2.0000
0.200	2.0000	1.000	2.0000	1.800	2.0000	2.600	2.0000
0.300	2.0000	1.100	2.0000	1.900	2.0000	2.700	2.0000
0.400	2.0000	1.200	2.0000	2.000	2.0000	2.800	2.0000
0.500	2.0000	1.300	2.0000	2.100	2.0000	2.900	2.0000
0.600	2.0000	1.400	2.0000	2.200	2.0000	3.000	2.0000
0.700	2.0000	1.500	2.0000	2.300	2.0000		
0.800	2.0000	1.600	2.0000	2.400	2.0000		

Offline Controls for Storm

Depth/Flow Relationship Manhole: S42, DS/PN: S1.012, Loop to PN: S1.020

Invert Level (m) 88.095

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.0000	0.900	6.0000	1.700	6.0000	2.500	6.0000
0.200	6.0000	1.000	6.0000	1.800	6.0000	2.600	6.0000
0.300	6.0000	1.100	6.0000	1.900	6.0000	2.700	6.0000
0.400	6.0000	1.200	6.0000	2.000	6.0000	2.800	6.0000
0.500	6.0000	1.300	6.0000	2.100	6.0000	2.900	6.0000
0.600	6.0000	1.400	6.0000	2.200	6.0000	3.000	6.0000
0.700	6.0000	1.500	6.0000	2.300	6.0000		
0.800	6.0000	1.600	6.0000	2.400	6.0000		

Depth/Flow Relationship Manhole: S54, DS/PN: S1.013, Loop to PN: S1.020

Invert Level (m) 87.000

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.0000	0.900	7.0000	1.700	7.0000	2.500	7.0000
0.200	7.0000	1.000	7.0000	1.800	7.0000	2.600	7.0000
0.300	7.0000	1.100	7.0000	1.900	7.0000	2.700	7.0000
0.400	7.0000	1.200	7.0000	2.000	7.0000	2.800	7.0000
0.500	7.0000	1.300	7.0000	2.100	7.0000	2.900	7.0000
0.600	7.0000	1.400	7.0000	2.200	7.0000	3.000	7.0000
0.700	7.0000	1.500	7.0000	2.300	7.0000		
0.800	7.0000	1.600	7.0000	2.400	7.0000		

Storage Structures for Storm

Tank or Pond Manhole: S42, DS/PN: S1.012

Invert Level (m) 88.095

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	291.2	1.705	1150.0

Tank or Pond Manhole: S53, DS/PN: S12.009

Invert Level (m) 87.442

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	175.6	1.094	420.0

Tank or Pond Manhole: S54, DS/PN: S1.013

Invert Level (m) 87.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	411.0	1.400	810.0

Tank or Pond Manhole: S55, DS/PN: S1.014

Invert Level (m) 86.000

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	181.2	1.400	530.0

Tank or Pond Manhole: S74, DS/PN: S1.019

Invert Level (m) 83.500

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	427.2	1.500	1151.0

Tank or Pond Manhole: S86, DS/PN: S19.007

Invert Level (m) 83.427

Tank or Pond Manhole: S86, DS/PN: S19.007

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	300.0	1.573	659.7

Tank or Pond Manhole: S90, DS/PN: S22.003

Invert Level (m) 84.855

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	169.0	1.000	335.5

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 2 Number of Time/Area Diagrams 0
Number of Online Controls 7 Number of Storage Structures 7 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.418
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 20.000 Cv (Winter) 0.840

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

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S1.000	S1	15 minute 100 year Winter I+40%	100.000	98.681	-0.119	0.000	0.45
S2.000	S2	15 minute 100 year Winter I+40%	100.408	99.529	0.321	0.000	1.23
S1.001	S3	15 minute 100 year Winter I+40%	99.426	98.471	-0.122	0.000	0.65
S1.002	S4	15 minute 100 year Winter I+40%	98.215	97.886	0.871	0.000	1.07
S1.003	S5	15 minute 100 year Winter I+40%	95.358	94.784	0.726	0.000	0.88
S3.000	S6	15 minute 100 year Winter I+40%	93.350	93.330	0.868	0.000	0.55
S1.004	S7	15 minute 100 year Winter I+40%	93.400	93.296	1.705	0.000	1.16
S1.005	S8	15 minute 100 year Winter I+40%	93.381	92.686	1.600	0.000	1.22
S4.000	S9	15 minute 100 year Winter I+40%	95.469	95.319	1.050	0.000	1.29
S4.001	S10	15 minute 100 year Winter I+40%	95.390	93.377	0.269	0.000	1.17
S1.006	S11	15 minute 100 year Winter I+40%	93.852	92.474	1.530	0.000	1.65
S1.007	S12	15 minute 100 year Winter I+40%	94.050	91.909	1.179	0.000	2.21
S1.008	S13	15 minute 100 year Winter I+40%	93.576	91.564	0.913	0.000	2.27
S1.009	S14	15 minute 100 year Winter I+40%	93.413	91.223	0.644	0.000	1.71
S1.010	S15	15 minute 100 year Winter I+40%	92.266	90.581	0.283	0.000	0.87

