TECHNICAL NOTE

DATE	**15 December 2017**	**CONFIDENTIALITY**	**Public**
SUBJECT	**Surface and Foul Water Drainage Overview**		
PROJECT Bicester	**AUTHOR AJG**	**CHECKED MPB**	**APPROVED MPB**
Project no. 70033775			

1. INTRODUCTION

1.1. This note has been prepared to provide an overview of how surface water drainage and foul water drainage for the new Phase 1A development at Bicester Gateway is being addressed in order to achieve the objectives of providing a sustainable drainage solution for the new development whilst not increasing flooding in areas beyond the site.

2. EXISTING SITE

2.1. The existing site is a green field site bounded to the North West by the A41 Oxford Road, to the South East by Wendlebury Road and to the South by Vendee Drive. The site currently drains from north to south to an existing ditch on the eastern boundary of the site. An existing 450mm diameter surface water culvert runs through the southern part of the site in South Easterly direction.

3. SURFACE WATER DRAINAGE

3.1. The National Planning Policy Framework (NPPF) requires that new developments do not increase flood risk by reducing the current flood storage capacity of a site or increase storm water runoff form a site. In accordance with NPPF it is the intention that the design for the development drainage system attenuates surface water discharge rates back to Greenfield runoff rates including for the effects of climate change, as such the development will not increase the offsite storm water flows or the extent of flooding offsite compared to the undeveloped site. Sustainable Urban Drainage (SuDS) are the most sustainable method of achieving this and may also offer the opportunity for betterment.

3.2. As part of the planning process, the feasibility of integrating various SuDs techniques is being informed by an appraisal of the existing information, namely topographical, flood modelling and the underlying ground condition/geology.

3.3. SuDS are the preferred approach to managing rainfall runoff generated from impermeable surfaces and will be employed as a key sustainability feature of the new development at Bicester Gateway. SuDs can be used to reduce the rate and volume of surface water discharges from developments to the receiving environment (e.g. natural watercourses, public sewers) thereby reducing flood risk, as well as treating pollutants, improving water quality, maintaining recharge to groundwater and providing a natural amenity and green space within a development while also enhancing biodiversity.

3.4. There are various SuDS techniques that are available and operate on two main principles:

- Infiltration; and
- Attenuation.

3.5. Infiltration SuDS rely on discharging to ground, where suitable ground conditions allow. Infiltration methods include the use of permeable pavements under roads and parking areas, infiltration trenches, soakaways and other techniques that are generally located below ground such as geo cellular systems. Their effectiveness depends on the soakage potential of the underlying geology. From a review of the Flood Risk Assessment undertaken by HDL it would appear that there is not a high potential across the site due to the ground conditions and high ground water.

3.6. However, where site ground conditions are deemed unsuitable for the widespread implementation of infiltration techniques, surface water runoff will need to be attenuated using on-site attenuation storage. On site 'above ground' storage measures include basins, ponds and swales, with 'below ground' facilities generally following the more engineered forms of underground storage.

3.7. The proposed surface water drainage strategy is shown on the accompanying WSP Drawing Number 3775-WSP-00-ZZ-DR-CE-1002.

3.8. The surface water drainage strategy proposes to restrict the rate of discharge to the existing ditch to a green field rate of 4.6l/s for up to the 1 in 100 year critical storm return event with 30% allowance for climate change. The restricted discharge will be controlled by a hydro brake chamber located adjacent to the low point of the proposed car park.

3.9. The attenuation volume required will be provided in the form of permeable pavements under the proposed roads and parking areas. These will include concrete block paving and tarmac construction with course graded aggregate below. To help slow the flow of water through the permeable pavements and maximise the storage available for attenuation check dams with control pipes/openings will be located within the aggregate foundation.

3.10. Surface water runoff from the roof areas of the proposed hotel will be collected in rainwater pipes which will discharge to the permeable pavement course graded aggregate. Flow diffuser chambers will be included so as to help avoid erosion of the aggregate construction.

3.11. The existing 450mm diameter culvert will be removed and diverted by a proposed swale and French drain arrangement which will include a perforated pipe running alongside the western and southern boundaries of the site. Inspection chambers will be provided for the purposes of maintenance.

