



NOTES

1. ALL LEVELS ARE IN METRES AOD UNLESS OTHERWISE SPECIFIED.

2. ALL BASINS HAVE BEEN SIZED USING FEH RAINFALL DATA AND HAVE AN ALLOWANCE FOR TIE-IN EARTHWORKS.

3. RESIDENTIAL DEVELOPMENT HAS BEEN ASSUMED TO BE 60% IMPERMEABLE PLUS AN ADDITIONAL 10% ALLOWANCE FOR URBAN CREEP. SCHOOL DEVELOPMENT HAS BEEN ASSUMED AS 30% IMPERMEABLE.

4. BASED UPON THE RESULTS OF ON-SITE INFILTRATION TESTING UNDERTAKEN BY EPS STRATEGIES, IT HAS BEEN FOUND THAT INFILTRATION IS VIABLE. THE INFILTRATION RATES USED IN THIS STRATEGY ARE BASED UPON THESE RESULTS RECEIVED FROM PIGEON ON 05/08/2019 VIA EMAIL.

5. SITE LAYOUT AND BOUNDARIES TAKEN FROM 'NORTH HEMEL FRAMEWORK 1-2500 LOW RES' RECEIVED FROM MOSAIC ON 03/12/2019.

6. TOPOGRAPHICAL DATA TAKEN FROM DRAWING 'COMBINED TOPOGRAPHICAL SURVEY 21.08.19' RECEIVED FROM PIGEON ON 21.08.2019.

7. BASINS ARE TO BE PRIVATELY MAINTAINED.

KEY

NORTH HEMEL HEMPSTEAD BROAD LOCATION BOUNDARY (87.9ha)

PROPOSED BASIN

3m BASIN ACCESS/MAINTENANCE TRACK

BASIN EARTHWORKS – CUT

BASIN EARTHWORKS – FILL

BASIN 1 CATCHMENT

BASIN 2 CATCHMENT

BASIN 3 CATCHMENT

BASIN 4 CATCHMENT

BASIN 5 CATCHMENT

BASIN 6 CATCHMENT

BASIN 7 CATCHMENT

BASIN 8 CATCHMENT

WSP MODELLED 1 IN 1000 YEAR SURFACE WATER FLOODING EXTENT

WSP MODELLED 1 IN 100 YEAR SURFACE WATER FLOODING EXTENT

WSP MODELLED 1 IN 30 YEAR SURFACE WATER FLOODING EXTENT

P05	10/12/2019	JAF	MINOR CHANGES TO CATCHMENT BOUNDARIES AND WORDING	JVB	JVB
P04	06/12/2019	JAF	UPDATED TO LATEST FRAMEWORK PLAN AND ADDED WSP MODELLED FLOOD EXTENTS	JVB	JVB
P03	29/11/2019	JAF	UPDATED TO LATEST FRAMEWORK PLAN	JVB	JVB
P02	22/08/2019	JAF	UPDATED FOLLOWING CLIENT COMMENTS	JVB	JVB
P01	13/08/2019	JAF	FIRST ISSUE	JVB	JVB
REV	DATE	BY	DESCRIPTION	CHK	APP

DRAWING STATUS: S0 - WORK IN PROGRESS

wsp

Unit 9 The Chase, John Tate Road, Foxholes Business Park, Hertford, SG13 7NN, UK
T+ 44 (0) 1992 526 000, F+ 44 (0) 1992 526 001
wsp.com

CLIENT: PIGEON (HEMEL HEMPSTEAD) LTD

ARCHITECT: MOSAIC

SITE/PROJECT: HEMEL HEMPSTEAD ROAD, HEMEL HEMPSTEAD

TITLE: INDICATIVE SURFACE WATER DRAINAGE STRATEGY

SCALE @ A1: 1:2000	CHECKED: JVB	APPROVED: JVB
PROJECT NO: 70061267	DESIGNED: JAF	DRAWN: JAF
DRAWING NO: 1267-D-01	REV: P05	

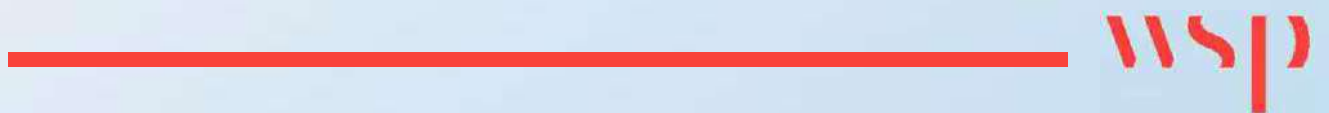
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File name: \\UK-WSP-GROUP\CONCENTRAL\DATA\PROJECTS\70061267\001\HEMEL HEMPSTEAD\ROAD\HEMEL HEMPSTEAD\INDICATIVE SURFACE WATER DRAINAGE STRATEGY\INDICATIVE SURFACE WATER DRAINAGE STRATEGY.dwg, printed on 10 December 2019 15:07:12, by: Pigeon, James


UNTIL TECHNICAL APPROVAL HAS BEEN OBTAINED FROM THE RELEVANT LOCAL AUTHORITIES OR STATUTORY BODIES, IT SHOULD BE UNDERSTOOD THAT ALL DRAWINGS ARE ISSUED AS PRELIMINARY AND NOT FOR CONSTRUCTION. SHOULD THE CONTRACTOR AND / OR EMPLOYER COMMENCE WORK PRIOR TO APPROVAL BEING GIVEN, IT IS ENTIRELY AT THEIR OWN RISK.

Appendix L

SOURCE CONTROL CALCULATIONS



WSP Group Ltd				Page 1																																																																																																																																																																																																																			
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<p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 1314 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>119.961</td><td>0.761</td><td>15.8</td><td>1120.0</td><td>O K</td></tr><tr><td>30 min Summer</td><td>120.193</td><td>0.993</td><td>17.8</td><td>1526.5</td><td>O K</td></tr><tr><td>60 min Summer</td><td>120.411</td><td>1.211</td><td>19.9</td><td>1938.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>120.673</td><td>1.473</td><td>22.4</td><td>2472.4</td><td>O K</td></tr><tr><td>180 min Summer</td><td>120.809</td><td>1.609</td><td>23.8</td><td>2767.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>120.890</td><td>1.690</td><td>24.6</td><td>2949.9</td><td>O K</td></tr><tr><td>360 min Summer</td><td>120.973</td><td>1.773</td><td>25.4</td><td>3139.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>121.002</td><td>1.802</td><td>25.7</td><td>3206.0</td><td>O K</td></tr><tr><td>600 min Summer</td><td>121.006</td><td>1.806</td><td>25.8</td><td>3217.0</td><td>O K</td></tr><tr><td>720 min Summer</td><td>120.998</td><td>1.798</td><td>25.7</td><td>3196.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>120.960</td><td>1.760</td><td>25.3</td><td>3108.5</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>120.881</td><td>1.681</td><td>24.5</td><td>2928.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>120.780</td><td>1.580</td><td>23.5</td><td>2703.6</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>120.693</td><td>1.493</td><td>22.6</td><td>2516.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>120.565</td><td>1.365</td><td>21.4</td><td>2247.5</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>120.473</td><td>1.273</td><td>20.5</td><td>2059.8</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>119.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>119.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>119.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>120.041</td><td>0.841</td><td>16.4</td><td>1256.0</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>116.368</td><td>0.0</td><td>27</td></tr><tr><td>30 min Summer</td><td>79.632</td><td>0.0</td><td>41</td></tr><tr><td>60 min Summer</td><td>51.072</td><td>0.0</td><td>70</td></tr><tr><td>120 min Summer</td><td>33.152</td><td>0.0</td><td>130</td></tr><tr><td>180 min Summer</td><td>25.172</td><td>0.0</td><td>188</td></tr><tr><td>240 min Summer</td><td>20.468</td><td>0.0</td><td>248</td></tr><tr><td>360 min Summer</td><td>15.020</td><td>0.0</td><td>366</td></tr><tr><td>480 min Summer</td><td>11.902</td><td>0.0</td><td>484</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>604</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>902</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>1126</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>1516</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>1932</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>2764</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>3576</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>26</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	119.961	0.761	15.8	1120.0	O K	30 min Summer	120.193	0.993	17.8	1526.5	O K	60 min Summer	120.411	1.211	19.9	1938.6	O K	120 min Summer	120.673	1.473	22.4	2472.4	O K	180 min Summer	120.809	1.609	23.8	2767.5	O K	240 min Summer	120.890	1.690	24.6	2949.9	O K	360 min Summer	120.973	1.773	25.4	3139.0	O K	480 min Summer	121.002	1.802	25.7	3206.0	O K	600 min Summer	121.006	1.806	25.8	3217.0	O K	720 min Summer	120.998	1.798	25.7	3196.8	O K	960 min Summer	120.960	1.760	25.3	3108.5	O K	1440 min Summer	120.881	1.681	24.5	2928.6	O K	2160 min Summer	120.780	1.580	23.5	2703.6	O K	2880 min Summer	120.693	1.493	22.6	2516.1	O K	4320 min Summer	120.565	1.365	21.4	2247.5	O K	5760 min Summer	120.473	1.273	20.5	2059.8	O K	7200 min Summer	119.200	0.000	0.0	0.0	O K	8640 min Summer	119.200	0.000	0.0	0.0	O K	10080 min Summer	119.200	0.000	0.0	0.0	O K	15 min Winter	120.041	0.841	16.4	1256.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	27	30 min Summer	79.632	0.0	41	60 min Summer	51.072	0.0	70	120 min Summer	33.152	0.0	130	180 min Summer	25.172	0.0	188	240 min Summer	20.468	0.0	248	360 min Summer	15.020	0.0	366	480 min Summer	11.902	0.0	484	600 min Summer	9.884	0.0	604	720 min Summer	8.468	0.0	722	960 min Summer	6.605	0.0	902	1440 min Summer	4.625	0.0	1126	2160 min Summer	3.241	0.0	1516	2880 min Summer	2.529	0.0	1932	4320 min Summer	1.805	0.0	2764	5760 min Summer	1.436	0.0	3576	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	26
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WSP Group Ltd				Page 2	
.		North Hemel Hempstead			
.		Surface Water Drainage			
.		Basin 1			
Date 28/11/2019		Designed by JAF			
File Basin 1.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	120.293	1.093	18.7	1712.6	O K
60 min Winter	120.531	1.331	21.0	2177.0	O K
120 min Winter	120.815	1.615	23.8	2780.9	O K
180 min Winter	120.964	1.764	25.3	3117.9	O K
240 min Winter	121.053	1.853	26.2	3328.4	O K
360 min Winter	121.146	1.946	27.2	3552.5	O K
480 min Winter	121.182	1.982	27.6	3639.8	O K
600 min Winter	121.192	1.992	27.7	3664.7	O K
720 min Winter	121.188	1.988	27.6	3654.7	O K
960 min Winter	121.157	1.957	27.3	3579.7	O K
1440 min Winter	121.066	1.866	26.4	3359.4	O K
2160 min Winter	120.955	1.755	25.3	3098.4	O K
2880 min Winter	120.852	1.652	24.2	2863.9	O K
4320 min Winter	120.678	1.478	22.5	2483.4	O K
5760 min Winter	120.547	1.347	21.2	2210.9	O K
7200 min Winter	119.200	0.000	0.0	0.0	O K
8640 min Winter	119.200	0.000	0.0	0.0	O K
10080 min Winter	119.200	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	41		
60 min Winter	51.072	0.0	70		
120 min Winter	33.152	0.0	128		
180 min Winter	25.172	0.0	186		
240 min Winter	20.468	0.0	244		
360 min Winter	15.020	0.0	360		
480 min Winter	11.902	0.0	474		
600 min Winter	9.884	0.0	588		
720 min Winter	8.468	0.0	700		
960 min Winter	6.605	0.0	918		
1440 min Winter	4.625	0.0	1170		
2160 min Winter	3.241	0.0	1624		
2880 min Winter	2.529	0.0	2080		
4320 min Winter	1.805	0.0	2980		
5760 min Winter	1.436	0.0	3816		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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Designed by JAF


