



PLANNING CONDITION & FRA COMPLIANCE REPORT

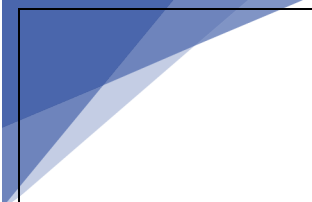
Bellway Homes Ltd (Eastern Counties) Development at
Wardentree Lane, Pinchbeck, Spalding, Lincolnshire



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REPORT ISSUE

Revision	Date	Notes
P01	8.2.21	Preliminary Issue
PO2	12.2.21	Conclusion added
PO3	15.2.21	Levels updated

PREPARED BY

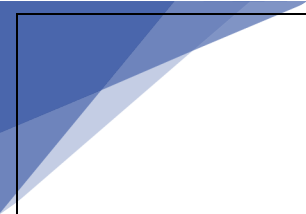
Rob Hill Director	February 2021
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REVIEWED BY

Phil Tomes Director	February 2021
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INTRODUCTION

Further to the application H14-0720-18, this document addresses three conditions; namely Conditions 9, 13 and 16.

- 9 *The development hereby permitted shall be carried out in accordance with the approved Flood Risk Assessment (FRA) and in particular the following mitigation measures:*

i) *Finished floor levels are set at 3.4 m above Ordnance Datum (AOD).*

- 13 *No development shall take place until a surface water drainage scheme for the site, based on sustainable urban drainage principles and an assessment of the hydrological and hydrogeological context of the development, has been submitted to and approved in writing by the Local Planning Authority.*

The scheme shall:

- a) Provide details of how run-off will be safely conveyed and attenuated during storms up to and including the 1 in 100 year critical storm event, with an allowance for climate change, from all hard surfaced areas within the development into the existing local drainage infrastructure and watercourse system without exceeding the run-off rate for the undeveloped site;*
- b) Provide attenuation details and discharge rates which shall be restricted to 1.4 litres per second per hectare;*
- c) Provide details of the timetable for and any phasing of implementation for the drainage scheme; and*
- d) Provide details of how the scheme shall be maintained and managed over the lifetime of the development, including any arrangements for adoption by any public body or Statutory Undertaker and any other arrangements required to secure the operation of the drainage system throughout its lifetime.*

The development shall be carried out in accordance with the approved drainage scheme and no dwelling shall be occupied until the approved scheme has been completed or provided on the site in accordance with the approved phasing. The approved scheme shall be retained and maintained in full in accordance with the approved details.

- 16 *No development shall commence until a foul water drainage strategy has been submitted to and approved in writing by the Local Planning Authority. No dwellings shall be occupied until the works have been carried out in accordance with the foul water strategy so approved unless otherwise approved in writing by the Local Planning Authority.*

CONDITION 9: COMPLIANCE WITH FRA

RELEVANT APPROVED DOCUMENT:

GEORGE SHUTTLEWORTH LTD. FLOOD RISK ASSESSMENT AND DRAINAGE REPORT. ISSUE 2 JULY 2018

The above document sets out the requirements to reduce the risk of flooding to the proposed development and future occupants. From consultations with Environment agency, Welland and Deeping IDB the FRA identified that any potential flooding on the site could reach a level of 3.1m AOD, and therefore proposes a minimum floor level of all dwellings of 3.4m AOD. To accord with this criteria, the attached Levels Strategy Drawing in Appendix A shows that no Finished Floor Levels are below this level of 3.4m AOD.

CONDITION 13: SURFACE WATER DRAINAGE SCHEME

RELEVANT APPROVED DOCUMENT:

GEORGE SHUTTLEWORTH LTD. FLOOD RISK ASSESSMENT AND DRAINAGE REPORT. ISSUE 2 JULY 2018

- a) Refer to Appendix B for drainage drawings showing how the system conveys the water and provides suitable attenuation (discussed in more detail below)
- b) The above document sets out the requirements of the design criteria for the site, namely 1.4l/s/Ha maximum runoff, with a 3.94 hectares gross area of site, gives a total discharge from the site of 5.5l/s. Storm events should be modelled up to and including the 1 in 100 year storm event, with an allowance for climate change. In line with current guidance and as per the FRA the rainfall intensity is designed for 20% climate change and tested for climate change allowances of 40%, to ensure that the system can cope with both events, and no flooding occurs

DRAINAGE DESIGN PHILOSOPHY

As part of the site investigation works it became apparent that the High Pressure Gas Main running along the southern boundary and then south to north within the middle of the development, would make the development form different to that which is within the FRA, and as such instead of the single outfall and attenuation basin, the site would need to be split East and West either side of the gas main with two separate outfalls, splitting the 5.2l/s into 3.3l/s to the west and 2.2l/s to the east as shown on the attached drawings.

Also due to the Gas Main location and statutory build off distances and depths, it was necessary to utilise these easements for undevelopable areas and as such it became apparent that POS, attenuation and swales could be allowed within certain distance of the main, but not structures. This prompted the decision to follow the principles of Sustainable Urban Drainage Systems with the use of swales and porous paving still as per the FRA, but place the swales within the overall gas main easements as opposed to parallel with the roads. These swales are placed alongside shared private drives and will take the SW from these and overlooking properties before outfalling into the attenuation basin and Blue Gout Drain to the north. All these features, along with other aspects of the drainage scheme are indicated on the attached drawings (App B). Hydraulic Calculations utilising drainage modelling software is attached within

Appendix C, these indicate the flow rates as per the requirement of 1.4l/s/ha as discussed earlier, and show how the attenuation levels and volumes work. A summary of the flows and levels in the ponds is also contained within the Drainage Drawings in App B.

- c) The drainage scheme will be implemented as the site progresses, ensuring that as hard surfacing and houses are constructed the associated drainage will be in place to take SW runoff from those elements. The outfalls and attenuation basins will be constructed prior to any connections to ensure protection of the downstream receiving water course.

d) **STORM DRAINAGE & SUDS MAINTENANCE REQUIREMENTS**

The Freeholders

The responsibility for maintenance of all elements of the development remain with Bellway Homes until handed over to the Anglian Water, Freeholders or a Management Company. Handover of external works to the Freeholders coincides with completion and sale of each respective residential unit. At handover the Freeholders will receive as built information together with (where applicable) operating and maintenance manuals which detail all maintenance protocols.

Surface Water Sewers

The principle means of surface water disposal from the development is by way of swales and adopted gravity sewer system, ultimately discharging into two infiltration Basins. The main drainage runs will be adopted by Anglian Water and maintenance will ultimately pass onto them as the sewers are formerly adopted. Upto that point Bellway Homes will be responsible for the sewers and will follow the same maintenance regime as detailed for the management company.

A Management Company will be commissioned to maintain the private shared storm water drainage system, where not adopted and the Management Company responsibilities will include the swales, ponds etc and all inflow and outflow structures and the outlets, where not adopted by Anglian Water.

The remaining shared storm water drainage system where located within the individual plot curtilage, will be the responsibility of the homeowner.

Quarterly (by Management Company/Adopting authority)

A system of regular inspections should be established, initially these inspections should be carried out in October and March, however, this may be modified to suit observations over time. Items to be observed and cleared are high levels of grit, leaves and other such detritus. The main aim of these inspections will be to prevent siltation of the system, which, if allowed to develop will reduce the effectiveness of the system.

The following elements should be inspected and cleaned as part of this preventative routine:

Chambers

Road gullies

Linear drainage channels/gullies located within communal areas

Quarterly (by Plot Freeholder)

It is also recommended that each homeowner regularly cleans and inspects rainwater pipes, gullies/linear drainage channels, porous paving etc, where located within their plot curtilage as a preventative measure to minimise the ingress of detritus into the storm water system. It is suggested that new homeowners are informed of such responsibilities in their welcome packs or within their conveyancing.