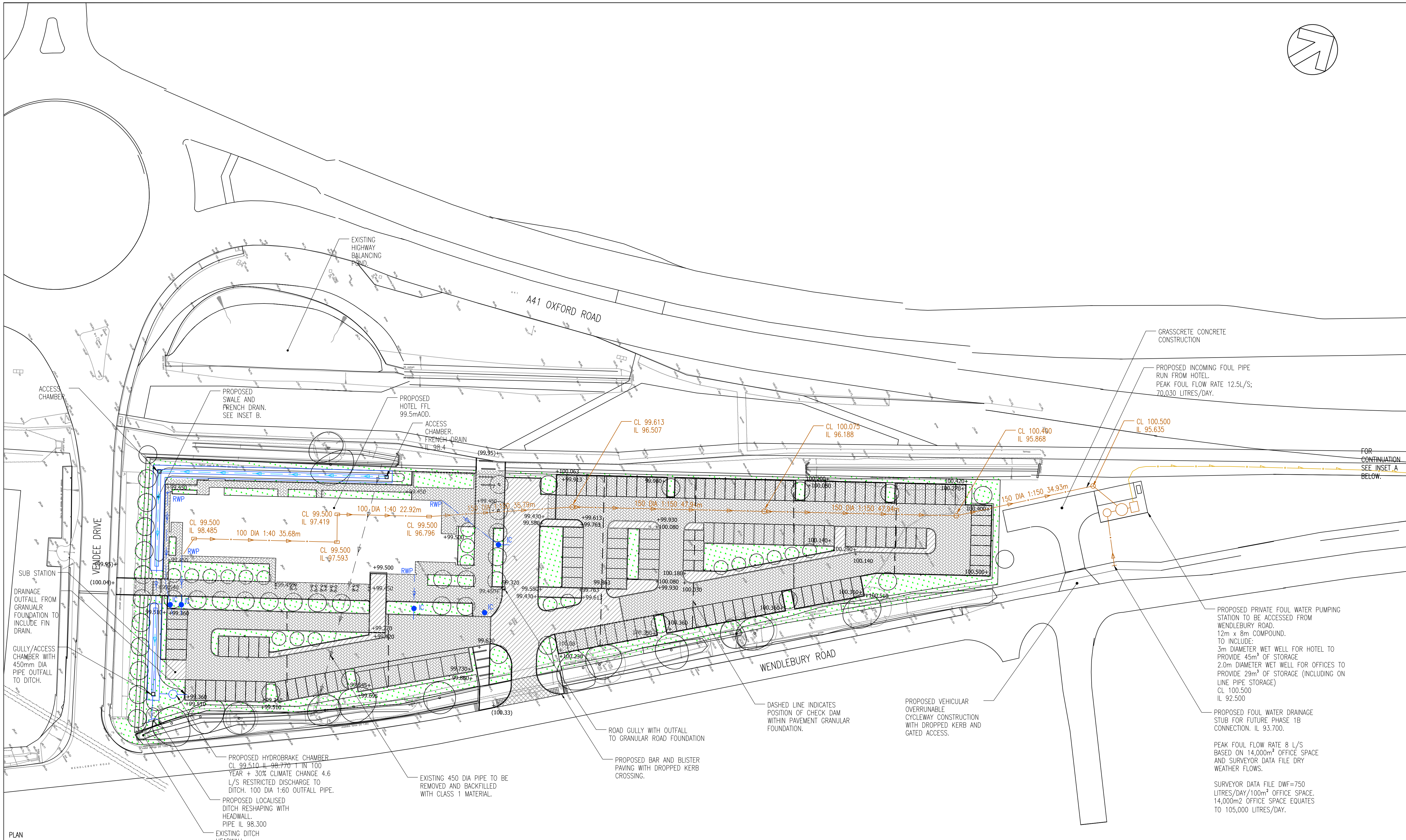
3.12. The accompanying surface water drainage hydraulic calculations have been prepared using the software Micro Drainage WinDes to support the drainage strategy.

