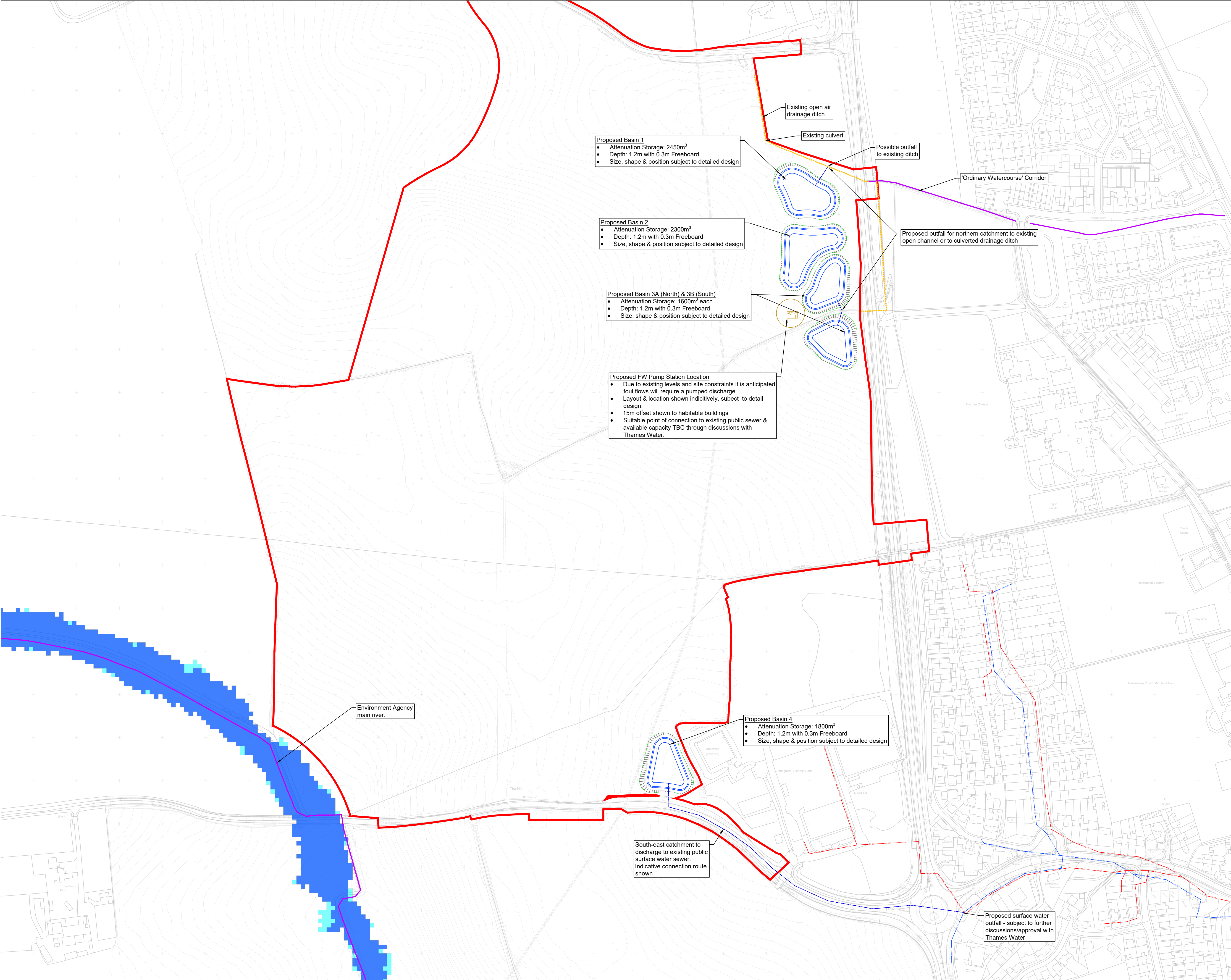


Appendix F: Proposed Drainage Strategy Layout & Associated Calculations



Legend

Notes:

- Do not scale from this drawing.
- The location of existing sewers and other features are shown indicatively based on utility companies asset plans. The location and details of any existing apparatus/features should be further investigated prior to commencement of works onsite.
- Fluvial flood zones and surface water flood risk zones shown based on EA flood maps. These zones are subject to change following further investigation of EA flood data.
- No detailed ground investigation information data is available for the site.
- BGS data shows the site is underlain with Chalk of the Lewes Nodular Chalk Formation and Seaford Chalk Formation, which may be suitable for infiltration. Full infiltration testing in accordance with BRE Digest 365 guidance is required onsite to check infiltration feasibility.
- If infiltration is found not to be a viable option, the preferred drainage strategy for the development is to discharge to the existing watercourses/ public sewer within the site and surrounding area, subject to approval from the LLFA, with surface water run-off from the development restricted to a pre-development greenfield Qbar rate.
- Indicative attenuation basins shown have been sized to contain the 1 in 100 year including 40% CC allowance event.
- The proposed basins are shown indicatively with grading shown tying into existing levels. The size, shape and position is subject to detail design.
- An indicative overview of the drainage strategy is shown based on currently available information. This is subject to change and further assessment as the site is taken forward and more detailed information becomes available.
- There is a considerable level difference in parts of the site, proposed basins have been shown to try to reflect the existing topography. However, significant earthworks may be required in the construction of the basins.
- Due to the existing topography of the site, it is anticipated that foul flows from northern parcel of the site will require a pumped connection to the proposed point of connection on the public sewer.
- For the attenuation option, it is anticipated that surface flows from the development will be conveyed to a suitable point of connection to the existing public sewer network or a local watercourse located within close proximity to the site. This is subject to approval with Thames Water/ LLFA.

P3	14.05.24	Updated Redline Plan	LE	LE
P2	22.03.24	Updated redline plan	LE	LE
P1	15.02.24	Preliminary Issue	MD	LE

Rev Date Description By Apvd

PROJECT:
LAND NORTH OF BALDOCK ROAD,
BUNTINGFORD

TITLE:
PRELIMINARY DRAINAGE LAYOUT

CLIENT:
HALLAM LAND MANAGEMENT

SCALE@A1:
1:2000

PROJECT REF:
23161

DRAWING No:
SK-C-007

REV:
P3

Revision Referencing
P = Preliminary A = Approval T = Tender C = Construction

Bristol, Cardiff, Plymouth, Winchester
St James Court, St James Parade, Bristol BS1 3LH

jubb.uk.com
+44(0)117 922 6266

Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

51.95294° N

Longitude:

0.03669° W

Reference:

639284752

Date:

Jan 11 2024 16:48

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):

5.14

Methodology

Q_{MED} estimation method:

Calculate from BFI and SAAR

BFI and SPR method:

Specify BFI manually

HOST class:

N/A

BFI / BFIHOST:

0.385

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

1.14

Hydrological characteristics

SAAR (mm):

Default

631

Edited

631

Hydrological region:

6

6

Growth curve factor 1 year:

0.85

0.85

Growth curve factor 30 years:

2.3

2.3

Growth curve factor 100 years:

3.19

3.19

Growth curve factor 200 years:

3.74

3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):		17.5
1 in 1 year (l/s):		14.87
1 in 30 years (l/s):		40.25
1 in 100 year (l/s):		55.82
1 in 200 years (l/s):		65.44

