

19 March 2019
Project No. 5003415

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Dear Sirs

RESPONSE NO.1 [LLFA COMMENTS SWM/2018/1020] FOR 18/01109/FUL

Further to the receipt of the Hampshire County Council response, regarding the Flood Risk Assessment for the above scheme, please find our comments below and evidence attached. We have used the references with the letter from HCC dated 3rd January 2019, to form the basis of our response below.

RESPONDING TO THE LLFA COMMENTS

1. **Evidence of and information on the existing drainage network for previously developed (brownfield) sites**
 - 1.1. The new design provides betterment to the original status/uncontrolled flow rates leaving the site, by controlling the flows up to a 100yr+40% climate change to the existing Greenfield 1:100yr event 7.4l/sec.
 - 1.2. Whether the existing flows enter the adjacent surface water network or watercourse uncontrolled, the new design attenuates the flows to provide betterment, therefore, we do not see that this is required for the assessment.
2. **Evidence that the proposed drainage will follow the same pattern as the existing. This avoids directing flow to other locations**
 - 2.1. See above... The new design provides betterment to the original status/uncontrolled flow rates leaving the site.
3. **Identification of and information on areas that may have been affected by failures in the existing drainage regime**
 - 3.1. See above... The new design provides betterment to the original status/uncontrolled flow rates leaving the site.
4. **Information evidencing that the correct level of water treatment in the system in accordance with the Ciria SuDS Manual C753**
 - 4.1. We have attached Appendix C for this assessment against CIRIA C753 Chapter 26.

5. Maintenance regimes of the entire surface water drainage system including individual SuDS features, including a plan illustrating the organisation responsible for each element. Evidence that those responsible/adopting bodies are in discussion with the developer. For larger/phased sites, we need to see evidence of measures taken to protect and ensure continued operation of drainage features during construction.

5.1. We need to understand what the client is intending to do with the site once constructed. Will they be commissioning a Management Company to maintain the drainage, or will the works be offered for adoption wherever possible?

6. Please provide hydraulic calculations Evidencing that enough storage/attenuation has been provided without increasing the runoff rate or volume. This must be shown for a 1 in 100 year plus climate change event.

6.1. These calculations have been provided in FRA Appendix E [Cl:12.1]. We have attached the calculations again with heading updated to try and clear up any confusion and include the 1:100yr+40%cc storage for completeness.

7. Exceedance flows are considered in the event of the pipe being non-operational. Evidence that Exceedance flows and runoff in excess of design criteria have been considered - calculations and plans should be provided to show where above ground flooding might occur and where this would pool and flow.

7.1. An exceedance flow is attached to address these concerns.

8. Evidence that Urban Creep has been considered in the application and that a 10% increase in impermeable area has been used in calculations to account for this.

8.1. An assessment of Urban Creep [10% area increase] is attached to respond to this item.

We trust the above and appendix provide the evidence required to resolve any concerns raised by the LLFA, however, please do not hesitate to contact us if you require any further evidence.

Yours sincerely

Paul Moore
Partner
For Ridge and Partners LLP

Enclosure Appendix A [Urban Creep calculations]
 Appendix B [Exceedance Flows]
 Appendix C [Level of Water Treatment]
 Appendix D [Storage Calculations]

APPENDIX A [URBAN CREEP CALCULATIONS]

Ridge and Partners LLP

The Cowyards
Blenheim Park, Oxford Road
Woodstock OX20 1QR

Date 19/03/2019
File 10% Urban - 100yr+40%cc...

XP Solutions

JLL-DAIRY CREST, HAVANT
[10% UC] 100yr +40% EVENT
100YR + 40% CELLULAR STORAGE

Designed by PDM
Checked by

Source Control 2018.1

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Summary of Results for 100 year Return Period (+40%)							
Half Drain Time : 285 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	13.489	0.339	0.0	7.4	7.4	112.7	0 K
30 min Summer	13.597	0.447	0.0	7.4	7.4	148.7	0 K
60 min Summer	13.701	0.551	0.0	7.4	7.4	183.1	0 K
120 min Summer	13.780	0.630	0.0	7.4	7.4	209.5	0 K
180 min Summer	13.801	0.651	0.0	7.4	7.4	216.6	0 K
240 min Summer	13.798	0.648	0.0	7.4	7.4	215.4	0 K
360 min Summer	13.782	0.632	0.0	7.4	7.4	210.2	0 K
480 min Summer	13.762	0.612	0.0	7.4	7.4	203.6	0 K
600 min Summer	13.741	0.591	0.0	7.4	7.4	196.4	0 K
720 min Summer	13.718	0.568	0.0	7.4	7.4	189.0	0 K
960 min Summer	13.674	0.524	0.0	7.4	7.4	174.1	0 K
1440 min Summer	13.587	0.437	0.0	7.4	7.4	145.1	0 K
2160 min Summer	13.470	0.320	0.0	7.4	7.4	106.5	0 K
2880 min Summer	13.377	0.227	0.0	7.4	7.4	75.5	0 K
4320 min Summer	13.259	0.109	0.0	7.4	7.4	36.3	0 K
5760 min Summer	13.223	0.073	0.0	6.9	6.9	24.1	0 K
7200 min Summer	13.209	0.059	0.0	5.8	5.8	19.5	0 K
8640 min Summer	13.199	0.049	0.0	5.1	5.1	16.2	0 K
10080 min Summer	13.191	0.041	0.0	4.5	4.5	13.6	0 K
15 min Winter	13.532	0.382	0.0	7.4	7.4	127.1	0 K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	128.238	0.0	120.1	22			
30 min Summer	86.178	0.0	161.4	36			
60 min Summer	55.250	0.0	207.0	64			
120 min Summer	34.177	0.0	256.2	122			
180 min Summer	25.410	0.0	285.6	182			
240 min Summer	20.436	0.0	306.3	230			
360 min Summer	15.037	0.0	338.1	288			
480 min Summer	12.081	0.0	362.3	350			
600 min Summer	10.185	0.0	381.8	418			
720 min Summer	8.854	0.0	398.3	488			
960 min Summer	7.093	0.0	425.5	622			
1440 min Summer	5.178	0.0	465.8	886			
2160 min Summer	3.772	0.0	509.1	1264			
2880 min Summer	3.009	0.0	541.5	1616			
4320 min Summer	2.184	0.0	589.5	2288			
5760 min Summer	1.738	0.0	625.4	2936			
7200 min Summer	1.455	0.0	654.6	3672			
8640 min Summer	1.260	0.0	680.0	4408			
10080 min Summer	1.115	0.0	702.4	5136			
15 min Winter	128.238	0.0	134.5	22			

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Ridge and Partners LLP

The Cowyards

Blenheim Park, Oxford Road

Woodstock OX20 1QR

Date 19/03/2019

File 10% Urban - 100yr+40%cc...