4. FOUL WATER DRAINAGE

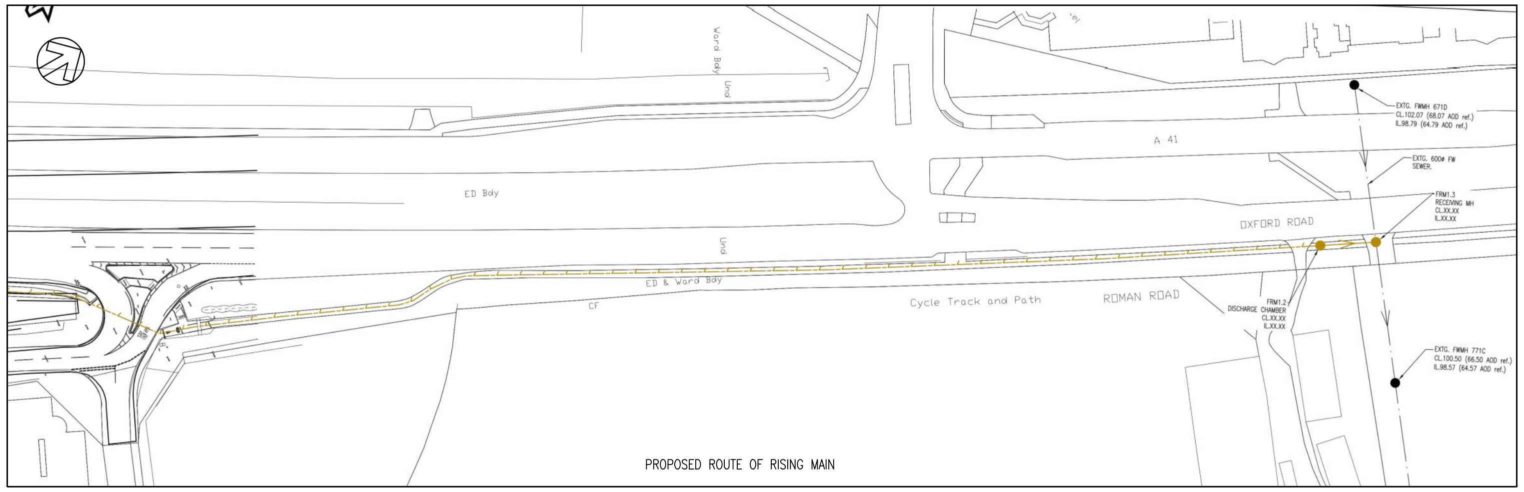
4.1. The proposed foul water drainage strategy is included on the accompanying WSP Drawing Number 3775-WSP-00-ZZ-DR-CE-1002.

4.2. The foul water discharge from the new hotel will be collected by a new on site gravity pipe system which will outfall to a new private foul water pumping station located north of the Phase 1A site. Foul water storage in to meet the requirements of Sewers for Adoption 7th edition will be provided for the hotel within the on site gravity pipes and manholes and a 3m diameter wet well within the pumping station compound. The foul flows will be pumped via a rising main to the existing Thames Water public sewer located in Oxford Road a distance of approximately 0.45km to the north.

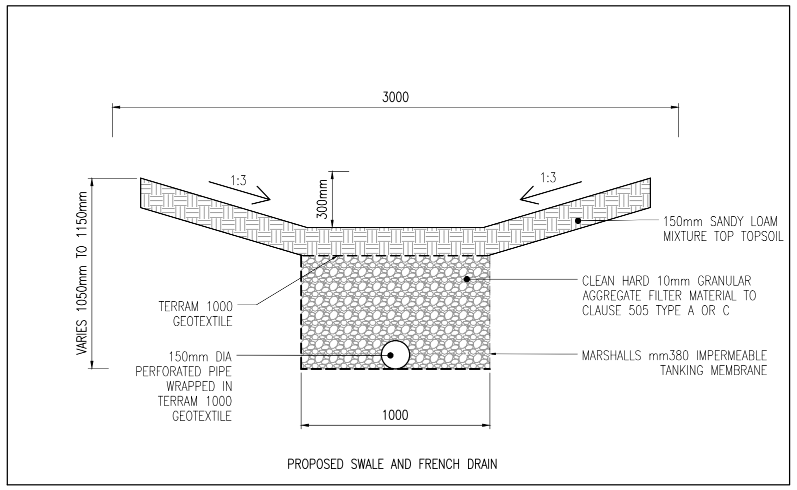
4.3. As part of the pumping station arrangement a second wet well with a 2.4m diameter and foul stub will be provided to serve the future Phase 1b development. The 2.4m diameter chamber has been sized to provide the required foul storage for the proposed office space in accordance with Sewers for Adoption whilst taking into account the on line storage within the future upstream pipes and manholes.