Checked by JWB


Source Control 2018.1.1


Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 508700 210100 TL 08700 10100
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40


Total Area (ha) 5.215


Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	1.739	4 8	1.738	8 12	1.738


WSP Group Ltd		Page 4																
.	North Hemel Hempstead																	
.	Surface Water Drainage																	
.	Basin 1																	
Date 28/11/2019	Designed by JAF																	
File Basin 1.SRCX	Checked by JWB																	
XP Solutions	Source Control 2018.1.1																	
<div>Model Details</div> <div>Storage is Online Cover Level (m) 121.500</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 119.200 Safety Factor 5.0 Infiltration Coefficient Base (m/hr) 0.13388 Porosity 1.00 Infiltration Coefficient Side (m/hr) 0.13388</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1270.0</td><td>1.000</td><td>1825.6</td><td>2.000</td><td>2481.7</td><td>2.300</td><td>2698.1</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1270.0	1.000	1825.6	2.000	2481.7	2.300	2698.1
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)											
0.000	1270.0	1.000	1825.6	2.000	2481.7	2.300	2698.1											
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<p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 1291 minutes.</p> <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>117.470</td><td>0.770</td><td>14.8</td><td>1044.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>117.703</td><td>1.003</td><td>16.7</td><td>1423.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>117.922</td><td>1.222</td><td>18.7</td><td>1807.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>118.183</td><td>1.483</td><td>21.2</td><td>2305.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>118.318</td><td>1.618</td><td>22.5</td><td>2580.0</td><td>O K</td></tr><tr><td>240 min Summer</td><td>118.399</td><td>1.699</td><td>23.3</td><td>2749.5</td><td>O K</td></tr><tr><td>360 min Summer</td><td>118.480</td><td>1.780</td><td>24.1</td><td>2924.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>118.508</td><td>1.808</td><td>24.4</td><td>2986.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>118.512</td><td>1.812</td><td>24.4</td><td>2995.4</td><td>O K</td></tr><tr><td>720 min Summer</td><td>118.503</td><td>1.803</td><td>24.3</td><td>2975.5</td><td>O K</td></tr><tr><td>960 min Summer</td><td>118.465</td><td>1.765</td><td>23.9</td><td>2892.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>118.388</td><td>1.688</td><td>23.2</td><td>2726.5</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>118.288</td><td>1.588</td><td>22.2</td><td>2518.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>118.202</td><td>1.502</td><td>21.4</td><td>2343.9</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>118.074</td><td>1.374</td><td>20.2</td><td>2092.8</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>117.981</td><td>1.281</td><td>19.3</td><td>1917.5</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>116.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>116.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>116.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>117.550</td><td>0.850</td><td>15.4</td><td>1171.4</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>116.368</td><td>0.0</td><td>27</td></tr><tr><td>30 min Summer</td><td>79.632</td><td>0.0</td><td>41</td></tr><tr><td>60 min Summer</td><td>51.072</td><td>0.0</td><td>70</td></tr><tr><td>120 min Summer</td><td>33.152</td><td>0.0</td><td>130</td></tr><tr><td>180 min Summer</td><td>25.172</td><td>0.0</td><td>188</td></tr><tr><td>240 min Summer</td><td>20.468</td><td>0.0</td><td>248</td></tr><tr><td>360 min Summer</td><td>15.020</td><td>0.0</td><td>366</td></tr><tr><td>480 min Summer</td><td>11.902</td><td>0.0</td><td>484</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>896</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>1118</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>1512</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>1928</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>2736</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>3576</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>26</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	117.470	0.770	14.8	1044.6	O K	30 min Summer	117.703	1.003	16.7	1423.7	O K	60 min Summer	117.922	1.222	18.7	1807.9	O K	120 min Summer	118.183	1.483	21.2	2305.3	O K	180 min Summer	118.318	1.618	22.5	2580.0	O K	240 min Summer	118.399	1.699	23.3	2749.5	O K	360 min Summer	118.480	1.780	24.1	2924.8	O K	480 min Summer	118.508	1.808	24.4	2986.2	O K	600 min Summer	118.512	1.812	24.4	2995.4	O K	720 min Summer	118.503	1.803	24.3	2975.5	O K	960 min Summer	118.465	1.765	23.9	2892.6	O K	1440 min Summer	118.388	1.688	23.2	2726.5	O K	2160 min Summer	118.288	1.588	22.2	2518.2	O K	2880 min Summer	118.202	1.502	21.4	2343.9	O K	4320 min Summer	118.074	1.374	20.2	2092.8	O K	5760 min Summer	117.981	1.281	19.3	1917.5	O K	7200 min Summer	116.700	0.000	0.0	0.0	O K	8640 min Summer	116.700	0.000	0.0	0.0	O K	10080 min Summer	116.700	0.000	0.0	0.0	O K	15 min Winter	117.550	0.850	15.4	1171.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	27	30 min Summer	79.632	0.0	41	60 min Summer	51.072	0.0	70	120 min Summer	33.152	0.0	130	180 min Summer	25.172	0.0	188	240 min Summer	20.468	0.0	248	360 min Summer	15.020	0.0	366	480 min Summer	11.902	0.0	484	600 min Summer	9.884	0.0	602	720 min Summer	8.468	0.0	722	960 min Summer	6.605	0.0	896	1440 min Summer	4.625	0.0	1118	2160 min Summer	3.241	0.0	1512	2880 min Summer	2.529	0.0	1928	4320 min Summer	1.805	0.0	2736	5760 min Summer	1.436	0.0	3576	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	26
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
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120 min Summer	118.183	1.483	21.2	2305.3	O K																																																																																																																																																																																																																		
180 min Summer	118.318	1.618	22.5	2580.0	O K																																																																																																																																																																																																																		
240 min Summer	118.399	1.699	23.3	2749.5	O K																																																																																																																																																																																																																		
360 min Summer	118.480	1.780	24.1	2924.8	O K																																																																																																																																																																																																																		
480 min Summer	118.508	1.808	24.4	2986.2	O K																																																																																																																																																																																																																		
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960 min Summer	118.465	1.765	23.9	2892.6	O K																																																																																																																																																																																																																		
1440 min Summer	118.388	1.688	23.2	2726.5	O K																																																																																																																																																																																																																		
2160 min Summer	118.288	1.588	22.2	2518.2	O K																																																																																																																																																																																																																		
2880 min Summer	118.202	1.502	21.4	2343.9	O K																																																																																																																																																																																																																		
4320 min Summer	118.074	1.374	20.2	2092.8	O K																																																																																																																																																																																																																		
5760 min Summer	117.981	1.281	19.3	1917.5	O K																																																																																																																																																																																																																		
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600 min Summer	9.884	0.0	602																																																																																																																																																																																																																				
720 min Summer	8.468	0.0	722																																																																																																																																																																																																																				
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1440 min Summer	4.625	0.0	1118																																																																																																																																																																																																																				
2160 min Summer	3.241	0.0	1512																																																																																																																																																																																																																				
2880 min Summer	2.529	0.0	1928																																																																																																																																																																																																																				
4320 min Summer	1.805	0.0	2736																																																																																																																																																																																																																				
5760 min Summer	1.436	0.0	3576																																																																																																																																																																																																																				
7200 min Summer	-0.012	0.0	0																																																																																																																																																																																																																				
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WSP Group Ltd				Page 6	
.		North Hemel Hempstead			
.		Surface Water Drainage			
.		Basin 2			
Date 28/11/2019		Designed by JAF			
File Basin 2.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	117.804	1.104	17.6	1597.3	O K
60 min Winter	118.041	1.341	19.9	2030.2	O K
120 min Winter	118.324	1.624	22.6	2592.9	O K
180 min Winter	118.472	1.772	24.0	2906.6	O K
240 min Winter	118.561	1.861	24.9	3102.2	O K
360 min Winter	118.652	1.952	25.8	3310.0	O K
480 min Winter	118.687	1.987	26.1	3390.1	O K
600 min Winter	118.697	1.997	26.2	3412.1	O K
720 min Winter	118.692	1.992	26.2	3401.8	O K
960 min Winter	118.661	1.961	25.9	3329.9	O K
1440 min Winter	118.571	1.871	25.0	3125.6	O K
2160 min Winter	118.461	1.761	23.9	2882.1	O K
2880 min Winter	118.358	1.658	22.9	2663.6	O K
4320 min Winter	118.184	1.484	21.2	2308.8	O K
5760 min Winter	118.054	1.354	20.0	2054.4	O K
7200 min Winter	116.700	0.000	0.0	0.0	O K
8640 min Winter	116.700	0.000	0.0	0.0	O K
10080 min Winter	116.700	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	41		
60 min Winter	51.072	0.0	70		
120 min Winter	33.152	0.0	128		
180 min Winter	25.172	0.0	186		
240 min Winter	20.468	0.0	244		
360 min Winter	15.020	0.0	360		
480 min Winter	11.902	0.0	474		
600 min Winter	9.884	0.0	588		
720 min Winter	8.468	0.0	700		
960 min Winter	6.605	0.0	918		
1440 min Winter	4.625	0.0	1160		
2160 min Winter	3.241	0.0	1612		
2880 min Winter	2.529	0.0	2076		
4320 min Winter	1.805	0.0	2952		
5760 min Winter	1.436	0.0	3808		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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WSP Group Ltd		Page 7
.	North Hemel Hempstead	
.	Surface Water Drainage	
.	Basin 2	
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XP Solutions	Source Control 2018.1.1	