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

PN	US/MH Name	Infil. Flow (l/s)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.000	S1			0.114	11.491	1.4	26.3	OK
S2.000	S2			0.528	13.256	1.6	27.6	SURCHARGED
S1.001	S3			0.245	59.217	3.0	131.2	OK
S1.002	S4			3.188	128.771	3.6	247.5	SURCHARGED
S1.003	S5			2.832	178.834	3.9	337.9	SURCHARGED
S3.000	S6			1.231	12.366	1.3	26.5	FLOOD RISK
S1.004	S7			11.158	217.719	1.7	360.0	FLOOD RISK
S1.005	S8			21.347	217.712	1.5	337.3	SURCHARGED
S4.000	S9			1.436	48.309	2.3	91.5	FLOOD RISK
S4.001	S10			1.372	87.489	2.4	169.7	SURCHARGED
S1.006	S11			10.000	305.220	2.2	479.0	SURCHARGED
S1.007	S12			10.614	314.942	2.2	487.7	SURCHARGED
S1.008	S13			5.507	314.948	2.2	486.3	SURCHARGED
S1.009	S14			4.560	341.769	2.3	508.5	SURCHARGED
S1.010	S15			10.553	341.777	2.6	467.4	SURCHARGED

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.
S1.011	S16	30 minute 100 year Winter I+40%	90.563	89.975	0.659	0.000	0.81
S5.000	S17	15 minute 100 year Winter I+40%	100.489	99.646	0.357	0.000	0.89
S5.001	S18	15 minute 100 year Winter I+40%	101.008	98.906	0.547	0.000	1.40
S5.002	S19	15 minute 100 year Winter I+40%	99.022	97.936	0.114	0.000	0.82
S6.000	S20	15 minute 100 year Winter I+40%	98.351	98.025	0.799	0.000	0.63
S5.003	S21	15 minute 100 year Winter I+40%	98.393	97.542	1.662	0.000	5.25
S5.004	S22	15 minute 100 year Winter I+40%	97.923	96.348	0.509	0.000	0.79
S5.005	S23	15 minute 100 year Winter I+40%	96.663	95.641	1.000	0.000	1.07
S5.006	S24	15 minute 100 year Winter I+40%	96.288	95.128	0.942	0.000	0.91
S5.007	S25	15 minute 100 year Winter I+40%	95.403	94.451	1.094	0.000	1.00
S5.008	S26	15 minute 100 year Winter I+40%	94.651	93.713	1.084	0.000	3.35
S5.009	S27	15 minute 100 year Winter I+40%	94.636	92.872	0.317	0.000	2.61
S5.010	S28	15 minute 100 year Winter I+40%	94.941	92.377	-0.122	0.000	0.86
S7.000	S29	15 minute 100 year Winter I+40%	91.221	90.704	0.683	0.000	0.77
S5.011	S30	15 minute 100 year Winter I+40%	92.017	90.528	0.817	0.000	1.96
S5.012	S31	30 minute 100 year Winter I+40%	90.864	89.943	0.452	0.000	0.85
S8.000	S32	15 minute 100 year Winter I+40%	95.177	95.105	1.128	0.000	1.13
S9.000	S33	15 minute 100 year Winter I+40%	96.734	96.097	0.563	0.000	1.49
S9.001	S34	15 minute 100 year Winter I+40%	96.323	95.319	0.135	0.000	1.14
S8.001	S35	15 minute 100 year Winter I+40%	95.971	94.680	1.027	0.000	2.43
S10.000	S36	15 minute 100 year Winter I+40%	94.298	93.199	0.101	0.000	0.37
S8.002	S37	15 minute 100 year Winter I+40%	94.646	93.158	0.709	0.000	1.10
S8.003	S38	15 minute 100 year Winter I+40%	93.364	92.482	0.643	0.000	0.86
S11.000	S39	15 minute 100 year Winter I+40%	92.308	92.165	1.057	0.000	1.14
S8.004	S40	15 minute 100 year Winter I+40%	92.190	91.568	0.976	0.000	1.02
S8.005	S41	15 minute 100 year Winter I+40%	90.801	90.199	0.999	0.000	1.30
S1.012	S42	120 minute 100 year Winter I+40%	89.800	89.759	1.214	0.000	0.69
S12.000	S43	15 minute 100 year Winter I+40%	97.773	96.838	0.160	0.000	0.96
S12.001	S44	15 minute 100 year Winter I+40%	97.227	96.345	0.318	0.000	0.52
S12.002	S45	15 minute 100 year Winter I+40%	96.688	96.227	0.739	0.000	1.22
S12.003	S46	15 minute 100 year Winter I+40%	95.149	93.912	-0.037	0.000	0.85
S12.004	S47	15 minute 100 year Winter I+40%	93.400	92.635	0.432	0.000	1.81
S12.005	S48	15 minute 100 year Winter I+40%	93.397	91.961	-0.124	0.000	0.77
S12.006	S49	15 minute 100 year Winter I+40%	92.467	91.188	-0.082	0.000	0.95
S13.000	S50	15 minute 100 year Winter I+40%	91.538	90.598	0.260	0.000	0.96
S12.007	S51	15 minute 100 year Winter I+40%	91.200	90.424	0.124	0.000	1.10
S12.008	S52	15 minute 100 year Winter I+40%	90.562	89.589	0.000	0.000	1.00
S12.009	S53	600 minute 100 year Winter I+40%	88.536	88.509	0.692	0.000	0.01
S1.013	S54	480 minute 100 year Winter I+40%	88.400	88.335	0.885	0.000	0.47
S1.014	S55	720 minute 100 year Winter I+40%	87.400	87.364	1.064	0.000	0.06
S14.000	S56	15 minute 100 year Winter I+40%	90.428	89.149	-0.079	0.000	0.75
S14.001	S57	15 minute 100 year Winter I+40%	89.753	88.746	0.193	0.000	1.12
S14.002	S58	15 minute 100 year Winter I+40%	89.097	87.813	-0.084	0.000	0.85