Ponds, Swales

Ponds and swales are to be maintained by either a Management Company or Anglian Water. Their maintenance regime shall be as follows: -

Inspections to identify any areas not operating correctly, eroded areas, pollution, blocked outlets, standing water, and reinstate design levels, repair eroded or damaged areas by returfing or reseeding.

Collect and remove from site all extraneous rubbish that is detrimental to the operation or detract from the appearance of the site, including paper, bottles, cans and similar debris.

Maintain grass height at no less than 100mm. Ensure that soil and grass does not become compacted. Do not cut during periods of drought or when ground conditions or grass is wet.

Maintenance of the pond is to be carried out in the vicinity of the inlets and outlets, monthly during growing seasons, and at least once every two months within the remainder of the pond, or else as required.

Maintenance of the swales are to be carried out monthly during growing seasons, or else as required.

Remove sediment as it builds up, ensuring that design storage volumes are not reduced by more than 10%.

Headwalls

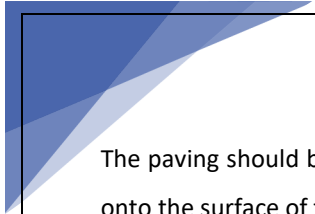
Headwalls are to be maintained by either Anglian Water or a Management Company. Their maintenance regime shall be as follows: -

Initially the headwalls shall be inspected on a monthly basis. All extraneous material such as litter and rubble be removed and cleared. After this initial three months the Headwalls themselves are to be checked for structural integrity on a six monthly inspection and any issues made good as per the original design drawings. Ensure water flows freely by removal of vegetation and siltation as necessary.

Porous Drives

Visual inspections should be made to ascertain where depressions, rutting and cracked or broken blocks are considered to be detrimental to the structural performance of the pavement or a hazard to users, this will require appropriate corrective action.

The paving should be agitated (e.g. brushed, vacuumed, etc.) at least twice a year, to ensure no vegetation of any sort is allowed to grow and develop in the joints. Ideally, this should be carried out in the spring and autumn seasons.



The paving should be inspected after any heavy precipitation to ensure there is no displacement of any organic matter onto the surface of the pavement.

For winter maintenance, the controlled use of de-icing may be used without causing significant detrimental effects towards the permeable pavements performance. When used carefully, the use of these chlorides will not result in an increase in the chloride levels in the local ground.

The inspection of the outfall should be undertaken initially on a twice-yearly basis.

Depending on the amount of usage and the environment the permeable pavement has received and been exposed to, the laying course material may require either cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. Should this occur, the uplifting and cleaning (or replacing), of the laying course maybe considered. The laying course material, jointing and blocks may be reused, minimising costs.

NB. Material removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and as such may need to be disposed of as 'controlled waste'.

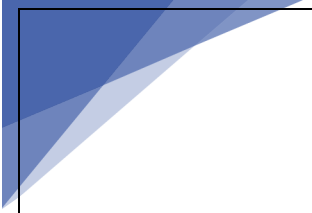
CONDITION 16 FOUL WATER DRAINAGE SCHEME

The foul drainage scheme is a gravity system running from east to west outfalling into the existing Anglian Water foul system adjacent to the site on the western boundary, refer to Appendix B for drawing indicating layout.

CONCLUSION

In conclusion the presented scheme, by the use of SuDS techniques, such as Swales, Porous Paving and Attenuation Basins, with restricted flow to agreed low flow levels of 1.4l/s/Ha, offers a surface water drainage scheme which complies with the approved FRA, taking on board up to date information, and will not increase the risk of flooding for the site and neighbouring properties, and ensure there is no increase in flows to the adjoining watercourse – Blue Gowt Drain, and this has been modelled for all storm events upto and including a 1 in 100 year event with a 40% allowance for climate change. There is also a specific scheme of maintenance that ensures these protective elements will continue to operate at optimum capacity throughout the lifetime of the development.

Likewise the foul scheme, being designed in accordance with the 'Design and Construction Guidance for foul and surface water sewers intended for adoption', will be suitable for and offered for adoption by Anglian Water.



APPENDIX A – LEVELS DRAWING



Bellway

Bellway Homes Limited (Eastern Counties)
3 Percy Road
Huntingdon
Cambridgeshire
PE29 6SZ

-  Slopes
-  Retaining Walls
-  Spot Levels
-  Finished Floor Level
-  Road Contours
-  Landscape Retaining Wall
-  Gravel Board on Fence

Existing Survey
information

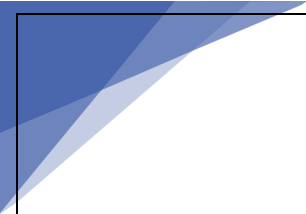
REV	DESCRIPTION	REV	DESCRIPTION	DATE
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STATUS: Preliminary	
SCALE: 1:500	DATE: August 2020
DRAWN: RAH	

TITLE: Levels Strategy	
PROJECT: Wardentree Lane, Pinchbeck	DRG. No: 1044-00-05 Rev B

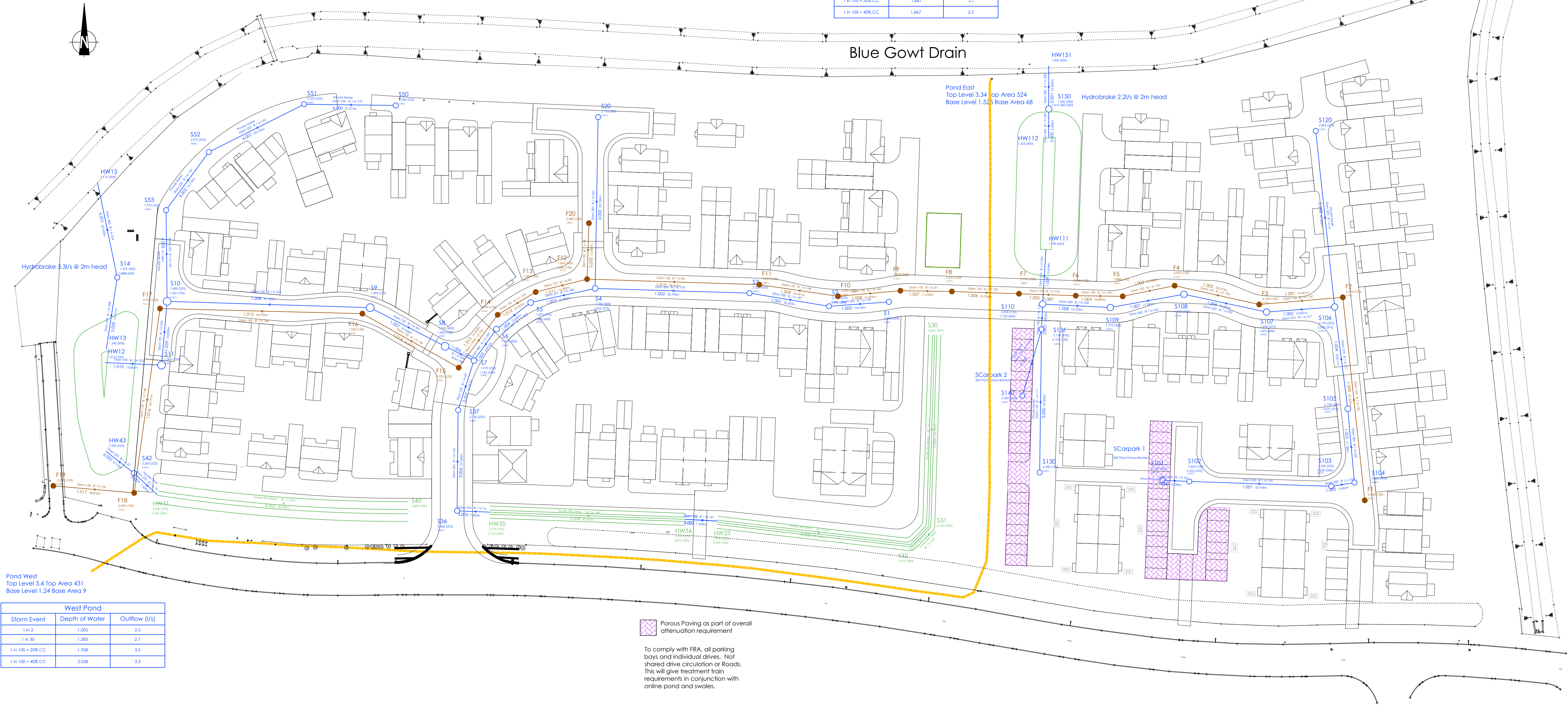
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APPENDIX B - DRAINAGE LAYOUTS