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<div>Model Details</div> <div>Storage is Online Cover Level (m) 119.000</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 116.700 Safety Factor 5.0 Infiltration Coefficient Base (m/hr) 0.13388 Porosity 1.00 Infiltration Coefficient Side (m/hr) 0.13388</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1160.0</td><td>1.000</td><td>1693.2</td><td>2.000</td><td>2326.9</td><td>2.300</td><td>2536.7</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1160.0	1.000	1693.2	2.000	2326.9	2.300	2536.7
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<p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 345 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>126.447</td><td>0.747</td><td>13.5</td><td>299.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>126.640</td><td>0.940</td><td>15.8</td><td>404.6</td><td>O K</td></tr><tr><td>60 min Summer</td><td>126.803</td><td>1.103</td><td>17.9</td><td>502.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>126.973</td><td>1.273</td><td>20.2</td><td>615.5</td><td>O K</td></tr><tr><td>180 min Summer</td><td>127.038</td><td>1.338</td><td>21.1</td><td>661.7</td><td>O K</td></tr><tr><td>240 min Summer</td><td>127.060</td><td>1.360</td><td>21.4</td><td>677.4</td><td>O K</td></tr><tr><td>360 min Summer</td><td>127.063</td><td>1.363</td><td>21.5</td><td>679.7</td><td>O K</td></tr><tr><td>480 min Summer</td><td>127.044</td><td>1.344</td><td>21.2</td><td>665.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>127.017</td><td>1.317</td><td>20.8</td><td>646.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>126.987</td><td>1.287</td><td>20.4</td><td>624.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>126.922</td><td>1.222</td><td>19.5</td><td>580.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>126.800</td><td>1.100</td><td>17.9</td><td>501.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>126.658</td><td>0.958</td><td>16.0</td><td>414.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>126.546</td><td>0.846</td><td>14.7</td><td>351.9</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>126.380</td><td>0.680</td><td>12.8</td><td>266.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>126.261</td><td>0.561</td><td>11.4</td><td>209.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>125.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O 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Summer</td><td>11.902</td><td>0.0</td><td>352</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>420</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>490</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>626</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>900</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>1300</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>1680</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>2428</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>3168</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>26</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	126.447	0.747	13.5	299.8	O K	30 min Summer	126.640	0.940	15.8	404.6	O K	60 min Summer	126.803	1.103	17.9	502.9	O K	120 min Summer	126.973	1.273	20.2	615.5	O K	180 min Summer	127.038	1.338	21.1	661.7	O K	240 min Summer	127.060	1.360	21.4	677.4	O K	360 min Summer	127.063	1.363	21.5	679.7	O K	480 min Summer	127.044	1.344	21.2	665.9	O K	600 min Summer	127.017	1.317	20.8	646.6	O K	720 min Summer	126.987	1.287	20.4	624.9	O K	960 min Summer	126.922	1.222	19.5	580.3	O K	1440 min Summer	126.800	1.100	17.9	501.1	O K	2160 min Summer	126.658	0.958	16.0	414.9	O K	2880 min Summer	126.546	0.846	14.7	351.9	O K	4320 min Summer	126.380	0.680	12.8	266.1	O K	5760 min Summer	126.261	0.561	11.4	209.7	O K	7200 min Summer	125.700	0.000	0.0	0.0	O K	8640 min Summer	125.700	0.000	0.0	0.0	O K	10080 min Summer	125.700	0.000	0.0	0.0	O K	15 min Winter	126.518	0.818	14.4	336.7	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	26	30 min Summer	79.632	0.0	40	60 min Summer	51.072	0.0	68	120 min Summer	33.152	0.0	124	180 min Summer	25.172	0.0	182	240 min Summer	20.468	0.0	232	360 min Summer	15.020	0.0	288	480 min Summer	11.902	0.0	352	600 min Summer	9.884	0.0	420	720 min Summer	8.468	0.0	490	960 min Summer	6.605	0.0	626	1440 min Summer	4.625	0.0	900	2160 min Summer	3.241	0.0	1300	2880 min Summer	2.529	0.0	1680	4320 min Summer	1.805	0.0	2428	5760 min Summer	1.436	0.0	3168	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	26
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Date 28/11/2019		Designed by JAF			
File Basin 3.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	126.726	1.026	16.9	455.1	O K
60 min Winter	126.902	1.202	19.2	567.1	O K
120 min Winter	127.088	1.388	21.8	697.8	O K
180 min Winter	127.163	1.463	22.9	753.9	O K
240 min Winter	127.191	1.491	23.3	775.9	O K
360 min Winter	127.189	1.489	23.3	774.2	O K
480 min Winter	127.167	1.467	23.0	757.5	O K
600 min Winter	127.134	1.434	22.5	732.5	O K
720 min Winter	127.096	1.396	21.9	704.1	O K
960 min Winter	127.016	1.316	20.8	645.5	O K
1440 min Winter	126.860	1.160	18.7	539.5	O K
2160 min Winter	126.673	0.973	16.2	423.5	O K
2880 min Winter	126.526	0.826	14.5	340.9	O K
4320 min Winter	126.310	0.610	12.0	232.6	O K
5760 min Winter	126.160	0.460	10.3	165.7	O K
7200 min Winter	125.700	0.000	0.0	0.0	O K
8640 min Winter	125.700	0.000	0.0	0.0	O K
10080 min Winter	125.700	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	39		
60 min Winter	51.072	0.0	68		
120 min Winter	33.152	0.0	122		
180 min Winter	25.172	0.0	178		
240 min Winter	20.468	0.0	234		
360 min Winter	15.020	0.0	300		
480 min Winter	11.902	0.0	372		
600 min Winter	9.884	0.0	450		
720 min Winter	8.468	0.0	526		
960 min Winter	6.605	0.0	674		
1440 min Winter	4.625	0.0	962		
2160 min Winter	3.241	0.0	1372		
2880 min Winter	2.529	0.0	1764		
4320 min Winter	1.805	0.0	2516		
5760 min Winter	1.436	0.0	3280		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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. . .	North Hemel Hempstead Surface Water Drainage Basin 3																																											
Date 28/11/2019 File Basin 3.SRCX	Designed by JAF Checked by JWB																																											
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<div>Model Details</div> <div>Storage is Online Cover Level (m) 127.500</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 125.700 Safety Factor 5.0</div> <div>Infiltration Coefficient Base (m/hr) 0.32990 Porosity 1.00</div> <div>Infiltration Coefficient Side (m/hr) 0.32990</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>300.0</td><td>1.000</td><td>595.9</td><td>1.500</td><td>781.5</td><td>1.800</td><td>904.9</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	300.0	1.000	595.9	1.500	781.5	1.800	904.9
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Summer</td><td>112.002</td><td>1.802</td><td>58.9</td><td>2907.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>111.982</td><td>1.782</td><td>58.4</td><td>2864.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>111.952</td><td>1.752</td><td>57.7</td><td>2802.4</td><td>O K</td></tr><tr><td>720 min Summer</td><td>111.919</td><td>1.719</td><td>56.9</td><td>2731.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>111.845</td><td>1.645</td><td>55.2</td><td>2579.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>111.700</td><td>1.500</td><td>51.8</td><td>2288.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>111.530</td><td>1.330</td><td>47.8</td><td>1963.7</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>111.397</td><td>1.197</td><td>44.8</td><td>1722.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>111.193</td><td>0.993</td><td>40.2</td><td>1373.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>111.038</td><td>0.838</td><td>37.0</td><td>1124.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>110.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>110.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>110.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>111.166</td><td>0.966</td><td>39.6</td><td>1329.5</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>116.368</td><td>0.0</td><td>26</td></tr><tr><td>30 min Summer</td><td>79.632</td><td>0.0</td><td>40</td></tr><tr><td>60 min Summer</td><td>51.072</td><td>0.0</td><td>70</td></tr><tr><td>120 min Summer</td><td>33.152</td><td>0.0</td><td>126</td></tr><tr><td>180 min Summer</td><td>25.172</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>20.468</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>15.020</td><td>0.0</td><td>354</td></tr><tr><td>480 min Summer</td><td>11.902</td><td>0.0</td><td>408</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>468</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>530</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>664</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>940</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>1348</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>1756</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>2516</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>3288</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>26</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	111.076	0.876	37.8	1183.9	O K	30 min Summer	111.329	1.129	43.2	1604.4	O K	60 min Summer	111.556	1.356	48.4	2012.0	O K	120 min Summer	111.810	1.610	54.3	2507.5	O K	180 min Summer	111.925	1.725	57.1	2744.2	O K	240 min Summer	111.979	1.779	58.4	2859.6	O K	360 min Summer	112.002	1.802	58.9	2907.8	O K	480 min Summer	111.982	1.782	58.4	2864.9	O K	600 min Summer	111.952	1.752	57.7	2802.4	O K	720 min Summer	111.919	1.719	56.9	2731.0	O K	960 min Summer	111.845	1.645	55.2	2579.1	O K	1440 min Summer	111.700	1.500	51.8	2288.1	O K	2160 min Summer	111.530	1.330	47.8	1963.7	O K	2880 min Summer	111.397	1.197	44.8	1722.2	O K	4320 min Summer	111.193	0.993	40.2	1373.1	O K	5760 min Summer	111.038	0.838	37.0	1124.0	O K	7200 min Summer	110.200	0.000	0.0	0.0	O K	8640 min Summer	110.200	0.000	0.0	0.0	O K	10080 min Summer	110.200	0.000	0.0	0.0	O K	15 min Winter	111.166	0.966	39.6	1329.5	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	26	30 min Summer	79.632	0.0	40	60 min Summer	51.072	0.0	70	120 min Summer	33.152	0.0	126	180 min Summer	25.172	0.0	184	240 min Summer	20.468	0.0	244	360 min Summer	15.020	0.0	354	480 min Summer	11.902	0.0	408	600 min Summer	9.884	0.0	468	720 min Summer	8.468	0.0	530	960 min Summer	6.605	0.0	664	1440 min Summer	4.625	0.0	940	2160 min Summer	3.241	0.0	1348	2880 min Summer	2.529	0.0	1756	4320 min Summer	1.805	0.0	2516	5760 min Summer	1.436	0.0	3288	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	26
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240 min Summer	111.979	1.779	58.4	2859.6	O K																																																																																																																																																																																																																		
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WSP Group Ltd				Page 14	
.		North Hemel Hempstead			
.		Surface Water Drainage			
.		Basin 3			
Date 28/11/2019		Designed by JAF			
File Basin 4.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<p style="text-align: center;"><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	111.442	1.242	45.8	1803.7	O K
60 min Winter	111.689	1.489	51.5	2267.1	O K
120 min Winter	111.968	1.768	58.1	2836.2	O K
180 min Winter	112.097	1.897	61.2	3115.7	O K
240 min Winter	112.161	1.961	62.7	3259.0	O K
360 min Winter	112.197	1.997	63.6	3341.0	O K
480 min Winter	112.176	1.976	63.1	3291.8	O K
600 min Winter	112.140	1.940	62.2	3210.4	O K
720 min Winter	112.103	1.903	61.3	3129.0	O K
960 min Winter	112.019	1.819	59.3	2944.9	O K
1440 min Winter	111.842	1.642	55.1	2572.1	O K
2160 min Winter	111.615	1.415	49.8	2123.1	O K
2880 min Winter	111.436	1.236	45.7	1792.5	O K
4320 min Winter	111.160	0.960	39.5	1319.4	O K
5760 min Winter	110.952	0.752	35.3	991.8	O K
7200 min Winter	110.200	0.000	0.0	0.0	O K
8640 min Winter	110.200	0.000	0.0	0.0	O K
10080 min Winter	110.200	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	40		
60 min Winter	51.072	0.0	68		
120 min Winter	33.152	0.0	124		
180 min Winter	25.172	0.0	182		
240 min Winter	20.468	0.0	238		
360 min Winter	15.020	0.0	350		
480 min Winter	11.902	0.0	452		
600 min Winter	9.884	0.0	486		
720 min Winter	8.468	0.0	560		
960 min Winter	6.605	0.0	714		
1440 min Winter	4.625	0.0	1016		
2160 min Winter	3.241	0.0	1452		
2880 min Winter	2.529	0.0	1872		
4320 min Winter	1.805	0.0	2680		
5760 min Winter	1.436	0.0	3456		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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Designed by JAF


