



AKSward

AKSward²
CONSTRUCTION CONSULTANTS

Bicester Heritage Hotel

**Drainage Strategy and Water Quality Management
Report**

BHH-AKSW-XX-XX-RP-C-0003

Prepared for
Bicester Heritage

July 2018

Job No: X162034

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Revision	Amendments	Prepared By	Checked	Date
P01	Preliminary Issue	NJ	GT	29.06.18
P02	Western car park removed. Entrance updated	NJ	GT	11.07.18

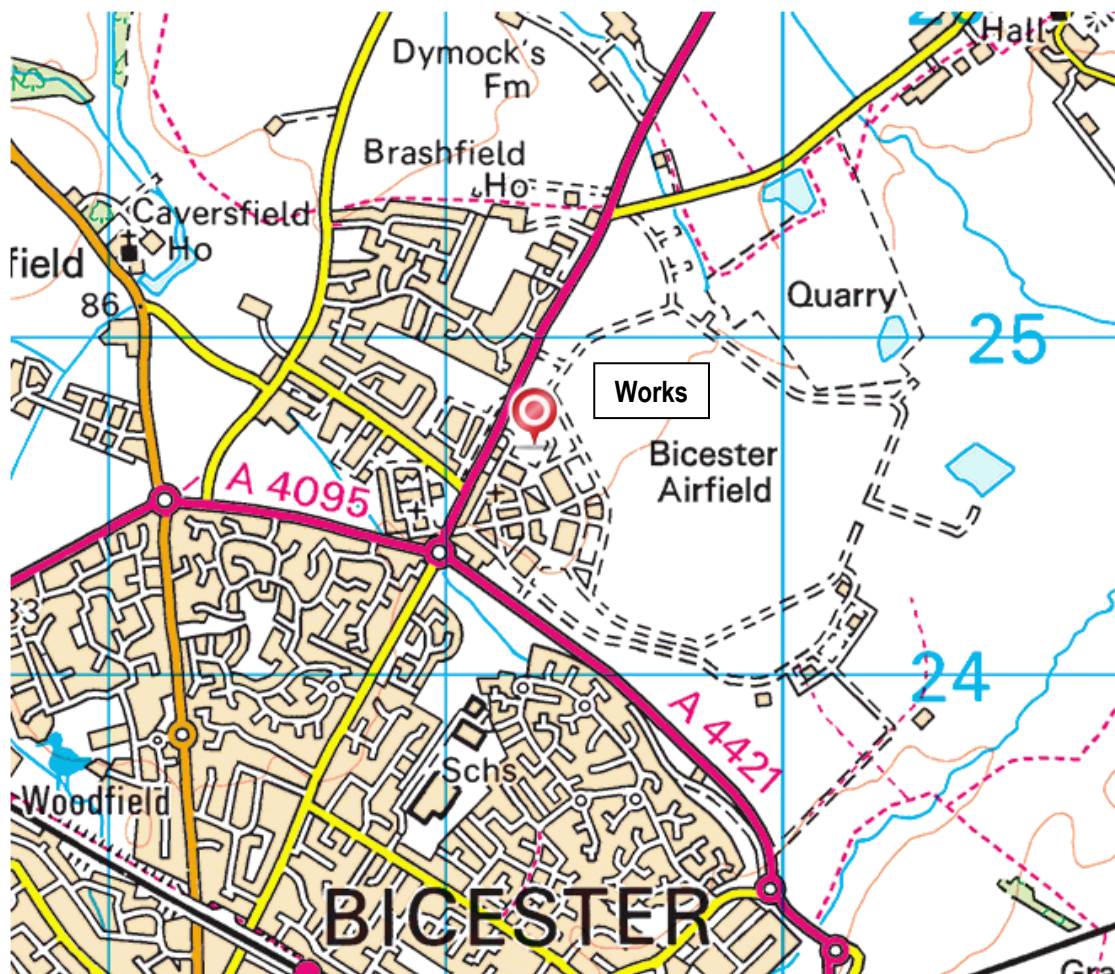
1.0 Introduction

- 1.1 AKS Ward have been commissioned to undertake a Drainage Strategy and Water Quality Management to support the planning application for a new hotel located within Bicester Heritage land.
- 1.2 The development includes a new hotel building, car parking and associated external areas.
- 1.3 The site is in Flood Zone 1 (low risk of fluvial flooding) and is 3.34 Hectares in area with approximately 1.80 Ha served by drainage. The site is located in Bicester and is currently a greenfield site.
- 1.4 The site is bounded by hangar units to the east and south, by the A4421 road to the west and by the Bicester Airfield to the north.
- 1.5 This Drainage Strategy must be read in conjunction with the Flood Risk Assessment prepared for the site by RAB Consultants.

2.0 Development Site Details

- 2.1 Development Description & Location
The site is located at NGR SP 59258 24680.

The plans of the development are contained within Appendix C.



3.0 Site Drainage Strategy

3.1 Existing Surface Water

The site currently drains towards the southeast and infiltrates into the ground. During exceedance events when the ground is saturated, it is understood that the runoff volume would drain towards the watercourse located further southeast outside of Bicester Heritage

British Geological Survey indicates that the site is underlain by Cornbrash Formation – Limestone. Infiltration tests were carried out within Bicester Heritage area and the results obtained were 1.43×10^{-6} m/s and 1.81×10^{-6} m/s.

Greenfield runoff rates and volumes have been calculated as follows:

Qbar:	0.7 l/s
Greenfield volume:	92.734 l/s

Existing drainage drawings are contained in Appendix A. Microdrainage calculations are contained in Appendix B

3.2 Proposed Surface Water

Surface system will be designed to agree with the National Standards for Sustainable Drainage.

Refer to drainage drawings and Microdrainage calculations in Appendix C and D. A Surface Water Pro-forma has been completed with a copy contained in Appendix E to ensure that the design is in accordance with the current SuDS requirements.

3.2.1 Runoff Destination

Due to ground conditions obtained, existing soil is considered permeable therefore infiltration as means of disposal is feasible.

Surface water drainage from the building and adjacent hard paving areas will be attenuated using a new cellular soakaway with a volume of 729.6 m³. Soakaway has been designed using the lowest infiltration rate obtained (1.43×10^{-6} m/s)

New parking areas will be drained using permeable paving. The new access road to the hotel will be drained via gullies into new swales located to both sides of the road.

3.2.2 Peak flow control

SuDS will be utilised on site in the form of permeable paving, swale and cellular soakaway. There will be no discharge flow rate from the site therefore peak runoff will not exceed the current flow rates for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event with an allowance for climate change.

3.2.3 Volume control

There is no additional discharged volume as the proposed hard paving areas and building will be drained into the permeable paving, cellular soakaway and swales therefore it will not exceed the current volume from each storm.

3.2.4 Flood risk within the development

The system has been designed in accordance with CIRIA SuDS manual with no flooding in the 30 year event and no flood water leaving the site for the 100 year + 40% climate change critical storm event.

3.2.5 Exceedance Events

In storm events exceeding the designed storm events above the 100 year + climate change the

flow of water would run towards the southeast of the site and ultimately discharge into the existing watercourse. This path is as per the existing situation

3.2.6 Structural integrity and construction

Surface system will be designed and constructed using approved materials in line with Building Regulation's and current British Standards appropriate for the location and proposed use.

3.2.7 Maintenance and operation

The drainage system will be CCTV surveyed on completion to ensure that the system is fully operational and maintenance schedules provided in the O&M manual for the owner to maintain the cellular tanks, permeable paving and swales.

Maintenance schedules have been provided in Appendix F for the SuDS. The owner of the site will be responsible for maintaining the SuDS on site.

3.3 Existing and Proposed Foul Water.

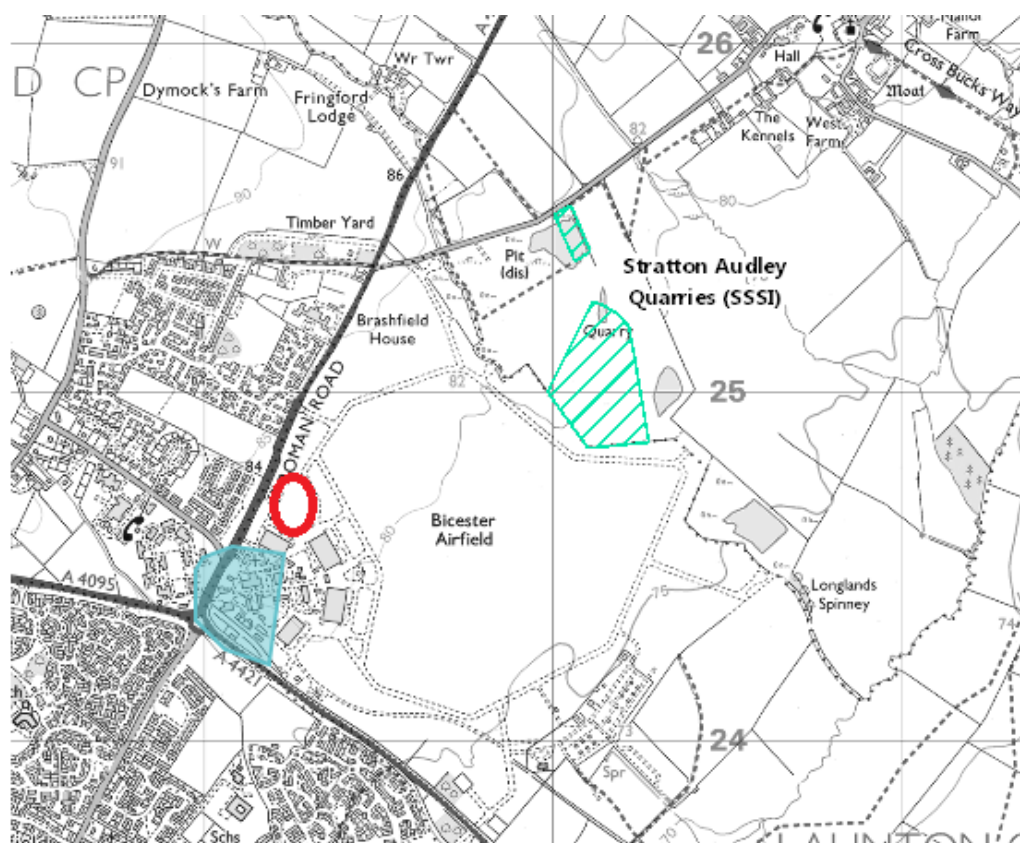
Foul water will discharge via private pumping chamber into the existing public sewer located within the site. Connection will be on site and via direct connection to the existing public drainage system.

A Pre-development Enquiry will be submitted to Thames Water to agree the discharge flow rates from the new development.

Any new foul drainage will be connected to the public system and S106 connection applications made to Thames Water.

3.4 Stratton Audley Quarries Site of Special Scientific Interest

The proposed development is located approximately 800m from Stratton Audley Quarries, and area declared 'Site of Special Scientific Interest'.



The proposed site falls from northwest to southeast therefore it does not contribute to the hydrology of the SSSI.

4.0 Water Quality Management

The surface system will be designed in order to not affect the water quality of the receiving watercourse.

CIRIA SuDS Manual 2015 Chapter 26 assigns pollution hazard indices for different land use types and SuDS mitigation index for every SuDS component depending on where the discharge is, surface or ground water.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydrocarbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways ¹	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways ¹	High	0.8 ²	0.8 ²	0.9 ²

TABLE 26.3 Indicative SuDS mitigation indices for discharges to surface waters

Type of SuDS component	Mitigation indices ¹		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4 ²	0.4	0.4
Swale	0.5	0.6	0.6
Bioretention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond ⁴	0.7 ³	0.7	0.5
Wetland	0.8 ³	0.8	0.8
Proprietary treatment systems ^{1,6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area.		