PLAN
SCALE 1:500



INSET A
SCALE 1:1000



INSET B
SCALE 1:50

DO NOT SCALE

NOTES

1. ALL DIMENSIONS SHOWN ARE IN METRES UNLESS OTHERWISE STATED.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM.
3. THIS DRAWING IS BASED ON:

TURKINGTON MARTIN'S LANDSCAPE MASTERPLAN TM336L01

TOPOGRAPHICAL SURVEY BY TARGET SURVEYS LIMITED REFERENCE 1206/1 DATED APRIL 2015.

4. REFER TO DRAWING NUMBER 3775-WSP-00-ZZ-DR-CE-1004 FOR SECTION AND DETAILS.

KEY

- PROPOSED PRIVATE FOUL WATER DRAINAGE
- PROPOSED PRIVATE FOUL WATER RISING MAIN
- PROPOSED PRIVATE SURFACE WATER DRAINAGE
- PROPOSED PRIVATE SURFACE WATER DRAINAGE PERFORATED PIPE
- RWP IC — PROPOSED RAIN WATER PIPE WITH FLOW DIFFUSER CHAMBER AND DISCHARGE TO GRANULAR PAVING CONSTRUCTION.
- PROPOSED TARMAC CONSTRUCTION WITH NORMAL CONSTRUCTION BELOW FOR JUNCTION ACCESS.
- PROPOSED TARMAC CONSTRUCTION WITH COURSE GRADED AGGREGATE BELOW.
- PROPOSED CONCRETE BLOCK PAVING TO LANDSCAPE ARCHITECT DETAILS.
- PROPOSED SOFT LANDSCAPING NOTE: REFER TO LANDSCAPE ARCHITECT DETAILS FOR TREE PITS.
- +99.360 PROPOSED FINISHED LEVEL.

REV	DATE	BY	DESCRIPTION	CHK	APP
P01	15/12/2017	MM	FIRST ISSUE	AJG	MB

DRAWING STATUS:
S2 - FOR INFORMATION

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wsp.com

CLIENT:
ATLAS HOTELS GROUP

ARCHITECT:
NORR

SITE/PROJECT:
HOLIDAY INN EXPRESS
BICESTER GATEWAY

TITLE:
DRAINAGE STRATEGY

SCALE @ A1:	CHECKED:		APPROVED:
AS SHOWN	AJG		MB
PROJECT No:	DESIGNED:	DRAWN:	DATE:
70033775	MM	MM	December 17

DRAWING No: 3775-WSP-00-ZZ-DR-CE-1002
REV: P01

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	2
Site Location	GB 454350 208500 SP 54350 08500
C (1km)	-0.023
D1 (1km)	0.345
D2 (1km)	0.312
D3 (1km)	0.226
E (1km)	0.292
F (1km)	2.461
Maximum Rainfall (mm/hr)	50
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

- Indicates pipe length does not match coordinates
« - 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)	Auto Design
S1.000	1.000#	0.010	100.0	0.050	4.00	0.0	0.600	oo	-2	
S1.001	1.000#	0.010	100.0	0.066	0.00	0.0	0.600	oo	-2	
S1.002	1.000#	0.010	100.0	0.071	0.00	0.0	0.600	oo	-2	
S1.003	1.000#	0.010	100.0	0.150	0.00	0.0	0.600	oo	-2	
S1.004	1.000#	0.010	100.0	0.247	0.00	0.0	0.600	oo	-2	

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	4.03	99.831	0.050	0.0	0.0	0.0	0.48	1.9«	6.8
S1.001	50.00	4.07	99.685	0.116	0.0	0.0	0.0	0.48	1.9«	15.7
S1.002	50.00	4.10	99.539	0.187	0.0	0.0	0.0	0.48	1.9«	25.4
S1.003	50.00	4.14	99.198	0.338	0.0	0.0	0.0	0.48	1.9«	45.7
S1.004	50.00	4.17	98.849	0.585	0.0	0.0	0.0	0.48	1.9«	79.2

Note: -2 conduit: 2 no. 50mm diameter openings within check dam.