XP Solutions

JLL-DAIRY CREST, HAVANT

[10% UC] 100yr +40% EVENT

100YR + 40% CELLULAR STORAGE

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Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m ³)	Status
30 min Winter	13.655	0.505	0.0	7.4	7.4	168.1	0 K
60 min Winter	13.776	0.626	0.0	7.4	7.4	208.0	0 K
120 min Winter	14.720	1.570	0.0	7.4	7.4	240.6	FLOOD
180 min Winter	14.731	1.581	0.0	7.4	7.4	251.3	FLOOD
240 min Winter	14.732	1.582	0.0	7.4	7.4	252.4	FLOOD
360 min Winter	14.725	1.575	0.0	7.4	7.4	245.7	FLOOD
480 min Winter	14.716	1.566	0.0	7.4	7.4	236.7	FLOOD
600 min Winter	14.706	1.556	0.0	7.4	7.4	226.7	FLOOD
720 min Winter	13.799	0.649	0.0	7.4	7.4	215.7	0 K
960 min Winter	13.730	0.580	0.0	7.4	7.4	192.8	0 K
1440 min Winter	13.595	0.445	0.0	7.4	7.4	147.9	0 K
2160 min Winter	13.419	0.269	0.0	7.4	7.4	89.4	0 K
2880 min Winter	13.291	0.141	0.0	7.4	7.4	46.7	0 K
4320 min Winter	13.216	0.066	0.0	6.3	6.3	21.9	0 K
5760 min Winter	13.199	0.049	0.0	5.1	5.1	16.2	0 K
7200 min Winter	13.188	0.038	0.0	4.3	4.3	12.5	0 K
8640 min Winter	13.180	0.030	0.0	3.7	3.7	10.0	0 K
10080 min Winter	13.174	0.024	0.0	3.3	3.3	8.1	0 K

Storm Event	Rain (mm/hr)	Flooded Volume (m ³)	Discharge Volume (m ³)	Time-Peak (mins)
30 min Winter	86.178	0.0	180.8	36
60 min Winter	55.250	0.0	231.8	64
120 min Winter	34.177	21.0	287.0	122
180 min Winter	25.410	31.7	320.0	178
240 min Winter	20.436	32.9	343.1	234
360 min Winter	15.037	26.2	378.7	334
480 min Winter	12.081	17.1	405.8	378
600 min Winter	10.185	7.1	427.5	454
720 min Winter	8.854	0.0	446.1	530
960 min Winter	7.093	0.0	476.4	678
1440 min Winter	5.178	0.0	521.8	956
2160 min Winter	3.772	0.0	570.3	1328
2880 min Winter	3.009	0.0	606.5	1648
4320 min Winter	2.184	0.0	660.3	2244
5760 min Winter	1.738	0.0	700.5	2944
7200 min Winter	1.455	0.0	733.2	3672
8640 min Winter	1.260	0.0	761.7	4408
10080 min Winter	1.115	0.0	786.7	5144

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR	JLL-DAIRY CREST, HAVANT [10% UC] 100yr +40% EVENT 100YR + 40% CELLULAR STORAGE	
Date 19/03/2019 File 10% Urban - 100yr+40%cc...	Designed by PDM Checked by	
XP Solutions Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.500

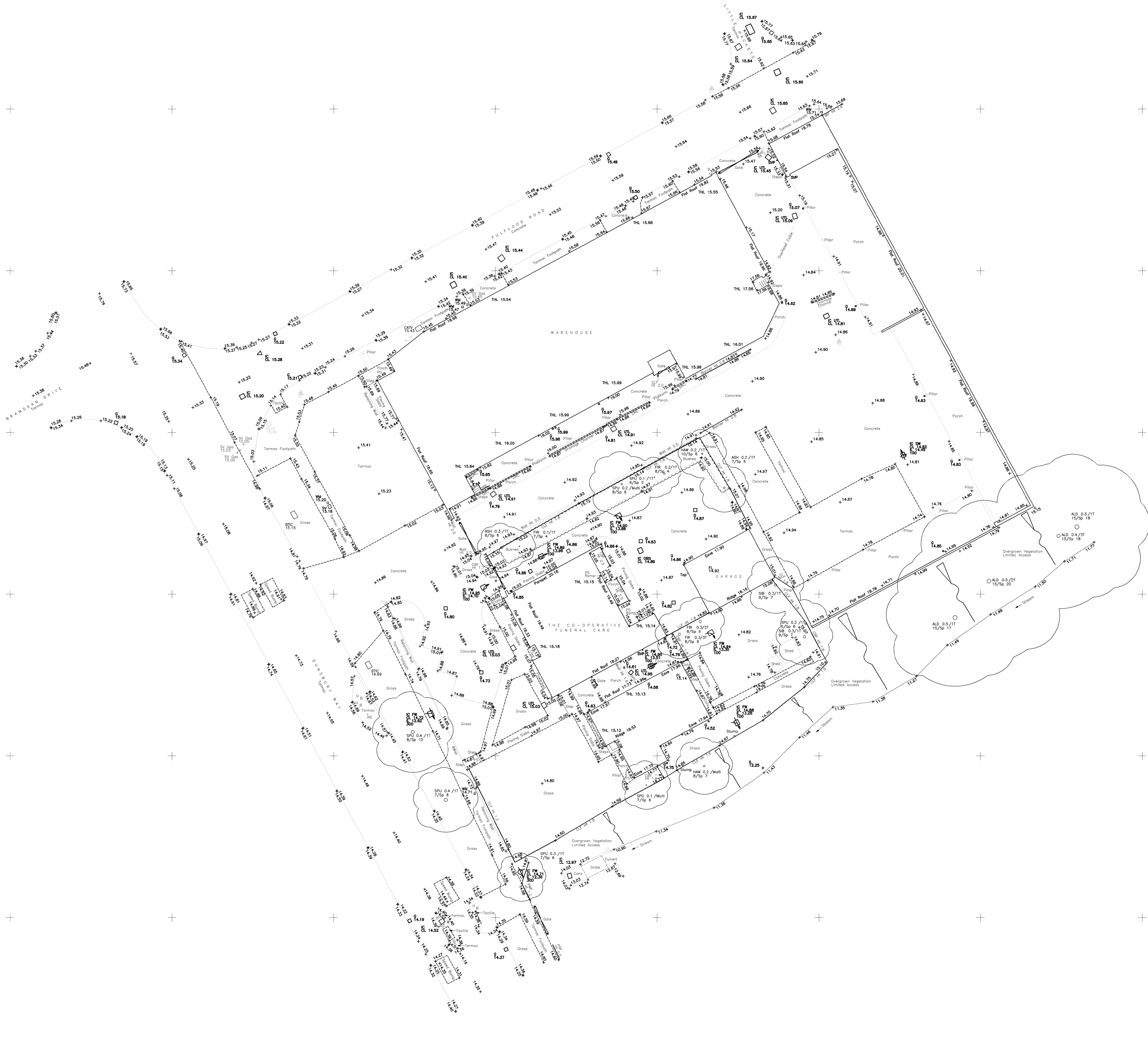
Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.250	4 8	0.250