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

PN	US/MH Name	Infil. Flow (l/s)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S1.011	S16			11.058	439.846	2.4	417.3	SURCHARGED
S5.000	S17			0.653	28.573	1.8	57.7	SURCHARGED
S5.001	S18			2.462	73.932	2.1	150.4	SURCHARGED
S5.002	S19			2.152	81.592	2.9	156.0	SURCHARGED
S6.000	S20			1.237	50.953	2.1	94.1	SURCHARGED
S5.003	S21			7.666	160.828	4.2	291.0	SURCHARGED
S5.004	S22			1.872	160.828	3.5	283.1	SURCHARGED
S5.005	S23			4.942	167.015	2.6	282.6	SURCHARGED
S5.006	S24			3.342	176.443	3.1	293.6	SURCHARGED
S5.007	S25			4.524	186.460	2.8	305.1	SURCHARGED
S5.008	S26			4.507	199.725	2.9	320.0	SURCHARGED
S5.009	S27			3.555	221.836	2.2	344.8	SURCHARGED
S5.010	S28			2.638	287.238	3.7	454.5	OK
S7.000	S29			1.021	24.738	1.6	47.2	SURCHARGED
S5.011	S30			5.136	311.452	3.1	485.0	SURCHARGED
S5.012	S31			5.352	401.653	3.4	427.3	SURCHARGED
S8.000	S32			1.609	49.490	1.4	96.3	FLOOD RISK
S9.000	S33			0.801	16.202	1.9	32.6	SURCHARGED
S9.001	S34			0.603	35.058	1.8	71.9	SURCHARGED
S8.001	S35			4.973	105.468	2.9	206.3	SURCHARGED
S10.000	S36			0.448	22.983	1.9	52.7	SURCHARGED
S8.002	S37			3.828	155.556	2.6	280.5	SURCHARGED
S8.003	S38			4.534	183.839	3.5	311.4	SURCHARGED
S11.000	S39			1.444	41.235	1.8	72.4	FLOOD RISK
S8.004	S40			6.209	230.083	3.7	377.3	SURCHARGED
S8.005	S41			4.875	228.014	3.3	367.8	SURCHARGED
S1.012	S42			1122.001	811.959	3.3	301.3	FLOOD RISK
S12.000	S43			0.345	16.204	2.3	34.7	SURCHARGED
S12.001	S44			0.735	23.864	2.3	49.4	SURCHARGED
S12.002	S45			1.520	60.692	3.0	118.6	SURCHARGED
S12.003	S46			0.370	94.278	3.5	188.6	OK
S12.004	S47			1.670	99.287	2.8	199.6	SURCHARGED
S12.005	S48			0.716	122.857	3.2	249.6	OK
S12.006	S49			0.730	122.857	2.7	249.0	OK
S13.000	S50			0.543	22.686	1.3	46.4	SURCHARGED
S12.007	S51			2.095	145.543	2.7	294.1	SURCHARGED
S12.008	S52			1.383	145.540	3.0	287.1	OK
S12.009	S53			310.490	191.067	1.0	3.0	FLOOD RISK
S1.013	S54			794.365	505.818	2.6	83.9	FLOOD RISK
S1.014	S55			459.722	396.507	1.0	7.4	FLOOD RISK
S14.000	S56			0.159	27.106	2.3	62.1	OK
S14.001	S57			0.839	41.248	2.3	90.8	SURCHARGED