East Pond		
Storm Event	Depth of Water	Outflow (l/s)
1 in 2	0.848	1.7
1 in 30	1.247	1.9
1 in 100 + 20% CC	1.661	2.1
1 in 100 + 40% CC	1.867	2.2



Pond West
Top Level 3.4 Top Area 431
Base Level 1.24 Base Area 9

Storm Event	Depth of Water	Outflow (l/s)
1 in 2	1.055	2.5
1 in 30	1.583	2.7
1 in 100 + 20% CC	1.938	3.2
1 in 100 + 40% CC	2.058	3.3

□ Porous Paving as part of overall attenuation requirement

To comply with FRA, all parking bays and individual drives. Not shared drive circulation or Roads. This will give treatment train requirements in conjunction with online pond and swales.

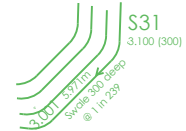
Bellway

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3 Percy Road
Huntingdon
Cambridgeshire
PE29 6SZ



Foul Water System

Surface Water Piped System



Surface Water SuDS System

REV	DESCRIPTION	REV	DESCRIPTION	DATE
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STATUS:

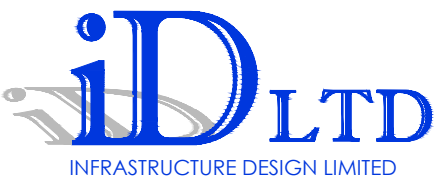
Preliminary

SCALE: 1:500
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DRAWN: RAH

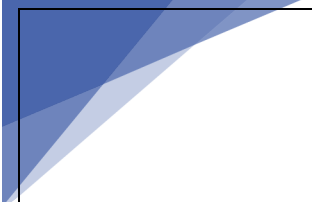
TITLE:

Drainage Strategy

PROJECT:
Wardentree Lane, Pinchbeck
DRG. No: 1044-00-03 Rev C



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APPENDIX C - DRAINAGE CALCULATIONS

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	5.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
101	0.055	5.00	3.600	1200	524718.819	325041.476	0.850
102	0.043	5.00	3.623	1200	524725.048	325041.173	1.098
103	0.075	5.00	4.474	1200	524757.947	325040.050	2.224
104	0.040	5.00	4.659	1200	524763.341	325040.911	2.434
105	0.087	5.00	4.616	1350	524761.785	325058.020	2.541
120	0.127	5.00	4.250	1200	524754.356	325122.422	1.425
106	0.014	5.00	4.450	1500	524758.746	325081.636	2.450
107	0.104	5.00	4.291	1500	524742.954	325080.449	2.416
108	0.019	5.00	4.160	1500	524723.802	325084.568	2.335
109	0.023	5.00	4.025	1500	524706.733	325081.501	2.250
130	0.020	5.00	3.600	1200	524690.360	325043.244	1.200
140	0.062	5.00	3.600	1200	524686.368	325061.091	1.250
131	0.000		3.600	1200	524690.790	325076.444	1.500
110	0.040	5.00	3.923	1500	524691.048	325082.290	2.173
111	0.000		4.000		524691.809	325094.961	2.375
112	0.061	5.00	3.900		524692.460	325120.838	2.375
150	0.000	5.00	3.900	1500	524692.460	325127.520	2.400
151			3.000		524692.460	325137.520	1.550

Links (Results)

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
1.000	101	102	0.977	7.7	7.5	0.750	0.873	0.055
1.001	102	103	1.016	40.4	13.3	0.873	1.924	0.098
1.002	103	104	1.059	74.9	23.4	1.924	2.134	0.173
1.003	104	105	1.034	73.1	28.9	2.134	2.166	0.213
1.004	105	106	1.011	111.7	40.7	2.166	2.075	0.300
2.000	120	106	1.680	66.8	17.2	1.200	2.075	0.127
1.005	106	107	1.012	111.8	59.8	2.075	1.966	0.441
1.006	107	108	1.021	162.3	73.9	1.966	1.885	0.545
1.007	108	109	1.086	172.7	76.4	1.885	1.800	0.564
1.008	109	110	0.804	127.8	79.6	1.800	1.723	0.587
3.000	130	131	0.954	16.9	2.7	1.050	1.350	0.020
4.000	140	131	0.861	6.8	8.4	1.150	1.350	0.062
3.001	131	110	0.928	16.4	11.1	1.350	1.723	0.082
1.009	110	111	1.271	202.2	96.1	1.723	1.850	0.709
1.010	112	150	1.238	197.0	8.3	1.925	1.950	0.061
1.011	150	151	1.108	78.3	8.3	2.100	1.250	0.061

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	2880	10080
30	120	240	480	720	1440	7200	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	20	0	0
100	40	0	0

Node 150 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.500	Product Number	CTL-SHE-0061-2300-2000-2300
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.3	Min Node Diameter (mm)	1200

Node 112 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	29.800
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.525	Main Channel Slope (1:X)	298.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.030

Inlets

111

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	68.0	0.0	2.000	524.0	0.0

Node 101 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.750	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.300
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	67.000		

Node 140 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.350	Slope (1:X)	1000.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)		Depth (m)	0.300
Safety Factor	2.0	Width (m)	5.000	Inf Depth (m)	
Porosity	0.30	Length (m)	55.000		

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	101	22	2.808	0.058	7.7	2.6385	0.0000	OK
15 minute winter	102	11	2.606	0.081	11.0	0.1556	0.0000	OK
15 minute winter	103	11	2.393	0.143	23.8	0.2585	0.0000	OK
15 minute winter	104	11	2.369	0.144	30.7	0.2109	0.0000	OK
720 minute winter	105	690	2.349	0.274	4.7	0.5800	0.0000	OK
15 minute winter	120	10	2.917	0.092	23.1	0.2683	0.0000	OK
720 minute winter	106	690	2.350	0.350	6.9	0.6577	0.0000	OK
720 minute winter	107	690	2.348	0.473	8.4	1.2441	0.0000	SURCHARGED
720 minute winter	108	690	2.348	0.523	8.2	1.0090	0.0000	SURCHARGED
720 minute winter	109	690	2.348	0.573	8.1	1.1295	0.0000	SURCHARGED
15 minute winter	130	10	2.446	0.046	3.6	0.0677	0.0000	OK
30 minute winter	140	23	2.413	0.063	8.6	3.0452	0.0000	OK
720 minute winter	131	690	2.348	0.248	1.3	0.2806	0.0000	SURCHARGED
720 minute winter	110	690	2.348	0.598	9.5	1.2762	0.0000	SURCHARGED
720 minute winter	111	690	2.348	0.723	9.1	0.0000	0.0000	OK
720 minute winter	112	705	2.348	0.823	5.8	0.4228	0.0000	SURCHARGED
720 minute winter	150	705	2.348	0.848	1.7	1.4977	0.0000	SURCHARGED
15 minute summer	151	1	1.450	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	101	1.000	102	4.3	0.959	0.558	0.0278	
15 minute winter	102	1.001	103	10.8	0.857	0.268	0.4168	
15 minute winter	103	1.002	104	23.8	0.714	0.318	0.1822	
15 minute winter	104	1.003	105	30.9	0.965	0.423	0.5505	
720 minute winter	105	1.004	106	4.7	0.443	0.042	2.3020	
15 minute winter	120	2.000	106	22.4	1.504	0.336	0.6138	
720 minute winter	106	1.005	107	6.8	0.578	0.061	1.7210	
720 minute winter	107	1.006	108	7.9	0.488	0.049	3.1039	
720 minute winter	108	1.007	109	7.7	0.428	0.045	2.7477	
720 minute winter	109	1.008	110	7.7	0.431	0.060	2.4884	
15 minute winter	130	3.000	131	3.5	0.569	0.207	0.2217	
30 minute winter	140	4.000	131	4.6	0.909	0.679	0.0808	
720 minute winter	131	3.001	110	1.3	0.536	0.080	0.1030	
720 minute winter	110	1.009	111	9.1	0.542	0.045	2.0113	
720 minute winter	111	Flow through pond	112	4.9	0.043	0.000	120.9846	
720 minute winter	112	1.010	150	1.7	0.176	0.009	1.0587	
720 minute winter	150	Hydro-Brake®	151	1.6				81.5