Checked by JWB


Source Control 2018.1.1


Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 508700 210100 TL 08700 10100
Data Type	Catchment
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40


Total Area (ha) 5.615


Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	1.872	4 8	1.872	8 12	1.871


WSP Group Ltd		Page 16																
.	North Hemel Hempstead																	
.	Surface Water Drainage																	
.	Basin 3																	
Date 28/11/2019	Designed by JAF																	
File Basin 4.SRCX	Checked by JWB																	
XP Solutions	Source Control 2018.1.1																	
<div>Model Details</div> <div>Storage is Online Cover Level (m) 112.500</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 110.200 Safety Factor 5.0 Infiltration Coefficient Base (m/hr) 0.32990 Porosity 1.00 Infiltration Coefficient Side (m/hr) 0.32990</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>1130.0</td><td>1.000</td><td>1656.9</td><td>2.000</td><td>2284.4</td><td>2.300</td><td>2492.2</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	1130.0	1.000	1656.9	2.000	2284.4	2.300	2492.2
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)											
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<p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 1121 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>118.534</td><td>0.834</td><td>9.1</td><td>603.1</td><td>O K</td></tr><tr><td>30 min Summer</td><td>118.767</td><td>1.067</td><td>10.6</td><td>821.5</td><td>O K</td></tr><tr><td>60 min Summer</td><td>118.980</td><td>1.280</td><td>12.1</td><td>1042.3</td><td>O K</td></tr><tr><td>120 min Summer</td><td>119.228</td><td>1.528</td><td>13.9</td><td>1326.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>119.354</td><td>1.654</td><td>14.9</td><td>1481.6</td><td>O K</td></tr><tr><td>240 min Summer</td><td>119.427</td><td>1.727</td><td>15.4</td><td>1575.9</td><td>O K</td></tr><tr><td>360 min Summer</td><td>119.498</td><td>1.798</td><td>16.0</td><td>1669.9</td><td>O K</td></tr><tr><td>480 min Summer</td><td>119.520</td><td>1.820</td><td>16.1</td><td>1698.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>119.519</td><td>1.819</td><td>16.1</td><td>1697.3</td><td>O K</td></tr><tr><td>720 min Summer</td><td>119.506</td><td>1.806</td><td>16.0</td><td>1679.6</td><td>O K</td></tr><tr><td>960 min Summer</td><td>119.470</td><td>1.770</td><td>15.7</td><td>1632.5</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>119.401</td><td>1.701</td><td>15.2</td><td>1541.5</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>119.309</td><td>1.609</td><td>14.5</td><td>1424.8</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>119.228</td><td>1.528</td><td>13.9</td><td>1326.0</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>119.102</td><td>1.402</td><td>13.0</td><td>1177.6</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>119.009</td><td>1.309</td><td>12.3</td><td>1074.2</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>117.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>117.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>117.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>118.615</td><td>0.915</td><td>9.6</td><td>676.3</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>116.368</td><td>0.0</td><td>27</td></tr><tr><td>30 min Summer</td><td>79.632</td><td>0.0</td><td>41</td></tr><tr><td>60 min Summer</td><td>51.072</td><td>0.0</td><td>70</td></tr><tr><td>120 min Summer</td><td>33.152</td><td>0.0</td><td>130</td></tr><tr><td>180 min Summer</td><td>25.172</td><td>0.0</td><td>188</td></tr><tr><td>240 min Summer</td><td>20.468</td><td>0.0</td><td>248</td></tr><tr><td>360 min Summer</td><td>15.020</td><td>0.0</td><td>366</td></tr><tr><td>480 min Summer</td><td>11.902</td><td>0.0</td><td>484</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>820</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>1062</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>1472</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>1880</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>2720</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>3520</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>26</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	118.534	0.834	9.1	603.1	O K	30 min Summer	118.767	1.067	10.6	821.5	O K	60 min Summer	118.980	1.280	12.1	1042.3	O K	120 min Summer	119.228	1.528	13.9	1326.3	O K	180 min Summer	119.354	1.654	14.9	1481.6	O K	240 min Summer	119.427	1.727	15.4	1575.9	O K	360 min Summer	119.498	1.798	16.0	1669.9	O K	480 min Summer	119.520	1.820	16.1	1698.5	O K	600 min Summer	119.519	1.819	16.1	1697.3	O K	720 min Summer	119.506	1.806	16.0	1679.6	O K	960 min Summer	119.470	1.770	15.7	1632.5	O K	1440 min Summer	119.401	1.701	15.2	1541.5	O K	2160 min Summer	119.309	1.609	14.5	1424.8	O K	2880 min Summer	119.228	1.528	13.9	1326.0	O K	4320 min Summer	119.102	1.402	13.0	1177.6	O K	5760 min Summer	119.009	1.309	12.3	1074.2	O K	7200 min Summer	117.700	0.000	0.0	0.0	O K	8640 min Summer	117.700	0.000	0.0	0.0	O K	10080 min Summer	117.700	0.000	0.0	0.0	O K	15 min Winter	118.615	0.915	9.6	676.3	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	27	30 min Summer	79.632	0.0	41	60 min Summer	51.072	0.0	70	120 min Summer	33.152	0.0	130	180 min Summer	25.172	0.0	188	240 min Summer	20.468	0.0	248	360 min Summer	15.020	0.0	366	480 min Summer	11.902	0.0	484	600 min Summer	9.884	0.0	602	720 min Summer	8.468	0.0	720	960 min Summer	6.605	0.0	820	1440 min Summer	4.625	0.0	1062	2160 min Summer	3.241	0.0	1472	2880 min Summer	2.529	0.0	1880	4320 min Summer	1.805	0.0	2720	5760 min Summer	1.436	0.0	3520	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	26
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Date 28/11/2019		Designed by JAF			
File Basin 5.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<p style="text-align: center;"><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	118.866	1.166	11.3	921.5	O K
60 min Winter	119.095	1.395	12.9	1170.2	O K
120 min Winter	119.362	1.662	14.9	1491.7	O K
180 min Winter	119.498	1.798	15.9	1669.0	O K
240 min Winter	119.578	1.878	16.6	1778.0	O K
360 min Winter	119.658	1.958	17.2	1890.1	O K
480 min Winter	119.684	1.984	17.4	1928.7	O K
600 min Winter	119.688	1.988	17.4	1934.3	O K
720 min Winter	119.680	1.980	17.3	1921.9	O K
960 min Winter	119.643	1.943	17.1	1869.8	O K
1440 min Winter	119.563	1.863	16.4	1757.3	O K
2160 min Winter	119.455	1.755	15.6	1612.3	O K
2880 min Winter	119.356	1.656	14.9	1484.1	O K
4320 min Winter	119.190	1.490	13.6	1280.1	O K
5760 min Winter	119.059	1.359	12.7	1128.9	O K
7200 min Winter	117.700	0.000	0.0	0.0	O K
8640 min Winter	117.700	0.000	0.0	0.0	O K
10080 min Winter	117.700	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	41		
60 min Winter	51.072	0.0	70		
120 min Winter	33.152	0.0	128		
180 min Winter	25.172	0.0	184		
240 min Winter	20.468	0.0	242		
360 min Winter	15.020	0.0	358		
480 min Winter	11.902	0.0	472		
600 min Winter	9.884	0.0	584		
720 min Winter	8.468	0.0	694		
960 min Winter	6.605	0.0	902		
1440 min Winter	4.625	0.0	1118		
2160 min Winter	3.241	0.0	1580		
2880 min Winter	2.529	0.0	2024		
4320 min Winter	1.805	0.0	2900		
5760 min Winter	1.436	0.0	3752		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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. . .	North Hemel Hempstead Surface Water Drainage Basin 5																																											
Date 28/11/2019 File Basin 5.SRCX	Designed by JAF Checked by JWB																																											
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<div>Model Details</div> <div>Storage is Online Cover Level (m) 120.000</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 117.700 Safety Factor 5.0 Infiltration Coefficient Base (m/hr) 0.13388 Porosity 1.00 Infiltration Coefficient Side (m/hr) 0.13388</div> <table><thead><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr></thead><tbody><tr><td>0.000</td><td>570.0</td><td>1.000</td><td>958.8</td><td>2.000</td><td>1448.1</td><td>2.300</td><td>1614.5</td></tr></tbody></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	570.0	1.000	958.8	2.000	1448.1	2.300	1614.5
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Summer</td><td>108.992</td><td>1.792</td><td>34.5</td><td>1386.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>108.967</td><td>1.767</td><td>34.0</td><td>1356.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>108.936</td><td>1.736</td><td>33.5</td><td>1322.3</td><td>O K</td></tr><tr><td>960 min Summer</td><td>108.869</td><td>1.669</td><td>32.3</td><td>1247.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>108.734</td><td>1.534</td><td>30.1</td><td>1104.9</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>108.569</td><td>1.369</td><td>27.3</td><td>940.5</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>108.440</td><td>1.240</td><td>25.2</td><td>821.5</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>108.249</td><td>1.049</td><td>22.1</td><td>656.9</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>108.106</td><td>0.906</td><td>20.0</td><td>543.8</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>107.