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Project No. 34320	
Sheet No. 1	Rev. -
Date 30.09.2020	
Designer MP	

Project: **Proposed Car Park Improvements at Drapers Place, Spalding, Lincs.**

Title:	**Surface Water Design Calculations**
Project:	**Proposed Car Park at**
Location:	**Drapers Place, Spalding, Lincs.**
Client:	**Lincolnshire Trading and Management**
Project Ref:	**34320**
Prepared By:	**M.Pett**
Date:	**September 2020**
Doc Ref:	**34320-MD-01**

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Project: **Proposed Car Park Improvements at Drapers Place, Spalding, Lincs.**

Drainage Statement:

Introduction:

The proposals relate to the existing car park improvements at the above site.

The current proposals are to provide a finished surface together with suitable surface water drainage management.

Site Location & Description:

The existing car park is located off Drapers Place / Francis Street, and has a semi-permeable unfinished surface with no positive surface water drainage.

The topographical survey indicates levels between 5.5m and 4.4m AOD. The site generally falls from the North-East to The South-West.

The sites ground conditions are water laden sandy clayey silt, overlaid by fill material, all of which are not suitable for infiltration.

The layout proposals for the 74 space car park are shown on Sensus Architecture drawing 20001-001-02 Rev.A.

Existing Surface Water:

There is currently no surface water drainage provision on site, as the existing surface is semi-permeable.

There are no dedicated Anglian Water surface water sewers adjacent to the site's boundaries, however there are multiple Anglian Water Foul and Combined. The closest surface water asset is located at the junction between Francis Street & The Crescent. However, connection to this (chamber 7551) is not feasible due to the excavations required, either down Abbey Yard or Francis Street being very difficult due to the existing building shallow foundations. In addition, these areas are congested with numerous other services.

Previous discussions have confirmed that a surface water connection to existing foul water chamber, reference 7509, would be possible albeit with a flow restriction. This foul sewer turns into a combined sewer approximately 50m downstream of the proposed connection point. Communication from Anglian Water dated 26th October 2016 is attached.

SuDS Considerations:

The SuDS hierarchy has been given consideration during the proposed drainage design. As highlighted previously, it has been established that the sites geotechnical characteristics do not lend themselves to an infiltration strategy.

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The use of swales and infiltration trenches was considered however due to the sites natural topography these would have to be located adjacent to existing buildings. Therefore, the use of these devices is unsuitable for this site.

The relatively small nature of the site makes the use of attenuation basins unfeasible, as the loss of parking spaces would be too high.

Therefore, the drainage design will be based upon the use of underground storage crates.

Surface Water Proposals:

It is proposed to collect the surface water run-off from the impermeable tarmac surface via a combination of drainage channel and gullies.

The surface water will be conveyed through an underground pipe network to a bypass separator to remove any oil contamination.

Downstream of this at the final proposed chamber will be a HydroBrake flow control device to restrict flows to 5 litres / second. This reduced flow will then discharge into the existing Anglian Water foul sewer.

Attenuation is to be incorporated into the upstream pipe network in the form of online attenuation crates. These will be located either side of a perforated diffuser pipe. These have been designed to store surface water run-off up to and including the 1 in 100 plus climate change allowance event. Therefore, there will be no surface water flooding.

The surface water design calculation are included below.

The drainage arrangement is shown on SRC drawing 34320 / 01.

Maintenance:

The proposed system will be the maintenance responsibility on the client, Lincolnshire Trading and Management.

Inspections and maintenance should be carried out yearly, as well as after or during use and/or heavy storms, in order that they continue to perform effectively.

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Project No. 34320	
Sheet No. 4	Rev. -
Date 30.09.2020	
Designer MP	

Project: **Proposed Car Park Improvements at Drapers Place, Spalding, Lincs.**

Calculation Summary:

The following calculations demonstrate the design of the surface water drainage system serving the proposals associated with the planning application. The design proposals are shown on SRC drawing 34320/01.

The system has been designed for storms up to and including the 1:100yr +40% climate change event.

The attenuation crates have been modelled as shown on the drainage strategy drawing and provides adequate storage.

A HydroBrake restricts all surface water run-off to 5 litres/second.

The following events output simulations are included within the calculations, 1:1yr, 1:2yr, 1:30yr & 1:100yr+40%CC.

The purpose of these calculation is to support the planning application and therefore they should not be used solely, for the detailed design/construction.

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Andy Richardson <andy.richardson@srcltd.com>

RE: Residential Development, Draper's Place, Spalding

Moody Adam <aMoody2@anglianwater.co.uk> 26 October 2016 at 14:37
To: Andy Richardson <andy.richardson@srcltd.com>

Hello Andy,

My responses below :

1. We would expect a S106 sewer connection application to serve the development : http://www.anglianwater.co.uk/developers/sewer-connect.aspx

2. I would need to see a ground investigation report or similar which proves a soak away would not work.

3. Then I'd need an explanation as to why you can not connect to SW manhole 7551.

4. Yes a combined connection with separation upto the connection would be accepted upon the above being satisfied.

5. The SW discharge rate would need to be restricted to 5l/s as part of the on site attenuation.

I do hope this helps but please let me know if there is anything else I can do.