Results for 30 year Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
30 minute winter	101	23	2.836	0.086	14.6	5.4505	0.0000	OK
960 minute winter	102	945	2.750	0.225	2.1	0.4306	0.0000	OK
960 minute winter	103	915	2.749	0.499	3.7	0.9011	0.0000	SURCHARGED
960 minute winter	104	915	2.749	0.524	4.5	0.7651	0.0000	SURCHARGED
960 minute winter	105	915	2.748	0.673	6.1	1.4236	0.0000	SURCHARGED
15 minute winter	120	10	2.956	0.131	43.9	0.3815	0.0000	OK
960 minute winter	106	915	2.747	0.747	8.9	1.4053	0.0000	SURCHARGED
960 minute winter	107	915	2.748	0.873	10.9	2.2930	0.0000	SURCHARGED
960 minute winter	108	930	2.749	0.924	11.2	1.7835	0.0000	SURCHARGED
960 minute winter	109	930	2.747	0.972	11.7	1.9164	0.0000	SURCHARGED
960 minute winter	130	930	2.747	0.347	0.4	0.5079	0.0000	SURCHARGED
960 minute winter	140	930	2.747	0.397	3.0	23.3682	0.0000	SURCHARGED
960 minute winter	131	945	2.746	0.646	1.8	0.7306	0.0000	SURCHARGED
960 minute winter	110	945	2.747	0.997	13.6	2.1286	0.0000	SURCHARGED
960 minute winter	111	930	2.747	1.122	13.4	0.0000	0.0000	OK
960 minute winter	112	930	2.747	1.222	8.4	0.6282	0.0000	SURCHARGED
960 minute winter	150	930	2.747	1.247	1.9	2.2038	0.0000	SURCHARGED
15 minute summer	151	1	1.450	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
30 minute winter	101	1.000	102	7.1	1.045	0.921	0.0421	
960 minute winter	102	1.001	103	2.1	0.539	0.052	1.3086	
960 minute winter	103	1.002	104	3.6	0.482	0.048	0.3846	
960 minute winter	104	1.003	105	4.3	0.551	0.058	1.2098	
960 minute winter	105	1.004	106	5.9	0.435	0.053	2.6263	
15 minute winter	120	2.000	106	43.3	1.602	0.649	1.3026	
960 minute winter	106	1.005	107	8.7	0.556	0.078	1.7468	
960 minute winter	107	1.006	108	10.8	0.450	0.067	3.1039	
960 minute winter	108	1.007	109	11.2	0.393	0.065	2.7477	
960 minute winter	109	1.008	110	11.6	0.373	0.091	2.4884	
960 minute winter	130	3.000	131	0.4	0.209	0.024	0.5845	
960 minute winter	140	4.000	131	-1.7	0.628	-0.255	0.1250	
960 minute winter	131	3.001	110	1.6	0.535	0.098	0.1030	
960 minute winter	110	1.009	111	13.4	0.484	0.067	2.0113	
960 minute winter	111	Flow through pond	112	7.1	0.043	0.000	236.6134	
960 minute winter	112	1.010	150	1.9	0.172	0.009	1.0587	
960 minute winter	150	Hydro-Brake®	151	1.9				116.1

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	101	1380	3.162	0.412	2.9	27.8356	0.0000	SURCHARGED
1440 minute winter	102	1380	3.162	0.637	2.3	1.2194	0.0000	SURCHARGED
1440 minute winter	103	1380	3.162	0.912	4.0	1.6462	0.0000	SURCHARGED
1440 minute winter	104	1380	3.161	0.936	4.7	1.3671	0.0000	SURCHARGED
1440 minute winter	105	1380	3.162	1.087	6.8	2.2997	0.0000	SURCHARGED
15 minute winter	120	11	3.477	0.652	68.4	1.8989	0.0000	SURCHARGED
1440 minute winter	106	1380	3.161	1.161	10.1	2.1846	0.0000	SURCHARGED
1440 minute winter	107	1380	3.161	1.286	12.4	3.3806	0.0000	SURCHARGED
1440 minute winter	108	1380	3.161	1.336	12.8	2.5793	0.0000	SURCHARGED
1440 minute winter	109	1380	3.162	1.387	13.3	2.7343	0.0000	SURCHARGED
1440 minute winter	130	1410	3.163	0.763	0.5	1.1171	0.0000	SURCHARGED
1440 minute winter	140	1380	3.162	0.812	3.4	24.2490	0.0000	SURCHARGED
1440 minute winter	131	1380	3.163	1.063	2.0	1.2020	0.0000	SURCHARGED
1440 minute winter	110	1380	3.162	1.412	16.2	3.0137	0.0000	SURCHARGED
1440 minute winter	111	1410	3.161	1.536	16.1	0.0000	0.0000	OK
1440 minute winter	112	1410	3.161	1.636	9.9	0.8412	0.0000	SURCHARGED
1440 minute winter	150	1410	3.161	1.661	2.1	2.9358	0.0000	SURCHARGED
15 minute summer	151	1	1.450	0.000	1.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	101	1.000	102	-1.8	0.711	-0.233	0.0488	
1440 minute winter	102	1.001	103	2.3	0.512	0.056	1.3092	
1440 minute winter	103	1.002	104	3.8	0.449	0.051	0.3846	
1440 minute winter	104	1.003	105	4.7	0.515	0.064	1.2098	
1440 minute winter	105	1.004	106	6.7	0.395	0.060	2.6263	
15 minute winter	120	2.000	106	59.4	1.614	0.889	1.6315	
1440 minute winter	106	1.005	107	9.9	0.505	0.089	1.7468	
1440 minute winter	107	1.006	108	12.3	0.389	0.076	3.1039	
1440 minute winter	108	1.007	109	12.7	0.348	0.074	2.7477	
1440 minute winter	109	1.008	110	13.3	0.350	0.104	2.4884	
1440 minute winter	130	3.000	131	0.6	0.191	0.037	0.5845	
1440 minute winter	140	4.000	131	-1.9	0.589	-0.285	0.1250	
1440 minute winter	131	3.001	110	1.9	0.484	0.118	0.1030	
1440 minute winter	110	1.009	111	16.1	0.487	0.080	2.0113	
1440 minute winter	111	Flow through pond	112	8.4	0.039	0.000	394.9390	
1440 minute winter	112	1.010	150	2.1	0.159	0.011	1.0587	
1440 minute winter	150	Hydro-Brake®	151	2.1				177.4