TABLE 26.4 Indicative SuDS mitigation indices for discharges to groundwater

Characteristics of the material overlying the proposed infiltration surface, through which the runoff percolates ¹	TSS	Metals	Hydrocarbons
A layer of dense vegetation underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.6 ⁴	0.5	0.6
A soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.3	0.3
Infiltration trench (where a suitable depth of filtration material is included that provides treatment, ie graded gravel with sufficient smaller particles but not single size coarse aggregate such as 20 mm gravel) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.4 ⁴	0.4	0.4
Constructed permeable pavement (where a suitable filtration layer is included that provides treatment, and including a geotextile at the base separating the foundation from the subgrade) underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.7	0.6	0.7
Bioretention underlain by a soil with good contaminant attenuation potential ² of at least 300 mm in depth ³	0.8 ⁴	0.8	0.8
Proprietary treatment systems ^{5, 6}	These must demonstrate that they can address each of the contaminant types to acceptable levels for inflow concentrations relevant to the contributing drainage area.		

CIRIA SuDS Manual states that 'To deliver adequate treatment, the selected SuDS components should have a total pollution mitigation index that equals or exceeds the pollution hazard index'

Total SuDS mitigation index \geq pollution hazard index
(for each contaminant type) (for each contaminant type)

Pollution hazard indices for land use are as follows:

Roof:	TTS 0.2	Metals 0.2	Hydrocarbons 0.05
Access road & car park:	TTS 0.5	Metals 0.4	Hydrocarbons 0.4

SuDS mitigation indices are determined by the type of SuDS utilised on site. The proposal for this site a cellular tank and proprietary treatment system (vortex separator):

Permeable pavement:	TTS 0.7	Metals 0.6	Hydrocarbons 0.7
Swale:	TTS 0.5	Metals 0.6	Hydrocarbons 0.6

Catchpit manholes will be installed prior to connecting into the new cellular soakaway therefore providing additional treatment for the surface water drained from the roof which will improve the water quality further.

Appendix A

Surveys & Historic Information

Asset location search



Property Searches

AKS Ward
Seacourt Tower
West WaySeacourt Tower
OXFORD
OX2 0JJ

Search address supplied Royal Air Force
Buckingham Road
Bicester
OX26 5HA

Your reference X162034 - Bicester Heritage

Our reference ALS/ALS Standard/2018_3816510

Search date 19 June 2018

Keeping you up-to-date

Knowledge of features below the surface is essential in every development. The benefits of this not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility for any commercial or residential project.

An asset location search provides information on the location of known Thames Water clean and/or wastewater assets, including details of pipe sizes, direction of flow and depth. Please note that information on cover and invert levels will only be provided where the data is available.



Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13



searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk



0845 070 9148



Search address supplied: Royal Air Force, Buckingham Road, Bicester, OX26 5HA

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

This search provides maps showing the position, size of Thames Water assets close to the proposed development and also manhole cover and invert levels, where available.

Please note that none of the charges made for this report relate to the provision of Ordnance Survey mapping information. The replies contained in this letter are given following inspection of the public service records available to this company. No responsibility can be accepted for any error or omission in the replies.

You should be aware that the information contained on these plans is current only on the day that the plans are issued. The plans should only be used for the duration of the work that is being carried out at the present time. Under no circumstances should this data be copied or transmitted to parties other than those for whom the current work is being carried out.

Thames Water do update these service plans on a regular basis and failure to observe the above conditions could lead to damage arising to new or diverted services at a later date.

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0845 070 9148, or use the address below:

Thames Water Utilities Ltd
Property Searches
PO Box 3189
Slough
SL1 4WW

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Waste Water Services

Please provide a copy extract from the public sewer map.

The following quartiles have been printed as they fall within Thames' sewerage area:

SP5824SE
SP5824NE
SP5924SW
SP5924NW

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an 'as constructed' record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

The following quartiles have been printed as they fall within Thames' water area:

SP5824SE
SP5824NE



SP5924SW
SP5924NW

Enclosed is a map showing the approximate positions of our water mains and associated apparatus. Please note that records are not kept of the positions of individual domestic supplies.

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0800 316 9800. The Customer Centre can also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

- Assets other than vested water mains may be shown on the plan, for information only.
- If an extract of the public water main record is enclosed, this will show known public water mains in the vicinity of the property. It should be possible to estimate the likely length and route of any private water supply pipe connecting the property to the public water network.

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 458750,224250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

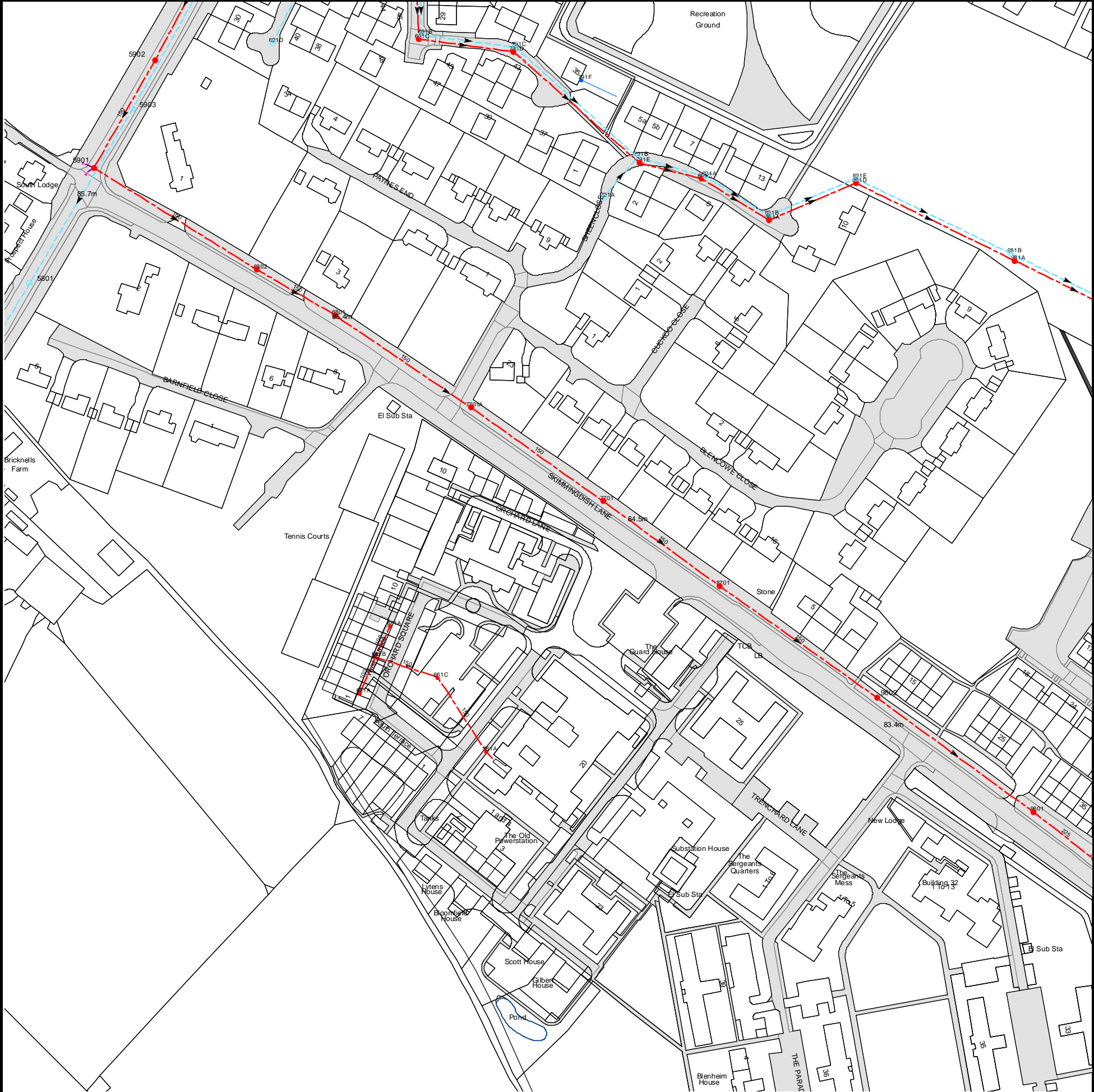
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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
531K	n/a	n/a
521C	n/a	n/a
621A	n/a	n/a
711A	n/a	n/a
721C	n/a	n/a
721D	n/a	n/a
6101	n/a	80.4
601B	n/a	n/a
7003	n/a	79.8
7001	n/a	79.38
701B	n/a	n/a
701C	n/a	n/a
7102	n/a	78.6
7002	n/a	77.75
7005	n/a	n/a
7006	n/a	n/a
7004	n/a	79.1
701A	n/a	n/a
7110	n/a	77.94
7104	n/a	78.83
7111	n/a	77.48
8103	n/a	78.66
8051	81.08	80.26
8001	81.12	77.24
8050	81.22	80.29
8052	80.23	78.35
8055	n/a	n/a
8053	80.1	78.55
8054	n/a	n/a
5205	83.41	80.91
5305	83.43	81.48
521B	n/a	n/a
531A	n/a	n/a
5207	83.36	81.12
5206	83.4	80.6
531I	n/a	n/a
521A	n/a	n/a
531E	n/a	n/a
5201	83.06	81.38
531J	n/a	n/a
531B	n/a	n/a
531H	n/a	n/a
531C	n/a	n/a
5101	83.15	80.18
5310	82.8	80.51
5110	83.01	80.34
5309	82.8	81.18
5209	83.05	79.75
5208	83.01	80.41
5102	83.05	80.39
5109	83.04	80.94
5311	82.77	81.07
6201	82.47	80.18
6202	82.49	79.54
6206	82.57	80.88
6207	82.59	80.63
5202	83.66	81
5203	83.65	81.7
5302	83.8	81.15
5301	83.81	81.71
5304	83.57	81.57
5303	83.8	81.15
5204	83.41	81.55
5010	82.5	80.05
5004	82.52	79.75
5005	82.75	79.69
5009	82.76	80.15
5003	82.95	79.75
5008	83	80.4
501A	n/a	n/a
501B	n/a	n/a
501C	n/a	n/a
5001	82.97	81.31
5002	82.97	81.81
601A	n/a	n/a
5105	83.14	81
5106	83.11	81.53
611B	n/a	n/a
611A	n/a	n/a
611C	n/a	n/a
5107	83.31	81.36
5104	83.37	80.76
5108	83.11	81.12
5103	83.13	80.5
5306	83.42	80.74
5307	83.17	81.26
5308	83.21	81.65
6302	82.8	80.77
6301	82.83	80.09
631A	n/a	n/a
9401	79.54	78.59

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7204	n/a	79.25
7208	81.4	80.02
7207	n/a	n/a
6210	81.97	79.7
6203	81.93	80.21
6209	81.88	79.94
6204	81.9	80.42
7209	n/a	n/a
721B	n/a	n/a
721A	n/a	n/a
6208	82.24	80.17
6205	82.22	80.55
7310	n/a	n/a
6305	82.01	80.57
7309	81.47	79.41
7308	81.45	79.79
7311	81.44	79.15
7306	80.99	79.37
7301	81.03	78.32
6304	82.16	80.36
7305	81.33	79.65
7302	81.38	78.78
6303	82.15	79.68
7304	81.77	79.97
7303	81.77	79.19
6306	82.41	80.53
6307	82.46	79.8
8101	80.65	77.43
8104	n/a	78.05
8110	80.56	77.53
8108	n/a	77.03
8105	n/a	78.26
8107	n/a	77.85
8106	n/a	78.41
7201	n/a	78.13
8212	n/a	n/a
8210	n/a	78.67
8213	n/a	n/a
8211	80.56	78.76
8214	80.27	77.56
8204	n/a	79.18
8202	n/a	78.88
8206	n/a	77.63
8203	n/a	78.98
8205	n/a	77.7
8216	80.57	78.89
8215	80.55	77.85
8303	80.4	79.05
8301	80.36	78.04
7307	80.66	79.17
8302	80.67	78.14
8306	80.47	79.04
8304	80.43	79.2
8305	80.48	78.81
831A	n/a	n/a
831B	n/a	n/a
831C	n/a	n/a
8102	80.5	78.02
8207	n/a	76.54
8201	n/a	78.72
8109	n/a	n/a
9204	n/a	78.47
9203	n/a	78.92
9303	n/a	78.75
9302	n/a	79.19
9104	n/a	n/a
9205	n/a	n/a
9201	79.59	77.75
9101	n/a	n/a
9207	n/a	n/a
9102	n/a	n/a
9208	n/a	n/a
9202	79.54	77.72
9103	n/a	n/a
9301	79.62	77.9
9106	n/a	n/a
6103	n/a	79.98
611D	n/a	n/a
7109	n/a	78.07
7105	n/a	78.96
7101	n/a	78.38
7108	n/a	78.16
7106	n/a	79.05
7103	n/a	79.28
6104	n/a	78.72
6102	n/a	79.56
6107	n/a	79.73
6110	n/a	78.89
7121	n/a	79.23
7118	n/a	79.65
6108	n/a	80.01
6111	n/a	79.56
7120	n/a	79.43