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O 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Summer</td><td>11.902</td><td>0.0</td><td>376</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>440</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>506</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>644</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>918</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>1324</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>1712</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>2476</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>3232</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>26</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	108.165	0.965	20.8	589.3	O K	30 min Summer	108.413	1.213	24.7	797.3	O K	60 min Summer	108.627	1.427	28.3	996.9	O K	120 min Summer	108.857	1.657	32.1	1234.8	O K	180 min Summer	108.955	1.755	33.8	1343.0	O K	240 min Summer	108.997	1.797	34.6	1391.0	O K	360 min Summer	109.009	1.809	34.8	1405.0	O K	480 min Summer	108.992	1.792	34.5	1386.2	O K	600 min Summer	108.967	1.767	34.0	1356.7	O K	720 min Summer	108.936	1.736	33.5	1322.3	O K	960 min Summer	108.869	1.669	32.3	1247.9	O K	1440 min Summer	108.734	1.534	30.1	1104.9	O K	2160 min Summer	108.569	1.369	27.3	940.5	O K	2880 min Summer	108.440	1.240	25.2	821.5	O K	4320 min Summer	108.249	1.049	22.1	656.9	O K	5760 min Summer	108.106	0.906	20.0	543.8	O K	7200 min Summer	107.200	0.000	0.0	0.0	O K	8640 min Summer	107.200	0.000	0.0	0.0	O K	10080 min Summer	107.200	0.000	0.0	0.0	O K	15 min Winter	108.255	1.055	22.2	661.6	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	26	30 min Summer	79.632	0.0	40	60 min Summer	51.072	0.0	68	120 min Summer	33.152	0.0	126	180 min Summer	25.172	0.0	184	240 min Summer	20.468	0.0	242	360 min Summer	15.020	0.0	314	480 min Summer	11.902	0.0	376	600 min Summer	9.884	0.0	440	720 min Summer	8.468	0.0	506	960 min Summer	6.605	0.0	644	1440 min Summer	4.625	0.0	918	2160 min Summer	3.241	0.0	1324	2880 min Summer	2.529	0.0	1712	4320 min Summer	1.805	0.0	2476	5760 min Summer	1.436	0.0	3232	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	26
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
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60 min Summer	108.627	1.427	28.3	996.9	O K																																																																																																																																																																																																																		
120 min Summer	108.857	1.657	32.1	1234.8	O K																																																																																																																																																																																																																		
180 min Summer	108.955	1.755	33.8	1343.0	O K																																																																																																																																																																																																																		
240 min Summer	108.997	1.797	34.6	1391.0	O K																																																																																																																																																																																																																		
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2160 min Summer	108.569	1.369	27.3	940.5	O K																																																																																																																																																																																																																		
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.		North Hemel Hempstead			
.		Surface Water Drainage			
.		Basin 6			
Date 28/11/2019		Designed by JAF			
File Basin 6.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	108.522	1.322	26.5	896.0	O K
60 min Winter	108.752	1.552	30.4	1122.9	O K
120 min Winter	109.001	1.801	34.6	1396.5	O K
180 min Winter	109.110	1.910	36.5	1524.9	O K
240 min Winter	109.160	1.960	37.4	1585.6	O K
360 min Winter	109.178	1.978	37.7	1607.9	O K
480 min Winter	109.154	1.954	37.3	1578.1	O K
600 min Winter	109.124	1.924	36.8	1542.4	O K
720 min Winter	109.088	1.888	36.1	1498.5	O K
960 min Winter	109.006	1.806	34.7	1401.8	O K
1440 min Winter	108.838	1.638	31.8	1214.7	O K
2160 min Winter	108.622	1.422	28.2	992.6	O K
2880 min Winter	108.453	1.253	25.4	833.3	O K
4320 min Winter	108.202	1.002	21.3	618.4	O K
5760 min Winter	108.013	0.813	18.7	474.5	O K
7200 min Winter	107.200	0.000	0.0	0.0	O K
8640 min Winter	107.200	0.000	0.0	0.0	O K
10080 min Winter	107.200	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	40		
60 min Winter	51.072	0.0	68		
120 min Winter	33.152	0.0	124		
180 min Winter	25.172	0.0	180		
240 min Winter	20.468	0.0	236		
360 min Winter	15.020	0.0	344		
480 min Winter	11.902	0.0	390		
600 min Winter	9.884	0.0	464		
720 min Winter	8.468	0.0	542		
960 min Winter	6.605	0.0	694		
1440 min Winter	4.625	0.0	988		
2160 min Winter	3.241	0.0	1412		
2880 min Winter	2.529	0.0	1820		
4320 min Winter	1.805	0.0	2600		
5760 min Winter	1.436	0.0	3352		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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.	North Hemel Hempstead	
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XP Solutions	Source Control 2018.1.1	
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<div>Model Details</div> <div>Storage is Online Cover Level (m) 109.500</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 107.200 Safety Factor 5.0</div> <div>Infiltration Coefficient Base (m/hr) 0.32990 Porosity 1.00</div> <div>Infiltration Coefficient Side (m/hr) 0.32990</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>450.0</td><td>1.000</td><td>801.1</td><td>2.000</td><td>1252.7</td><td>2.300</td><td>1407.7</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	450.0	1.000	801.1	2.000	1252.7	2.300	1407.7
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<p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 4334 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>105.922</td><td>0.722</td><td>2.3</td><td>529.7</td><td>O K</td></tr><tr><td>30 min Summer</td><td>106.132</td><td>0.932</td><td>2.6</td><td>723.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>106.332</td><td>1.132</td><td>3.0</td><td>925.7</td><td>O K</td></tr><tr><td>120 min Summer</td><td>106.573</td><td>1.373</td><td>3.4</td><td>1194.9</td><td>O K</td></tr><tr><td>180 min Summer</td><td>106.705</td><td>1.505</td><td>3.7</td><td>1353.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>106.789</td><td>1.589</td><td>3.9</td><td>1459.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>106.889</td><td>1.689</td><td>4.1</td><td>1589.7</td><td>O K</td></tr><tr><td>480 min Summer</td><td>106.943</td><td>1.743</td><td>4.2</td><td>1661.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>106.976</td><td>1.776</td><td>4.2</td><td>1707.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>106.997</td><td>1.797</td><td>4.3</td><td>1736.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>107.021</td><td>1.821</td><td>4.3</td><td>1769.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>107.030</td><td>1.830</td><td>4.4</td><td>1782.4</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>107.016</td><td>1.816</td><td>4.3</td><td>1762.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>106.990</td><td>1.790</td><td>4.3</td><td>1726.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>106.955</td><td>1.755</td><td>4.2</td><td>1678.0</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>106.935</td><td>1.735</td><td>4.2</td><td>1651.8</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>105.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>105.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>105.200</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>105.993</td><td>0.793</td><td>2.4</td><td>593.4</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>116.368</td><td>0.0</td><td>27</td></tr><tr><td>30 min Summer</td><td>79.632</td><td>0.0</td><td>42</td></tr><tr><td>60 min Summer</td><td>51.072</td><td>0.0</td><td>72</td></tr><tr><td>120 min Summer</td><td>33.152</td><td>0.0</td><td>132</td></tr><tr><td>180 min Summer</td><td>25.172</td><td>0.0</td><td>190</td></tr><tr><td>240 min Summer</td><td>20.468</td><td>0.0</td><td>250</td></tr><tr><td>360 min Summer</td><td>15.020</td><td>0.0</td><td>370</td></tr><tr><td>480 min Summer</td><td>11.902</td><td>0.0</td><td>490</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>608</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>728</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>968</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>1446</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>2164</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>2804</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>3456</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>4208</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>27</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	105.922	0.722	2.3	529.7	O K	30 min Summer	106.132	0.932	2.6	723.9	O K	60 min Summer	106.332	1.132	3.0	925.7	O K	120 min Summer	106.573	1.373	3.4	1194.9	O K	180 min Summer	106.705	1.505	3.7	1353.5	O K	240 min Summer	106.789	1.589	3.9	1459.6	O K	360 min Summer	106.889	1.689	4.1	1589.7	O K	480 min Summer	106.943	1.743	4.2	1661.9	O K	600 min Summer	106.976	1.776	4.2	1707.1	O K	720 min Summer	106.997	1.797	4.3	1736.7	O K	960 min Summer	107.021	1.821	4.3	1769.1	O K	1440 min Summer	107.030	1.830	4.4	1782.4	O K	2160 min Summer	107.016	1.816	4.3	1762.3	O K	2880 min Summer	106.990	1.790	4.3	1726.1	O K	4320 min Summer	106.955	1.755	4.2	1678.0	O K	5760 min Summer	106.935	1.735	4.2	1651.8	O K	7200 min Summer	105.200	0.000	0.0	0.0	O K	8640 min Summer	105.200	0.000	0.0	0.0	O K	10080 min Summer	105.200	0.000	0.0	0.0	O K	15 min Winter	105.993	0.793	2.4	593.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	116.368	0.0	27	30 min Summer	79.632	0.0	42	60 min Summer	51.072	0.0	72	120 min Summer	33.152	0.0	132	180 min Summer	25.172	0.0	190	240 min Summer	20.468	0.0	250	360 min Summer	15.020	0.0	370	480 min Summer	11.902	0.0	490	600 min Summer	9.884	0.0	608	720 min Summer	8.468	0.0	728	960 min Summer	6.605	0.0	968	1440 min Summer	4.625	0.0	1446	2160 min Summer	3.241	0.0	2164	2880 min Summer	2.529	0.0	2804	4320 min Summer	1.805	0.0	3456	5760 min Summer	1.436	0.0	4208	7200 min Summer	-0.012	0.0	0	8640 min Summer	-0.010	0.0	0	10080 min Summer	-0.008	0.0	0	15 min Winter	116.368	0.0	27