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)	Auto Design
S1.005	1.000#	0.010	100.0	0.044	0.00	0.0	0.600	oo	-2	🔒
S1.006	2.933	0.020	146.7	0.058	0.00	0.0	0.600	o	150	🔒
S1.007	5.010	0.034	147.4	0.000	0.00	0.0	0.600	o	150	🔒
S2.000	57.141	0.050	1143.0	0.015	4.00	0.0	0.600	o	150	🔒
S2.001	23.769	0.021	1143.0	0.005	0.00	0.0	0.600	o	150	🔒
S2.002	10.458	0.009	1143.0	0.024	0.00	0.0	0.600	o	450	🔒
S2.003	21.075	0.018	1143.0	0.004	0.00	0.0	0.600	o	150	🔒
S1.008	6.707	0.037	181.3	0.000	0.00	0.0	0.600	o	450	🔒

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)
S1.005	50.00	4.21	98.793	0.629	0.0	0.0	0.0	0.48	1.9«	85.2
S1.006	50.00	4.27	98.790	0.687	0.0	0.0	0.0	0.83	14.6«	93.0
S1.007	50.00	4.37	98.770	0.687	0.0	0.0	0.0	0.83	14.6«	93.0
S2.000	50.00	7.29	98.400	0.015	0.0	0.0	0.0	0.29	5.1	2.0
S2.001	50.00	8.66	98.350	0.020	0.0	0.0	0.0	0.29	5.1	2.7
S2.002	50.00	8.96	98.329	0.044	0.0	0.0	0.0	0.59	94.3	5.9
S2.003	47.19	10.17	98.239	0.047	0.0	0.0	0.0	0.29	5.1«	6.0
S1.008	46.96	10.24	98.337	0.734	0.0	0.0	0.0	1.51	239.7	93.4

Note: -2 conduit: 2 no. 50mm diameter openings within check dam.

Online Controls for Storm

Hydro-Brake Optimum® Manhole: S7, DS/PN: S1.007, Volume (m³): 0.9

Unit Reference	MD-SHE-0106-4600-0650-4600
Design Head (m)	0.650
Design Flow (l/s)	4.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Diameter (mm)	106
Invert Level (m)	98.770
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	0.650	4.6
Flush-Flo™	0.201	4.6
Kick-Flo®	0.451	3.9
Mean Flow over Head Range	-	3.9

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)**
0.100	3.6	1.200	6.1	3.000	9.4	7.000	14.0
0.200	4.6	1.400	6.6	3.500	10.1	7.500	14.5
0.300	4.5	1.600	7.0	4.000	10.8	8.000	15.0
0.400	4.2	1.800	7.4	4.500	11.4	8.500	15.5
0.500	4.1	2.000	7.8	5.000	12.0	9.000	15.9
0.600	4.4	2.200	8.1	5.500	12.5	9.500	16.4
0.800	5.1	2.400	8.5	6.000	13.1		
1.000	5.6	2.600	8.8	6.500	13.6		

Note: Hydro brake control to restrict discharge to 4.6l/s for 1 in 100 year + 30%cc.

Storage Structures for Storm

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

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	22.5
Membrane Percolation (mm/hr)	1000	Length (m)	22.2
Max Percolation (l/s)	138.8	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	99.831	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S2, DS/PN: S1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	26.4
Membrane Percolation (mm/hr)	1000	Length (m)	25.0
Max Percolation (l/s)	183.3	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	99.685	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S3, DS/PN: S1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	16.0
Membrane Percolation (mm/hr)	1000	Length (m)	44.4
Max Percolation (l/s)	197.3	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	99.539	Cap Volume Depth (m)	0.350

Porous Car Park Manhole: S4, DS/PN: S1.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	36.8
Membrane Percolation (mm/hr)	1000	Length (m)	22.3
Max Percolation (l/s)	228.0	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	99.198	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S5, DS/PN: S1.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	36.0
Membrane Percolation (mm/hr)	1000	Length (m)	36.5
Max Percolation (l/s)	365.0	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	98.849	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S6, DS/PN: S1.005

Infiltration Coefficient Base (m/hr)	0.00000	Max Percolation (l/s)	75.6
Membrane Percolation (mm/hr)	1000	Safety Factor	2.0