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR		JLL-DAIRY CREST, HAVANT [10% UC] 100yr +40% EVENT 100YR + 40% CELLULAR STORAGE																																																																																											
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XP Solutions		Source Control 2018.1																																																																																											
Model Details Storage is Online Cover Level (m) 14.700 Cellular Storage Structure Invert Level (m) 13.150 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>350.0</td><td>0.0</td><td>0.661</td><td>0.0</td><td>0.0</td></tr><tr><td>0.660</td><td>350.0</td><td>0.0</td><td></td><td></td><td></td></tr></table> Depth/Flow Relationship Outflow Control Invert Level (m) 13.130 <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>7.4000</td><td>0.900</td><td>7.4000</td><td>1.700</td><td>7.4000</td><td>2.500</td><td>7.4000</td></tr><tr><td>0.200</td><td>7.4000</td><td>1.000</td><td>7.4000</td><td>1.800</td><td>7.4000</td><td>2.600</td><td>7.4000</td></tr><tr><td>0.300</td><td>7.4000</td><td>1.100</td><td>7.4000</td><td>1.900</td><td>7.4000</td><td>2.700</td><td>7.4000</td></tr><tr><td>0.400</td><td>7.4000</td><td>1.200</td><td>7.4000</td><td>2.000</td><td>7.4000</td><td>2.800</td><td>7.4000</td></tr><tr><td>0.500</td><td>7.4000</td><td>1.300</td><td>7.4000</td><td>2.100</td><td>7.4000</td><td>2.900</td><td>7.4000</td></tr><tr><td>0.600</td><td>7.4000</td><td>1.400</td><td>7.4000</td><td>2.200</td><td>7.4000</td><td>3.000</td><td>7.4000</td></tr><tr><td>0.700</td><td>7.4000</td><td>1.500</td><td>7.4000</td><td>2.300</td><td>7.4000</td><td></td><td></td></tr><tr><td>0.800</td><td>7.4000</td><td>1.600</td><td>7.4000</td><td>2.400</td><td>7.4000</td><td></td><td></td></tr></table>				Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	350.0	0.0	0.661	0.0	0.0	0.660	350.0	0.0				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	7.4000	0.900	7.4000	1.700	7.4000	2.500	7.4000	0.200	7.4000	1.000	7.4000	1.800	7.4000	2.600	7.4000	0.300	7.4000	1.100	7.4000	1.900	7.4000	2.700	7.4000	0.400	7.4000	1.200	7.4000	2.000	7.4000	2.800	7.4000	0.500	7.4000	1.300	7.4000	2.100	7.4000	2.900	7.4000	0.600	7.4000	1.400	7.4000	2.200	7.4000	3.000	7.4000	0.700	7.4000	1.500	7.4000	2.300	7.4000			0.800	7.4000	1.600	7.4000	2.400	7.4000		
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																								
0.000	350.0	0.0	0.661	0.0	0.0																																																																																								
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Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)																																																																																						
0.100	7.4000	0.900	7.4000	1.700	7.4000	2.500	7.4000																																																																																						
0.200	7.4000	1.000	7.4000	1.800	7.4000	2.600	7.4000																																																																																						
0.300	7.4000	1.100	7.4000	1.900	7.4000	2.700	7.4000																																																																																						
0.400	7.4000	1.200	7.4000	2.000	7.4000	2.800	7.4000																																																																																						
0.500	7.4000	1.300	7.4000	2.100	7.4000	2.900	7.4000																																																																																						
0.600	7.4000	1.400	7.4000	2.200	7.4000	3.000	7.4000																																																																																						
0.700	7.4000	1.500	7.4000	2.300	7.4000																																																																																								
0.800	7.4000	1.600	7.4000	2.400	7.4000																																																																																								
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APPENDIX B [EXCEEDANCE FLOWS]

LEGEND			
ALDR	ALD	BARBED WIRE FENCE	BWF
ASH	ASH	CONCRETE FENCE	CF
ASPH	ASPH	CORRUGATED IRON FENCE	CIF
BEECH	BCH	CLOSE BOARD FENCE	CBF
BOX ELDER	BOW	CHAIN LINK FENCE	CLF
CEDEAR	CEA	CHESTNUT PALING	CPH
CHERRY	CHY	CORNER BARRIER	CRB
COTTONGASTER	COY	CABLE TELEVISION INSPECTION COVER	CTV
CYPRESS	CYP	CABLE TELEVISION BOX	CTB
ELM	ELM	CONTROL BOX	CBX
FR	FR	INTRUSION FENCE	INF
FRUIT	FRU	IRON MESH FENCE	IMF
HAWTHORN	HAW	LARCH LAP FENCE	LLF
HOL	HOL	MISCELLANEOUS FENCE	MIF
HOLLY	HOL	PALE FENCE	PF
HORSE CHESTNUT	HCH	POCKET FENCE	POF
HORNBEAM	HNB	POST AND RAIL FENCE	PAR
LABURNUM	LBN	POST AND RAIL FENCE	PAR
LARIX	LAR	STOCK WIRE FENCE	SWF
LAUREL	LRL	WIRE MESH FENCE	WMF
LEAF	LEA	WIRE MESH FENCE	WMF
LOCUST	LIC	RETAINING WALL	RW
LONDON PLANE	LPL	BARBED WIRE FENCE	BWF
MAHONIA	MAL	RED LEVEL	RL
MAPLE	MAL	COVER LEVEL	CL
MALBERRY	MAL	CAMP PROOF COURSE	CPC
MA	MA	FLOOR LEVEL	FL
POPULAR	POP	INSET LEVEL	IL
PRUNUS	PRN	THRESHOLD LEVEL	TL
RHODODENDRON	RND	FOUL WATER	FW
ROWAN	ROW	SUBSIDIARY WATER	SW
SILVER BIRCH	SBR	GULLY POT	GP
SORBUS	SOR	UNABLE TO LIFT	UTL
SPRICE	SPR	OBSTRUCTED	OS
STRAWBERRY	STR	WATER LEVEL	WL
SWEET CHESTNUT	SCN	CONCRETE	CONC
STICKLE	STK	PAVING SLABS	PS
WALNUT	WAL	BRICK PAVING	BP
WILLOW	WIL	STONE SETS	TS
YEW	YEW	TACTILE PAVING	TAP
SPECIES UNKNOWN	SUK	TARMAC	TAR
		DRAINAGE CHANNEL	DC