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.13%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	101	1410	3.366	0.616	3.9	28.3314	0.0000	FLOOD RISK
1440 minute winter	102	1410	3.366	0.841	2.8	1.6094	0.0000	FLOOD RISK
1440 minute winter	103	1410	3.366	1.116	4.7	2.0148	0.0000	SURCHARGED
1440 minute winter	104	1410	3.366	1.141	5.7	1.6656	0.0000	SURCHARGED
1440 minute winter	105	1410	3.366	1.291	8.1	2.7322	0.0000	SURCHARGED
15 minute winter	120	12	3.910	1.085	79.8	3.1598	0.0000	SURCHARGED
1440 minute winter	106	1410	3.366	1.366	12.0	2.5693	0.0000	SURCHARGED
1440 minute winter	107	1410	3.366	1.491	14.7	3.9196	0.0000	SURCHARGED
1440 minute winter	108	1410	3.367	1.542	15.1	2.9757	0.0000	SURCHARGED
1440 minute winter	109	1410	3.367	1.592	15.6	3.1399	0.0000	SURCHARGED
1440 minute winter	130	1410	3.367	0.967	0.6	1.4161	0.0000	FLOOD RISK
1440 minute winter	140	1410	3.367	1.017	3.8	24.6847	0.0000	FLOOD RISK
1440 minute winter	131	1410	3.367	1.267	2.2	1.4334	0.0000	FLOOD RISK
1440 minute winter	110	1410	3.367	1.617	18.8	3.4516	0.0000	SURCHARGED
1440 minute winter	111	1410	3.367	1.742	18.7	0.0000	0.0000	OK
1440 minute winter	112	1410	3.367	1.842	11.3	0.9468	0.0000	SURCHARGED
1440 minute winter	150	1410	3.367	1.867	2.2	3.2990	0.0000	SURCHARGED
15 minute summer	151	1	1.450	0.000	1.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	101	1.000	102	-2.4	0.735	-0.313	0.0488	
1440 minute winter	102	1.001	103	2.6	0.512	0.065	1.3092	
1440 minute winter	103	1.002	104	4.6	0.455	0.062	0.3846	
1440 minute winter	104	1.003	105	5.6	0.515	0.077	1.2098	
1440 minute winter	105	1.004	106	8.0	0.375	0.072	2.6263	
15 minute winter	120	2.000	106	67.8	1.706	1.015	1.6315	
1440 minute winter	106	1.005	107	11.8	0.486	0.106	1.7468	
1440 minute winter	107	1.006	108	14.6	0.402	0.090	3.1039	
1440 minute winter	108	1.007	109	14.9	0.360	0.087	2.7477	
1440 minute winter	109	1.008	110	15.5	0.360	0.122	2.4884	
1440 minute winter	130	3.000	131	0.5	0.191	0.032	0.5845	
1440 minute winter	140	4.000	131	-2.1	0.589	-0.309	0.1250	
1440 minute winter	131	3.001	110	2.2	0.484	0.134	0.1030	
1440 minute winter	110	1.009	111	18.7	0.499	0.092	2.0113	
1440 minute winter	111	Flow through pond	112	9.6	0.042	0.000	487.9371	
1440 minute winter	112	1.010	150	2.2	0.118	0.011	1.0587	
1440 minute winter	150	Hydro-Brake®	151	2.2				185.2

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	2	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	20.000	Minimum Backdrop Height (m)	5.000
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.079	5.00	3.725	1200	524655.413	325082.802	1.225
2	0.018	5.00	3.793	1200	524641.533	325081.778	1.468
3	0.083	5.00	3.873	1200	524623.092	325084.833	1.648
20	0.076	5.00	3.475	1200	524587.993	325125.648	1.300
4	0.078	5.00	3.634	1350	524587.313	325085.925	1.709
5	0.009	5.00	3.530	1350	524572.362	325082.648	1.730
6	0.066	5.00	3.450	1350	524564.429	325076.493	1.675
30	0.067	5.00	3.800		524668.026	325075.275	0.300
31	0.000		3.400		524666.610	325030.822	0.300
32	0.068	5.00	3.400		524662.404	325026.584	0.325
33			3.400		524615.603	325032.002	0.450
34	0.064	5.00	3.400		524608.250	325032.386	0.500
35	0.000	5.00	3.400		524562.805	325034.063	0.625
36	0.041	5.00	3.400	1200	524555.306	325034.367	1.100
37	0.000	5.00	3.400	1200	524555.543	325057.708	1.250
7	0.000	5.00	3.400	1350	524559.206	325069.195	1.650
8	0.000	5.00	3.400	1800	524552.525	325072.500	1.975
9	0.034	5.00	3.591	1800	524535.159	325081.467	2.196
50	0.058	5.00	3.400	1200	524541.066	325128.340	1.050
51	0.041	5.00	3.600	1200	524519.855	325128.621	1.375
52	0.018	5.00	3.800	1200	524497.755	325117.531	1.725
53	0.016	5.00	4.000	1200	524487.843	325104.078	2.025
10	0.020	5.00	3.674	1800	524488.082	325082.933	2.349
11	0.053	5.00	3.600	1800	524486.787	325068.140	2.300
12	0.000		3.600		524473.719	325068.734	2.335
40	0.054	5.00	3.400		524544.037	325034.202	0.600
41	0.000		3.400		524485.828	325038.081	0.800
42	0.000	5.00	3.400	1200	524480.369	325043.120	1.200
43	0.000		3.400		524473.925	325048.150	2.135
13	0.000	5.00	3.400		524473.996	325071.900	2.160
14	0.000		3.443	1200	524476.513	325088.461	2.233
15			1.466		524471.963	325110.418	0.356

Links (Results)

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)
1.000	1	2	1.106	44.0	10.7	1.000	1.168	0.079
1.001	2	3	1.146	81.0	13.1	1.168	1.348	0.097
1.002	3	4	1.244	87.9	24.4	1.348	1.334	0.180
2.000	20	4	1.039	73.4	10.3	1.000	1.334	0.076
1.003	4	5	1.030	113.8	45.3	1.334	1.280	0.334
1.004	5	6	1.008	160.3	46.5	1.280	1.225	0.343
1.005	6	7	1.067	169.7	55.4	1.225	1.200	0.409
3.000	30	31	1.069	609.5	9.1	0.000	0.000	0.067
3.001	31	32	0.730	415.9	9.1	0.000	0.025	0.067
3.002	32	33	0.581	331.0	18.3	0.025	0.150	0.135
3.003	33	34	1.075	42.7	18.3	0.225	0.275	0.135
3.004	34	35	0.591	336.9	27.0	0.200	0.325	0.199
3.005	35	36	3.308	131.5	27.0	0.400	0.875	0.199
3.006	36	37	1.045	41.6	32.5	0.875	1.025	0.240
3.007	37	7	1.577	62.7	32.5	1.025	1.200	0.240
1.006	7	8	1.172	186.4	88.0	1.200	1.225	0.649
1.007	8	9	1.089	480.9	88.0	1.225	1.446	0.649
1.008	9	10	1.071	473.2	91.8	1.446	1.599	0.683
5.000	50	51	1.001	39.8	7.9	0.825	1.150	0.058
5.001	51	52	1.015	40.4	13.4	1.150	1.500	0.099
5.002	52	53	1.008	40.1	15.9	1.500	1.800	0.117
4.003	53	10	1.003	39.9	18.0	1.800	1.599	0.133
1.009	10	11	1.141	503.9	111.2	1.599	1.550	0.836
1.010	11	12	1.216	537.3	117.1	1.550	1.575	0.889
4.000	40	41	0.970	1629.6	7.3	0.000	0.200	0.054
4.001	41	42	3.050	121.3	7.3	0.575	0.975	0.054
4.002	42	43	2.516	100.0	7.3	0.975	1.275	0.054
1.011	13	14	1.023	289.3	0.0	1.560	1.633	0.000
1.012	14	15	1.046	73.9	0.0	1.933	0.056	0.000