Manhole Reference	Manhole Cover Level	Manhole Invert Level
7117	n/a	79.85
6109	n/a	79.93
6112	82.48	79.32
7112	n/a	78
7107	n/a	78.54
7119	n/a	80.15
7206	n/a	79.73
7202	n/a	78.68
7205	n/a	79.09
7203	n/a	78.83
9006	n/a	n/a
9001	79.47	77.16
9002	n/a	n/a
9007	n/a	n/a
9008	n/a	n/a
9004	n/a	n/a
9009	n/a	n/a
9005	n/a	n/a
9105	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



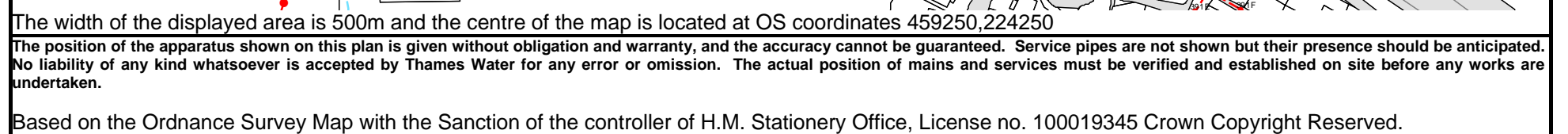
The width of the displayed area is 500m and the centre of the map is located at OS coordinates 458750,224750

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Manhole Reference	Manhole Cover Level	Manhole Invert Level
661A	n/a	n/a
661B	n/a	n/a
671A	n/a	n/a
661C	n/a	n/a
761A	n/a	n/a
791F	n/a	n/a
5801	n/a	n/a
6802	85.62	83.47
5901	85.75	83.93
5903	n/a	n/a
5902	86.19	84.32
691D	n/a	n/a
691C	n/a	n/a
691B	n/a	n/a
791C	n/a	n/a
6801	85.368	83.078
7701A	85.025	82.595
791D	n/a	n/a
7701	84.35	82.18
791A	n/a	n/a
791B	n/a	n/a
791E	n/a	n/a
891C	n/a	n/a
891A	n/a	n/a
8701	84.05	81.75
891B	n/a	n/a
881A	n/a	n/a
891D	n/a	n/a
891E	n/a	n/a
9602	n/a	n/a
981B	n/a	n/a
981A	n/a	n/a
9601	82.4	80.59
0601	82.161	80.421
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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
0301	79.67	78.03
0302	79.52	78.48
0402	80.37	78.27
0401	80.61	79.04
0107	n/a	n/a
0305	n/a	n/a
0304	79.42	78.28
0113	n/a	n/a
0201	n/a	n/a
0202	n/a	n/a
0101	n/a	n/a
0303	n/a	n/a
0002	n/a	n/a
0001	77.72	76.44
1001	n/a	n/a
0106	n/a	n/a
0102	77.87	76.65
0108	n/a	n/a
0114	n/a	n/a
0104	n/a	n/a
0105	n/a	n/a
0109	n/a	n/a
301A	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 459250,224750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
191S	n/a	n/a
091C	n/a	n/a
091B	n/a	n/a
091A	n/a	n/a
091G	n/a	n/a
091D	n/a	n/a
191J	n/a	n/a
191B	n/a	n/a
191A	n/a	n/a
191G	n/a	n/a
291D	n/a	n/a
291B	n/a	n/a
291C	n/a	n/a
0502	81.079	79.379
0501	81.22	79.22
1601	82.73	79.52
1701	83.87	79.67
1702	84.44	79.84
1703	84.17	80.85
1704	84.41	80.21
171A	n/a	n/a
2801	n/a	n/a
081A	n/a	n/a
191N	n/a	n/a
181C	n/a	n/a
181A	n/a	n/a
191Q	n/a	n/a
191R	n/a	n/a
181B	n/a	n/a
191L	n/a	n/a
191M	n/a	n/a
191K	n/a	n/a
191F	n/a	n/a
191P	n/a	n/a
091H	n/a	n/a
191I	n/a	n/a
091E	n/a	n/a
191C	n/a	n/a
091F	n/a	n/a
191O	n/a	n/a
191H	n/a	n/a
0504	82.09	80.06
0503	81.4	79.78
291A	n/a	n/a
2802	n/a	n/a
2901	n/a	n/a
The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.		



ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

	Foul: A sewer designed to convey waste water from domestic and industrial sources to a treatment works.
	Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.
	Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.
	Trunk Surface Water
	Trunk Foul
	Storm Relief
	Trunk Combined
	Vent Pipe
	Bio-solids (Sludge)
	Proposed Thames Surface Water Sewer
	Proposed Thames Water Foul Sewer
	Gallery
	Foul Rising Main
	Surface Water Rising Main
	Combined Rising Main
	Sludge Rising Main
	Proposed Thames Water Rising Main
	Vacuum

Notes:

- 1) All levels associated with the plans are to Ordnance Datum Newlyn.
- 2) All measurements on the plans are metric.
- 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.
- 4) Most private pipes are not shown on our plans, as in the past, this information has not been recorded.
- 5) 'na' or '0' on a manhole level indicates that data is unavailable.

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

	Air Valve
	Dam Chase
	Fitting
	Meter
	Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

	Control Valve
	Drop Pipe
	Ancillary
	Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

	Outfall
	Undefined End
	Inlet

Other Symbols

Symbols used on maps which do not fall under other general categories

	Public/Private Pumping Station
	Change of characteristic indicator (C.O.C.I.)
	Invert Level
	Summit

Areas

Lines denoting areas of underground surveys, etc.

	Agreement
	Operational Site
	Chamber
	Tunnel
	Conduit Bridge

Other Sewer Types (Not Operated or Maintained by Thames Water)

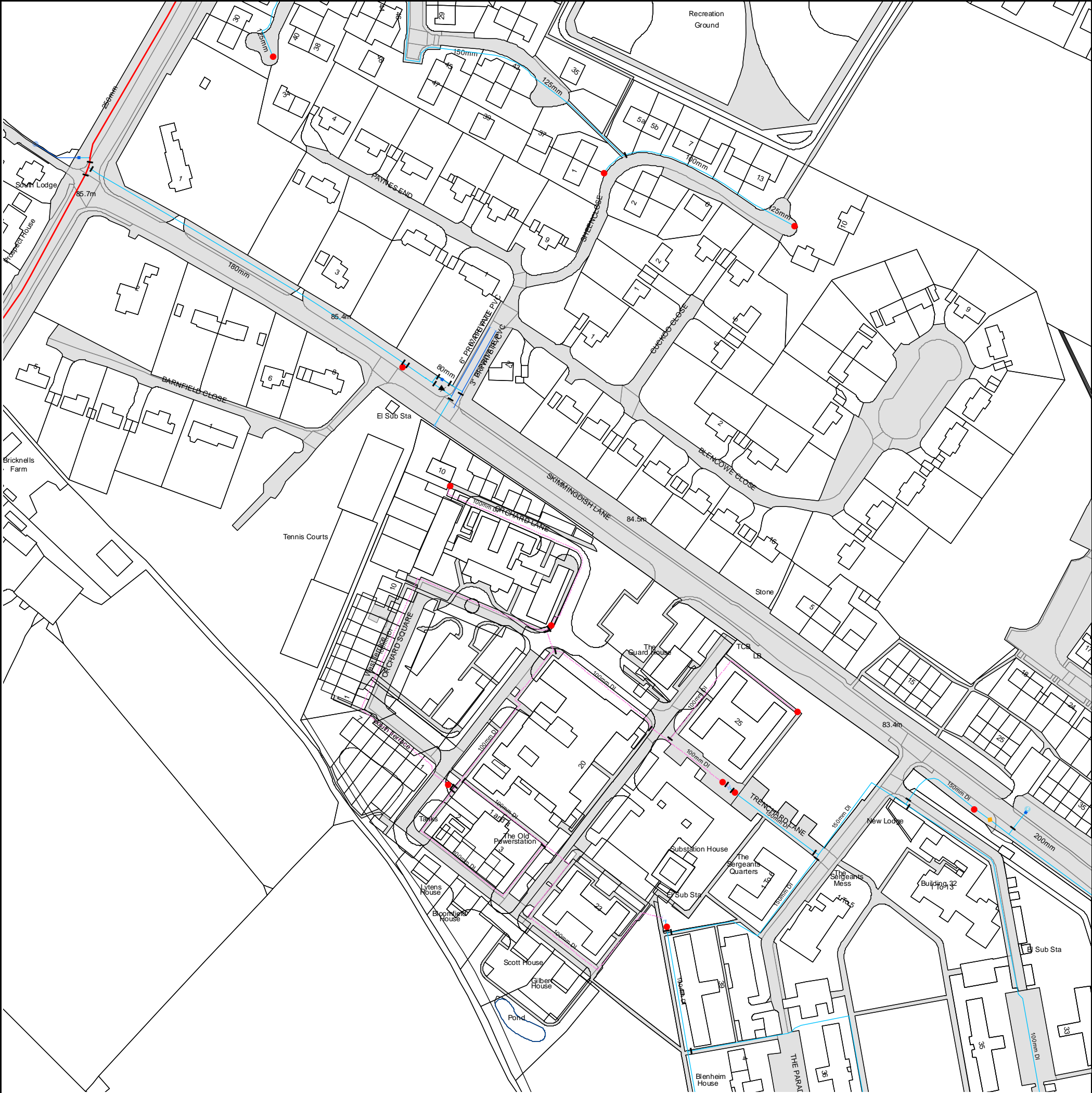
	Foul Sewer
	Surface Water Sewer
	Combined Sewer
	Gully
	Culverted Watercourse
	Proposed
	Abandoned Sewer



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 458750,224250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