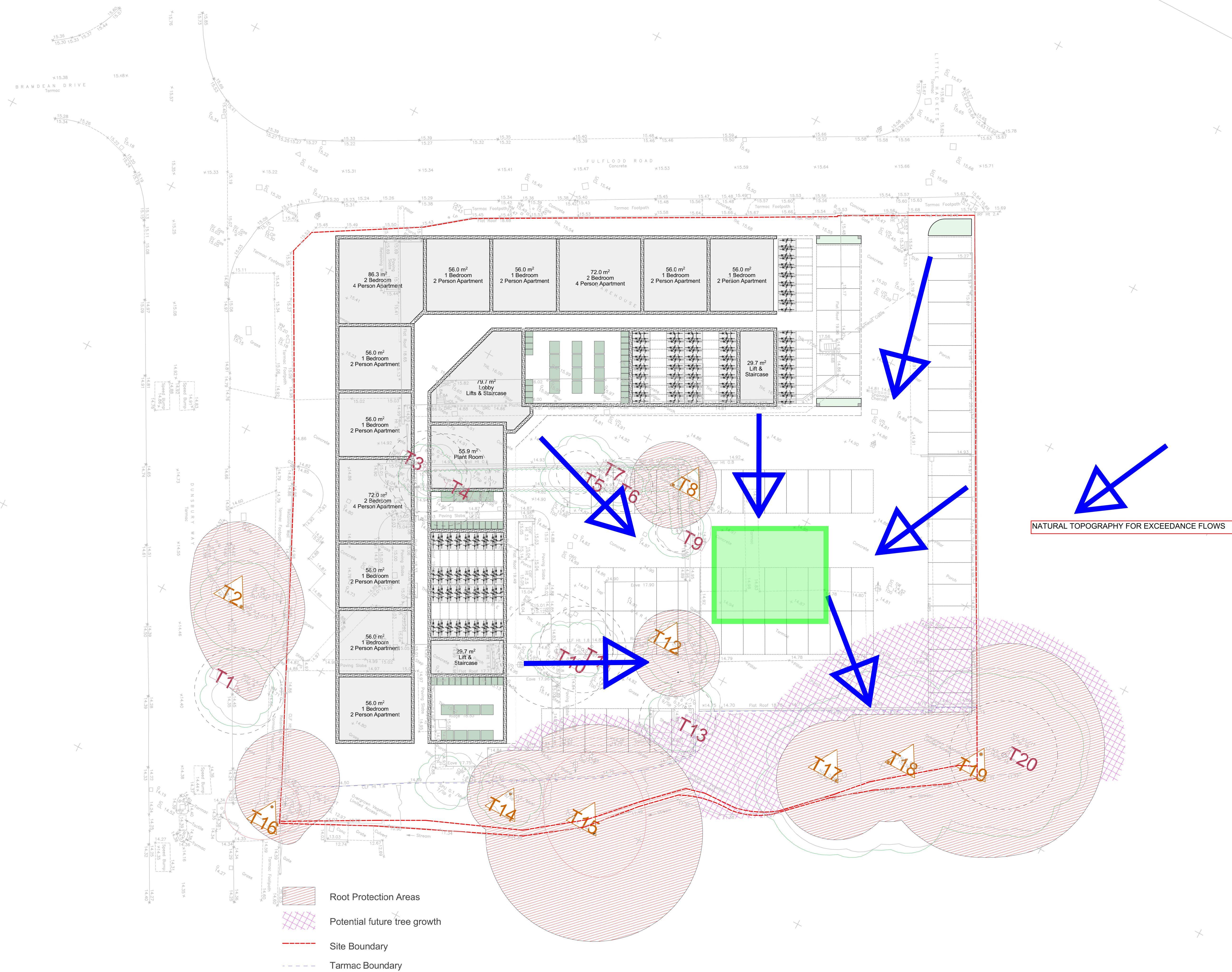
STATION SCHEDULE			
STN No	EASTINGS	NORTHINGS	HEIGHT
01	471326.747	108202.554	15.499
02	471275.940	108244.879	15.587
03	471286.243	108218.862	14.718
04	471342.257	108251.259	14.878

DRAINAGE
Invert levels, pipe sizes and pipe connections have been surveyed by visual inspection only and therefore the complete accuracy of this information cannot be guaranteed.

NORTHPOINT
The survey grid is related to OSN202 and has been fixed by using GPS receivers.

LEVELS
Levels are related to OSN202 and have been obtained by using GPS receivers.

Digital Terrain Surveys LLP
Land Survey Partnership
Client: The Southern Co-operative
Location: Dunsbury Way, Havant, Hampshire
Type of Survey: Site Survey
Plotted Scale 1:200 @ A0 Date: April 2017
Ref No: 315280417-SM1 Q & Checked: PH/LH
Drawing Number: 1 of 1 Revision



NATURAL TOPOGRAPHY FOR EXCEEDANCE FLOWS

APPENDIX C [LEVEL OF WATER TREATMENT]

WATER QUALITY REQUIREMENTS

The effect of the Proposed Development on local water quality has been assessed quantitatively adapting the SUDS simple index approach for contamination mitigation defined in CIRIA Report C753 “The SUDS Manual” (Chapter 26). The degree of impact depends on the sensitivity of the receptor, the nature of the development, and the number or quality of water treatment methods proposed.

The proposed development areas are classified under three land uses: residential roof, residential car park, and low traffic roads (general access road). In accordance with CIRIA C753 guidelines the residential roof has a very low pollution hazard index; the car park and the access road have low pollution hazard level. These are summarised in Table 4 below.

Table 1 - CIRIA C753 Pollution Hazard Indices for Different Land Use Classifications

LAND USE	POLLUTION HAZARD LEVEL	TOTAL SUSPENDED SOLIDS (TSS)	METALS	HYDROCARBONS	PROPOSED TREATMENT
Residential Roof	Very low	0.2	0.2	0.05	n/a
Residential Car Park	Low	0.5	0.4	0.4	By-Pass Separator

Roof drainage is discharged directly into the local private drainage network and conveyed to a central attenuation crates located in the private car park. This discharges into the Rider Stream watercourse.

Surface water generated by the external hard paved area is to be collected via linear drainage channels, permeable parking bays and/or gullies and conveyed directly into the surface water network, passing through an upstream By-Pass separator before the attenuation crates and discharge into the watercourse.

To deliver adequate treatment, the SUDS components incorporated in the drainage design should have a total pollution mitigation index that equals or exceeds the pollution hazard index shown in Table 5 below. The exact pollution removal potential of the proposed drainage network to be determined at detailed design stage

Table 5 - CIRIA C753 Mitigation Indices for Different Land Use Classifications

LAND USE	TOTAL SUSPENDED SOLIDS (TSS)	METALS	HYDROCARBONS
Permeable Paving	0.7	0.6	0.7
[Class 1] By-Pass Separator	<5mg/l Oil Concentration	Specialist Design	<5mg/l Oil Concentration

APPENDIX D {STORAGE CALCULATIONS}

Calculated by:

Site name: Dairy Crest Depot

Site location: Havant

Site coordinates

Latitude: 50.86926° N

Longitude: 0.98778° W

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the SuDS Manual, C753 (Ciria, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Reference:

Date: 2019-03-19 12:25

Methodology

IH124

Site characteristics

Total site area (ha)	0.45
----------------------	------

Methodology

Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Calculate from SOIL type

	Default	Edited
SOIL type	4	4
HOST class	---	---
SPR/SPRHOST	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm)	759	759
Hydrological region	7	7
Growth curve factor: 1 year	0.85	0.85
Growth curve factor: 30 year	2.3	2.3
Growth curve factor: 100 year	3.19	3.19

Notes:

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

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

Where flow rates are less than 5.0 l/s consents are usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set in which case blockage work must be addressed by using appropriate drainage elements

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

Greenfield runoff rates

	Default	Edited
Qbar (l/s)	2.39	2.39
1 in 1 year (l/s)	2.03	2.03
1 in 30 years (l/s)	5.49	5.49
1 in 100 years (l/s)	7.62	7.62