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

PN	US/MH Name	Infil. Flow (l/s)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S14.002	S58			0.291	75.424	3.1	167.5	OK

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
S14.003	S59	15 minute 100 year Winter I+40%	88.000	86.880	0.272	0.000	0.58
S14.004	S60	15 minute 100 year Winter I+40%	87.700	86.790	0.819	0.000	0.61
S1.015	S61	15 minute 100 year Winter I+40%	87.300	86.689	1.172	0.000	0.44
S15.000	S62	15 minute 100 year Winter I+40%	89.605	88.588	0.183	0.000	1.00
S15.001	S63	15 minute 100 year Winter I+40%	88.510	87.716	0.406	0.000	0.99
S15.002	S64	15 minute 100 year Winter I+40%	87.877	87.226	0.649	0.000	0.80
S15.003	S65	15 minute 100 year Winter I+40%	87.531	86.892	1.219	0.000	0.68
S1.016	S66	15 minute 100 year Winter I+40%	86.700	86.548	1.747	0.000	1.30
S16.000	S67	15 minute 100 year Winter I+40%	88.678	88.475	0.997	0.000	0.32
S17.000	S68	15 minute 100 year Winter I+40%	89.866	88.550	-0.116	0.000	0.47
S16.001	S69	15 minute 100 year Winter I+40%	89.149	88.439	1.329	0.000	1.27
S18.000	S70	15 minute 100 year Winter I+40%	87.310	86.539	0.429	0.000	0.52
S16.002	S71	15 minute 100 year Winter I+40%	87.050	86.498	0.669	0.000	0.85
S1.017	S72	15 minute 100 year Winter I+40%	85.850	85.839	1.449	0.000	2.13
S1.018	S73	15 minute 100 year Winter I+40%	85.800	84.988	0.785	0.000	2.13
S1.019	S74	1440 minute 100 year Winter I+40%	85.000	84.963	1.088	0.000	0.04
S1.020	S75	600 minute 100 year Winter I+40%	85.000	83.172	-0.302	0.000	0.11
S19.000	S76	15 minute 100 year Winter I+40%	86.471	85.783	0.475	0.000	0.76
S19.001	S77	15 minute 100 year Winter I+40%	86.232	85.691	0.673	0.000	0.54
S19.002	S78	15 minute 100 year Winter I+40%	86.121	85.633	0.924	0.000	0.73
S20.000	S79	15 minute 100 year Winter I+40%	87.525	87.063	0.738	0.000	0.62
S20.001	S80	15 minute 100 year Winter I+40%	87.377	87.003	0.879	0.000	1.01
S19.003	S81	15 minute 100 year Winter I+40%	86.060	85.585	1.084	0.000	1.52
S21.000	S82	15 minute 100 year Winter I+40%	86.399	85.864	0.665	0.000	1.11
S19.004	S83	15 minute 100 year Winter I+40%	85.531	84.877	0.678	0.000	1.67
S19.005	S84	600 minute 100 year Winter I+40%	85.500	84.815	0.740	0.000	0.20
S19.006	S85	600 minute 100 year Winter I+40%	85.500	84.813	0.863	0.000	0.18
S19.007	S86	600 minute 100 year Winter I+40%	85.016	84.812	1.010	0.000	0.04
S22.000	S87	15 minute 100 year Winter I+40%	89.316	88.193	0.077	0.000	0.81
S22.001	S88	15 minute 100 year Winter I+40%	87.570	87.074	0.704	0.000	1.13
S22.002	S89	15 minute 100 year Winter I+40%	86.574	85.820	0.446	0.000	1.74
S22.003	S90	480 minute 100 year Winter I+40%	85.855	85.727	0.572	0.000	0.04