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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St James's Court, Suite B Ground Floor West, St James ... Bristol, BS1 3LH					
Date 16/02/2024 16:41 File Catchment 1_Attenuation...		Designed by Checked by			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	0.890	0.890	17.5	2180.1	O K
360 min Winter	0.950	0.950	17.5	2326.6	O K
480 min Winter	0.975	0.975	17.5	2388.9	O K
600 min Winter	0.984	0.984	17.5	2410.4	O K
720 min Winter	0.983	0.983	17.5	2409.3	O K
960 min Winter	0.967	0.967	17.5	2368.3	O K
1440 min Winter	0.905	0.905	17.5	2216.9	O K
2160 min Winter	0.825	0.825	17.5	2020.1	O K
2880 min Winter	0.745	0.745	17.5	1826.1	O K
4320 min Winter	0.585	0.585	17.5	1434.4	O K
5760 min Winter	0.460	0.460	17.5	1126.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
240 min Winter	19.471	0.0	2232.1	244	
360 min Winter	14.296	0.0	2432.9	360	
480 min Winter	11.361	0.0	2546.9	476	
600 min Winter	9.463	0.0	2613.8	590	
720 min Winter	8.132	0.0	2648.4	704	
960 min Winter	6.379	0.0	2642.3	924	
1440 min Winter	4.498	0.0	2508.3	1302	
2160 min Winter	3.173	0.0	3398.3	1644	
2880 min Winter	2.485	0.0	3541.4	2108	
4320 min Winter	1.779	0.0	3780.3	2936	
5760 min Winter	1.415	0.0	4088.6	3688	
©1982-2019 Innovyze					

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Date 16/02/2024 16:41 File Catchment 1_Attenuation...	Designed by Checked by	
Innovyze Source Control 2019.1		

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Date 16/02/2024 16:41 File Catchment 1_Attenuation...	Designed by Checked by	
Innovyze Source Control 2019.1		

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	2450.0	1.000	2450.0	1.100	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0187-1750-1000-1750
Design Head (m)	1.000
Design Flow (l/s)	17.5
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	187
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	17.5
Flush-Flo™	0.331	17.5
Kick-Flo®	0.713	14.9
Mean Flow over Head Range	-	14.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.6	1.200	19.1	3.000	29.6	7.000	44.5
0.200	16.8	1.400	20.5	3.500	31.9	7.500	46.0
0.300	17.5	1.600	21.9	4.000	34.0	8.000	47.5
0.400	17.4	1.800	23.1	4.500	36.0	8.500	48.9
0.500	17.1	2.000	24.3	5.000	37.8	9.000	50.3
0.600	16.5	2.200	25.5	5.500	39.6	9.500	51.6
0.800	15.7	2.400	26.6	6.000	41.3		
1.000	17.5	2.600	27.6	6.500	43.0		

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Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

51.95294° N

Longitude:

0.03669° W

Reference:

21596204

Date:

Jan 11 2024 16:44

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):

4.83

Methodology

Q_{MED} estimation method:

Calculate from BFI and SAAR

BFI and SPR method:

Specify BFI manually

HOST class:

N/A

BFI / BFIHOST:

0.385

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

1.14

Hydrological characteristics

SAAR (mm):

Default

631

Edited

631

Hydrological region:

6

6

Growth curve factor 1 year:

0.85

0.85

Growth curve factor 30 years:

2.3

2.3

Growth curve factor 100 years:

3.19

3.19

Growth curve factor 200 years:

3.74

3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Q_{BAR} (l/s):		16.44
1 in 1 year (l/s):		13.98
1 in 30 years (l/s):		37.82
1 in 100 year (l/s):		52.45
1 in 200 years (l/s):		61.5