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Detailed
FSR Region	England and Wales	Skip Steady State	✓
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15	60	180	360	600	960	5760
30	120	240	480	720	1440	10080

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	20	0	0
100	40	0	0

Node 14 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	1.210	Product Number	CTL-SHE-0077-3300-1700-3300
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.3	Min Node Diameter (mm)	1200

Node 43 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.265	Discharge Coefficient	1.000
Replaces Downstream Link	x	Diameter (m)	0.300		

Node 12 Online Orifice Control

Flap Valve	x	Invert Level (m)	1.265	Discharge Coefficient	0.600
Replaces Downstream Link	x	Diameter (m)	0.825		

Node 13 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	10.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	1.240	Main Channel Slope (1:X)	400.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.030

Inlets

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Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	9.0	0.0	2.150	431.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	1	10	2.589	0.089	14.4	0.2155	0.0000	OK
15 minute winter	2	10	2.418	0.093	17.4	0.1280	0.0000	OK
15 minute winter	3	11	2.354	0.129	32.4	0.2756	0.0000	OK
15 minute winter	20	10	2.261	0.086	13.9	0.1980	0.0000	OK
600 minute winter	4	540	2.249	0.324	6.2	0.7606	0.0000	OK
600 minute winter	5	555	2.251	0.451	9.1	0.6920	0.0000	SURCHARGED
600 minute winter	6	555	2.251	0.476	8.1	1.0557	0.0000	SURCHARGED
15 minute summer	30	10	3.535	0.035	11.6	0.1570	0.0000	OK
15 minute winter	31	12	3.150	0.050	12.2	0.0000	0.0000	OK
15 minute winter	32	12	3.143	0.068	21.3	0.2857	0.0000	OK
15 minute winter	33	14	3.047	0.097	21.0	0.0000	0.0000	OK
15 minute winter	34	14	2.974	0.074	22.0	0.1901	0.0000	OK
30 minute winter	35	22	2.836	0.061	21.4	0.0000	0.0000	OK
30 minute winter	36	22	2.430	0.130	24.6	0.2436	0.0000	OK
30 minute winter	37	22	2.257	0.107	24.7	0.1212	0.0000	OK
600 minute winter	7	555	2.247	0.497	11.3	0.7110	0.0000	SURCHARGED
600 minute winter	8	585	2.245	0.820	11.8	2.0875	0.0000	SURCHARGED
600 minute winter	9	585	2.249	0.854	16.0	2.4373	0.0000	SURCHARGED
15 minute winter	50	10	2.428	0.078	10.6	0.1742	0.0000	OK
15 minute winter	51	10	2.329	0.104	17.9	0.1803	0.0000	OK
960 minute winter	52	750	2.245	0.170	1.8	0.2282	0.0000	OK
600 minute winter	53	585	2.245	0.270	3.6	0.3480	0.0000	SURCHARGED
600 minute winter	10	570	2.248	0.923	15.5	2.5056	0.0000	SURCHARGED
600 minute winter	11	570	2.250	0.950	12.3	2.8554	0.0000	SURCHARGED
600 minute winter	12	615	2.269	1.004	107.6	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	1	1.000	2	14.2	0.984	0.322	0.2001	
15 minute winter	2	1.001	3	17.3	0.735	0.213	0.4429	
15 minute winter	3	1.002	4	32.0	1.121	0.364	1.0220	
15 minute winter	20	2.000	4	13.5	0.669	0.184	0.8878	
600 minute winter	4	1.003	5	9.0	0.566	0.079	1.6186	
600 minute winter	5	1.004	6	7.9	0.423	0.049	1.5904	
600 minute winter	6	1.005	7	8.5	0.409	0.050	1.4219	
15 minute summer	30	3.000	31	12.3	0.310	0.020	1.9975	
15 minute winter	31	3.001	32	11.0	0.159	0.027	0.4159	
15 minute winter	32	3.002	33	21.0	0.252	0.064	4.6844	
15 minute winter	33	3.003	34	16.7	1.222	0.391	0.1021	
15 minute winter	34	3.004	35	21.6	0.270	0.064	3.6514	
30 minute winter	35	3.005	36	21.2	1.341	0.161	0.1215	
30 minute winter	36	3.006	37	24.7	1.165	0.594	0.4944	
30 minute winter	37	3.007	7	24.7	1.407	0.393	0.2115	
600 minute winter	7	1.006	8	11.8	0.605	0.063	1.1810	
600 minute winter	8	1.007	9	15.9	0.268	0.033	8.6017	
600 minute winter	9	1.008	10	12.5	0.227	0.026	20.7297	
15 minute winter	50	5.000	51	10.4	0.691	0.262	0.3203	
15 minute winter	51	5.001	52	17.6	0.890	0.435	0.4888	
960 minute winter	52	5.002	53	1.5	0.455	0.037	0.6017	
600 minute winter	53	4.003	10	3.4	0.540	0.085	0.8410	
600 minute winter	10	1.009	11	11.8	0.272	0.024	6.5358	
600 minute winter	11	1.010	12	17.4	0.404	0.032	5.7572	
600 minute winter	12	Flow through pond	13	-23.3	0.045	0.000	105.7783	

Results for 2 year Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	40	11	2.847	0.047	9.8	0.0845	0.0000	OK
15 minute winter	41	14	2.640	0.040	9.8	0.0000	0.0000	OK
600 minute winter	42	570	2.245	0.045	1.0	0.0511	0.0000	OK
600 minute winter	43	570	2.248	0.983	2.1	0.0000	0.0000	OK
600 minute winter	13	570	2.245	1.005	20.6	0.0000	0.0000	SURCHARGED
600 minute winter	14	510	2.245	1.035	8.7	1.1703	0.0000	SURCHARGED
15 minute summer	15	1	1.466	0.356	2.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	40	4.000	41	9.8	0.217	0.006	2.6369	
15 minute winter	41	4.001	42	8.2	1.621	0.067	0.0375	
600 minute winter	42	4.002	43	1.0	0.795	0.010	0.1857	
600 minute winter	43	Flow through pond	13	-23.3	0.045	0.000	105.7783	
600 minute winter	13	1.011	14	8.7	0.031	0.030	4.7184	
600 minute winter	14	Hydro-Brake®	15	2.7				92.7