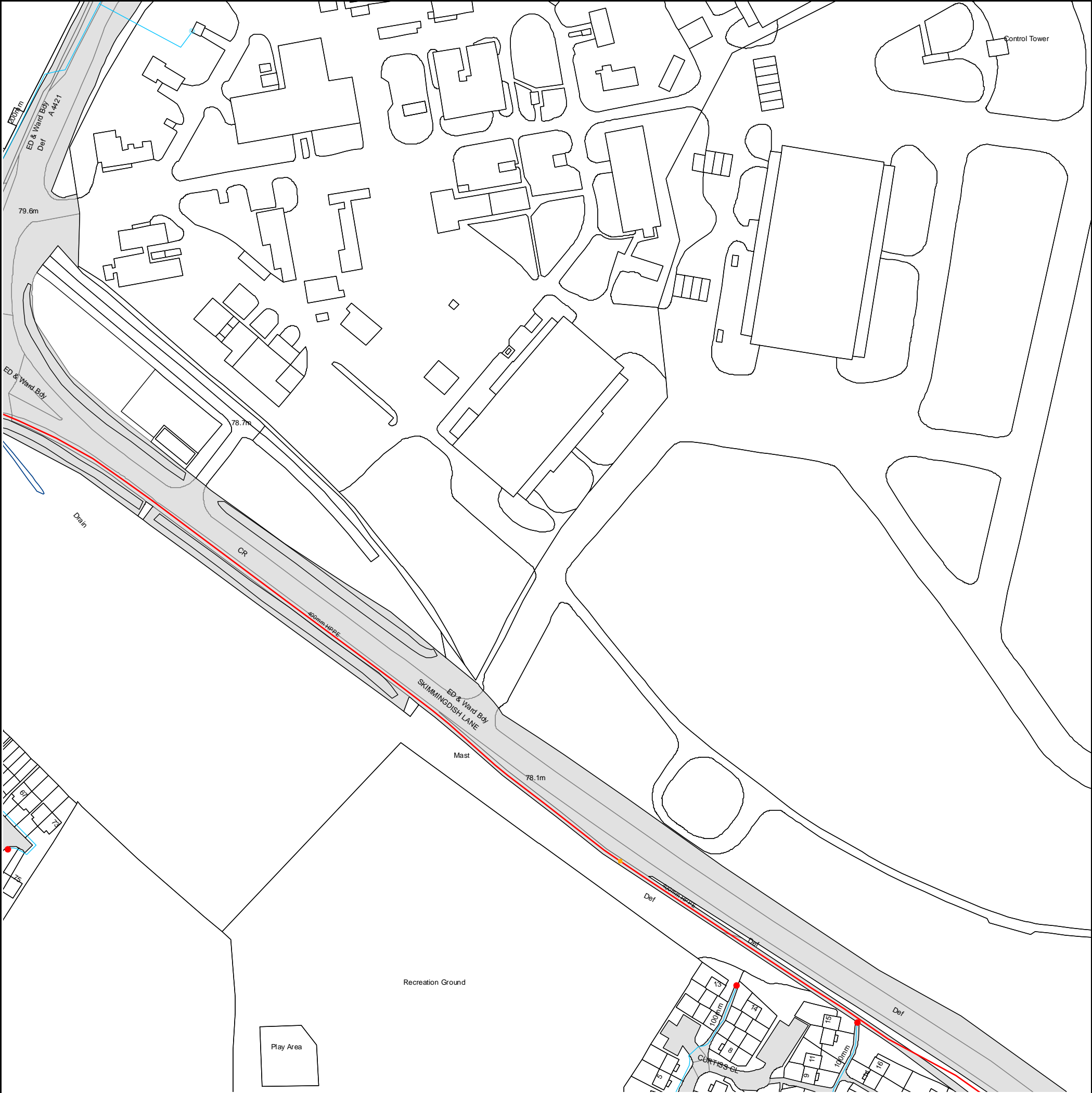
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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 458750,224750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 459250,224250

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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The width of the displayed area is 500m and the centre of the map is located at OS coordinates 459250,224750

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

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ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"	Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
16"	Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.
3" SUPPLY	Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.
3" FIRE	Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.
3" METERED	Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.
	Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.
	Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Valves

	General Purpose Valve
	Air Valve
	Pressure Control Valve
	Customer Valve

Hydrants

	Single Hydrant
--	----------------

Meters

	Meter
--	-------

End Items

Symbol indicating what happens at the end of a water main.

	Blank Flange
	Capped End
	Emptying Pit
	Undefined End
	Manifold
	Customer Supply
	Fire Supply

Operational Sites

	Booster Station
	Other
	Other (Proposed)
	Pumping Station
	Service Reservoir
	Shaft Inspection
	Treatment Works
	Unknown
	Water Tower

Other Symbols

	Data Logger
--	-------------

Other Water Pipes (Not Operated or Maintained by Thames Water)

	Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.
	Private Main: Indicates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL's terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	BACS Payment	Telephone Banking	Cheque
Call 0845 070 9148 quoting your invoice number starting CBA or ADS / OSS	Account number 90478703 Sort code 60-00-01 A remittance advice must be sent to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW. or email ps.billing@thameswater.co.uk	By calling your bank and quoting: Account number 90478703 Sort code 60-00-01 and your invoice number	Made payable to ' Thames Water Utilities Ltd ' Write your Thames Water account number on the back. Send to: Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW or by DX to 151280 Slough 13

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Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

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- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

By giving you this information, the search firm is confirming that they keep to the principles of the Code. This provides important protection for you.

The Code's core principles

Firms which subscribe to the Search Code will:

- display the Search Code logo prominently on their search reports
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- at all times maintain adequate and appropriate insurance to protect consumers
- conduct business in an honest, fair and professional manner
- handle complaints speedily and fairly
- ensure that products and services comply with industry registration rules and standards and relevant laws
- monitor their compliance with the Code

Complaints

If you have a query or complaint about your search, you should raise it directly with the search firm, and if appropriate ask for any complaint to be considered under their formal internal complaints procedure. If you remain dissatisfied with the firm's final response, after your complaint has been formally considered, or if the firm has exceeded the response timescales, you may refer your complaint for consideration under The Property Ombudsman scheme (TPOs). The Ombudsman can award compensation of up to £5,000 to you if he finds that you have suffered actual loss as a result of your search provider failing to keep to the Code.

Please note that all queries or complaints regarding your search should be directed to your search provider in the first instance, not to TPOs or to the PCCB.

TPOs Contact Details

The Property Ombudsman scheme
Milford House
43-55 Milford Street
Salisbury
Wiltshire SP1 2BP
Tel: 01722 333306
Fax: 01722 332296
Email: admin@tpos.co.uk

You can get more information about the PCCB from www.propertycodes.org.uk

PLEASE ASK YOUR SEARCH PROVIDER IF YOU WOULD LIKE A COPY OF THE SEARCH CODE

SOAKAWAY TEST - BRE DIGEST 365

PROJECT: Bicester Heritage
JOB REF: N16218
DATE: 01/02/2018
TEST REF: ST1 - SW Corner

Length of trial pit	=	L_{TP}	=	0.90	m
Width of trial pit	=	W_{TP}	=	0.90	m
Depth of trial pit	=	D	=	1.00	m
Pit Voids	=	PV	=	100	%

(Note - for open pits, $PV = 100\%$. For stone filled pits, $PV = 30\%$)

Water Depth at Start of Test, D_{TP}	=	0.850	m
75% Effective Depth, D_{75}	=	0.888	m
50% Effective Depth, D_{50}	=	0.926	m
25% Effective Depth, D_{25}	=	0.963	m

Time from 75% to 25% effective depth, T_L	=	655	mins
---	---	-----	------

Volume of water escaping during this test between D_{75} and D_{25}

$$\begin{aligned}
 &= V_{tp75-25} \\
 &= (L_{TP} \times W_{TP} \times (D_{25} - D_{75}) \times PV) = 0.061 \text{ m}^3
 \end{aligned}$$

Mean surface area through which the above volume escapes, is the wetted area.
Only 50% of the effective depth is allowed in the calculation:

Hence:

$$\begin{aligned}
 A_{P50} &= \text{Wet Base Area} + \text{Wet Sides Area (from } D_{50} \text{ to base of pit)} \\
 A_{P50} &= (L_{TP} \times W_{TP}) + (2L_{TP} + 2W_{TP}) \times (D - D_{50}) \\
 A_{P50} &= 0.81 + 0.268 \\
 A_{P50} &= 1.08 \text{ m}^2
 \end{aligned}$$

$$\text{Soil Infiltration Rate} = f = \frac{V_{TP75-25}}{A_{P50} \times 60 \times T_L} \text{ m/s}$$

$$f = \frac{0.06}{1.08 \times 60 \times 655} \text{ m/s}$$

$$\text{Soil Infiltration Rate } f = 1.43E-06 \text{ m/s}$$

SOAKAWAY TEST - BRE DIGEST 365

PROJECT: Bicester Heritage
JOB REF: N16218
DATE: 01/02/2018
TEST REF: ST2 - Mid way along S elevation

Length of trial pit	=	L_{TP}	=	1.10	m
Width of trial pit	=	W_{TP}	=	0.90	m
Depth of trial pit	=	D	=	1.00	m
Pit Voids	=	PV	=	100	%

(Note - for open pits, $PV = 100\%$. For stone filled pits, $PV = 30\%$)

Water Depth at Start of Test, D_{TP}	=	0.800	m
75% Effective Depth, D_{75}	=	0.850	m
50% Effective Depth, D_{50}	=	0.900	m
25% Effective Depth, D_{25}	=	0.950	m

Time from 75% to 25% effective depth, T_L	=	655	mins
---	---	-----	------

Volume of water escaping during this test between D_{75} and D_{25}

$$\begin{aligned}
 &= V_{tp75-25} \\
 &= (L_{TP} \times W_{TP} \times (D_{25} - D_{75}) \times PV) = 0.099 \text{ m}^3
 \end{aligned}$$

Mean surface area through which the above volume escapes, is the wetted area.
Only 50% of the effective depth is allowed in the calculation:

Hence:

$$\begin{aligned}
 A_{P50} &= \text{Wet Base Area} + \text{Wet Sides Area (from } D_{50} \text{ to base of pit)} \\
 A_{P50} &= (L_{TP} \times W_{TP}) + (2L_{TP} + 2W_{TP}) \times (D - D_{50}) \\
 A_{P50} &= 0.99 + 0.400 \\
 A_{P50} &= 1.39 \text{ m}^2
 \end{aligned}$$


$$\text{Soil Infiltration Rate} = f = \frac{V_{TP75-25}}{A_{P50} \times 60 \times T_L} \text{ m/s}$$

$$f = \frac{0.10}{1.39 \times 60 \times 655} \text{ m/s}$$

$$\text{Soil Infiltration Rate } f = 1.81E-06 \text{ m/s}$$

Appendix B

Existing Drainage Calculations

AKSWard		Page 1
Seacourt Tower West Way Oxford		
Date 11/07/2018 13:56 File Qbar.srcx	Designed by noelia.jara Checked by	
Micro Drainage Source Control 2018.1		

ICP SUDS Mean Annual Flood


Input


Return Period (years)	30	Soil	0.150
Area (ha)	1.800	Urban	0.000
SAAR (mm)	682	Region Number	Region 6

Results 1/s

QBAR Rural	0.7
QBAR Urban	0.7
Q30 years	1.6
Q1 year	0.6
Q30 years	1.6
Q100 years	2.3

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AKSWard		Page 1																										
Seacourt Tower																												
West Way																												
Oxford																												
Date 11/07/2018 13:57	Designed by noelia.jara																											
File Qbar.srcx	Checked by																											
Micro Drainage		Source Control 2018.1																										
<p style="text-align: center;"><u>Greenfield Runoff Volume</u></p> <p style="text-align: center;">FSR Data</p> <table> <tr> <td>Return Period (years)</td> <td>1</td> </tr> <tr> <td>Storm Duration (mins)</td> <td>360</td> </tr> <tr> <td>Region</td> <td>England and Wales</td> </tr> <tr> <td>M5-60 (mm)</td> <td>20.000</td> </tr> <tr> <td>Ratio R</td> <td>0.404</td> </tr> <tr> <td>Areal Reduction Factor</td> <td>1.00</td> </tr> <tr> <td>Area (ha)</td> <td>1.800</td> </tr> <tr> <td>SAAR (mm)</td> <td>685</td> </tr> <tr> <td>CWI</td> <td>102.300</td> </tr> <tr> <td>Urban</td> <td>0.000</td> </tr> <tr> <td>SPR</td> <td>10.000</td> </tr> </table> <p style="text-align: center;">Results</p> <table> <tr> <td>Percentage Runoff (%)</td> <td>4.33</td> </tr> <tr> <td>Greenfield Runoff Volume (m³)</td> <td>16.946</td> </tr> </table>			Return Period (years)	1	Storm Duration (mins)	360	Region	England and Wales	M5-60 (mm)	20.000	Ratio R	0.404	Areal Reduction Factor	1.00	Area (ha)	1.800	SAAR (mm)	685	CWI	102.300	Urban	0.000	SPR	10.000	Percentage Runoff (%)	4.33	Greenfield Runoff Volume (m³)	16.946
Return Period (years)	1																											
Storm Duration (mins)	360																											
Region	England and Wales																											
M5-60 (mm)	20.000																											
Ratio R	0.404																											
Areal Reduction Factor	1.00																											
Area (ha)	1.800																											
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Percentage Runoff (%)	4.33																											
Greenfield Runoff Volume (m³)	16.946																											
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AKSWard		Page 1
Seacourt Tower West Way Oxford		
Date 11/07/2018 13:58 File Qbar.srcx	Designed by noelia.jara Checked by	
Micro Drainage Source Control 2018.1		

Greenfield Runoff Volume


FSR Data

Return Period (years)	30
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.404
Areal Reduction Factor	1.00
Area (ha)	1.800
SAAR (mm)	685
CWI	102.300
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	6.26
Greenfield Runoff Volume (m³)	54.053