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Jubb Consulting Engineers Ltd (Bristol)					Page 1
St James's Court, Suite B Ground Floor West, St James ... Bristol, BS1 3LH					
Date 16/02/2024 16:43 File Catchment 2_Attenuation...		Designed by Checked by			
Innovyze		Source Control 2019.1			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.287	0.287	16.3	660.0	O K
30 min Summer	0.402	0.402	16.4	923.9	O K
60 min Summer	0.520	0.520	16.4	1195.9	O K
120 min Summer	0.663	0.663	16.4	1524.8	O K
180 min Summer	0.742	0.742	16.4	1706.4	O K
240 min Summer	0.790	0.790	16.4	1817.6	O K
360 min Summer	0.841	0.841	16.4	1935.2	O K
480 min Summer	0.862	0.862	16.4	1981.5	O K
600 min Summer	0.867	0.867	16.4	1993.5	O K
720 min Summer	0.864	0.864	16.4	1986.2	O K
960 min Summer	0.843	0.843	16.4	1939.4	O K
1440 min Summer	0.794	0.794	16.4	1826.7	O K
2160 min Summer	0.729	0.729	16.4	1675.6	O K
2880 min Summer	0.664	0.664	16.4	1527.8	O K
4320 min Summer	0.561	0.561	16.4	1290.5	O K
5760 min Summer	0.480	0.480	16.4	1103.3	O K
15 min Winter	0.322	0.322	16.4	740.4	O K
30 min Winter	0.451	0.451	16.4	1036.9	O K
60 min Winter	0.584	0.584	16.4	1343.4	O K
120 min Winter	0.747	0.747	16.4	1717.0	O K
180 min Winter	0.835	0.835	16.4	1921.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	106.120	0.0	583.8	22	
30 min Summer	74.620	0.0	833.4	37	
60 min Summer	48.790	0.0	1182.9	66	
120 min Summer	31.640	0.0	1537.2	126	
180 min Summer	23.973	0.0	1743.8	186	
240 min Summer	19.471	0.0	1883.6	244	
360 min Summer	14.296	0.0	2062.4	364	
480 min Summer	11.361	0.0	2171.1	482	
600 min Summer	9.463	0.0	2244.1	602	
720 min Summer	8.132	0.0	2294.7	722	
960 min Summer	6.379	0.0	2348.5	934	
1440 min Summer	4.498	0.0	2302.4	1144	
2160 min Summer	3.173	0.0	2851.0	1536	
2880 min Summer	2.485	0.0	2973.6	1908	
4320 min Summer	1.779	0.0	3175.1	2684	
5760 min Summer	1.415	0.0	3426.4	3464	
15 min Winter	106.120	0.0	658.7	22	
30 min Winter	74.620	0.0	933.4	37	
60 min Winter	48.790	0.0	1327.0	66	
120 min Winter	31.640	0.0	1719.9	124	
180 min Winter	23.973	0.0	1947.3	182	
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Date 16/02/2024 16:43 File Catchment 2_Attenuation...		Designed by Checked by			
Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	0.890	0.890	16.4	2047.4	O K
360 min Winter	0.950	0.950	16.4	2184.5	O K
480 min Winter	0.975	0.975	16.4	2242.5	O K
600 min Winter	0.984	0.984	16.4	2262.5	O K
720 min Winter	0.983	0.983	16.4	2261.2	O K
960 min Winter	0.966	0.966	16.4	2222.5	O K
1440 min Winter	0.904	0.904	16.4	2079.7	O K
2160 min Winter	0.824	0.824	16.4	1894.2	O K
2880 min Winter	0.744	0.744	16.4	1712.0	O K
4320 min Winter	0.584	0.584	16.4	1343.7	O K
5760 min Winter	0.458	0.458	16.4	1054.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
240 min Winter	19.471	0.0	2099.2	240	
360 min Winter	14.296	0.0	2288.0	358	
480 min Winter	11.361	0.0	2395.0	474	
600 min Winter	9.463	0.0	2457.4	588	
720 min Winter	8.132	0.0	2488.9	700	
960 min Winter	6.379	0.0	2479.9	922	
1440 min Winter	4.498	0.0	2354.5	1300	
2160 min Winter	3.173	0.0	3192.8	1644	
2880 min Winter	2.485	0.0	3327.4	2104	
4320 min Winter	1.779	0.0	3552.6	2936	
5760 min Winter	1.415	0.0	3839.7	3688	
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Innovyze	Source Control 2019.1	