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR		JLL-DAIRY CREST, HAVANT 30yr + 40%cc EVENT 30yr + 40%cc Below Ground																																																																																																																																																																																																																																																																																		
Date 19/03/2019 File 30YR+40%CC [UNDERGROUND...]		Designed by AHAY Checked by																																																																																																																																																																																																																																																																																		
XP Solutions		Source Control 2018.1																																																																																																																																																																																																																																																																																		
<u>Summary of Results for 30 year Return Period (+40%)</u> Half Drain Time : 174 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Control (l/s)</th><th>Max Σ Outflow (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>13.448</td><td>0.298</td><td>0.0</td><td>7.4</td><td>7.4</td><td>76.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>13.535</td><td>0.385</td><td>0.0</td><td>7.4</td><td>7.4</td><td>98.8</td><td>O K</td></tr><tr><td>60 min Summer</td><td>13.613</td><td>0.463</td><td>0.0</td><td>7.4</td><td>7.4</td><td>118.7</td><td>O K</td></tr><tr><td>120 min Summer</td><td>13.659</td><td>0.509</td><td>0.0</td><td>7.4</td><td>7.4</td><td>130.7</td><td>O K</td></tr><tr><td>180 min Summer</td><td>13.663</td><td>0.513</td><td>0.0</td><td>7.4</td><td>7.4</td><td>131.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>13.656</td><td>0.506</td><td>0.0</td><td>7.4</td><td>7.4</td><td>129.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>13.636</td><td>0.486</td><td>0.0</td><td>7.4</td><td>7.4</td><td>124.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>13.613</td><td>0.463</td><td>0.0</td><td>7.4</td><td>7.4</td><td>118.7</td><td>O K</td></tr><tr><td>600 min Summer</td><td>13.588</td><td>0.438</td><td>0.0</td><td>7.4</td><td>7.4</td><td>112.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>13.562</td><td>0.412</td><td>0.0</td><td>7.4</td><td>7.4</td><td>105.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>13.512</td><td>0.362</td><td>0.0</td><td>7.4</td><td>7.4</td><td>92.9</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>13.421</td><td>0.271</td><td>0.0</td><td>7.4</td><td>7.4</td><td>69.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>13.317</td><td>0.167</td><td>0.0</td><td>7.4</td><td>7.4</td><td>42.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>13.253</td><td>0.103</td><td>0.0</td><td>7.4</td><td>7.4</td><td>26.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>13.215</td><td>0.065</td><td>0.0</td><td>6.3</td><td>6.3</td><td>16.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>13.199</td><td>0.049</td><td>0.0</td><td>5.1</td><td>5.1</td><td>12.7</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>13.189</td><td>0.039</td><td>0.0</td><td>4.4</td><td>4.4</td><td>10.0</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>13.182</td><td>0.032</td><td>0.0</td><td>3.8</td><td>3.8</td><td>8.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>13.176</td><td>0.026</td><td>0.0</td><td>3.4</td><td>3.4</td><td>6.7</td><td>O K</td></tr><tr><td>15 min Winter</td><td>13.486</td><td>0.336</td><td>0.0</td><td>7.4</td><td>7.4</td><td>86.3</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Discharge Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>99.061</td><td>0.0</td><td>83.5</td><td>21</td></tr><tr><td>30 min Summer</td><td>65.934</td><td>0.0</td><td>111.1</td><td>35</td></tr><tr><td>60 min Summer</td><td>42.036</td><td>0.0</td><td>141.8</td><td>64</td></tr><tr><td>120 min Summer</td><td>26.007</td><td>0.0</td><td>175.3</td><td>120</td></tr><tr><td>180 min Summer</td><td>19.411</td><td>0.0</td><td>196.5</td><td>156</td></tr><tr><td>240 min Summer</td><td>15.691</td><td>0.0</td><td>211.7</td><td>188</td></tr><tr><td>360 min Summer</td><td>11.620</td><td>0.0</td><td>235.2</td><td>254</td></tr><tr><td>480 min Summer</td><td>9.379</td><td>0.0</td><td>253.2</td><td>324</td></tr><tr><td>600 min Summer</td><td>7.938</td><td>0.0</td><td>267.7</td><td>390</td></tr><tr><td>720 min Summer</td><td>6.924</td><td>0.0</td><td>280.3</td><td>460</td></tr><tr><td>960 min Summer</td><td>5.577</td><td>0.0</td><td>300.9</td><td>590</td></tr><tr><td>1440 min Summer</td><td>4.105</td><td>0.0</td><td>332.4</td><td>842</td></tr><tr><td>2160 min Summer</td><td>3.018</td><td>0.0</td><td>366.6</td><td>1192</td></tr><tr><td>2880 min Summer</td><td>2.424</td><td>0.0</td><td>392.5</td><td>1524</td></tr><tr><td>4320 min Summer</td><td>1.777</td><td>0.0</td><td>431.8</td><td>2208</td></tr><tr><td>5760 min Summer</td><td>1.425</td><td>0.0</td><td>461.7</td><td>2936</td></tr><tr><td>7200 min Summer</td><td>1.201</td><td>0.0</td><td>486.2</td><td>3672</td></tr><tr><td>8640 min Summer</td><td>1.044</td><td>0.0</td><td>507.4</td><td>4400</td></tr><tr><td>10080 min Summer</td><td>0.928</td><td>0.0</td><td>526.1</td><td>5136</td></tr><tr><td>15 min Winter</td><td>99.061</td><td>0.0</td><td>93.5</td><td>21</td></tr></table>				Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status	15 min Summer	13.448	0.298	0.0	7.4	7.4	76.3	O K	30 min Summer	13.535	0.385	0.0	7.4	7.4	98.8	O K	60 min Summer	13.613	0.463	0.0	7.4	7.4	118.7	O K	120 min Summer	13.659	0.509	0.0	7.4	7.4	130.7	O K	180 min Summer	13.663	0.513	0.0	7.4	7.4	131.5	O K	240 min Summer	13.656	0.506	0.0	7.4	7.4	129.8	O K	360 min Summer	13.636	0.486	0.0	7.4	7.4	124.8	O K	480 min Summer	13.613	0.463	0.0	7.4	7.4	118.7	O K	600 min Summer	13.588	0.438	0.0	7.4	7.4	112.2	O K	720 min Summer	13.562	0.412	0.0	7.4	7.4	105.7	O K	960 min Summer	13.512	0.362	0.0	7.4	7.4	92.9	O K	1440 min Summer	13.421	0.271	0.0	7.4	7.4	69.6	O K	2160 min Summer	13.317	0.167	0.0	7.4	7.4	42.9	O K	2880 min Summer	13.253	0.103	0.0	7.4	7.4	26.4	O K	4320 min Summer	13.215	0.065	0.0	6.3	6.3	16.7	O K	5760 min Summer	13.199	0.049	0.0	5.1	5.1	12.7	O K	7200 min Summer	13.189	0.039	0.0	4.4	4.4	10.0	O K	8640 min Summer	13.182	0.032	0.0	3.8	3.8	8.1	O K	10080 min Summer	13.176	0.026	0.0	3.4	3.4	6.7	O K	15 min Winter	13.486	0.336	0.0	7.4	7.4	86.3	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	15 min Summer	99.061	0.0	83.5	21	30 min Summer	65.934	0.0	111.1	35	60 min Summer	42.036	0.0	141.8	64	120 min Summer	26.007	0.0	175.3	120	180 min Summer	19.411	0.0	196.5	156	240 min Summer	15.691	0.0	211.7	188	360 min Summer	11.620	0.0	235.2	254	480 min Summer	9.379	0.0	253.2	324	600 min Summer	7.938	0.0	267.7	390	720 min Summer	6.924	0.0	280.3	460	960 min Summer	5.577	0.0	300.9	590	1440 min Summer	4.105	0.0	332.4	842	2160 min Summer	3.018	0.0	366.6	1192	2880 min Summer	2.424	0.0	392.5	1524	4320 min Summer	1.777	0.0	431.8	2208	5760 min Summer	1.425	0.0	461.7	2936	7200 min Summer	1.201	0.0	486.2	3672	8640 min Summer	1.044	0.0	507.4	4400	10080 min Summer	0.928	0.0	526.1	5136	15 min Winter	99.061	0.0	93.5	21
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																																																																													
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Ridge and Partners LLP

The Cowyards
Blenheim Park, Oxford Road
Woodstock OX20 1QR

Date 19/03/2019
File 30YR+40%CC [UNDERGROUND...]