Results for 30 year Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	1	855	2.796	0.296	2.9	0.7171	0.0000	SURCHARGED
960 minute winter	2	810	2.796	0.471	3.8	0.6485	0.0000	SURCHARGED
960 minute winter	3	855	2.792	0.567	5.0	1.2114	0.0000	SURCHARGED
960 minute winter	20	840	2.794	0.619	2.9	1.4238	0.0000	SURCHARGED
960 minute winter	4	840	2.793	0.868	10.7	2.0335	0.0000	SURCHARGED
960 minute winter	5	840	2.792	0.992	11.7	1.5228	0.0000	SURCHARGED
960 minute winter	6	840	2.794	1.019	7.6	2.2612	0.0000	SURCHARGED
15 minute winter	30	11	3.550	0.050	23.2	0.2214	0.0000	OK
15 minute winter	31	12	3.178	0.078	22.2	0.0000	0.0000	OK
15 minute winter	32	12	3.173	0.098	42.0	0.4107	0.0000	OK
15 minute winter	33	14	3.099	0.149	40.0	0.0000	0.0000	OK
15 minute winter	34	13	3.013	0.113	46.7	0.2902	0.0000	OK
15 minute winter	35	14	2.868	0.093	46.4	0.0000	0.0000	OK
960 minute winter	36	840	2.793	0.493	5.3	0.9242	0.0000	SURCHARGED
960 minute winter	37	840	2.800	0.650	5.3	0.7350	0.0000	SURCHARGED
960 minute winter	7	840	2.795	1.045	13.7	1.4960	0.0000	SURCHARGED
960 minute winter	8	840	2.794	1.369	13.5	3.4853	0.0000	SURCHARGED
960 minute winter	9	840	2.792	1.397	15.3	3.9859	0.0000	SURCHARGED
720 minute winter	50	720	2.789	0.439	2.2	0.9826	0.0000	SURCHARGED
720 minute winter	51	720	2.790	0.565	3.1	0.9754	0.0000	SURCHARGED
720 minute winter	52	720	2.790	0.715	3.2	0.9580	0.0000	SURCHARGED
720 minute winter	53	720	2.790	0.815	3.6	1.0510	0.0000	SURCHARGED
720 minute winter	10	720	2.791	1.466	25.4	3.9800	0.0000	SURCHARGED
720 minute winter	11	720	2.791	1.491	21.5	4.4821	0.0000	SURCHARGED
960 minute winter	12	840	2.817	1.552	98.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	1	1.000	2	3.6	0.539	0.081	0.5535	
960 minute winter	2	1.001	3	3.5	0.408	0.043	1.3163	
960 minute winter	3	1.002	4	5.9	0.600	0.068	2.5207	
960 minute winter	20	2.000	4	4.5	0.408	0.061	2.7977	
960 minute winter	4	1.003	5	11.5	0.532	0.101	1.6882	
960 minute winter	5	1.004	6	6.1	0.391	0.038	1.5909	
960 minute winter	6	1.005	7	8.8	0.377	0.052	1.4219	
15 minute winter	30	3.000	31	22.2	0.351	0.036	3.3743	
15 minute winter	31	3.001	32	20.8	0.187	0.050	0.6688	
15 minute winter	32	3.002	33	40.0	0.301	0.121	7.8297	
15 minute winter	33	3.003	34	33.8	1.438	0.790	0.1743	
15 minute winter	34	3.004	35	46.4	0.352	0.138	6.0446	
15 minute winter	35	3.005	36	45.1	1.512	0.343	0.2074	
960 minute winter	36	3.006	37	5.3	0.781	0.127	0.9283	
960 minute winter	37	3.007	7	6.2	0.870	0.099	0.4795	
960 minute winter	7	1.006	8	13.5	0.552	0.072	1.1810	
960 minute winter	8	1.007	9	14.6	0.284	0.030	8.6017	
960 minute winter	9	1.008	10	22.0	0.235	0.046	20.7297	
720 minute winter	50	5.000	51	2.3	0.410	0.059	0.8437	
720 minute winter	51	5.001	52	2.7	0.532	0.067	0.9834	
720 minute winter	52	5.002	53	3.3	0.542	0.082	0.6646	
720 minute winter	53	4.003	10	3.8	0.534	0.096	0.8410	
720 minute winter	10	1.009	11	20.1	0.282	0.040	6.5358	
720 minute winter	11	1.010	12	22.0	0.394	0.041	5.7572	
960 minute winter	12	Flow through pond	13	39.0	0.051	0.001	246.6702	

Results for 30 year Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	40	11	2.866	0.066	18.7	0.1190	0.0000	OK
720 minute winter	41	705	2.795	0.195	2.8	0.0000	0.0000	OK
720 minute winter	42	705	2.794	0.594	2.5	0.6718	0.0000	SURCHARGED
720 minute winter	43	705	2.797	1.532	5.6	0.0000	0.0000	OK
720 minute winter	13	705	2.793	1.553	61.1	0.0000	0.0000	SURCHARGED
720 minute winter	14	705	2.793	1.583	5.4	1.7906	0.0000	SURCHARGED
15 minute summer	15	1	1.466	0.356	2.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	40	4.000	41	18.8	0.273	0.012	4.0530	
720 minute winter	41	4.001	42	2.5	0.950	0.021	0.2833	
720 minute winter	42	4.002	43	2.7	0.795	0.027	0.3251	
720 minute winter	43	Flow through pond	13	60.1	0.017	0.001	246.8272	
720 minute winter	13	1.011	14	5.4	0.019	0.019	4.7184	
720 minute winter	14	Hydro-Brake®	15	2.8				121.1

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	1	900	3.167	0.667	2.7	1.6141	0.0000	SURCHARGED
960 minute winter	2	900	3.169	0.844	4.9	1.1609	0.0000	SURCHARGED
960 minute winter	3	900	3.161	0.936	5.8	2.0016	0.0000	SURCHARGED
1440 minute winter	20	1290	3.169	0.994	1.8	2.2855	0.0000	SURCHARGED
960 minute winter	4	915	3.157	1.232	10.9	2.8880	0.0000	SURCHARGED
960 minute winter	5	915	3.153	1.353	10.7	2.0776	0.0000	SURCHARGED
1440 minute winter	6	1350	3.155	1.380	15.5	3.0623	0.0000	FLOOD RISK
15 minute winter	30	11	3.564	0.064	36.1	0.2862	0.0000	OK
15 minute winter	31	12	3.206	0.106	34.7	0.0000	0.0000	OK
15 minute winter	32	12	3.201	0.126	66.0	0.5279	0.0000	OK
15 minute winter	33	13	3.151	0.201	62.9	0.0000	0.0000	OK
960 minute winter	34	870	3.151	0.251	9.3	0.6433	0.0000	OK
960 minute winter	35	870	3.151	0.376	7.8	0.0000	0.0000	FLOOD RISK
960 minute winter	36	945	3.153	0.853	8.2	1.5998	0.0000	FLOOD RISK
1440 minute winter	37	1350	3.160	1.010	6.1	1.1421	0.0000	FLOOD RISK
1440 minute winter	7	1350	3.159	1.409	25.2	2.0165	0.0000	FLOOD RISK
1440 minute winter	8	1350	3.160	1.735	27.9	4.4149	0.0000	FLOOD RISK
1440 minute winter	9	1350	3.155	1.760	24.7	5.0220	0.0000	SURCHARGED
960 minute winter	50	900	3.159	0.809	2.0	1.8082	0.0000	FLOOD RISK
960 minute winter	51	945	3.161	0.936	3.2	1.6168	0.0000	SURCHARGED
960 minute winter	52	900	3.153	1.078	3.7	1.4443	0.0000	SURCHARGED
960 minute winter	53	1005	3.153	1.178	4.1	1.5186	0.0000	SURCHARGED
960 minute winter	10	870	3.151	1.826	25.9	4.9563	0.0000	SURCHARGED
960 minute winter	11	870	3.149	1.849	27.0	5.5596	0.0000	SURCHARGED
960 minute winter	12	870	3.173	1.908	92.2	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	1	1.000	2	3.4	0.596	0.078	0.5535	
960 minute winter	2	1.001	3	-4.9	0.436	-0.060	1.3163	
960 minute winter	3	1.002	4	5.6	0.619	0.064	2.5207	
1440 minute winter	20	2.000	4	5.8	0.392	0.079	2.7977	
960 minute winter	4	1.003	5	10.4	0.532	0.092	1.6882	
960 minute winter	5	1.004	6	10.9	0.386	0.068	1.5909	
1440 minute winter	6	1.005	7	21.4	0.335	0.126	1.4219	
15 minute winter	30	3.000	31	34.7	0.365	0.057	4.7541	
15 minute winter	31	3.001	32	32.7	0.209	0.079	0.9360	
15 minute winter	32	3.002	33	62.9	0.326	0.190	11.4962	
15 minute winter	33	3.003	34	55.9	1.740	1.307	0.2319	
960 minute winter	34	3.004	35	7.8	0.175	0.023	28.1945	
960 minute winter	35	3.005	36	6.8	0.943	0.052	0.2985	
960 minute winter	36	3.006	37	8.0	0.821	0.193	0.9283	
1440 minute winter	37	3.007	7	6.7	0.786	0.107	0.4795	
1440 minute winter	7	1.006	8	27.9	0.497	0.150	1.1810	
1440 minute winter	8	1.007	9	24.1	0.276	0.050	8.6017	
1440 minute winter	9	1.008	10	15.6	0.238	0.033	20.7297	
960 minute winter	50	5.000	51	1.9	0.398	0.048	0.8437	
960 minute winter	51	5.001	52	3.1	0.516	0.077	0.9834	
960 minute winter	52	5.002	53	3.6	0.503	0.090	0.6646	
960 minute winter	53	4.003	10	5.5	0.489	0.138	0.8410	
960 minute winter	10	1.009	11	25.2	0.281	0.050	6.5358	
960 minute winter	11	1.010	12	28.0	0.395	0.052	5.7572	
960 minute winter	12	Flow through pond	13	45.4	0.022	0.001	369.4781	