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AKSWard		Page 1
Seacourt Tower		
West Way		
Oxford		
Date 11/07/2018 13:58	Designed by noelia.jara	
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Micro Drainage		Source Control 2018.1

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.404
Areal Reduction Factor	1.00
Area (ha)	1.800
SAAR (mm)	685
CWI	102.300
Urban	0.000
SPR	10.000

Results

Percentage Runoff (%)	8.27
Greenfield Runoff Volume (m³)	92.734

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Appendix C

Proposed Site Plans

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GENERAL NOTES

- All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
- All drainage to be installed in accordance with relevant Building Regulations documents and Current Sewers for Adoption where applicable.
- Connections to Public sewers to be agreed and inspected by Water Authority.
- Invert level, size and cover levels to existing manholes and sewers to be checked prior to any construction. Any discrepancies to be reported immediately.
- Invert to base of soil stack bends to be 450mm below lowest branch connection for up to 3 storeys buildings. For buildings up to 5 storeys the invert to base of soil stack bends should be not less than 750mm.
- All RWP and Foul Water drain point setting out is to be confirmed by Architect.
- All RWP & SVP sizes & setting out by Architect / M&E Engineer. All below ground connections to match above ground outlet size. Min 100/110mm diameter.
- Foul drains to project 100mm above finished floor level.
- All internal Manholes and Inspection Chambers to have double sealed recessed covers to suit floor finishes by Architect.
- All external covers in footpaths and roads in non tarmac areas to have recessed trays to suit the paving material.
- Refer to drainage specification for pipe materials.
- All pipework to be 100/110 UNO. Refer to note 7 connection sizes.
- All foul and surface water drainage stacks to have above ground rodding access, refer to above ground drainage layout by others.
- This drawing has been produced in colour and should be reproduced in colour for clarity.
- A CCTV Survey and report in WINCAN format for all new drainage will be required before the "As Built" drawings will be issued.

IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.

- Key
- Road Gully
 - Storm Polypropylene Inspection Chamber
 - Storm Concrete Inspection Chamber
 - Storm Concrete Manhole
 - Permeable Sub-base
 - Permeable Paving
 - Grasscrete Paving
 - Foul Polypropylene Inspection Chamber
 - Foul Concrete Inspection Chamber
 - Foul Concrete Manhole
 - New Foul Sewer
 - New Foul Rising Main
 - New Surface Water Sewer
 - New Linear Drainage System
 - Existing Drainage
 - Existing Manholes
 - Existing Foul Sewer
 - Existing Surface Water Sewer
 - Existing Sewers to be abandoned and grouted up either end

P03	Drainage updated to suit revised entrance	NJ	GT	11.07.18
P02	Preliminary Issue	NJ	GT	29.06.18
P01	Preliminary Issue	NJ	GT	21.06.18

Rev.	Amendment	Dm	Chkd	Date
Orig Status				Suitability

Preliminary

AKSWard²

CONSTRUCTION CONSULTANTS

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OX2 0JJ

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Fax: 01865 248006
e-mail: oxford@aksward.com
web: www.aksward.com

London
Hitchin
Oxford
Southampton
Birmingham

Client Bicester Heritage Ltd.

Project Bicester Heritage Hotel

Title Drainage Layout
Sheet 1 of 3

Reviewed Scheme	GT	Date	21.06.18
Reviewed Final		Date	

Scales at A1	1:250	Project No.	X162034
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Project Ref.	Originator	Zone	Level	Type	Role	Dwg No.	Rev.
BHH	AKSW	XX	GF	DR	C	9201	P03

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GENERAL NOTES

- All setting out to be in accordance with the Architects drawings. Any discrepancies between the Engineers and the Architects drawings to be referred to the Architect before proceeding. Dimensions must not be scaled.
- All drainage to be installed in accordance with relevant Building Regulations documents and Current Sewers for Adoption where applicable.
- Connections to Public sewers to be agreed and inspected by Water Authority.
- Invert level, size and cover levels to existing manholes and sewers to be checked prior to any construction. Any discrepancies to be reported immediately.
- Invert to base of soil stack bends to be 450mm below lowest branch connection for up to 3 storeys buildings. For buildings up to 5 storeys the invert to base of soil stack bends should be not less than 750mm.
- All RWP and Foul Water drain point setting out is to be confirmed by Architect.
- All RWP & SVP sizes & setting out by Architect / M&E Engineer. All below ground connections to match above ground outlet size, Min 100/110mm diameter.
- Foul drains to project 100mm above finished floor level.
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- All external covers in footpaths and roads in non tarmac areas to have recessed trays to suit the paving material.
- Refer to drainage specification for pipe materials.
- All pipework to be 100/110Ø UNO. Refer to note 7 connection sizes.
- All foul and surface water drainage stacks to have above ground rodding access, refer to above ground drainage layout by others.
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- A CCTV Survey and report in WINCAN format for all new drainage will be required before the "As Built" drawings will be issued.

IDENTIFIES RISKS DURING THE CONSTRUCTION PROCESS ON THE DRAWINGS:

NOTE: The list below and notes on the drawing identify risks which are deemed to be unusual, abnormal, residual or unexpected to a competent contractor carrying out the works. These notes relate to risks which we have been unable to design out.

- Key
- Road Gully
 - Storm Polypropylene Inspection Chamber
 - Storm Concrete Inspection Chamber
 - Storm Concrete Manhole
 - Permeable Sub-base
 - Permeable Paving
 - Grasscrete Paving
 - Foul Polypropylene Inspection Chamber
 - Foul Concrete Inspection Chamber
 - Foul Concrete Manhole
 - New Foul Sewer
 - New Foul Rising Main
 - New Surface Water Sewer
 - New Linear Drainage System
- Existing Drainage
- Existing Manholes
 - Existing Foul Sewer
 - Existing Surface Water Sewer
 - Existing Sewers to be abandoned and grouted up either end

P03	Drainage updated to suit revised entrance	NJ	GT	11.07.18
P02	Preliminary Issue	NJ	GT	29.06.18
P01	Preliminary Issue	NJ	GT	21.06.18
Rev.	Amendment	Dm	Chkd	Date

Drg Status: Preliminary Suitability

AKSWard²

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Client: Bicester Heritage Ltd.

Project: Bicester Heritage Hotel

Title: Drainage Layout
Sheet 2 of 3

Reviewed Scheme: GT Date: 21.06.18

Reviewed Final: Date:

Scales at A1: 1:250 Project No: X162034

Project Ref. Originator Zone Level Type Role Drg No. Rev.

BHH · AKSW · XX · GF · DR · C · 9202 · P03

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 - New Surface Water Sewer
 - New Linear Drainage System
 - Existing Drainage
 - Existing Manholes
 - Existing Foul Sewer
 - Existing Surface Water Sewer
 - Existing Sewers to be abandoned and grouted up either end

P03 Drainage updated to suit revised entrance NJ GT 11.07.18
P02 Preliminary Issue NJ GT 29.06.18
P01 Preliminary Issue NJ GT 21.06.18

Rev.	Amendment	Dm	Chkd	Date
Orig Status				Suitability

Preliminary

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Client Bicester Heritage Ltd.

Project Bicester Heritage Hotel

Title Drainage Layout
Sheet 3 of 3

Reviewed Scheme	GT	Date	21.06.18
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Reviewed Final	Date
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Scales at A1	1:250	Project No.	X162034
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Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
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Key

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- Storm Polypropylene Inspection Chamber
- Storm Concrete Inspection Chamber
- Storm Concrete Manhole
- Permeable Sub-base
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- Foul Polypropylene Inspection Chamber
- Foul Concrete Inspection Chamber
- Foul Concrete Manhole
- New Foul Sewer
- New Foul Rising Main
- New Surface Water Sewer
- New Linear Drainage System
- Existing Drainage
- Existing Manholes
- Existing Foul Sewer
- Existing Surface Water Sewer
- Existing Sewers to be abandoned and grouted up either end
- Flooded Area max. 50mm deep.

P03	Drainage updated to suit revised entrance	NJ	GT	11.07.18
P02	Preliminary Issue	NJ	GT	29.06.18
P01	Preliminary Issue	NJ	GT	21.06.18
Rev.	Amendment	Dm	Chkd	Date

Drg Status	Suitability
------------	-------------

Preliminary

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Client **Bicester Heritage Ltd.**

Project **Bicester Heritage Hotel**

Title **Flooded Areas
1 in 100 Year + 40% CC
Critical Storm**

Reviewed Scheme	GT	Date	21.06.18
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Reviewed Final	Date
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Scales at A1	1:250	Project No.	X162034
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Project Ref.	Originator	Zone	Level	Type	Role	Drg No.	Rev.
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BHH · AKSW · XX · GF · DR · C · 9209 · P03

Appendix D

Proposed Drainage Calculations

AKSWard Ltd		Page 1
Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel SW Drainage Roof and Hard Paving Areas	
Date 29/06/2018 File Proposed_SWS_P02.mdx	Designed by NJ Checked by GT	
Micro Drainage	Network 2018.1	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	30	PIMP (%)	100
M5-60 (mm)	20.000	Add Flow / Climate Change (%)	0
Ratio R	0.404	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits


Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

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

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	30	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.404		


AKSWard Ltd		Page 2
Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel SW Drainage Roof and Hard Paving Areas	
Date 29/06/2018 File Proposed_SWS_P02.mdx	Designed by NJ Checked by GT	
Micro Drainage	Network 2018.1	

Online Controls for Storm

Pump Manhole: S08_Soakaway, DS/PN: S1.009, Volume (m³): 4.6

Invert Level (m) 80.722

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.0000	0.900	0.0000	1.700	0.0000	2.500	0.0000
0.200	0.0000	1.000	0.0000	1.800	0.0000	2.600	0.0000
0.300	0.0000	1.100	0.0000	1.900	0.0000	2.700	0.0000
0.400	0.0000	1.200	0.0000	2.000	0.0000	2.800	0.0000
0.500	0.0000	1.300	0.0000	2.100	0.0000	2.900	0.0000
0.600	0.0000	1.400	0.0000	2.200	0.0000	3.000	0.0000
0.700	0.0000	1.500	0.0000	2.300	0.0000		
0.800	0.0000	1.600	0.0000	2.400	0.0000		

AKSWard Ltd		Page 3
Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel SW Drainage Roof and Hard Paving Areas	
Date 29/06/2018 File Proposed_SWS_P02.mdx	Designed by NJ Checked by GT	
Micro Drainage	Network 2018.1	

Storage Structures for Storm


Cellular Storage Manhole: S08_Soakaway, DS/PN: S1.009

Invert Level (m) 79.750 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00515 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00515

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	640.0	640.0	1.201	0.0	774.4
1.200	640.0	774.4			

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Page 4

Seacourt Tower	Bicester Heritage Hotel	
West Way Oxford	SW Drainage Roof and	
OX2 0JJ	Hard Paving Areas	
Date 29/06/2018	Designed by NJ	
File Proposed_SWS_P02.mdx	Checked by GT	
Micro Drainage	Network 2018.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details


Rainfall Model	FSR	Ratio R	0.404
Region England and Wales Cv (Summer)	0.750		
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S01	15 Winter	1	+0%	30/15 Winter	100/15 Summer	
S1.001	S0JT	15 Winter	1	+0%			
S1.002	S0JT	15 Winter	1	+0%			
S1.003	S0JT	15 Winter	1	+0%			
S1.004	S02	15 Winter	1	+0%	30/15 Winter		
S1.005	S0JT	15 Winter	1	+0%			
S1.006	S0JT	15 Winter	1	+0%			
S1.007	S03	15 Winter	1	+0%	100/15 Summer		
S2.000	S04	15 Winter	1	+0%	100/15 Summer	100/15 Winter	
S2.001	S05	15 Winter	1	+0%	100/15 Summer		
S2.002	S0JT	15 Winter	1	+0%			
S2.003	S06	15 Winter	1	+0%	30/15 Summer		
S1.008	S07	15 Winter	1	+0%	30/15 Summer		
S1.009	S08_Soakaway	2880 Winter	1	+0%	100/2880 Winter		