XP Solutions

JLL-DAIRY CREST, HAVANT
30yr + 40%cc EVENT
30yr + 40%cc Below Ground

Designed by AHAY
Checked by

Source Control 2018.1

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	13.587	0.437	0.0	7.4	7.4	112.1	O K
60 min Winter	13.679	0.529	0.0	7.4	7.4	135.6	O K
120 min Winter	13.741	0.591	0.0	7.4	7.4	151.7	O K
180 min Winter	13.750	0.600	0.0	7.4	7.4	153.9	O K
240 min Winter	13.738	0.588	0.0	7.4	7.4	150.8	O K
360 min Winter	13.711	0.561	0.0	7.4	7.4	143.8	O K
480 min Winter	13.675	0.525	0.0	7.4	7.4	134.5	O K
600 min Winter	13.635	0.485	0.0	7.4	7.4	124.4	O K
720 min Winter	13.594	0.444	0.0	7.4	7.4	114.0	O K
960 min Winter	13.515	0.365	0.0	7.4	7.4	93.6	O K
1440 min Winter	13.376	0.226	0.0	7.4	7.4	57.9	O K
2160 min Winter	13.242	0.092	0.0	7.4	7.4	23.6	O K
2880 min Winter	13.216	0.066	0.0	6.3	6.3	16.8	O K
4320 min Winter	13.193	0.043	0.0	4.7	4.7	11.1	O K
5760 min Winter	13.181	0.031	0.0	3.8	3.8	8.0	O K
7200 min Winter	13.173	0.023	0.0	3.2	3.2	5.9	O K
8640 min Winter	13.168	0.018	0.0	2.8	2.8	4.5	O K
10080 min Winter	13.163	0.013	0.0	2.5	2.5	3.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	65.934	0.0	124.5	35
60 min Winter	42.036	0.0	158.7	64
120 min Winter	26.007	0.0	196.4	120
180 min Winter	19.411	0.0	219.9	174
240 min Winter	15.691	0.0	237.1	204
360 min Winter	11.620	0.0	263.3	276
480 min Winter	9.379	0.0	283.5	352
600 min Winter	7.938	0.0	300.0	426
720 min Winter	6.924	0.0	314.0	498
960 min Winter	5.577	0.0	337.1	636
1440 min Winter	4.105	0.0	372.3	884
2160 min Winter	3.018	0.0	410.6	1172
2880 min Winter	2.424	0.0	439.6	1496
4320 min Winter	1.777	0.0	483.7	2208
5760 min Winter	1.425	0.0	517.1	2936
7200 min Winter	1.201	0.0	544.5	3672
8640 min Winter	1.044	0.0	568.3	4392
10080 min Winter	0.928	0.0	589.3	5136

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR	JLL-DAIRY CREST, HAVANT 30yr + 40%cc EVENT 30yr + 40%cc Below Ground	
Date 19/03/2019 File 30YR+40%CC [UNDERGROUND...]	Designed by AHAY Checked by	
XP Solutions Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.450

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.225	4 8	0.225

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR		JLL-DAIRY CREST, HAVANT 30yr + 40%cc EVENT 30yr + 40%cc Below Ground
Date 19/03/2019 File 30YR+40%CC [UNDERGROUND...]		Designed by AHAY Checked by
XP Solutions		Source Control 2018.1

Model Details

Storage is Online Cover Level (m) 14.700

Cellular Storage Structure

Invert Level (m) 13.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	270.0	0.0	0.661	0.0	0.0
0.660	270.0	0.0			

Depth/Flow Relationship Outflow Control

Invert Level (m) 13.130

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.4000	0.900	7.4000	1.700	7.4000	2.500	7.4000
0.200	7.4000	1.000	7.4000	1.800	7.4000	2.600	7.4000
0.300	7.4000	1.100	7.4000	1.900	7.4000	2.700	7.4000
0.400	7.4000	1.200	7.4000	2.000	7.4000	2.800	7.4000
0.500	7.4000	1.300	7.4000	2.100	7.4000	2.900	7.4000
0.600	7.4000	1.400	7.4000	2.200	7.4000	3.000	7.4000
0.700	7.4000	1.500	7.4000	2.300	7.4000		
0.800	7.4000	1.600	7.4000	2.400	7.4000		

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The Cowyards
Blenheim Park, Oxford Road
Woodstock OX20 1QR

Date 19/03/2019
File 100YR+40%CC [ABOVE GROU...

XP Solutions

JLL-DAIRY CREST, HAVANT
100yr + 40%cc EVENT
30yr [Below] 100yr [Above]

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Micro
Drainage

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 253 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	13.542	0.392	0.0	7.4	7.4	100.6	O K
30 min Summer	13.666	0.516	0.0	7.4	7.4	132.4	O K
60 min Summer	13.782	0.632	0.0	7.4	7.4	162.1	O K
120 min Summer	14.713	1.563	0.0	7.4	7.4	183.5	FLOOD
180 min Summer	14.717	1.567	0.0	7.4	7.4	187.5	FLOOD
240 min Summer	14.715	1.565	0.0	7.4	7.4	185.1	FLOOD
360 min Summer	14.709	1.559	0.0	7.4	7.4	179.1	FLOOD
480 min Summer	14.702	1.552	0.0	7.4	7.4	172.2	FLOOD
600 min Summer	13.793	0.643	0.0	7.4	7.4	165.0	O K
720 min Summer	13.764	0.614	0.0	7.4	7.4	157.5	O K
960 min Summer	13.707	0.557	0.0	7.4	7.4	142.8	O K
1440 min Summer	13.597	0.447	0.0	7.4	7.4	114.7	O K
2160 min Summer	13.456	0.306	0.0	7.4	7.4	78.6	O K
2880 min Summer	13.350	0.200	0.0	7.4	7.4	51.4	O K
4320 min Summer	13.237	0.087	0.0	7.4	7.4	22.3	O K
5760 min Summer	13.215	0.065	0.0	6.3	6.3	16.6	O K
7200 min Summer	13.202	0.052	0.0	5.3	5.3	13.2	O K
8640 min Summer	13.192	0.042	0.0	4.6	4.6	10.8	O K
10080 min Summer	13.185	0.035	0.0	4.1	4.1	9.0	O K
15 min Winter	13.593	0.443	0.0	7.4	7.4	113.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.238	0.0	108.1	22
30 min Summer	86.178	0.0	145.3	36
60 min Summer	55.250	0.0	186.4	64
120 min Summer	34.177	14.1	230.4	122
180 min Summer	25.410	18.2	257.0	180
240 min Summer	20.436	15.7	275.7	214
360 min Summer	15.037	9.7	304.5	276
480 min Summer	12.081	2.8	325.9	340
600 min Summer	10.185	0.0	343.5	410
720 min Summer	8.854	0.0	358.6	478
960 min Summer	7.093	0.0	382.9	612
1440 min Summer	5.178	0.0	419.3	872
2160 min Summer	3.772	0.0	458.2	1240
2880 min Summer	3.009	0.0	487.4	1588
4320 min Summer	2.184	0.0	530.6	2212
5760 min Summer	1.738	0.0	562.9	2936
7200 min Summer	1.455	0.0	589.2	3672
8640 min Summer	1.260	0.0	612.1	4400
10080 min Summer	1.115	0.0	632.2	5136
15 min Winter	128.238	0.0	121.1	22

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Date 19/03/2019
File 100YR+40%CC [ABOVE GROU...