Jubb Consulting Engineers Ltd (Bristol)			Page 4																																																																																																				
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Innovyze		Source Control 2019.1																																																																																																					
Model Details Storage is Online Cover Level (m) 1.500 Tank or Pond Structure Invert Level (m) 0.000 <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></tr><tr><td>0.000</td><td>2300.0</td><td>1.000</td><td>2300.0</td><td>1.100</td><td>0.0</td></tr></table> Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0182-1640-1000-1640 Design Head (m) 1.000 Design Flow (l/s) 16.4 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 182 Invert Level (m) 0.000 Minimum Outlet Pipe Diameter (mm) 225 Suggested Manhole Diameter (mm) 1500 <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.000</td><td>16.4</td></tr><tr><td>Flush-Flo™</td><td>0.328</td><td>16.4</td></tr><tr><td>Kick-Flo®</td><td>0.709</td><td>13.9</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>13.9</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>6.4</td><td>1.200</td><td>17.9</td><td>3.000</td><td>27.7</td><td>7.000</td><td>41.7</td></tr><tr><td>0.200</td><td>15.7</td><td>1.400</td><td>19.2</td><td>3.500</td><td>29.8</td><td>7.500</td><td>43.1</td></tr><tr><td>0.300</td><td>16.4</td><td>1.600</td><td>20.5</td><td>4.000</td><td>31.8</td><td>8.000</td><td>44.5</td></tr><tr><td>0.400</td><td>16.3</td><td>1.800</td><td>21.7</td><td>4.500</td><td>33.7</td><td>8.500</td><td>45.8</td></tr><tr><td>0.500</td><td>16.0</td><td>2.000</td><td>22.8</td><td>5.000</td><td>35.4</td><td>9.000</td><td>47.1</td></tr><tr><td>0.600</td><td>15.4</td><td>2.200</td><td>23.9</td><td>5.500</td><td>37.1</td><td>9.500</td><td>48.4</td></tr><tr><td>0.800</td><td>14.8</td><td>2.400</td><td>24.9</td><td>6.000</td><td>38.7</td><td></td><td></td></tr><tr><td>1.000</td><td>16.4</td><td>2.600</td><td>25.9</td><td>6.500</td><td>40.2</td><td></td><td></td></tr></table>					Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	2300.0	1.000	2300.0	1.100	0.0	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.000	16.4	Flush-Flo™	0.328	16.4	Kick-Flo®	0.709	13.9	Mean Flow over Head Range	-	13.9	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	6.4	1.200	17.9	3.000	27.7	7.000	41.7	0.200	15.7	1.400	19.2	3.500	29.8	7.500	43.1	0.300	16.4	1.600	20.5	4.000	31.8	8.000	44.5	0.400	16.3	1.800	21.7	4.500	33.7	8.500	45.8	0.500	16.0	2.000	22.8	5.000	35.4	9.000	47.1	0.600	15.4	2.200	23.9	5.500	37.1	9.500	48.4	0.800	14.8	2.400	24.9	6.000	38.7			1.000	16.4	2.600	25.9	6.500	40.2		
Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)																																																																																																		
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0.200	15.7	1.400	19.2	3.500	29.8	7.500	43.1																																																																																																
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0.500	16.0	2.000	22.8	5.000	35.4	9.000	47.1																																																																																																
0.600	15.4	2.200	23.9	5.500	37.1	9.500	48.4																																																																																																
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1.000	16.4	2.600	25.9	6.500	40.2																																																																																																		
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Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

51.95294° N

Longitude:

0.03669° W

Reference:

992707282

Date:

Jan 11 2024 16:12

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):

7.46

Methodology

Q_{MED} estimation method:

Calculate from BFI and SAAR

BFI and SPR method:

Specify BFI manually

HOST class:

N/A

BFI / BFIHOST:

0.385

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

1.14

Hydrological characteristics

SAAR (mm):

Default

631

Edited

631

Hydrological region:

6

6

Growth curve factor 1 year:

0.85

0.85

Growth curve factor 30 years:

2.3

2.3

Growth curve factor 100 years:

3.19

3.19

Growth curve factor 200 years:

3.74

3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):		25.4
1 in 1 year (l/s):		21.59
1 in 30 years (l/s):		58.41
1 in 100 year (l/s):		81.01
1 in 200 years (l/s):		94.98

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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St James's Court, Suite B Ground Floor West, St James ... Bristol, BS1 3LH					
Date 16/02/2024 16:44 File Catchment 3_Attenuation...		Designed by Checked by			
Innovyze		Source Control 2019.1			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
15 min Summer	0.293	0.293	25.2	937.2	O K
30 min Summer	0.410	0.410	25.4	1312.4	O K
60 min Summer	0.531	0.531	25.4	1699.4	O K
120 min Summer	0.677	0.677	25.4	2165.8	O K
180 min Summer	0.757	0.757	25.4	2421.7	O K
240 min Summer	0.806	0.806	25.4	2577.9	O K
360 min Summer	0.856	0.856	25.4	2739.0	O K
480 min Summer	0.875	0.875	25.4	2798.4	O K
600 min Summer	0.878	0.878	25.4	2809.0	O K
720 min Summer	0.873	0.873	25.4	2792.2	O K
960 min Summer	0.850	0.850	25.4	2719.1	O K
1440 min Summer	0.800	0.800	25.4	2561.3	O K
2160 min Summer	0.730	0.730	25.4	2337.4	O K
2880 min Summer	0.663	0.663	25.4	2122.9	O K
4320 min Summer	0.556	0.556	25.4	1777.7	O K
5760 min Summer	0.471	0.471	25.4	1506.3	O K
15 min Winter	0.329	0.329	25.3	1051.5	O K
30 min Winter	0.460	0.460	25.4	1473.6	O K
60 min Winter	0.597	0.597	25.4	1909.9	O K
120 min Winter	0.762	0.762	25.4	2439.7	O K
180 min Winter	0.852	0.852	25.4	2727.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
15 min Summer	106.120	0.0	814.1	25	
30 min Summer	74.620	0.0	1171.7	40	
60 min Summer	48.790	0.0	1675.1	68	
120 min Summer	31.640	0.0	2181.1	128	
180 min Summer	23.973	0.0	2477.5	186	
240 min Summer	19.471	0.0	2678.9	246	
360 min Summer	14.296	0.0	2939.4	364	
480 min Summer	11.361	0.0	3101.3	484	
600 min Summer	9.463	0.0	3213.8	602	
720 min Summer	8.132	0.0	3296.7	720	
960 min Summer	6.379	0.0	3404.3	876	
1440 min Summer	4.498	0.0	3456.8	1110	
2160 min Summer	3.173	0.0	4058.7	1496	
2880 min Summer	2.485	0.0	4233.2	1876	
4320 min Summer	1.779	0.0	4518.6	2644	
5760 min Summer	1.415	0.0	4880.7	3408	
15 min Winter	106.120	0.0	921.1	25	
30 min Winter	74.620	0.0	1316.3	39	
60 min Winter	48.790	0.0	1880.8	68	
120 min Winter	31.640	0.0	2443.1	126	
180 min Winter	23.973	0.0	2771.1	184	
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Innovyze		Source Control 2019.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	0.908	0.908	25.4	2904.3	O K
360 min Winter	0.966	0.966	25.4	3092.3	O K
480 min Winter	0.990	0.990	25.4	3167.5	O K
600 min Winter	0.996	0.996	25.4	3188.6	O K
720 min Winter	0.994	0.994	25.4	3179.8	O K
960 min Winter	0.972	0.972	25.4	3111.7	O K
1440 min Winter	0.907	0.907	25.4	2903.2	O K
2160 min Winter	0.821	0.821	25.4	2626.6	O K
2880 min Winter	0.732	0.732	25.4	2342.2	O K
4320 min Winter	0.564	0.564	25.4	1803.6	O K
5760 min Winter	0.435	0.435	25.4	1391.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
240 min Winter	19.471	0.0	2992.7	242	
360 min Winter	14.296	0.0	3275.7	358	
480 min Winter	11.361	0.0	3446.8	474	
600 min Winter	9.463	0.0	3560.7	588	
720 min Winter	8.132	0.0	3639.0	700	