Kind regards

Adam Moody

Developer Services, WRI Engineer (Boston, South Kesteven, North Kesteven, South Holland)

Anglian Water Services Limited

PO Box 495, Huntingdon, PE29 6YY

Tel : 01604 446671

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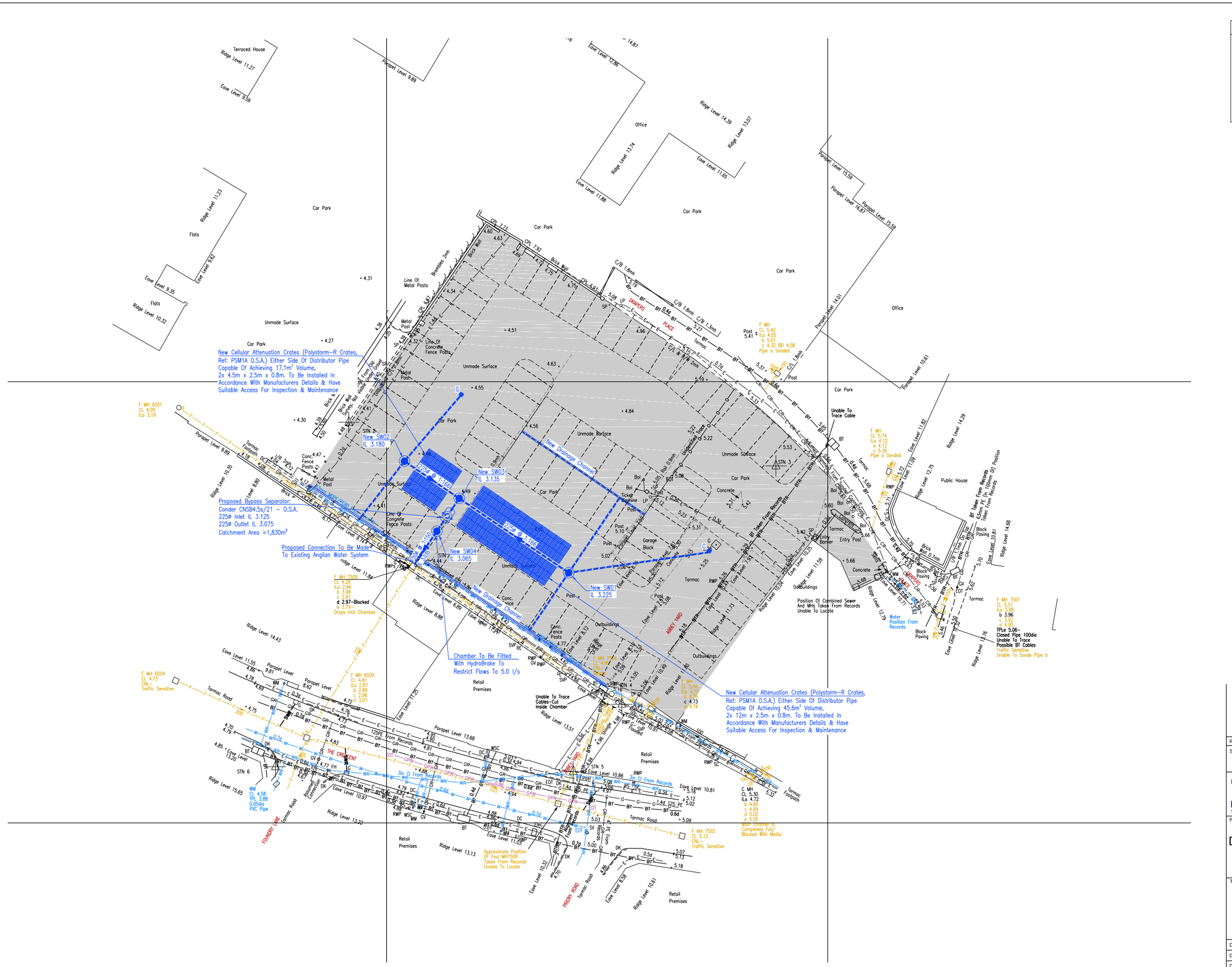

Rev	Date	Remarks

Status: FOR INFORMATION

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Project: Car Park Improvements at Drapers Place, Spalding, Lincs. For Lincolnshire Trading & Management

Title: Proposed Surface Water Drainage Strategy

Date	Sept. '20	Scale	1:200 @A1
Drawn	MP	Checked	SRC
Design	SRC	File Name	34320-01

DRG No. 34320/01 — Rev -

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Existing Network Details for Existing