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																		
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180 min Summer	106.705	1.505	3.7	1353.5	O K																																																																																																																																																																																																																		
240 min Summer	106.789	1.589	3.9	1459.6	O K																																																																																																																																																																																																																		
360 min Summer	106.889	1.689	4.1	1589.7	O K																																																																																																																																																																																																																		
480 min Summer	106.943	1.743	4.2	1661.9	O K																																																																																																																																																																																																																		
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WSP Group Ltd				Page 26	
.		North Hemel Hempstead			
.		Surface Water Drainage			
.		Basin 7			
Date 28/11/2019		Designed by JAF			
File Basin 7.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<p style="text-align: center;"><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	106.221	1.021	2.8	811.1	O K
60 min Winter	106.435	1.235	3.2	1037.4	O K
120 min Winter	106.694	1.494	3.7	1339.9	O K
180 min Winter	106.835	1.635	4.0	1518.4	O K
240 min Winter	106.925	1.725	4.1	1638.0	O K
360 min Winter	107.032	1.832	4.4	1785.3	O K
480 min Winter	107.090	1.890	4.5	1867.9	O K
600 min Winter	107.126	1.926	4.6	1920.2	O K
720 min Winter	107.150	1.950	4.6	1955.0	O K
960 min Winter	107.177	1.977	4.7	1994.6	O K
1440 min Winter	107.192	1.992	4.7	2016.6	O K
2160 min Winter	107.184	1.984	4.7	2005.5	O K
2880 min Winter	107.166	1.966	4.6	1977.5	O K
4320 min Winter	107.123	1.923	4.5	1914.4	O K
5760 min Winter	107.101	1.901	4.5	1882.9	O K
7200 min Winter	105.200	0.000	0.0	0.0	O K
8640 min Winter	105.200	0.000	0.0	0.0	O K
10080 min Winter	105.200	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	41		
60 min Winter	51.072	0.0	72		
120 min Winter	33.152	0.0	130		
180 min Winter	25.172	0.0	188		
240 min Winter	20.468	0.0	248		
360 min Winter	15.020	0.0	364		
480 min Winter	11.902	0.0	482		
600 min Winter	9.884	0.0	600		
720 min Winter	8.468	0.0	718		
960 min Winter	6.605	0.0	952		
1440 min Winter	4.625	0.0	1416		
2160 min Winter	3.241	0.0	2100		
2880 min Winter	2.529	0.0	2764		
4320 min Winter	1.805	0.0	3892		
5760 min Winter	1.436	0.0	4440		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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WSP Group Ltd		Page 27
.	North Hemel Hempstead	
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.	Basin 7	
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XP Solutions	Source Control 2018.1.1	
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<div>Model Details</div> <div>Storage is Online Cover Level (m) 107.500</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 105.200 Safety Factor 5.0 Infiltration Coefficient Base (m/hr) 0.03501 Porosity 1.00 Infiltration Coefficient Side (m/hr) 0.03501</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>600.0</td><td>1.000</td><td>997.6</td><td>2.000</td><td>1495.7</td><td>2.300</td><td>1664.8</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	600.0	1.000	997.6	2.000	1495.7	2.300	1664.8
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<p>Summary of Results for 100 year Return Period (+40%)</p> <p>Half Drain Time : 4694 minutes.</p> <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>105.386</td><td>0.686</td><td>3.0</td><td>722.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>105.595</td><td>0.895</td><td>3.4</td><td>987.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>105.796</td><td>1.096</td><td>3.8</td><td>1263.4</td><td>O K</td></tr><tr><td>120 min Summer</td><td>106.042</td><td>1.342</td><td>4.4</td><td>1631.4</td><td>O K</td></tr><tr><td>180 min Summer</td><td>106.178</td><td>1.478</td><td>4.7</td><td>1848.4</td><td>O K</td></tr><tr><td>240 min Summer</td><td>106.265</td><td>1.565</td><td>4.9</td><td>1994.0</td><td>O K</td></tr><tr><td>360 min Summer</td><td>106.369</td><td>1.669</td><td>5.1</td><td>2173.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>106.426</td><td>1.726</td><td>5.3</td><td>2273.0</td><td>O K</td></tr><tr><td>600 min Summer</td><td>106.461</td><td>1.761</td><td>5.3</td><td>2336.3</td><td>O K</td></tr><tr><td>720 min Summer</td><td>106.484</td><td>1.784</td><td>5.4</td><td>2378.3</td><td>O K</td></tr><tr><td>960 min Summer</td><td>106.510</td><td>1.810</td><td>5.5</td><td>2425.5</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>106.523</td><td>1.823</td><td>5.5</td><td>2449.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>106.513</td><td>1.813</td><td>5.5</td><td>2430.7</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>106.490</td><td>1.790</td><td>5.4</td><td>2389.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>106.452</td><td>1.752</td><td>5.3</td><td>2320.0</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>106.432</td><td>1.732</td><td>5.3</td><td>2283.3</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>104.700</td><td>0.000</td><td>0.0</td><td>0.0</td><td>O 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Summer</td><td>11.902</td><td>0.0</td><td>490</td></tr><tr><td>600 min Summer</td><td>9.884</td><td>0.0</td><td>610</td></tr><tr><td>720 min Summer</td><td>8.468</td><td>0.0</td><td>728</td></tr><tr><td>960 min Summer</td><td>6.605</td><td>0.0</td><td>968</td></tr><tr><td>1440 min Summer</td><td>4.625</td><td>0.0</td><td>1446</td></tr><tr><td>2160 min Summer</td><td>3.241</td><td>0.0</td><td>2164</td></tr><tr><td>2880 min Summer</td><td>2.529</td><td>0.0</td><td>2880</td></tr><tr><td>4320 min Summer</td><td>1.805</td><td>0.0</td><td>3592</td></tr><tr><td>5760 min Summer</td><td>1.436</td><td>0.0</td><td>4328</td></tr><tr><td>7200 min Summer</td><td>-0.012</td><td>0.0</td><td>0</td></tr><tr><td>8640 min Summer</td><td>-0.010</td><td>0.0</td><td>0</td></tr><tr><td>10080 min Summer</td><td>-0.008</td><td>0.0</td><td>0</td></tr><tr><td>15 min Winter</td><td>116.368</td><td>0.0</td><td>27</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max 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30 min Summer	105.595	0.895	3.4	987.9	O K																																																																																																																																																																																																																		
60 min Summer	105.796	1.096	3.8	1263.4	O K																																																																																																																																																																																																																		
120 min Summer	106.042	1.342	4.4	1631.4	O K																																																																																																																																																																																																																		
180 min Summer	106.178	1.478	4.7	1848.4	O K																																																																																																																																																																																																																		
240 min Summer	106.265	1.565	4.9	1994.0	O K																																																																																																																																																																																																																		
360 min Summer	106.369	1.669	5.1	2173.0	O K																																																																																																																																																																																																																		
480 min Summer	106.426	1.726	5.3	2273.0	O K																																																																																																																																																																																																																		
600 min Summer	106.461	1.761	5.3	2336.3	O K																																																																																																																																																																																																																		
720 min Summer	106.484	1.784	5.4	2378.3	O K																																																																																																																																																																																																																		
960 min Summer	106.510	1.810	5.5	2425.5	O K																																																																																																																																																																																																																		
1440 min Summer	106.523	1.823	5.5	2449.6	O K																																																																																																																																																																																																																		