XP Solutions

JLL-DAIRY CREST, HAVANT
100yr + 40%cc EVENT
30yr[Below] 100yr[Above]

Designed by AHAY
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Page 2



Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	13.734	0.584	0.0	7.4	7.4	149.8	O K
60 min Winter	14.714	1.564	0.0	7.4	7.4	184.6	FLOOD
120 min Winter	14.741	1.591	0.0	7.4	7.4	211.5	FLOOD
180 min Winter	14.749	1.599	0.0	7.4	7.4	218.8	FLOOD
240 min Winter	14.747	1.597	0.0	7.4	7.4	217.7	FLOOD
360 min Winter	14.739	1.589	0.0	7.4	7.4	209.0	FLOOD
480 min Winter	14.729	1.579	0.0	7.4	7.4	199.7	FLOOD
600 min Winter	14.719	1.569	0.0	7.4	7.4	189.1	FLOOD
720 min Winter	14.708	1.558	0.0	7.4	7.4	177.8	FLOOD
960 min Winter	13.754	0.604	0.0	7.4	7.4	154.9	O K
1440 min Winter	13.584	0.434	0.0	7.4	7.4	111.3	O K
2160 min Winter	13.376	0.226	0.0	7.4	7.4	57.9	O K
2880 min Winter	13.247	0.097	0.0	7.4	7.4	25.0	O K
4320 min Winter	13.208	0.058	0.0	5.8	5.8	14.8	O K
5760 min Winter	13.192	0.042	0.0	4.6	4.6	10.8	O K
7200 min Winter	13.182	0.032	0.0	3.9	3.9	8.2	O K
8640 min Winter	13.175	0.025	0.0	3.3	3.3	6.4	O K
10080 min Winter	13.170	0.020	0.0	3.0	3.0	5.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	86.178	0.0	162.8	36
60 min Winter	55.250	15.2	208.7	64
120 min Winter	34.177	42.1	258.4	120
180 min Winter	25.410	49.4	288.2	178
240 min Winter	20.436	48.3	309.1	232
360 min Winter	15.037	39.6	341.0	294
480 min Winter	12.081	30.4	365.4	370
600 min Winter	10.185	19.7	385.0	446
720 min Winter	8.854	8.4	401.6	520
960 min Winter	7.093	0.0	428.8	666
1440 min Winter	5.178	0.0	469.7	938
2160 min Winter	3.772	0.0	513.2	1296
2880 min Winter	3.009	0.0	545.8	1560
4320 min Winter	2.184	0.0	594.3	2208
5760 min Winter	1.738	0.0	630.4	2936
7200 min Winter	1.455	0.0	659.9	3624
8640 min Winter	1.260	0.0	685.6	4328
10080 min Winter	1.115	0.0	708.1	5136

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR	JLL-DAIRY CREST, HAVANT 100yr + 40%cc EVENT 30yr[Below] 100yr[Above]	
Date 19/03/2019	Designed by AHAY	
File 100YR+40%CC [ABOVE GROU...	Checked by	
XP Solutions		Source Control 2018.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.450

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.225	4 8	0.225

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR	JLL-DAIRY CREST, HAVANT 100yr + 40%cc EVENT 30yr[Below] 100yr[Above]	
Date 19/03/2019 File 100YR+40%CC [ABOVE GROU...	Designed by AHAY Checked by	
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Model Details

Storage is Online Cover Level (m) 14.700

Cellular Storage Structure

Invert Level (m) 13.150 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	270.0	0.0	0.661	0.0	0.0
0.660	270.0	0.0			

Depth/Flow Relationship Outflow Control

Invert Level (m) 13.130

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	7.4000	0.900	7.4000	1.700	7.4000	2.500	7.4000
0.200	7.4000	1.000	7.4000	1.800	7.4000	2.600	7.4000
0.300	7.4000	1.100	7.4000	1.900	7.4000	2.700	7.4000
0.400	7.4000	1.200	7.4000	2.000	7.4000	2.800	7.4000
0.500	7.4000	1.300	7.4000	2.100	7.4000	2.900	7.4000
0.600	7.4000	1.400	7.4000	2.200	7.4000	3.000	7.4000
0.700	7.4000	1.500	7.4000	2.300	7.4000		
0.800	7.4000	1.600	7.4000	2.400	7.4000		

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Date 19/03/2019
File 100yr+40%cc [Below Grou...

XP Solutions

JLL-DAIRY CREST, HAVANT
100yr + 40%cc EVENT
100yr + 40%cc Below Ground

Designed by PDM
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Source Control 2018.1

Page 1



Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 253 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	13.453	0.303	0.0	7.4	7.4	100.8	O K
30 min Summer	13.549	0.399	0.0	7.4	7.4	132.8	O K
60 min Summer	13.640	0.490	0.0	7.4	7.4	162.8	O K
120 min Summer	13.706	0.556	0.0	7.4	7.4	184.8	O K
180 min Summer	13.720	0.570	0.0	7.4	7.4	189.4	O K
240 min Summer	13.714	0.564	0.0	7.4	7.4	187.4	O K
360 min Summer	13.698	0.548	0.0	7.4	7.4	182.0	O K
480 min Summer	13.678	0.528	0.0	7.4	7.4	175.5	O K
600 min Summer	13.656	0.506	0.0	7.4	7.4	168.3	O K
720 min Summer	13.634	0.484	0.0	7.4	7.4	161.0	O K
960 min Summer	13.590	0.440	0.0	7.4	7.4	146.3	O K
1440 min Summer	13.506	0.356	0.0	7.4	7.4	118.5	O K
2160 min Summer	13.399	0.249	0.0	7.4	7.4	82.9	O K
2880 min Summer	13.319	0.169	0.0	7.4	7.4	56.1	O K
4320 min Summer	13.233	0.083	0.0	7.4	7.4	27.5	O K
5760 min Summer	13.213	0.063	0.0	6.2	6.2	21.0	O K
7200 min Summer	13.201	0.051	0.0	5.2	5.2	16.9	O K
8640 min Summer	13.192	0.042	0.0	4.6	4.6	13.9	O K
10080 min Summer	13.185	0.035	0.0	4.1	4.1	11.6	O K
15 min Winter	13.492	0.342	0.0	7.4	7.4	113.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.238	0.0	108.1	22
30 min Summer	86.178	0.0	145.2	36
60 min Summer	55.250	0.0	186.2	64
120 min Summer	34.177	0.0	230.5	122
180 min Summer	25.410	0.0	257.0	180
240 min Summer	20.436	0.0	275.8	214
360 min Summer	15.037	0.0	304.3	276
480 min Summer	12.081	0.0	326.0	340
600 min Summer	10.185	0.0	343.6	410
720 min Summer	8.854	0.0	358.4	478
960 min Summer	7.093	0.0	382.9	612
1440 min Summer	5.178	0.0	419.2	872
2160 min Summer	3.772	0.0	458.1	1240
2880 min Summer	3.009	0.0	487.3	1588
4320 min Summer	2.184	0.0	530.6	2212
5760 min Summer	1.738	0.0	562.8	2944
7200 min Summer	1.455	0.0	589.1	3672
8640 min Summer	1.260	0.0	612.1	4408
10080 min Summer	1.115	0.0	632.2	5136
15 min Winter	128.238	0.0	121.1	22