PN	US/MH Name	Infil. Flow (l/s)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S14.003	S59			2.556	117.545	2.1	260.6	SURCHARGED
S14.004	S60			12.012	138.168	2.0	266.3	SURCHARGED
S1.015	S61			12.703	136.311	2.0	200.6	SURCHARGED
S15.000	S62			0.456	44.488	2.7	94.7	SURCHARGED
S15.001	S63			1.306	77.191	2.6	158.7	SURCHARGED

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

PN	US/MH Name	Infil. Flow (l/s)	Infil. Vol (m³)	Maximum Vol (m³)	Discharge Vol (m³)	Maximum Velocity (m/s)	Pipe Flow (l/s)	Status
S15.002	S64			3.394	117.849	2.9	240.0	SURCHARGED
S15.003	S65			5.678	117.849	2.7	197.3	SURCHARGED
S1.016	S66			19.047	288.037	1.9	425.0	FLOOD RISK
S16.000	S67			1.461	17.083	1.2	32.8	FLOOD RISK
S17.000	S68			0.118	13.257	1.6	30.4	OK
S16.001	S69			5.756	104.874	2.6	186.5	SURCHARGED
S18.000	S70			0.734	14.437	1.6	32.0	SURCHARGED
S16.002	S71			5.355	142.283	2.7	226.8	SURCHARGED
S1.017	S72			20.749	428.570	2.9	646.6	FLOOD RISK
S1.018	S73			7.834	440.193	3.0	661.9	SURCHARGED
S1.019	S74			1107.659	1146.757	0.9	7.0	FLOOD RISK
S1.020	S75			0.173	1304.837	0.7	20.0	OK
S19.000	S76			0.871	31.515	1.3	64.6	SURCHARGED
S19.001	S77			5.606	85.752	1.3	153.7	SURCHARGED
S19.002	S78			14.250	104.274	1.0	160.1	SURCHARGED
S20.000	S79			1.084	20.034	1.6	36.6	SURCHARGED
S20.001	S80			1.727	91.635	2.6	167.3	SURCHARGED
S19.003	S81			11.627	249.138	1.8	380.4	SURCHARGED
S21.000	S82			1.001	40.951	2.0	79.3	SURCHARGED
S19.004	S83			18.781	288.061	2.1	455.0	SURCHARGED
S19.005	S84			6.446	801.685	0.8	53.3	SURCHARGED
S19.006	S85			6.796	795.609	0.9	53.0	SURCHARGED
S19.007	S86			622.954	336.839	0.6	5.0	FLOOD RISK
S22.000	S87			0.421	71.287	2.9	153.5	SURCHARGED
S22.001	S88			2.980	99.275	2.9	205.2	SURCHARGED
S22.002	S89			2.083	98.839	2.9	203.7	SURCHARGED
S22.003	S90			208.038	106.181	0.4	2.0	FLOOD RISK

Appendix C

MicroDrainage Network

Pipes number 1.012 and 1.013 loop to the 'dummy' pipe number 1.020, located to the south-east, whereby a constant, total flow rate of 13.0l/s have been removed from Infiltration Basin 1 (i.e. S42) and Infiltration Basin 2 (i.e. S54) via Depth/Flow Relationship units.

Exceedances from Infiltration Basin 1 (S42) will overflow into the following Infiltration Basin 2 (S54), located at the downstream side, via a Weir Manhole unit located within chamber S42.

Exceedances from Infiltration Basin 2 (S54) will overflow into the following Attenuation Basin 2 (S55), located at the downstream side, via a Weir Manhole unit located within chamber S54.

Attenuated outflow rates from the Attenuation Basin 1 (SS3) would be restricted to the maximum value of 3.0l/s and discharged into Infiltration Basin 2 (S54), located at the downstream side, via a Hydro-Brake unit located within chamber S53.

Attenuated outflow rates from the Attenuation Basin 2 (SS5) would be restricted to the maximum value of 7.4l/s and discharged into the downstream drainage system (S61) allocated within the southern catchment, via a Hydro-Brake unit located within chamber S55.

Pipes number 1.012 and 1.013 loop to the 'dummy' pipe number 1.020, located to the south-east, whereby a constant, total flow rate of 13.0l/s (Depth/Flow Relationship) has been removed from Infiltration Basin 1 (i.e. S42) and Infiltration Basin 2 (i.e. S54).

Exceedances from Infiltration Basin 1 (S42) will overflow into the following Infiltration Basin 2 (S54), located at the downstream side, via a Weir Manhole unit located within chamber S42.