2160 min Summer	106.513	1.813	5.5	2430.7	O K																																																																																																																																																																																																																		
2880 min Summer	106.490	1.790	5.4	2389.1	O K																																																																																																																																																																																																																		
4320 min Summer	106.452	1.752	5.3	2320.0	O K																																																																																																																																																																																																																		
5760 min Summer	106.432	1.732	5.3	2283.3	O K																																																																																																																																																																																																																		
7200 min Summer	104.700	0.000	0.0	0.0	O K																																																																																																																																																																																																																		
8640 min Summer	104.700	0.000	0.0	0.0	O K																																																																																																																																																																																																																		
10080 min Summer	104.700	0.000	0.0	0.0	O K																																																																																																																																																																																																																		
15 min Winter	105.456	0.756	3.2	809.8	O K																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																				
15 min Summer	116.368	0.0	27																																																																																																																																																																																																																				
30 min Summer	79.632	0.0	42																																																																																																																																																																																																																				
60 min Summer	51.072	0.0	72																																																																																																																																																																																																																				
120 min Summer	33.152	0.0	132																																																																																																																																																																																																																				
180 min Summer	25.172	0.0	190																																																																																																																																																																																																																				
240 min Summer	20.468	0.0	250																																																																																																																																																																																																																				
360 min Summer	15.020	0.0	370																																																																																																																																																																																																																				
480 min Summer	11.902	0.0	490																																																																																																																																																																																																																				
600 min Summer	9.884	0.0	610																																																																																																																																																																																																																				
720 min Summer	8.468	0.0	728																																																																																																																																																																																																																				
960 min Summer	6.605	0.0	968																																																																																																																																																																																																																				
1440 min Summer	4.625	0.0	1446																																																																																																																																																																																																																				
2160 min Summer	3.241	0.0	2164																																																																																																																																																																																																																				
2880 min Summer	2.529	0.0	2880																																																																																																																																																																																																																				
4320 min Summer	1.805	0.0	3592																																																																																																																																																																																																																				
5760 min Summer	1.436	0.0	4328																																																																																																																																																																																																																				
7200 min Summer	-0.012	0.0	0																																																																																																																																																																																																																				
8640 min Summer	-0.010	0.0	0																																																																																																																																																																																																																				
10080 min Summer	-0.008	0.0	0																																																																																																																																																																																																																				
15 min Winter	116.368	0.0	27																																																																																																																																																																																																																				
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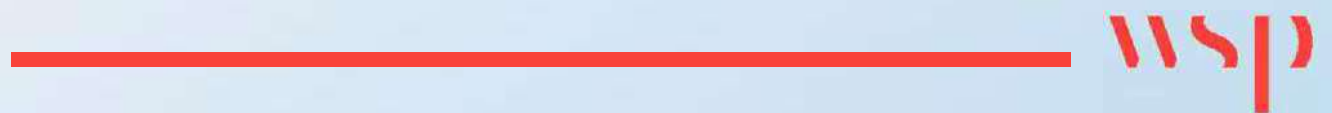
WSP Group Ltd				Page 30	
.		North Hemel Hempstead			
.		Surface Water Drainage			
.		Basin 8			
Date 28/11/2019		Designed by JAF			
File Basin 8.SRCX		Checked by JWB			
XP Solutions		Source Control 2018.1.1			
<p style="text-align: center;"><u>Summary of Results for 100 year Return Period (+40%)</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	105.684	0.984	3.6	1106.9	O K
60 min Winter	105.900	1.200	4.1	1415.9	O K
120 min Winter	106.166	1.466	4.7	1829.4	O K
180 min Winter	106.312	1.612	5.0	2073.7	O K
240 min Winter	106.406	1.706	5.2	2237.7	O K
360 min Winter	106.518	1.818	5.5	2440.4	O K
480 min Winter	106.580	1.880	5.6	2554.8	O K
600 min Winter	106.619	1.919	5.7	2628.0	O K
720 min Winter	106.644	1.944	5.8	2677.2	O K
960 min Winter	106.674	1.974	5.8	2734.7	O K
1440 min Winter	106.693	1.993	5.9	2771.2	O K
2160 min Winter	106.690	1.990	5.9	2765.2	O K
2880 min Winter	106.675	1.975	5.8	2735.3	O K
4320 min Winter	106.636	1.936	5.8	2661.2	O K
5760 min Winter	106.610	1.910	5.7	2611.9	O K
7200 min Winter	104.700	0.000	0.0	0.0	O K
8640 min Winter	104.700	0.000	0.0	0.0	O K
10080 min Winter	104.700	0.000	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	79.632	0.0	41		
60 min Winter	51.072	0.0	72		
120 min Winter	33.152	0.0	130		
180 min Winter	25.172	0.0	188		
240 min Winter	20.468	0.0	248		
360 min Winter	15.020	0.0	366		
480 min Winter	11.902	0.0	482		
600 min Winter	9.884	0.0	600		
720 min Winter	8.468	0.0	718		
960 min Winter	6.605	0.0	952		
1440 min Winter	4.625	0.0	1418		
2160 min Winter	3.241	0.0	2104		
2880 min Winter	2.529	0.0	2772		
4320 min Winter	1.805	0.0	4020		
5760 min Winter	1.436	0.0	4512		
7200 min Winter	-0.012	0.0	0		
8640 min Winter	-0.010	0.0	0		
10080 min Winter	-0.008	0.0	0		
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WSP Group Ltd		Page 31
.	North Hemel Hempstead	
.	Surface Water Drainage	
.	Basin 8	
Date 28/11/2019	Designed by JAF	
File Basin 8.SRCX	Checked by JWB	
XP Solutions	Source Control 2018.1.1	
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WSP Group Ltd		Page 32																
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Date 28/11/2019	Designed by JAF																	
File Basin 8.SRCX	Checked by JWB																	
XP Solutions	Source Control 2018.1.1																	
<div>Model Details</div> <div>Storage is Online Cover Level (m) 107.000</div> <div>Infiltration Basin Structure</div> <div>Invert Level (m) 104.700 Safety Factor 5.0 Infiltration Coefficient Base (m/hr) 0.03501 Porosity 1.00 Infiltration Coefficient Side (m/hr) 0.03501</div> <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>900.0</td><td>1.000</td><td>1375.7</td><td>2.000</td><td>1951.8</td><td>2.300</td><td>2144.3</td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	900.0	1.000	1375.7	2.000	1951.8	2.300	2144.3
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)											
0.000	900.0	1.000	1375.7	2.000	1951.8	2.300	2144.3											
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Appendix M