Porous Car Park Manhole: S6, DS/PN: S1.005

Porosity	0.32	Slope (1:X)	1000.0
Invert Level (m)	98.793	Depression Storage (mm)	5
Width (m)	17.0	Evaporation (mm/day)	3
Length (m)	16.0	Cap Volume Depth (m)	0.500

Porous Car Park Manhole: S7, DS/PN: S1.006

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	23.0
Membrane Percolation (mm/hr)	1000	Length (m)	23.0
Max Percolation (l/s)	146.9	Slope (1:X)	1000.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.32	Evaporation (mm/day)	3
Invert Level (m)	98.790	Cap Volume Depth (m)	0.440

Filter Drain Manhole: S9, DS/PN: S2.000

Infiltration Coefficient Base (m/hr)	0.00000	Trench Length (m)	57.1
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.000
Porosity	0.30	Slope (1:X)	1143.0
Invert Level (m)	98.400	Cap Volume Depth (m)	0.600
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000

Filter Drain Manhole: S10, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	0.00000	Trench Length (m)	23.8
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.000
Porosity	0.30	Slope (1:X)	1143.0
Invert Level (m)	98.350	Cap Volume Depth (m)	0.600
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000

Filter Drain Manhole: S11, DS/PN: S2.002

Infiltration Coefficient Base (m/hr)	0.00000	Trench Length (m)	21.1
Infiltration Coefficient Side (m/hr)	0.00000	Pipe Diameter (m)	0.150
Safety Factor	2.0	Pipe Depth above Invert (m)	0.000
Porosity	0.30	Slope (1:X)	1143.0
Invert Level (m)	98.329	Cap Volume Depth (m)	0.600
Trench Width (m)	1.0	Cap Infiltration Depth (m)	0.000

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	10
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location	GB 454350 208500 SP 54350 08500
C (1km)	-0.023
D1 (1km)	0.345
D2 (1km)	0.312
D3 (1km)	0.226
E (1km)	0.292
F (1km)	2.461
Cv (Summer)	0.750
Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	240 Winter	1	+0%	30/30 Winter				99.855
S1.001	S2	360 Winter	1	+0%	30/15 Winter				99.720
S1.002	S3	480 Winter	1	+0%	30/15 Summer				99.587
S1.003	S4	480 Winter	1	+0%	1/120 Summer				99.266
S1.004	S5	960 Winter	1	+0%	1/60 Summer				98.952
S1.005	S6	960 Winter	1	+0%	1/60 Winter				98.910
S1.006	S7	960 Winter	1	+0%	30/960 Winter				98.864
S1.007	S7	960 Winter	1	+0%	30/480 Winter				98.860
S2.000	S9	15 Winter	1	+0%	100/15 Summer				98.445
S2.001	S10	30 Winter	1	+0%	100/15 Summer				98.402
S2.002	S11	60 Winter	1	+0%					98.386
S2.003	S12	960 Winter	1	+0%	30/15 Summer				98.385

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	-0.026	0.000	0.36		0.7	OK	
S1.001	S2	-0.015	0.000	0.61		1.2	OK	
S1.002	S3	-0.002	0.000	0.76		1.5	OK	
S1.003	S4	0.018	0.000	1.24		2.5	SURCHARGED	
S1.004	S5	0.053	0.000	1.45		2.9	SURCHARGED	
S1.005	S6	0.067	0.000	1.51		3.0	SURCHARGED	
S1.006	S7	-0.076	0.000	0.30		3.2	OK	
S1.007	S7	-0.060	0.000	0.28		3.2	OK	
S2.000	S9	-0.105	0.000	0.18		1.0	OK*	
S2.001	S10	-0.098	0.000	0.19		0.9	OK*	
S2.002	S11	-0.393	0.000	0.02		1.8	OK*	
S2.003	S12	-0.004	0.000	0.10		0.5	OK*	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.008	S13	960 Winter	1	+0%					98.383