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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel SW Drainage Roof and Hard Paving Areas	
Date 29/06/2018 File Proposed_SWS_P02.mdx	Designed by NJ Checked by GT	
Micro Drainage	Network 2018.1	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S01		82.056	-0.169	0.000	0.14		4.9	OK
S1.001	S0JT		82.006	-0.152	0.000	0.23		8.3	OK*
S1.002	S0JT		81.955	-0.136	0.000	0.33		12.0	OK*
S1.003	S0JT		81.905	-0.119	0.000	0.45		16.4	OK*
S1.004	S02		81.780	-0.177	0.000	0.35		24.3	OK
S1.005	S0JT		81.715	-0.167	0.000	0.41		28.0	OK*
S1.006	S0JT		81.633	-0.174	0.000	0.36		32.9	OK*
S1.007	S03		81.416	-0.241	0.000	0.27		41.2	OK
S2.000	S04		82.053	-0.172	0.000	0.12		4.9	OK
S2.001	S05		81.719	-0.199	0.000	0.25		20.4	OK
S2.002	S0JT		81.501	-0.191	0.000	0.28		25.6	OK*
S2.003	S06		81.300	-0.166	0.000	0.40		34.3	OK
S1.008	S07		81.049	-0.139	0.000	0.71		83.8	OK
S1.009	S08_Soakaway		80.035	-1.062	0.000	0.00		0.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S01	2
S1.001	S0JT	
S1.002	S0JT	
S1.003	S0JT	
S1.004	S02	
S1.005	S0JT	
S1.006	S0JT	
S1.007	S03	
S2.000	S04	1
S2.001	S05	
S2.002	S0JT	
S2.003	S06	
S1.008	S07	
S1.009	S08_Soakaway	

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Seacourt Tower

West Way Oxford

OX2 0JJ

Bicester Heritage Hotel

SW Drainage Roof and

Hard Paving Areas

Date 29/06/2018

File Proposed_SWS_P02.mdx

Designed by NJ

Checked by GT

Micro Drainage

Network 2018.1

Micro Drainage

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

for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0 Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 1

Number of Online Controls 1 Number of Time/Area Diagrams 0

Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.404

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

Analysis Timestep 2.5 Second Increment (Extended)

DTS Status OFF

DVD Status ON

Inertia Status ON

Profile(s) Summer and Winter


Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 1, 30, 100

Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surgecharge	First (Y) Flood	First (Z) Overflow
S1.000	S01	15 Winter	30	+0%	30/15 Winter	100/15 Summer	
S1.001	S0JT	15 Winter	30	+0%			
S1.002	S0JT	15 Winter	30	+0%			
S1.003	S0JT	15 Winter	30	+0%			
S1.004	S02	15 Winter	30	+0%	30/15 Winter		
S1.005	S0JT	15 Winter	30	+0%			
S1.006	S0JT	15 Winter	30	+0%			
S1.007	S03	15 Winter	30	+0%	100/15 Summer		
S2.000	S04	15 Winter	30	+0%	100/15 Summer	100/15 Winter	
S2.001	S05	15 Winter	30	+0%	100/15 Summer		
S2.002	S0JT	15 Winter	30	+0%			
S2.003	S06	15 Winter	30	+0%	30/15 Summer		
S1.008	S07	15 Winter	30	+0%	30/15 Summer		
S1.009	S08_Soakaway	4320 Winter	30	+0%	100/2880 Winter		

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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel SW Drainage Roof and Hard Paving Areas	
Date 29/06/2018 File Proposed_SWS_P02.mdx	Designed by NJ Checked by GT	
Micro Drainage	Network 2018.1	

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S01		82.225	0.000	0.000	0.31		10.9	SURCHARGED
S1.001	S0JT		82.158	0.000	0.000	0.53		19.4	SURCHARGED*
S1.002	S0JT		82.091	0.000	0.000	0.76		27.6	SURCHARGED*
S1.003	S0JT		82.024	0.000	0.000	1.04		37.9	SURCHARGED*
S1.004	S02		81.972	0.015	0.000	0.85		58.6	SURCHARGED
S1.005	S0JT		81.879	-0.003	0.000	1.00		68.6	OK*
S1.006	S0JT		81.737	-0.070	0.000	0.94		84.9	OK*
S1.007	S03		81.601	-0.056	0.000	0.68		105.3	OK
S2.000	S04		82.085	-0.140	0.000	0.29		11.9	OK
S2.001	S05		81.808	-0.110	0.000	0.70		58.4	OK
S2.002	S0JT		81.692	0.000	0.000	0.73		65.7	SURCHARGED*
S2.003	S06		81.612	0.146	0.000	0.99		83.9	SURCHARGED
S1.008	S07		81.377	0.189	0.000	1.80		212.4	SURCHARGED
S1.009	S08_Soakaway		80.406	-0.691	0.000	0.00		0.0	OK

PN	US/MH Name	Level Exceeded
S1.000	S01	2
S1.001	S0JT	
S1.002	S0JT	
S1.003	S0JT	
S1.004	S02	
S1.005	S0JT	
S1.006	S0JT	
S1.007	S03	
S2.000	S04	1
S2.001	S05	
S2.002	S0JT	
S2.003	S06	
S1.008	S07	
S1.009	S08_Soakaway	

AKSward Ltd

Page 1

Seacourt Tower

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Bicester Heritage Hotel

SW Drainage Roof and

Hard Paving Areas

Date 29/06/2018

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Micro Drainage

Network 2018.1

Micro Drainage

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

Simulation Criteria

Areal Reduction Factor 1.000

Additional Flow - % of Total Flow 0.000

Hot Start (mins) 0

MADD Factor * 10m³/ha Storage 2.000

Hot Start Level (mm) 0

Inlet Coefficient 0.800

Manhole Headloss Coeff (Global) 0.500

Flow per Person per Day (l/per/day) 0.000

Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0

Number of Storage Structures 1

Number of Online Controls 1

Number of Time/Area Diagrams 0

Number of Offline Controls 0

Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR

Ratio R 0.404

Region England and Wales Cv (Summer) 0.750

M5-60 (mm) 20.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0

DVD Status ON

Analysis Timestep Fine

Inertia Status ON

DTS Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080

Return Period(s) (years) 100

Climate Change (%) 0

PN

US/MH Name

Storm

Return Period

Climate Change

First (X) Surge

First (Y) Flood

First (Z) Overflow

Overflow Act.

S1.000

S01

15 Winter

100

+0%

100/15

Summer

S1.001

S0JT

30 Winter

100

+0%

S1.002

S0JT

30 Winter

100

+0%

S1.003

S0JT

30 Winter

100

+0%

S1.004

S02

15 Winter

100

+0%

100/15

Summer

S1.005

S0JT

30 Winter

100

+0%

S1.006

S0JT

15 Winter

100

+0%

S1.007

S03

15 Winter

100

+0%

100/15

Summer

S2.000

S04

15 Winter

100

+0%

S2.001

S05

15 Winter

100

+0%

100/15

Summer

S2.002

S0JT

30 Winter

100

+0%

S2.003

S06

15 Winter

100

+0%

100/15

Summer

S1.008

S07

15 Winter

100

+0%

100/15

Summer

S1.009


S08_Soakaway

4320 Winter

100

+0%

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AKSWard Ltd		Page 2
Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel SW Drainage Roof and Hard Paving Areas	
Date 29/06/2018 File Proposed_SWS_P02.mdx	Designed by NJ Checked by GT	
Micro Drainage	Network 2018.1	

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

PN	US/MH Name	Water Surcharged Flooded			Pipe		Status	Level Exceeded
		Level (m)	Depth (m)	Volume (m³)	Flow / Overflow Cap. (l/s)	Flow (l/s)		
S1.000	S01	82.506	0.281	0.000	0.40	14.0	SURCHARGED	
S1.001	S0JT	82.158	0.000	0.000	0.56	20.5	SURCHARGED*	
S1.002	S0JT	82.091	0.000	0.000	0.82	30.0	SURCHARGED*	
S1.003	S0JT	82.024	0.000	0.000	1.14	41.7	SURCHARGED*	
S1.004	S02	82.238	0.281	0.000	1.04	71.6	SURCHARGED	
S1.005	S0JT	81.882	0.000	0.000	1.08	74.1	SURCHARGED*	
S1.006	S0JT	81.807	0.000	0.000	1.09	99.0	SURCHARGED*	
S1.007	S03	81.858	0.201	0.000	0.82	126.6	SURCHARGED	
S2.000	S04	82.156	-0.069	0.000	0.37	14.9	OK	
S2.001	S05	82.118	0.200	0.000	0.80	66.1	SURCHARGED	
S2.002	S0JT	81.692	0.000	0.000	0.73	65.7	SURCHARGED*	
S2.003	S06	81.854	0.388	0.000	1.18	100.0	SURCHARGED	
S1.008	S07	81.524	0.336	0.000	2.18	257.4	SURCHARGED	
S1.009	S08_Soakaway	80.602	-0.495	0.000	0.00	0.0	OK	

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Seacourt Tower	Bicester Heritage Hotel	
West Way Oxford	SW Drainage Roof and	
OX2 0JJ	Hard Paving Areas	
Date 29/06/2018	Designed by NJ	
File Proposed_SWS_P02.mdx	Checked by GT	
Micro Drainage	Network 2018.1	

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

Simulation Criteria

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

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

Synthetic Rainfall Details


Rainfall Model	FSR	Ratio R	0.404
Region England and Wales Cv (Summer)			0.750
M5-60 (mm)	20.000 Cv (Winter)		0.840


Margin for Flood Risk Warning (mm) 300.0
Analysis Timestep 2.5 Second Increment (Extended)
DTS Status OFF
DVD Status ON
Inertia Status ON


Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440, 2160, 2880, 4320, 5760, 7200, 8640, 10080
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow
S1.000	S01	15 Winter	100	+40%	30/15 Winter	100/15 Summer	
S1.001	S0JT	15 Winter	100	+40%			
S1.002	S0JT	15 Winter	100	+40%			
S1.003	S0JT	15 Winter	100	+40%			
S1.004	S02	15 Winter	100	+40%	30/15 Winter		
S1.005	S0JT	5760 Winter	100	+40%			
S1.006	S0JT	5760 Winter	100	+40%			
S1.007	S03	15 Winter	100	+40%	100/15 Summer		
S2.000	S04	15 Winter	100	+40%	100/15 Summer	100/15 Winter	
S2.001	S05	15 Winter	100	+40%	100/15 Summer		
S2.002	S0JT	4320 Winter	100	+40%			
S2.003	S06	15 Winter	100	+40%	30/15 Summer		
S1.008	S07	5760 Winter	100	+40%	30/15 Summer		
S1.009	S08_Soakaway	5760 Winter	100	+40%	100/2880 Winter		