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
SW1.000	15.000	0.090	166.7	0.123	5.00	0.0	0.600	o	225	Pipe/Conduit
SW2.000	7.500	0.045	166.7	0.059	5.00	0.0	0.600	o	225	Pipe/Conduit
SW1.001	7.500	0.050	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit

Network Results Table

PN	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Vel (m/s)	Cap (l/s)
SW1.000	3.175	0.123	0.0	1.01	40.2
SW2.000	3.130	0.059	0.0	1.01	40.2
SW1.001	3.085	0.183	0.0	0.82	14.5

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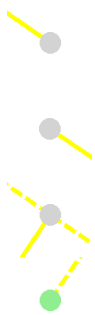
Manhole Schedules for Existing

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SW01	4.500	1.325	Open Manhole	1200	SW1.000	3.175	225				
SW02	4.500	1.370	Open Manhole	1200	SW2.000	3.130	225				
SW03	4.500	1.415	Open Manhole	1500	SW1.001	3.085	150	SW1.000	3.085	225	
								SW2.000	3.085	225	
SW	4.500	1.465	Open Manhole	0		OUTFALL		SW1.001	3.035	150	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
SW01	524680064.173	322599977.107	524680064.173	322599977.107	Required	
SW02	524680045.563	322599989.753	524680045.563	322599989.753	Required	
SW03	524680051.766	322599985.538	524680051.766	322599985.538	Required	
SW	524680047.551	322599979.334			No Entry	



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PIPELINE SCHEDULES for Existing

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)
SW1.000	o	225	SW01	4.500	3.175	1.100	Open Manhole	1200
SW2.000	o	225	SW02	4.500	3.130	1.145	Open Manhole	1200
SW1.001	o	150	SW03	4.500	3.085	1.265	Open Manhole	1500

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
SW1.000	15.000	166.7	SW03	4.500	3.085	1.190	Open Manhole	1500
SW2.000	7.500	166.7	SW03	4.500	3.085	1.190	Open Manhole	1500
SW1.001	7.500	150.0	SW	4.500	3.035	1.315	Open Manhole	0

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Area Summary for Existing

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.042	0.042	0.042
	User	-	100	0.031	0.031	0.073
	User	-	100	0.031	0.031	0.104
	User	-	100	0.020	0.020	0.123
2.000	User	-	100	0.037	0.037	0.037
	User	-	100	0.023	0.023	0.059
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.183	0.183	0.183

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Online Controls for Existing

Hydro-Brake® Optimum Manhole: SW03, DS/PN: SW1.001, Volume (m³): 3.3

Unit Reference	MD-SHE-0098-5000-1500-5000
Design Head (m)	1.500
Design Flow (l/s)	5.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	3.085
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.500	5.0
Flush-Flo™	0.431	4.9
Kick-Flo®	0.878	3.9
Mean Flow over Head Range	-	4.3

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

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

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Storage Structures for Existing

Tank or Pond Manhole: SW03, DS/PN: SW1.001

Invert Level (m) 3.085

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	78.4	0.800	78.4	0.801	0.0

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	15 Winter	1	+0%	30/15 Summer				3.283
SW2.000	SW02	60 Winter	1	+0%	30/15 Winter				3.227
SW1.001	SW03	60 Winter	1	+0%	2/30 Summer				3.226

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	-0.117	0.000	0.45		16.0	OK	
SW2.000	SW02	-0.128	0.000	0.13		3.9	OK	
SW1.001	SW03	-0.009	0.000	0.32		4.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	15 Winter	2	+0%	30/15 Summer				3.301
SW2.000	SW02	60 Winter	2	+0%	30/15 Winter				3.269
SW1.001	SW03	60 Winter	2	+0%	2/30 Summer				3.267

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	-0.099	0.000	0.59		20.7	OK	
SW2.000	SW02	-0.086	0.000	0.17		4.9	OK	
SW1.001	SW03	0.032	0.000	0.35		4.3	SURCHARGED	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	60 Winter	30	+0%	30/15 Summer				3.477
SW2.000	SW02	60 Winter	30	+0%	30/15 Winter				3.472
SW1.001	SW03	60 Winter	30	+0%	2/30 Summer				3.470

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	0.077	0.000	0.55		19.4	SURCHARGED	
SW2.000	SW02	0.117	0.000	0.31		9.2	SURCHARGED	
SW1.001	SW03	0.235	0.000	0.39		4.9	SURCHARGED	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.400
Region England and Wales Cv (Summer) 0.750
M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 2, 30, 100
Climate Change (%) 0, 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
SW1.000	SW01	120 Winter	100	+40%	30/15 Summer				4.461
SW2.000	SW02	120 Winter	100	+40%	30/15 Winter				4.457
SW1.001	SW03	120 Winter	100	+40%	2/30 Summer				4.455

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
SW1.000	SW01	1.061	0.000	0.62		22.0	FLOOD RISK	
SW2.000	SW02	1.102	0.000	0.35		10.4	FLOOD RISK	
SW1.001	SW03	1.220	0.000	0.39		4.9	FLOOD RISK	

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