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.008	S13	-0.404	0.000	0.02		3.4	OK	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	10
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location	GB 454350 208500 SP 54350 08500
C (1km)	-0.023
D1 (1km)	0.345
D2 (1km)	0.312
D3 (1km)	0.226
E (1km)	0.292
F (1km)	2.461
Cv (Summer)	0.750
Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	120 Winter	30	+0%	30/30 Winter				99.888
S1.001	S2	240 Winter	30	+0%	30/15 Winter				99.767
S1.002	S3	360 Winter	30	+0%	30/15 Summer				99.642
S1.003	S4	480 Winter	30	+0%	1/120 Summer				99.365
S1.004	S5	960 Winter	30	+0%	1/60 Summer				99.149
S1.005	S6	960 Winter	30	+0%	1/60 Winter				99.052
S1.006	S7	960 Winter	30	+0%	30/960 Winter				98.951
S1.007	S7	960 Winter	30	+0%	30/480 Winter				98.945
S2.000	S9	15 Winter	30	+0%	100/15 Summer				98.487
S2.001	S10	15 Winter	30	+0%	100/15 Summer				98.462
S2.002	S11	15 Winter	30	+0%					98.450
S2.003	S12	15 Winter	30	+0%	30/15 Summer				98.445

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.007	0.000	0.99		2.0	SURCHARGED	
S1.001	S2	0.032	0.000	1.49		3.0	SURCHARGED	
S1.002	S3	0.053	0.000	1.81		3.6	SURCHARGED	
S1.003	S4	0.117	0.000	2.54		5.1	SURCHARGED	
S1.004	S5	0.250	0.000	2.25		4.5	SURCHARGED	
S1.005	S6	0.209	0.000	2.27		4.5	SURCHARGED	
S1.006	S7	0.011	0.000	0.43		4.6	SURCHARGED	
S1.007	S7	0.025	0.000	0.39		4.6	SURCHARGED	
S2.000	S9	-0.063	0.000	0.46		2.5	OK*	
S2.001	S10	-0.038	0.000	0.69		3.2	OK*	
S2.002	S11	-0.329	0.000	0.06		6.4	OK*	
S2.003	S12	0.056	0.000	1.66		7.4	SURCHARGED*	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.008	S13	30 Winter	30	+0%					98.409

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.008	S13	-0.378	0.000	0.06		9.1	OK	

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

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	10
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Site Location	GB 454350 208500 SP 54350 08500
C (1km)	-0.023
D1 (1km)	0.345
D2 (1km)	0.312
D3 (1km)	0.226
E (1km)	0.292
F (1km)	2.461
Cv (Summer)	0.750
Cv (Winter)	0.840

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

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.000	S1	60 Winter	100	+30%	30/30 Winter				99.935
S1.001	S2	240 Winter	100	+30%	30/15 Winter				99.839
S1.002	S3	360 Winter	100	+30%	30/15 Summer				99.728
S1.003	S4	960 Winter	100	+30%	1/120 Summer				99.546
S1.004	S5	960 Winter	100	+30%	1/60 Summer				99.474
S1.005	S6	960 Winter	100	+30%	1/60 Winter				99.334
S1.006	S7	1440 Winter	100	+30%	30/960 Winter				99.238
S1.007	S7	1440 Winter	100	+30%	30/480 Winter				99.233
S2.000	S9	15 Winter	100	+30%	100/15 Summer				98.584
S2.001	S10	15 Winter	100	+30%	100/15 Summer				98.564
S2.002	S11	15 Winter	100	+30%					98.554
S2.003	S12	15 Winter	100	+30%	30/15 Summer				98.551

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.000	S1	0.054	0.000	1.82		3.6	SURCHARGED	
S1.001	S2	0.104	0.000	2.41		4.8	SURCHARGED	
S1.002	S3	0.139	0.000	2.75		5.5	FLOOD RISK	
S1.003	S4	0.298	0.000	3.30		6.6	FLOOD RISK	
S1.004	S5	0.575	0.000	3.08		6.2	FLOOD RISK	
S1.005	S6	0.491	0.000	2.82		5.7	FLOOD RISK	
S1.006	S7	0.298	0.000	0.43		4.6	FLOOD RISK	
S1.007	S7	0.313	0.000	0.40		4.6	FLOOD RISK	
S2.000	S9	0.034	0.000	0.69		3.8	SURCHARGED*	
S2.001	S10	0.064	0.000	1.30		6.1	SURCHARGED*	
S2.002	S11	-0.225	0.000	0.11		11.4	OK*	
S2.003	S12	0.162	0.000	2.87		12.7	SURCHARGED*	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
S1.008	S13	15 Winter	100	+30%					98.436

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
S1.008	S13	-0.351	0.000	0.11		16.6	OK	