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR			JLL-DAIRY CREST, HAVANT 100yr + 40%cc EVENT 100yr + 40%cc Below Ground				
Date 19/03/2019 File 100yr+40%cc [Below Grou...			Designed by PDM Checked by				
XP Solutions			Source Control 2018.1				
Summary of Results for 100 year Return Period (+40%)							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max E Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	13.602	0.452	0.0	7.4	7.4	150.2	O K
60 min Winter	13.707	0.557	0.0	7.4	7.4	185.2	O K
120 min Winter	13.789	0.639	0.0	7.4	7.4	212.6	O K
180 min Winter	14.632	1.482	0.0	7.4	7.4	220.4	Flood Risk
240 min Winter	13.992	0.842	0.0	7.4	7.4	219.7	O K
360 min Winter	13.787	0.637	0.0	7.4	7.4	211.7	O K
480 min Winter	13.760	0.610	0.0	7.4	7.4	202.9	O K
600 min Winter	13.729	0.579	0.0	7.4	7.4	192.5	O K
720 min Winter	13.695	0.545	0.0	7.4	7.4	181.4	O K
960 min Winter	13.627	0.477	0.0	7.4	7.4	158.7	O K
1440 min Winter	13.497	0.347	0.0	7.4	7.4	115.5	O K
2160 min Winter	13.339	0.189	0.0	7.4	7.4	62.9	O K
2880 min Winter	13.242	0.092	0.0	7.4	7.4	30.5	O K
4320 min Winter	13.207	0.057	0.0	5.7	5.7	19.1	O K
5760 min Winter	13.192	0.042	0.0	4.6	4.6	13.9	O K
7200 min Winter	13.182	0.032	0.0	3.9	3.9	10.6	O K
8640 min Winter	13.175	0.025	0.0	3.3	3.3	8.3	O K
10080 min Winter	13.170	0.020	0.0	3.0	3.0	6.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	86.178	0.0	162.7	36			
60 min Winter	55.250	0.0	208.6	64			
120 min Winter	34.177	0.0	258.2	120			
180 min Winter	25.410	0.0	288.0	178			
240 min Winter	20.436	0.0	308.9	232			
360 min Winter	15.037	0.0	340.9	294			
480 min Winter	12.081	0.0	365.1	370			
600 min Winter	10.185	0.0	384.9	446			
720 min Winter	8.854	0.0	401.5	520			
960 min Winter	7.093	0.0	428.8	666			
1440 min Winter	5.178	0.0	469.6	938			
2160 min Winter	3.772	0.0	513.2	1296			
2880 min Winter	3.009	0.0	545.8	1560			
4320 min Winter	2.184	0.0	594.2	2244			
5760 min Winter	1.738	0.0	630.4	2944			
7200 min Winter	1.455	0.0	659.9	3664			
8640 min Winter	1.260	0.0	685.5	4360			
10080 min Winter	1.115	0.0	708.0	5136			
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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR	JLL-DAIRY CREST, HAVANT 100yr + 40%cc EVENT 100yr + 40%cc Below Ground	
Date 19/03/2019 File 100yr+40%cc [Below Grou...	Designed by PDM Checked by	
XP Solutions Source Control 2018.1		

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.450

Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)
0 4	0.225	4 8	0.225

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The Cowyards Blenheim Park, Oxford Road Woodstock OX20 1QR	JLL-DAIRY CREST, HAVANT 100yr + 40%cc EVENT 100yr + 40%cc Below Ground																																																																																											
Date 19/03/2019	Designed by PDM																																																																																											
File 100yr+40%cc [Below Grou...	Checked by																																																																																											
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Model Details Storage is Online Cover Level (m) 14.700 Cellular Storage Structure Invert Level (m) 13.150 Safety Factor 2.0 Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95 Infiltration Coefficient Side (m/hr) 0.00000 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th><th>Inf. Area (m²)</th></tr><tr><td>0.000</td><td>350.0</td><td>0.0</td><td>0.661</td><td>0.0</td><td>0.0</td></tr><tr><td>0.660</td><td>350.0</td><td>0.0</td><td></td><td></td><td></td></tr></table> Depth/Flow Relationship Outflow Control Invert Level (m) 13.130 <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>7.4000</td><td>0.900</td><td>7.4000</td><td>1.700</td><td>7.4000</td><td>2.500</td><td>7.4000</td></tr><tr><td>0.200</td><td>7.4000</td><td>1.000</td><td>7.4000</td><td>1.800</td><td>7.4000</td><td>2.600</td><td>7.4000</td></tr><tr><td>0.300</td><td>7.4000</td><td>1.100</td><td>7.4000</td><td>1.900</td><td>7.4000</td><td>2.700</td><td>7.4000</td></tr><tr><td>0.400</td><td>7.4000</td><td>1.200</td><td>7.4000</td><td>2.000</td><td>7.4000</td><td>2.800</td><td>7.4000</td></tr><tr><td>0.500</td><td>7.4000</td><td>1.300</td><td>7.4000</td><td>2.100</td><td>7.4000</td><td>2.900</td><td>7.4000</td></tr><tr><td>0.600</td><td>7.4000</td><td>1.400</td><td>7.4000</td><td>2.200</td><td>7.4000</td><td>3.000</td><td>7.4000</td></tr><tr><td>0.700</td><td>7.4000</td><td>1.500</td><td>7.4000</td><td>2.300</td><td>7.4000</td><td></td><td></td></tr><tr><td>0.800</td><td>7.4000</td><td>1.600</td><td>7.4000</td><td>2.400</td><td>7.4000</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	0.000	350.0	0.0	0.661	0.0	0.0	0.660	350.0	0.0				Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	7.4000	0.900	7.4000	1.700	7.4000	2.500	7.4000	0.200	7.4000	1.000	7.4000	1.800	7.4000	2.600	7.4000	0.300	7.4000	1.100	7.4000	1.900	7.4000	2.700	7.4000	0.400	7.4000	1.200	7.4000	2.000	7.4000	2.800	7.4000	0.500	7.4000	1.300	7.4000	2.100	7.4000	2.900	7.4000	0.600	7.4000	1.400	7.4000	2.200	7.4000	3.000	7.4000	0.700	7.4000	1.500	7.4000	2.300	7.4000			0.800	7.4000	1.600	7.4000	2.400	7.4000		
Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)																																																																																							
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0.600	7.4000	1.400	7.4000	2.200	7.4000	3.000	7.4000																																																																																					
0.700	7.4000	1.500	7.4000	2.300	7.4000																																																																																							
0.800	7.4000	1.600	7.4000	2.400	7.4000																																																																																							
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