Exceedances from Infiltration Basin 2 (S54) will overflow into the following Attenuation Basin 2 (S55), located at the downstream side, via a Weir Manhole unit located within chamber S54.

Attenuated outflow rates from the Attenuation Basin 1 (S53) would be restricted to the maximum value of 3.0l/s and discharged into Infiltration Basin 2 (S54), located at the downstream side, via a Hydro-Brake unit located within chamber S53.

Attenuated outflow rates from the Attenuation Basin 2 (S55) would be restricted to the maximum value of 7.4l/s and discharged into the downstream drainage system (S61) allocated within the southern catchment, via a Hydro-Brake unit located within chamber S55.

A constant flow rate of 7.0l/s (Depth/Flow Relationship) has been removed from Infiltration Basin 3 (S74) via the 'dummy' pipe number 1.019, which also connects to the immediate downstream 'dummy' pipe number 1.020.

A constant, total flow rate of 7.0l/s (Depth/Flow Relationship) has been removed from Infiltration Basin 4 (S86) and Infiltration Basin 5 (S90) via the 'dummy' pipe numbers 19.007 and 22.003.

Appendix D

Updated Surface Water Drainage Strategy

DRAINAGE STRATEGY

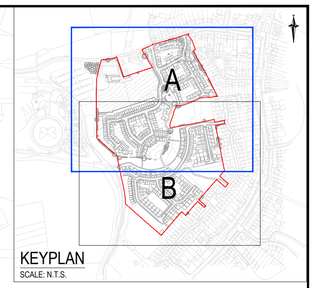
- All surface water run-off from the proposed development are to be discharged by gravity into two infiltration basins, established in 'cascade', before discharging to the underlaying chalk bedrock via deep boreholes, with no direct discharges off-site.
- Two attenuation basins will be established both to the west and south of the infiltration basins location in order to provide additional surface water storage. Flows will be attenuated at a restricted maximum rate of 3.0 l/s and 7.0 l/s for all rainfall events including 1:100 year+40%CC event, using Hydro-Brake flow controls, before discharging into infiltration basin 2 and then into the downstream drainage system allocated within the southern land parcel.
- Deep borehole soakaways will be assigned to the base level of the infiltration basin, in order to reach the chalk bedrock (Lewes Nodular Chalk and Seaford Chalk Formationst) and allow store run-off from the proposed development to infiltrate into the underlying chalk bedrock.
- Tree pits and swales will be established along the proposed major access roads as primary surface water treatment stage. Run-off from the proposed shared surfaces streets and private drives will be treated via permeable pavement as primary treatment stage.
- The SuDS features have been designed to cater for all storm events up to and including the 1 in 100 year + 40% climate change storm event.

Swale

Infiltration / Attenuation Basin

Tree Pits

Permeable Pavement



KEYPLAN
SCALE: N.T.S.

Notes

1. This drawing is based on OS mapping and McBains Illustrative Masterplan (Job No. LHG61860, Drg. No. REDC01-MCB-ZZ-ZZ-DR-A-0210-D5-P1, date: March 2022).
2. Dimensions not to be scaled.
3. All proposed surface water sewers and levels shown on this drawing are indicative only.
4. SuDS features sized based on MicroDrainage calculations.
5. All drainage works to be constructed as detailed in Sewers for Adoption 7th Edition or as stipulated by Local Drainage Authority as appropriate.
6. All works within root protection areas to be agreed with Arboriculturalist. Services to be installed using sensitive construction methods under supervision of an arboriculturalist.

KEY

- Proposed Surface Water Drain
- Exceedance Flow Paths

Impermeable Area managed by the SuDS:

Impermeable Area: 32.085m²

Imp. Area+10% Urban creep = **35,294m²**

Infiltration Basin (1):
Base Area: 291.2m²
Top Area: 1,150m²
Depth: 1.705m
IL: 88.095m AOD
Min. CL: 89.800m AOD
Max. Water level: 89.759m AOD *(1%AEP+40%CC)*
Max. Water depth: 1.664m deep *(1%AEP+40%CC)*
Max. Volume: 1,122.0m³ *(1%AEP+40%CC)*

Infiltration Basin (2):
Base Area: 411m²
Top Area: 810m²
Depth: 1.4m
IL: 87.000m AOD
Min. CL: 88.400m AOD
Max. Water level: 88.335m AOD *(1%AEP+40%CC)*
Max. Water depth: 1.335m deep *(1%AEP+40%CC)*
Max. Volume: 794.4m³ *(1%AEP+40%CC)*