960 min Winter	6.379	0.0	3719.2	916	
1440 min Winter	4.498	0.0	3638.8	1158	
2160 min Winter	3.173	0.0	4546.5	1620	
2880 min Winter	2.485	0.0	4740.4	2076	
4320 min Winter	1.779	0.0	5063.8	2860	
5760 min Winter	1.415	0.0	5470.2	3584	
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Jubb Consulting Engineers Ltd (Bristol)			Page 4																																																																																																				
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Model Details Storage is Online Cover Level (m) 1.500 Tank or Pond Structure Invert Level (m) 0.000 <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></tr></thead><tbody><tr><td>0.000</td><td>3200.0</td><td>1.000</td><td>3200.0</td><td>1.100</td><td>0.0</td></tr></tbody></table> Hydro-Brake® Optimum Outflow Control Unit Reference MD-SHE-0220-2540-1000-2540 Design Head (m) 1.000 Design Flow (l/s) 25.4 Flush-Flo™ Calculated Objective Minimise upstream storage Application Surface Sump Available Yes Diameter (mm) 220 Invert Level (m) 0.000 Minimum Outlet Pipe Diameter (mm) 300 Suggested Manhole Diameter (mm) 1500 <table><thead><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>Design Point (Calculated)</td><td>1.000</td><td>25.4</td></tr><tr><td>Flush-Flo™</td><td>0.362</td><td>25.4</td></tr><tr><td>Kick-Flo®</td><td>0.736</td><td>21.9</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>21.1</td></tr></tbody></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><thead><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr></thead><tbody><tr><td>0.100</td><td>7.4</td><td>1.200</td><td>27.7</td><td>3.000</td><td>43.0</td><td>7.000</td><td>64.9</td></tr><tr><td>0.200</td><td>21.7</td><td>1.400</td><td>29.8</td><td>3.500</td><td>46.4</td><td>7.500</td><td>67.1</td></tr><tr><td>0.300</td><td>25.2</td><td>1.600</td><td>31.8</td><td>4.000</td><td>49.5</td><td>8.000</td><td>69.3</td></tr><tr><td>0.400</td><td>25.3</td><td>1.800</td><td>33.7</td><td>4.500</td><td>52.4</td><td>8.500</td><td>71.3</td></tr><tr><td>0.500</td><td>24.9</td><td>2.000</td><td>35.4</td><td>5.000</td><td>55.1</td><td>9.000</td><td>73.4</td></tr><tr><td>0.600</td><td>24.3</td><td>2.200</td><td>37.1</td><td>5.500</td><td>57.7</td><td>9.500</td><td>75.3</td></tr><tr><td>0.800</td><td>22.8</td><td>2.400</td><td>38.7</td><td>6.000</td><td>60.2</td><td></td><td></td></tr><tr><td>1.000</td><td>25.4</td><td>2.600</td><td>40.2</td><td>6.500</td><td>62.6</td><td></td><td></td></tr></tbody></table>					Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	3200.0	1.000	3200.0	1.100	0.0	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.000	25.4	Flush-Flo™	0.362	25.4	Kick-Flo®	0.736	21.9	Mean Flow over Head Range	-	21.1	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	7.4	1.200	27.7	3.000	43.0	7.000	64.9	0.200	21.7	1.400	29.8	3.500	46.4	7.500	67.1	0.300	25.2	1.600	31.8	4.000	49.5	8.000	69.3	0.400	25.3	1.800	33.7	4.500	52.4	8.500	71.3	0.500	24.9	2.000	35.4	5.000	55.1	9.000	73.4	0.600	24.3	2.200	37.1	5.500	57.7	9.500	75.3	0.800	22.8	2.400	38.7	6.000	60.2			1.000	25.4	2.600	40.2	6.500	62.6		
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Calculated by:

Site name:

Site location:

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:

51.95294° N

Longitude:

0.03669° W

Reference:

3088877763

Date:

Jan 11 2024 16:02

Runoff estimation approach

FEH Statistical

Site characteristics

Total site area (ha):

3.69

Methodology

Q_{MED} estimation method:

Calculate from BFI and SAAR

BFI and SPR method:

Specify BFI manually

HOST class:

N/A

BFI / BFIHOST:

0.385

Q_{MED} (l/s):

Q_{BAR} / Q_{MED} factor:

1.14

Hydrological characteristics

SAAR (mm):

Default

631

Edited

631

Hydrological region:

6

6

Growth curve factor 1 year:

0.85

0.85

Growth curve factor 30 years:

2.3

2.3

Growth curve factor 100 years:

3.19

3.19

Growth curve factor 200 years:

3.74

3.74

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

Default

Edited

Q_{BAR} (l/s):		12.56
1 in 1 year (l/s):		10.68
1 in 30 years (l/s):		28.89
1 in 100 year (l/s):		40.07
1 in 200 years (l/s):		46.98

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

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30 min Winter	74.620	0.0	744.0	40																																																																																																																																						
60 min Winter	48.790	0.0	1050.5	68																																																																																																																																						
120 min Winter	31.640	0.0	1360.1	126																																																																																																																																						
180 min Winter	23.973	0.0	1539.0	184																																																																																																																																						
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<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
240 min Winter	0.895	0.895	12.6	1611.3	O K
360 min Winter	0.956	0.956	12.6	1719.9	O K
480 min Winter	0.981	0.981	12.6	1766.2	O K
600 min Winter	0.990	0.990	12.6	1782.4	O K
720 min Winter	0.990	0.990	12.6	1781.9	O K
960 min Winter	0.974	0.974	12.6	1752.3	O K
1440 min Winter	0.912	0.912	12.6	1641.1	O K
2160 min Winter	0.830	0.830	12.6	1494.1	O K
2880 min Winter	0.752	0.752	12.6	1353.7	O K
4320 min Winter	0.593	0.593	12.6	1066.5	O K
5760 min Winter	0.465	0.465	12.6	836.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
240 min Winter	19.471	0.0	1658.1	244	
360 min Winter	14.296	0.0	1804.0	360	
480 min Winter	11.361	0.0	1882.9	476	
600 min Winter	9.463	0.0	1923.3	590	
720 min Winter	8.132	0.0	1935.8	702	
960 min Winter	6.379	0.0	1906.7	924	
1440 min Winter	4.498	0.0	1810.6	1318	
2160 min Winter	3.173	0.0	2517.6	1648	
2880 min Winter	2.485	0.0	2623.8	2112	
4320 min Winter	1.779	0.0	2801.8	2944	
5760 min Winter	1.415	0.0	3024.1	3696	
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Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1800.0	1.000	1800.0	1.100	0.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0162-1260-1000-1260
Design Head (m)	1.000
Design Flow (l/s)	12.6
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	162
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	12.6
Flush-Flo™	0.313	12.6
Kick-Flo®	0.690	10.6
Mean Flow over Head Range	-	10.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	5.8	1.200	13.7	3.000	21.2	7.000	31.9
0.200	12.2	1.400	14.8	3.500	22.9	7.500	33.0
0.300	12.6	1.600	15.7	4.000	24.4	8.000	34.1
0.400	12.5	1.800	16.6	4.500	25.8	8.500	35.1
0.500	12.2	2.000	17.5	5.000	27.1	9.000	36.1
0.600	11.7	2.200	18.3	5.500	28.4	9.500	37.0
0.800	11.3	2.400	19.1	6.000	29.6		
1.000	12.6	2.600	19.8	6.500	30.8		

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