THAMES WATER CORRESPONDENCE



Forsdyke, James

From: Berryman, James
Sent: 06 December 2019 15:35
To: Forsdyke, James
Subject: FW: RE: Hemel Hempstead Road Pre-Development Enquiry
Attachments: Capacity concerns.pdf; Waste Cost Underwriting Agreement.pdf; Wastewater FAQs for pre-planning enquiries.pdf

Best regards

James

James Berryman

Associate Director



Mob: +44(0) 7761 810 496
Fax: +44(0) 1992 526 001

Unit 9, The Chase, John Tate Road,
Foxholes Business Park, Hertford,
SG13 7NN
wsp.com

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From: DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Sent: 21 August 2019 12:34
To: Berryman, James <James.Berryman@wsp.com>
Subject: RE: RE: Hemel Hempstead Road Pre-Development Enquiry

Hi James,

Thanks for your reply. I have attached the formal Thames Waters Utilities response. Due to the capacity concerns for this site the letter sets out the next steps regarding modelling and undertaking improvement works.

If you wish to discuss the matter please feel free to give me a call.

Kind Regards

Andrew John

Developer Services – Sewer Adoptions Team

Office: 0203 5779018

Andrew.John@thameswater.co.uk

Get advice on making your sewer connection correctly at connectright.org.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB

Find us online at developers.thameswater.co.uk

From: "Berryman, James" <James.Berryman@wsp.com>
To: [DEVELOPER.SERVICES@THAMESWATER.CO.U](mailto:DEVELOPER.SERVICES@THAMESWATER.CO.UK)
<DEVELOPER.SERVICES@THAMESWATER.CO.UK>;Forsdyke, James <james.forsdyke@wsp.com>
CC:
Sent: 13.08.19 11:44:55
Subject: RE: Hemel Hempstead Road Pre-Development Enquiry

Hi Andrew

Thanks for your email.

Unfortunately it is not feasible to reduce the foul water discharge from the site, the proposed development is allocated within the draft St Albans City & District Local Plan 2020-2036 and so the housing numbers are fixed and are required in order for the council to meet their housing targets.

I would expect Thames Water have been consulted as part of the Local Plan process and you may already have undertaken modelling for the site so that the next AMP cycle will deliver the required capacity – if possible can you discuss with your asset planners?

Many thanks

James

James Berryman
Associate Director



Mob: +44(0) 7761 810 496
Fax: +44(0) 1992 526 001

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From: [DEVELOPER.SERVICES@THAMESWATER.CO.U](mailto:DEVELOPER.SERVICES@THAMESWATER.CO.UK) <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
Sent: 06 August 2019 15:24
To: Forsdyke, James <james.forsdyke@wsp.com>
Cc: Berryman, James <James.Berryman@wsp.com>
Subject: RE: Hemel Hempstead Road Pre-Development Enquiry

Hi James,

Thanks for you application, I have passed the flow rates that you provided to our asset planning team and they have capacity concerns. To move your application forward are you able to redesign the foul water flow rates to achieve a flow below 45l/s.

If this can be achieved Thames Water will still need to undertake modelling and possibly capacity improvement works. This could take approximately 20 months once we have received evidence;-

1. of land ownership
2. outline or full planning permission

If you wish to discuss the matter please give me a call.

Kind Regards

Andrew John

Developer Services – Sewer Adoptions Team

Office: 0203 5779018

Andrew.John@thameswater.co.uk

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From: "Forsdyke, James" <james.forsdyke@wsp.com>
To: DEVELOPER.SERVICES@THAMESWATER.CO.U <DEVELOPER.SERVICES@THAMESWATER.CO.UK>
CC: Berryman, James <James.Berryman@wsp.com>
Sent: 25.07.19 12:07:43
Subject: Hemel Hempstead Road Pre-Development Enquiry

Dear Sir/Madam,

Please find attached the required documents for you to undertake a pre-development enquiry for the site at Hemel Hempstead Road.

If you require any additional information please feel free to contact myself or James Berryman (CC'ed).

Kind regards,

James Forsdyke BEng GMICE

Assistant Engineer



Tel: +44(0)1992 526 022

Unit 9 The Chase, Foxholes Business Park, Hertford, SG13 7NN.

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James Forsdyke
Unit 9, The Chase,
John Tate Road, Foxholes Business Park
Hertford
SG13 7NN



Date 21/08/19

Pre-planning enquiry: Capacity concerns

Dear James

Thank you for providing information on your development for the Land North of Hemel Hempstead Road, Hemel Hempstead, for 1500 dwellings, primary school for 630 pupils, a nursing home (112 bed) and a local centre, foul water to discharging by pump (76.5l/s) into chamber 3906 and surface water by gravity into chamber 8150, (2l/s/ha).

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

We've assessed your **foul water** proposals and concluded that our sewerage network is unfortunately unable to meet the needs of your **full** development at this time.

In order to ensure we make the appropriate upgrades – or 'off-site reinforcement' – to serve the remainder of your development, we'll need to carry out modelling work, design a solution and build the necessary improvements. This work is done at our cost.

Once we've begun modelling, we may need to contact you to discuss changing the connection point for capacity reasons. Please note that we'll pay the cost of covering any extra distance if the connection needs to be made at a point further away than the nearest practicable point of at least the same diameter.

How long could modelling and reinforcement take?

Typical timescales for a development of your size are:

Modelling: 8 months
Design: 6 months
Construction: 6 months
Total: 20 months

If the time you're likely to take from planning and construction through to first occupancy is longer than this, we'll be able to carry out the necessary upgrades in time for your development. If it's shorter, please contact me on the number below to discuss the timing of our activities.

What do you need to tell us before we start modelling?

We're responsible for funding any modelling and reinforcement work. We need, though, to spend our customers' money wisely, so we'll only carry out modelling once we're confident that your development will proceed.

In order to have this confidence, we'll need to know that you **own the land and have either outline or full planning permission**. Please email this information to us as soon as you have it.

If you'd like us to start modelling work ahead of this point, we can do this if you agree to underwrite the cost of modelling and design. That means we'll fund the work – but you agree to pay the cost if you don't achieve first occupancy within five years.

I've attached an example of our underwriting agreement. Please call me on the number below if you'd like to discuss this or want to request a copy of the agreement to complete.

If the modelling shows we need to carry out reinforcement work, then before we start construction we'll need you to supply us with notification that you've confirmed your F10 – Notification of construction project - submission to the Health and Safety Executive.

Surface Water

Please note that discharging surface water to the public sewer network should only be considered after all other methods of disposal have been investigated and proven to not be viable. In accordance with the Building Act 2000 Clause H3.3, positive connection to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. The disposal hierarchy being: 1st Soakaways; 2nd Watercourses; 3rd Sewers.

Only when it can be proven that soakage into the ground or a connection into an adjacent watercourse is not possible would we consider a restricted discharge into the public surface water/combined sewer network.

If the peak surface water run-off discharge is then restricted to Greenfield run-off rates/a maximum of 2l/s/ha, as your drainage strategy indicates, then we would have no objections to the proposals.

Thames Water Planning team would ask to see why it is not practicable on the site to restrict to Greenfield run-off rates if they are consulted as part of any planning application.

In considering your surface water needs, we support the use of sustainable drainage on development sites. You'll need to show the local authority and/or lead local flood authority how you've taken into account the surface water hierarchy that we've included.

Please see the attached 'Planning your wastewater' leaflet for additional information.

What do I need to do next?

Please submit the evidence we required or you will need to underwrite the cost of modelling for the capacity improvement project to commence. We are unable to start modelling until this confirmation is received.

Please note that you must keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient supply capacity.

If you've any further questions, please contact me on 0203 5779018.

Yours sincerely

Andrew John

Thames Water