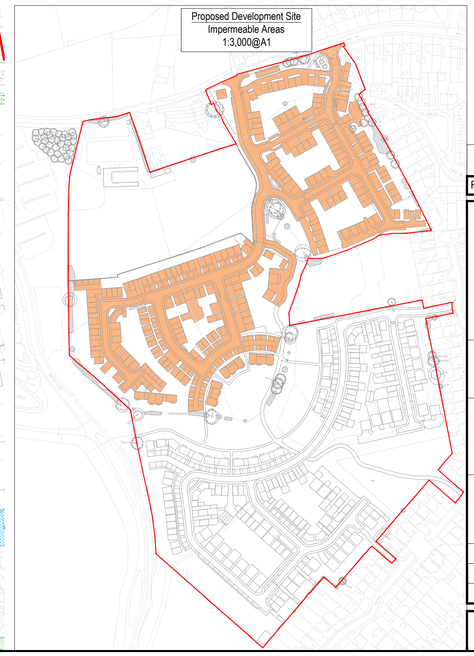
Attenuation Basin (1):
Base Area: 175.6m²
Top Area: 420m²
Depth: 1.094m
IL: 87.442m AOD
Min. CL: 88.536m AOD
Max. Water level: 88.509m AOD *(1%AEP+40%CC)*
Max. Water depth: 1.067m deep *(1%AEP+40%CC)*
Max. Volume: 310.5m³ *(1%AEP+40%CC)*
Max. Outflow rate: 3.0 l/s *(1%AEP+40%CC)*

Attenuation Basin (2):
Base Area: 181.2m²
Top Area: 530m²
Depth: 1.4m
IL: 86.000m AOD
Min. CL: 87.400m AOD
Max. Water level: 87.364m AOD *(1%AEP+40%CC)*
Max. Water depth: 1.364m deep *(1%AEP+40%CC)*
Max. Volume: 459.7m³ *(1%AEP+40%CC)*
Max. Outflow rate: 7.4 l/s *(1%AEP+40%CC)*

Deep Borehole Soakaways:
Infiltration rate: 1l/s per borehole
6 No. Deep boreholes (Infiltration Basin 1)
7 No. Deep boreholes (Infiltration Basin 2)

- Hydro-Brake Optimum unit *(as shown in plan)*
- Weir Manhole *(as shown in plan)*
- Proposed headwall
- Proposed permeable pavement
- Indicative location of potential tree pits
- Indicative location of potential swales

Rev.	Description	Date	Chkd
P9	Updated in accordance with the comments from LPA	09/08/2022 AQ	JB



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Client :
Alban Developments, Alban Peter Pearson, CALA Homes (Chiltern) & Redington Capital

Project :
Land south of Chiswell Green Lane

Title :
Indicative Surface Water Drainage Strategy (North Catchment)

Project Engineer :	A. Quigley	Scale :	1:750@A1
Project Director :	J. Birch	Date :	August 2022
Status :	Planning		

Drawing No. 8210856 - SK01/A Rev P9

Infiltration basin (1)
IL = 88.095m
Highest water level = 89.759m
Min. CL = 89.800m

Infiltration basin (2)
IL = 87.000m
Highest water level = 88.335m
Min. CL = 88.400m

Attenuation basin (2)
IL = 86.000m
Highest water level = 87.364m
Min. CL = 87.400m

Attenuation basin (1)
IL = 87.442m
Highest water level = 88.509m
Min. CL = 88.536m

15.0 0.0 15.0 30.0 45.0 60.0 75.0
Scale = 1:750 @ A1

DRAINAGE STRATEGY

- All surface water run-off from the proposed development are to be discharged by gravity into three infiltration basins before discharging to the underlaying chalk bedrock via deep boreholes, with no direct discharges off-site.
- Infiltration basin 1 established to the east of the site, behind the tree line, would also managed attenuated run-off rates from northern drainage system, allocated within the northern land parcel. Deep borehole soakaways will be assigned to the base level of the infiltration basin, in order to reach the chalk bedrock (Lewes Nodular Chalk and Seaford Chalk Formationst) and allow store run-off from the proposed development to infiltrate into the underlying chalk bedrock.
- Tree pits and swales will be established along the proposed major access roads as primary surface water treatment stage. Run-off from the proposed shared surfaces streets and private drives will be treated via permeable pavement as primary treatment stage.
- The SuDS features have been designed to cater for all storm events up to and including the 1 in 100 year + 40% climate change storm event.