Results for 100 year +20% CC Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	40	945	3.148	0.348	2.6	0.6258	0.0000	OK
960 minute winter	41	945	3.148	0.548	4.3	0.0000	0.0000	FLOOD RISK
960 minute winter	42	930	3.148	0.948	4.4	1.0720	0.0000	FLOOD RISK
960 minute winter	43	945	3.150	1.885	6.8	0.0000	0.0000	OK
960 minute winter	13	930	3.148	1.908	45.4	0.0000	0.0000	FLOOD RISK
960 minute winter	14	945	3.148	1.938	6.9	2.1914	0.0000	FLOOD RISK
15 minute summer	15	1	1.466	0.356	2.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	40	4.000	41	3.3	0.100	0.002	62.9452	
960 minute winter	41	4.001	42	-4.3	0.928	-0.036	0.2955	
960 minute winter	42	4.002	43	-4.4	0.738	-0.044	0.3251	
960 minute winter	43	Flow through pond	13	45.4	0.022	0.001	369.4781	
960 minute winter	13	1.011	14	6.9	0.024	0.024	4.7184	
960 minute winter	14	Hydro-Brake®	15	3.2				176.1

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	1	1290	3.277	0.777	2.2	1.8817	0.0000	SURCHARGED
1440 minute winter	2	1350	3.280	0.955	4.6	1.3134	0.0000	SURCHARGED
1440 minute winter	3	1440	3.272	1.047	6.0	2.2387	0.0000	SURCHARGED
1440 minute winter	20	1350	3.279	1.104	2.6	2.5401	0.0000	FLOOD RISK
960 minute winter	4	930	3.275	1.350	12.6	3.1655	0.0000	SURCHARGED
1440 minute winter	5	1440	3.272	1.472	13.6	2.2600	0.0000	FLOOD RISK
1440 minute winter	6	1440	3.272	1.497	13.7	3.3227	0.0000	FLOOD RISK
15 minute winter	30	11	3.570	0.070	42.1	0.3126	0.0000	OK
1440 minute winter	31	1440	3.273	0.173	1.9	0.0000	0.0000	OK
1440 minute winter	32	1440	3.273	0.198	3.8	0.8274	0.0000	OK
1440 minute winter	33	1440	3.272	0.322	3.8	0.0000	0.0000	FLOOD RISK
1440 minute winter	34	1440	3.273	0.373	12.4	0.9536	0.0000	FLOOD RISK
1440 minute winter	35	1440	3.273	0.498	5.6	0.0000	0.0000	FLOOD RISK
1440 minute winter	36	1440	3.273	0.973	8.4	1.8248	0.0000	FLOOD RISK
1440 minute winter	37	1440	3.272	1.122	7.5	1.2695	0.0000	FLOOD RISK
960 minute winter	7	930	3.273	1.523	24.9	2.1796	0.0000	FLOOD RISK
960 minute winter	8	930	3.274	1.849	25.1	4.7055	0.0000	FLOOD RISK
1440 minute winter	9	1440	3.272	1.877	18.0	5.3578	0.0000	SURCHARGED
1440 minute winter	50	1440	3.273	0.923	1.6	2.0633	0.0000	FLOOD RISK
1440 minute winter	51	1440	3.272	1.047	3.8	1.8087	0.0000	SURCHARGED
1440 minute winter	52	1410	3.274	1.199	4.2	1.6064	0.0000	SURCHARGED
1440 minute winter	53	1410	3.277	1.302	3.6	1.6781	0.0000	SURCHARGED
1440 minute winter	10	1440	3.272	1.947	22.1	5.2871	0.0000	SURCHARGED
1440 minute winter	11	1440	3.272	1.972	23.4	5.9269	0.0000	SURCHARGED
960 minute winter	12	960	3.298	2.033	113.8	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	1	1.000	2	4.1	0.538	0.094	0.5535	
1440 minute winter	2	1.001	3	4.0	0.387	0.050	1.3163	
1440 minute winter	3	1.002	4	5.1	0.558	0.058	2.5207	
1440 minute winter	20	2.000	4	3.6	0.375	0.050	2.7977	
960 minute winter	4	1.003	5	12.1	0.535	0.107	1.6882	
1440 minute winter	5	1.004	6	12.0	0.357	0.075	1.5909	
1440 minute winter	6	1.005	7	11.5	0.334	0.068	1.4219	
15 minute winter	30	3.000	31	40.4	0.366	0.066	5.3556	
1440 minute winter	31	3.001	32	1.9	0.090	0.005	1.7235	
1440 minute winter	32	3.002	33	3.8	0.098	0.011	22.3693	
1440 minute winter	33	3.003	34	10.9	0.855	0.255	0.2928	
1440 minute winter	34	3.004	35	5.6	0.162	0.017	46.1652	
1440 minute winter	35	3.005	36	7.2	0.876	0.055	0.2985	
1440 minute winter	36	3.006	37	7.5	0.737	0.179	0.9283	
1440 minute winter	37	3.007	7	6.6	0.786	0.105	0.4795	
960 minute winter	7	1.006	8	25.1	0.541	0.135	1.1810	
960 minute winter	8	1.007	9	24.7	0.332	0.051	8.6017	
1440 minute winter	9	1.008	10	18.1	0.209	0.038	20.7297	
1440 minute winter	50	5.000	51	2.8	0.363	0.070	0.8437	
1440 minute winter	51	5.001	52	3.8	0.465	0.094	0.9834	
1440 minute winter	52	5.002	53	3.5	0.454	0.088	0.6646	
1440 minute winter	53	4.003	10	4.2	0.446	0.106	0.8410	
1440 minute winter	10	1.009	11	21.9	0.259	0.043	6.5358	
1440 minute winter	11	1.010	12	24.9	0.404	0.046	5.7572	
960 minute winter	12	Flow through pond	13	50.4	0.051	0.001	416.4381	

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 85.29%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	40	945	3.266	0.466	3.6	0.8392	0.0000	OK
960 minute winter	41	945	3.266	0.666	6.0	0.0000	0.0000	FLOOD RISK
960 minute winter	42	945	3.266	1.066	6.1	1.2053	0.0000	FLOOD RISK
960 minute winter	43	960	3.267	2.002	11.2	0.0000	0.0000	OK
960 minute winter	13	945	3.267	2.027	50.4	0.0000	0.0000	FLOOD RISK
960 minute winter	14	945	3.268	2.058	7.0	2.3271	0.0000	FLOOD RISK
15 minute summer	15	1	1.466	0.356	2.7	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	40	4.000	41	2.1	0.105	0.001	90.9177	
960 minute winter	41	4.001	42	-6.0	0.950	-0.050	0.2955	
960 minute winter	42	4.002	43	-6.1	0.725	-0.061	0.3251	
960 minute winter	43	Flow through pond	13	50.4	0.051	0.001	416.4381	
960 minute winter	13	1.011	14	7.0	0.075	0.024	4.7184	
960 minute winter	14	Hydro-Brake®	15	3.3				184.6