Tree Pits

Infiltration Basin

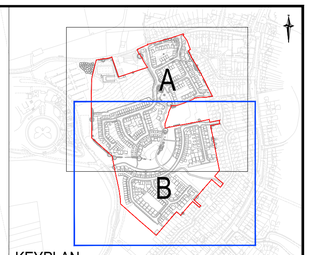
Infiltration basin (5)
IL = 84.855m
Highest water level = 85.727m
Min. CL = 85.855m

Infiltration basin (4)
IL = 83.427m
Highest water level = 84.813m
Min. CL = 85.000m

Infiltration basin (3)
IL = 83.500m
Highest water level = 84.964m
Min. CL = 85.000m

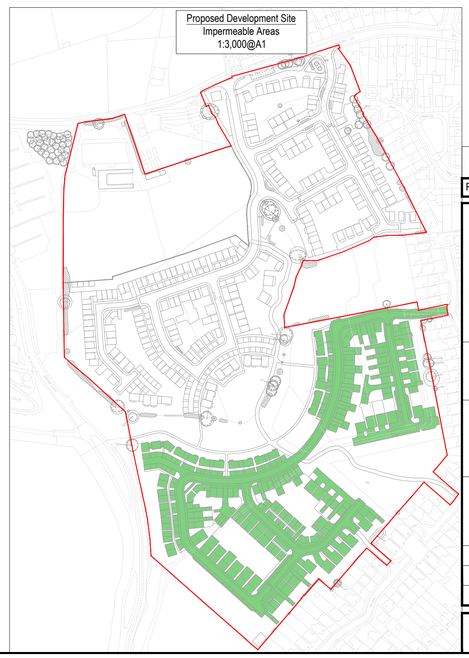
Swale

Permeable Pavement



KEYPLAN
SCALE: N.T.S.

Proposed Development Site
Impermeable Areas
1:3,000@A1



0.0 15.0 30.0 45.0 60.0 75.0
Scale = 1:750 @ A1

Notes

1. This drawing is based on OS mapping and McBains Illustrative Masterplan (Job No. LHG61860, Drg. No. REDC01-MCB-ZZ-ZZ-DR-A-0210-D5-P1, date: March 2022)
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6. All works within root protection areas to be agreed with Arboriculturalist. Services to be installed using sensitive construction methods under supervision of an arboriculturalist.

KEY

- Proposed Surface Water Drain
- Exceedance Flow Paths

Impermeable Area managed by the SuDS:

Impermeable Area: 26,055m²

Imp. Area+10% Urban creep = **28,661m²**

Infiltration Basin (3):
Base Area: 427.2m²
Top Area: 1,151m²
Sides Slope: 1/3
Depth: 1.5m
Min. CL: 85.000m AOD
IL: 83.500m AOD
Max. Water level: 84.964m AOD *(1%AEP+40%CC)*
Max. Water depth: 1.464m deep *(1%AEP+40%CC)*
Max. Volume: 1,108.3m³ *(1%AEP+40%CC)*

Infiltration Basin (4):
Base Area: 300m²
Top Area: 659.7m²
Sides Slope: 1/3
Depth: 1.573m
Min. CL: 85.000m AOD
IL: 83.427m AOD
Max. Water level: 84.813m AOD *(1%AEP+40%CC)*
Max. Water depth: 1.386m deep *(1%AEP+40%CC)*
Max. Volume: 623.0m³ *(1%AEP+40%CC)*

Infiltration Basin (5):
Base Area: 169m²
Top Area: 335.5m²
Sides Slope: 1/3
Depth: 1.0m
Min. CL: 85.855m AOD
IL: 84.855m AOD
Max. Water level: 85.727m AOD *(1%AEP+40%CC)*
Max. Water depth: 0.872m deep *(1%AEP+40%CC)*
Max. Volume: 208.0m³ *(1%AEP+40%CC)*

Deep Borehole Soakaways:
Infiltration rate: 1l/s per borehole
7 No. Deep boreholes *(Infiltration Basin 3)*
5 No. Deep boreholes *(Infiltration Basin 4)*
2 No. Deep boreholes *(Infiltration Basin 5)*

- Hydro-Brake Optimum unit *(as shown in plan)*
- Weir Manhole *(as shown in plan)*
- Proposed headwall
- Proposed permeable pavement
- Indicative location of potential tree pits
- Indicative location of potential swales

Rev.	Description	Date	Chkd
P8	Updated in accordance with the comments from LPA	09/08/2022 AQ	JB

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Project :
Land south of Chiswell Green Lane

Title :
Indicative Surface Water Drainage Strategy (South Catchment)

Project Engineer :	A. Quigley	Scale :	1:750@A1
Project Director :	J. Birch	Date :	August 2022
Status :	Planning		

Drawing No. 8210856 - SK01/B Rev P8