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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 2																																																																																																																																																																																																																					
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<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 220 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>0.052</td><td>0.052</td><td>0.3</td><td>3.3</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.066</td><td>0.066</td><td>0.4</td><td>5.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.078</td><td>0.078</td><td>0.5</td><td>7.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.087</td><td>0.087</td><td>0.5</td><td>9.3</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.091</td><td>0.091</td><td>0.5</td><td>10.1</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.093</td><td>0.093</td><td>0.5</td><td>10.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.095</td><td>0.095</td><td>0.6</td><td>11.2</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.097</td><td>0.097</td><td>0.6</td><td>11.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.097</td><td>0.097</td><td>0.6</td><td>11.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.097</td><td>0.097</td><td>0.6</td><td>11.6</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.096</td><td>0.096</td><td>0.6</td><td>11.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.093</td><td>0.093</td><td>0.5</td><td>10.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.087</td><td>0.087</td><td>0.5</td><td>9.3</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.081</td><td>0.081</td><td>0.5</td><td>8.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.071</td><td>0.071</td><td>0.4</td><td>6.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.064</td><td>0.064</td><td>0.4</td><td>5.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.058</td><td>0.058</td><td>0.3</td><td>4.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.053</td><td>0.053</td><td>0.3</td><td>3.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.050</td><td>0.050</td><td>0.3</td><td>3.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.058</td><td>0.058</td><td>0.3</td><td>4.2</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>31.093</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>20.252</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>12.800</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>7.926</td><td>0.0</td><td>120</td></tr><tr><td>180 min Summer</td><td>5.960</td><td>0.0</td><td>172</td></tr><tr><td>240 min Summer</td><td>4.862</td><td>0.0</td><td>198</td></tr><tr><td>360 min Summer</td><td>3.628</td><td>0.0</td><td>260</td></tr><tr><td>480 min Summer</td><td>2.939</td><td>0.0</td><td>328</td></tr><tr><td>600 min Summer</td><td>2.495</td><td>0.0</td><td>398</td></tr><tr><td>720 min Summer</td><td>2.183</td><td>0.0</td><td>464</td></tr><tr><td>960 min Summer</td><td>1.768</td><td>0.0</td><td>600</td></tr><tr><td>1440 min Summer</td><td>1.314</td><td>0.0</td><td>866</td></tr><tr><td>2160 min Summer</td><td>0.977</td><td>0.0</td><td>1252</td></tr><tr><td>2880 min Summer</td><td>0.791</td><td>0.0</td><td>1616</td></tr><tr><td>4320 min Summer</td><td>0.588</td><td>0.0</td><td>2336</td></tr><tr><td>5760 min Summer</td><td>0.476</td><td>0.0</td><td>3056</td></tr><tr><td>7200 min Summer</td><td>0.405</td><td>0.0</td><td>3752</td></tr><tr><td>8640 min Summer</td><td>0.354</td><td>0.0</td><td>4488</td></tr><tr><td>10080 min Summer</td><td>0.317</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>31.093</td><td>0.0</td><td>18</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.052	0.052	0.3	3.3	O K	30 min Summer	0.066	0.066	0.4	5.4	O K	60 min Summer	0.078	0.078	0.5	7.5	O K	120 min Summer	0.087	0.087	0.5	9.3	O K	180 min Summer	0.091	0.091	0.5	10.1	O K	240 min Summer	0.093	0.093	0.5	10.6	O K	360 min Summer	0.095	0.095	0.6	11.2	O K	480 min Summer	0.097	0.097	0.6	11.5	O K	600 min Summer	0.097	0.097	0.6	11.6	O K	720 min Summer	0.097	0.097	0.6	11.6	O K	960 min Summer	0.096	0.096	0.6	11.3	O K	1440 min Summer	0.093	0.093	0.5	10.6	O K	2160 min Summer	0.087	0.087	0.5	9.3	O K	2880 min Summer	0.081	0.081	0.5	8.1	O K	4320 min Summer	0.071	0.071	0.4	6.2	O K	5760 min Summer	0.064	0.064	0.4	5.0	O K	7200 min Summer	0.058	0.058	0.3	4.1	O K	8640 min Summer	0.053	0.053	0.3	3.4	O K	10080 min Summer	0.050	0.050	0.3	3.0	O K	15 min Winter	0.058	0.058	0.3	4.2	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	31.093	0.0	19	30 min Summer	20.252	0.0	33	60 min Summer	12.800	0.0	62	120 min Summer	7.926	0.0	120	180 min Summer	5.960	0.0	172	240 min Summer	4.862	0.0	198	360 min 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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 2			
Date 29/06/2018 File Permeable paving 2.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 1 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.073	0.073	0.4	6.5	O K
60 min Winter	0.085	0.085	0.5	8.9	O K
120 min Winter	0.095	0.095	0.6	11.1	O K
180 min Winter	0.099	0.099	0.6	12.0	O K
240 min Winter	0.101	0.101	0.6	12.5	O K
360 min Winter	0.103	0.103	0.6	13.0	O K
480 min Winter	0.103	0.103	0.6	13.1	O K
600 min Winter	0.103	0.103	0.6	13.0	O K
720 min Winter	0.102	0.102	0.6	12.8	O K
960 min Winter	0.100	0.100	0.6	12.2	O K
1440 min Winter	0.094	0.094	0.5	10.8	O K
2160 min Winter	0.084	0.084	0.5	8.8	O K
2880 min Winter	0.076	0.076	0.4	7.1	O K
4320 min Winter	0.063	0.063	0.4	4.9	O K
5760 min Winter	0.054	0.054	0.3	3.6	O K
7200 min Winter	0.048	0.048	0.3	2.9	O K
8640 min Winter	0.045	0.045	0.2	2.5	O K
10080 min Winter	0.043	0.043	0.2	2.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	20.252	0.0	33		
60 min Winter	12.800	0.0	62		
120 min Winter	7.926	0.0	118		
180 min Winter	5.960	0.0	174		
240 min Winter	4.862	0.0	224		
360 min Winter	3.628	0.0	278		
480 min Winter	2.939	0.0	356		
600 min Winter	2.495	0.0	432		
720 min Winter	2.183	0.0	506		
960 min Winter	1.768	0.0	646		
1440 min Winter	1.314	0.0	922		
2160 min Winter	0.977	0.0	1316		
2880 min Winter	0.791	0.0	1676		
4320 min Winter	0.588	0.0	2416		
5760 min Winter	0.476	0.0	3112		
7200 min Winter	0.405	0.0	3752		
8640 min Winter	0.354	0.0	4416		
10080 min Winter	0.317	0.0	5240		
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<p style="text-align: center;"><u>Summary of Results for 30 year Return Period</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.140	0.140	0.6	22.2	O K
60 min Winter	0.164	0.164	0.6	28.1	Flood Risk
120 min Winter	0.186	0.186	0.6	33.5	Flood Risk
180 min Winter	0.197	0.197	0.6	36.3	Flood Risk
240 min Winter	0.204	0.204	0.6	37.8	Flood Risk
360 min Winter	0.210	0.210	0.6	39.3	Flood Risk
480 min Winter	0.211	0.211	0.6	39.7	Flood Risk
600 min Winter	0.211	0.211	0.6	39.5	Flood Risk
720 min Winter	0.208	0.208	0.6	38.9	Flood Risk
960 min Winter	0.204	0.204	0.6	37.9	Flood Risk
1440 min Winter	0.192	0.192	0.6	35.0	Flood Risk
2160 min Winter	0.171	0.171	0.6	29.8	Flood Risk
2880 min Winter	0.151	0.151	0.6	24.7	Flood Risk
4320 min Winter	0.116	0.116	0.6	16.2	O K
5760 min Winter	0.096	0.096	0.6	11.3	O K
7200 min Winter	0.084	0.084	0.5	8.7	O K
8640 min Winter	0.074	0.074	0.4	6.8	O K
10080 min Winter	0.067	0.067	0.4	5.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	49.584	0.0	33		
60 min Winter	30.811	0.0	62		
120 min Winter	18.584	0.0	120		
180 min Winter	13.680	0.0	178		
240 min Winter	10.960	0.0	236		
360 min Winter	8.001	0.0	350		
480 min Winter	6.397	0.0	460		
600 min Winter	5.375	0.0	566		
720 min Winter	4.661	0.0	656		
960 min Winter	3.719	0.0	742		
1440 min Winter	2.704	0.0	1050		
2160 min Winter	1.963	0.0	1476		
2880 min Winter	1.563	0.0	1876		
4320 min Winter	1.133	0.0	2596		
5760 min Winter	0.901	0.0	3240		
7200 min Winter	0.754	0.0	3968		
8640 min Winter	0.652	0.0	4672		
10080 min Winter	0.576	0.0	5352		
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Summer</td><td>10.377</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>8.265</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>6.922</td><td>0.0</td><td>594</td></tr><tr><td>720 min Summer</td><td>5.986</td><td>0.0</td><td>640</td></tr><tr><td>960 min Summer</td><td>4.756</td><td>0.0</td><td>758</td></tr><tr><td>1440 min Summer</td><td>3.434</td><td>0.0</td><td>1010</td></tr><tr><td>2160 min Summer</td><td>2.475</td><td>0.0</td><td>1408</td></tr><tr><td>2880 min Summer</td><td>1.960</td><td>0.0</td><td>1816</td></tr><tr><td>4320 min Summer</td><td>1.409</td><td>0.0</td><td>2592</td></tr><tr><td>5760 min Summer</td><td>1.114</td><td>0.0</td><td>3344</td></tr><tr><td>7200 min Summer</td><td>0.927</td><td>0.0</td><td>4032</td></tr><tr><td>8640 min Summer</td><td>0.798</td><td>0.0</td><td>4672</td></tr><tr><td>10080 min Summer</td><td>0.703</td><td>0.0</td><td>5344</td></tr><tr><td>15 min 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Summer	0.097	0.097	0.6	11.5	O K	15 min Winter	0.142	0.142	0.6	22.5	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	99.025	0.0	19	30 min Summer	64.904	0.0	34	60 min Summer	40.510	0.0	64	120 min Summer	24.421	0.0	122	180 min Summer	17.920	0.0	182	240 min Summer	14.300	0.0	242	360 min Summer	10.377	0.0	362	480 min Summer	8.265	0.0	480	600 min Summer	6.922	0.0	594	720 min Summer	5.986	0.0	640	960 min Summer	4.756	0.0	758	1440 min Summer	3.434	0.0	1010	2160 min Summer	2.475	0.0	1408	2880 min Summer	1.960	0.0	1816	4320 min Summer	1.409	0.0	2592	5760 min Summer	1.114	0.0	3344	7200 min Summer	0.927	0.0	4032	8640 min Summer	0.798	0.0	4672	10080 min Summer	0.703	0.0	5344	15 min Winter	99.025	0.0	19
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AKSWard Ltd				Page 2	
Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 2			
Date 29/06/2018 File Permeable paving 2.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.174	0.174	0.6	30.6	Flood Risk
60 min Winter	0.207	0.207	0.6	38.6	Flood Risk
120 min Winter	0.237	0.237	0.6	46.1	Flood Risk
180 min Winter	0.253	0.253	0.6	49.9	Flood Risk
240 min Winter	0.261	0.261	0.6	52.0	Flood Risk
360 min Winter	0.271	0.271	0.6	54.3	Flood Risk
480 min Winter	0.274	0.274	0.6	55.2	Flood Risk
600 min Winter	0.275	0.275	0.6	55.4	Flood Risk
720 min Winter	0.274	0.274	0.6	55.0	Flood Risk
960 min Winter	0.267	0.267	0.6	53.5	Flood Risk
1440 min Winter	0.254	0.254	0.6	50.2	Flood Risk
2160 min Winter	0.230	0.230	0.6	44.4	Flood Risk
2880 min Winter	0.206	0.206	0.6	38.3	Flood Risk
4320 min Winter	0.161	0.161	0.6	27.3	Flood Risk
5760 min Winter	0.126	0.126	0.6	18.6	O K
7200 min Winter	0.102	0.102	0.6	12.7	O K
8640 min Winter	0.090	0.090	0.5	10.0	O K
10080 min Winter	0.081	0.081	0.5	8.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	64.904	0.0	33		
60 min Winter	40.510	0.0	62		
120 min Winter	24.421	0.0	122		
180 min Winter	17.920	0.0	180		
240 min Winter	14.300	0.0	238		
360 min Winter	10.377	0.0	354		
480 min Winter	8.265	0.0	468		
600 min Winter	6.922	0.0	578		
720 min Winter	5.986	0.0	686		
960 min Winter	4.756	0.0	884		
1440 min Winter	3.434	0.0	1096		
2160 min Winter	2.475	0.0	1540		
2880 min Winter	1.960	0.0	1964		
4320 min Winter	1.409	0.0	2768		
5760 min Winter	1.114	0.0	3464		
7200 min Winter	0.927	0.0	4040		
8640 min Winter	0.798	0.0	4752		
10080 min Winter	0.703	0.0	5440		
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Car Park 2	
Date 29/06/2018 File Permeable paving 2.srcx	Designed by NJ Checked by GT	
Micro Drainage 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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram


Total Area (ha) 0.130


Time (mins)	Area
From:	To: (ha)
0	4 0.130

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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Car Park 2																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.450</p> <p style="text-align: center;"><u>Porous Car Park Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Width (m)</td> <td>82.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>10.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>227.8</td> <td>Slope (1:X)</td> <td>100.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Volume Depth (m)</td> <td>0.350</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	82.0	Membrane Percolation (mm/hr)	1000	Length (m)	10.0	Max Percolation (l/s)	227.8	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	0.000	Cap Volume Depth (m)	0.350
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Risk</td></tr><tr><td>480 min Summer</td><td>0.345</td><td>0.345</td><td>0.6</td><td>72.5</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.348</td><td>0.348</td><td>0.6</td><td>73.3</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.348</td><td>0.348</td><td>0.6</td><td>73.4</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.344</td><td>0.344</td><td>0.6</td><td>72.4</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.333</td><td>0.333</td><td>0.6</td><td>69.5</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.314</td><td>0.314</td><td>0.6</td><td>65.0</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.295</td><td>0.295</td><td>0.6</td><td>60.3</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.260</td><td>0.260</td><td>0.6</td><td>51.6</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.228</td><td>0.228</td><td>0.6</td><td>43.7</td><td>Flood Risk</td></tr><tr><td>7200 min 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Summer</td><td>14.528</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.570</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>9.690</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.380</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>6.658</td><td>0.0</td><td>916</td></tr><tr><td>1440 min Summer</td><td>4.807</td><td>0.0</td><td>1140</td></tr><tr><td>2160 min Summer</td><td>3.465</td><td>0.0</td><td>1516</td></tr><tr><td>2880 min Summer</td><td>2.744</td><td>0.0</td><td>1928</td></tr><tr><td>4320 min Summer</td><td>1.973</td><td>0.0</td><td>2724</td></tr><tr><td>5760 min Summer</td><td>1.559</td><td>0.0</td><td>3512</td></tr><tr><td>7200 min Summer</td><td>1.298</td><td>0.0</td><td>4256</td></tr><tr><td>8640 min Summer</td><td>1.118</td><td>0.0</td><td>5008</td></tr><tr><td>10080 min Summer</td><td>0.985</td><td>0.0</td><td>5656</td></tr><tr><td>15 min 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Summer	0.174	0.174	0.6	30.6	Flood Risk	10080 min Summer	0.153	0.153	0.6	25.3	Flood Risk	15 min Winter	0.185	0.185	0.6	33.3	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	138.634	0.0	19	30 min Summer	90.866	0.0	34	60 min Summer	56.713	0.0	64	120 min Summer	34.190	0.0	124	180 min Summer	25.088	0.0	182	240 min Summer	20.020	0.0	242	360 min Summer	14.528	0.0	362	480 min Summer	11.570	0.0	482	600 min Summer	9.690	0.0	602	720 min Summer	8.380	0.0	720	960 min Summer	6.658	0.0	916	1440 min Summer	4.807	0.0	1140	2160 min Summer	3.465	0.0	1516	2880 min Summer	2.744	0.0	1928	4320 min Summer	1.973	0.0	2724	5760 min Summer	1.559	0.0	3512	7200 min Summer	1.298	0.0	4256	8640 min Summer	1.118	0.0	5008	10080 min Summer	0.985	0.0	5656	15 min Winter	138.634	0.0	19
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 2			
Date 29/06/2018 File Permeable paving 2.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<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	0.232	0.232	0.6	44.7	Flood Risk
60 min Winter	0.278	0.278	0.6	56.1	Flood Risk
120 min Winter	0.323	0.323	0.6	67.2	Flood Risk
180 min Winter	0.347	0.347	0.6	73.0	Flood Risk
240 min Winter	0.362	0.362	0.6	76.5	Flood Risk
360 min Winter	0.384	0.384	0.6	80.8	Flood Risk
480 min Winter	0.401	0.401	0.6	83.2	Flood Risk
600 min Winter	0.412	0.412	0.6	84.4	Flood Risk
720 min Winter	0.418	0.418	0.6	84.9	Flood Risk
960 min Winter	0.414	0.414	0.6	84.6	Flood Risk
1440 min Winter	0.385	0.385	0.6	81.0	Flood Risk
2160 min Winter	0.355	0.355	0.6	75.0	Flood Risk
2880 min Winter	0.329	0.329	0.6	68.5	Flood Risk
4320 min Winter	0.276	0.276	0.6	55.6	Flood Risk
5760 min Winter	0.228	0.228	0.6	43.7	Flood Risk
7200 min Winter	0.186	0.186	0.6	33.3	Flood Risk
8640 min Winter	0.150	0.150	0.6	24.6	O K
10080 min Winter	0.122	0.122	0.6	17.7	O K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	90.866		0.0	33	
60 min Winter	56.713		0.0	62	
120 min Winter	34.190		0.0	122	
180 min Winter	25.088		0.0	180	
240 min Winter	20.020		0.0	240	
360 min Winter	14.528		0.0	356	
480 min Winter	11.570		0.0	472	
600 min Winter	9.690		0.0	586	
720 min Winter	8.380		0.0	700	
960 min Winter	6.658		0.0	924	
1440 min Winter	4.807		0.0	1326	
2160 min Winter	3.465		0.0	1644	
2880 min Winter	2.744		0.0	2104	
4320 min Winter	1.973		0.0	2980	
5760 min Winter	1.559		0.0	3752	
7200 min Winter	1.298		0.0	4536	
8640 min Winter	1.118		0.0	5192	
10080 min Winter	0.985		0.0	5840	
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Car Park 2	
Date 29/06/2018 File Permeable paving 2.srcx	Designed by NJ Checked by GT	
Micro Drainage 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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40


Time Area Diagram


Total Area (ha) 0.130


Time (mins)	Area
From:	To: (ha)
0	4 0.130

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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Car Park 2																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.450</p> <p style="text-align: center;"><u>Porous Car Park Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Width (m)</td> <td>82.0</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>10.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>227.8</td> <td>Slope (1:X)</td> <td>100.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Volume Depth (m)</td> <td>0.350</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	82.0	Membrane Percolation (mm/hr)	1000	Length (m)	10.0	Max Percolation (l/s)	227.8	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	0.000	Cap Volume Depth (m)	0.350
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<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 324 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>0.044</td><td>0.044</td><td>0.3</td><td>3.2</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.076</td><td>0.076</td><td>0.6</td><td>9.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.100</td><td>0.100</td><td>0.8</td><td>16.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.119</td><td>0.119</td><td>0.9</td><td>23.3</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.127</td><td>0.127</td><td>1.0</td><td>26.8</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.132</td><td>0.132</td><td>1.0</td><td>28.9</td><td>Flood Risk</td></tr><tr><td>360 min 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Summer</td><td>0.109</td><td>0.109</td><td>0.9</td><td>19.9</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>0.101</td><td>0.101</td><td>0.8</td><td>16.8</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>0.093</td><td>0.093</td><td>0.7</td><td>14.3</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.086</td><td>0.086</td><td>0.7</td><td>12.4</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.060</td><td>0.060</td><td>0.5</td><td>5.9</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>31.093</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>20.252</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>12.800</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>7.926</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>5.960</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>4.862</td><td>0.0</td><td>240</td></tr><tr><td>360 min Summer</td><td>3.628</td><td>0.0</td><td>308</td></tr><tr><td>480 min Summer</td><td>2.939</td><td>0.0</td><td>368</td></tr><tr><td>600 min Summer</td><td>2.495</td><td>0.0</td><td>432</td></tr><tr><td>720 min Summer</td><td>2.183</td><td>0.0</td><td>498</td></tr><tr><td>960 min Summer</td><td>1.768</td><td>0.0</td><td>636</td></tr><tr><td>1440 min Summer</td><td>1.314</td><td>0.0</td><td>910</td></tr><tr><td>2160 min Summer</td><td>0.977</td><td>0.0</td><td>1300</td></tr><tr><td>2880 min Summer</td><td>0.791</td><td>0.0</td><td>1700</td></tr><tr><td>4320 min Summer</td><td>0.588</td><td>0.0</td><td>2460</td></tr><tr><td>5760 min Summer</td><td>0.476</td><td>0.0</td><td>3176</td></tr><tr><td>7200 min Summer</td><td>0.405</td><td>0.0</td><td>3896</td></tr><tr><td>8640 min Summer</td><td>0.354</td><td>0.0</td><td>4664</td></tr><tr><td>10080 min Summer</td><td>0.317</td><td>0.0</td><td>5344</td></tr><tr><td>15 min 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Summer	0.086	0.086	0.7	12.4	O K	15 min Winter	0.060	0.060	0.5	5.9	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	31.093	0.0	19	30 min Summer	20.252	0.0	34	60 min Summer	12.800	0.0	64	120 min Summer	7.926	0.0	122	180 min Summer	5.960	0.0	182	240 min Summer	4.862	0.0	240	360 min Summer	3.628	0.0	308	480 min Summer	2.939	0.0	368	600 min Summer	2.495	0.0	432	720 min Summer	2.183	0.0	498	960 min Summer	1.768	0.0	636	1440 min Summer	1.314	0.0	910	2160 min Summer	0.977	0.0	1300	2880 min Summer	0.791	0.0	1700	4320 min Summer	0.588	0.0	2460	5760 min Summer	0.476	0.0	3176	7200 min Summer	0.405	0.0	3896	8640 min Summer	0.354	0.0	4664	10080 min Summer	0.317	0.0	5344	15 min Winter	31.093	0.0	19
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 3			
Date 29/06/2018 File Permeable paving 3.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 1 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.089	0.089	0.7	13.2	O K
60 min Winter	0.113	0.113	0.9	21.0	Flood Risk
120 min Winter	0.132	0.132	1.0	28.7	Flood Risk
180 min Winter	0.141	0.141	1.1	32.8	Flood Risk
240 min Winter	0.146	0.146	1.2	35.3	Flood Risk
360 min Winter	0.151	0.151	1.2	37.6	Flood Risk
480 min Winter	0.153	0.153	1.2	38.5	Flood Risk
600 min Winter	0.154	0.154	1.2	39.2	Flood Risk
720 min Winter	0.154	0.154	1.2	39.5	Flood Risk
960 min Winter	0.154	0.154	1.2	39.3	Flood Risk
1440 min Winter	0.150	0.150	1.2	37.2	Flood Risk
2160 min Winter	0.141	0.141	1.1	33.1	Flood Risk
2880 min Winter	0.132	0.132	1.0	28.9	Flood Risk
4320 min Winter	0.115	0.115	0.9	21.9	Flood Risk
5760 min Winter	0.101	0.101	0.8	16.8	Flood Risk
7200 min Winter	0.089	0.089	0.7	13.0	O K
8640 min Winter	0.079	0.079	0.6	10.3	O K
10080 min Winter	0.071	0.071	0.6	8.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	20.252	0.0	33		
60 min Winter	12.800	0.0	62		
120 min Winter	7.926	0.0	120		
180 min Winter	5.960	0.0	176		
240 min Winter	4.862	0.0	232		
360 min Winter	3.628	0.0	338		
480 min Winter	2.939	0.0	382		
600 min Winter	2.495	0.0	458		
720 min Winter	2.183	0.0	534		
960 min Winter	1.768	0.0	684		
1440 min Winter	1.314	0.0	980		
2160 min Winter	0.977	0.0	1388		
2880 min Winter	0.791	0.0	1788		
4320 min Winter	0.588	0.0	2552		
5760 min Winter	0.476	0.0	3288		
7200 min Winter	0.405	0.0	3968		
8640 min Winter	0.354	0.0	4680		
10080 min Winter	0.317	0.0	5440		
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Date 29/06/2018 File Permeable paving 3.srcx	Designed by NJ Checked by GT	
Micro Drainage Source Control 2018.1		

Rainfall Details


Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0

Time Area Diagram


Total Area (ha) 0.395


Time (mins)	Area
From:	To: (ha)
0	4 0.395

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<div>Summary of Results for 30 year Return Period</div> <div>Half Drain Time : 546 minutes.</div> <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>0.148</td><td>0.148</td><td>1.2</td><td>36.1</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>0.177</td><td>0.177</td><td>1.4</td><td>52.2</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.203</td><td>0.203</td><td>1.6</td><td>68.1</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.224</td><td>0.224</td><td>1.8</td><td>82.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.233</td><td>0.233</td><td>1.8</td><td>90.0</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.238</td><td>0.238</td><td>1.9</td><td>93.9</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.242</td><td>0.242</td><td>1.9</td><td>97.2</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.243</td><td>0.243</td><td>1.9</td><td>98.3</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.244</td><td>0.244</td><td>1.9</td><td>98.8</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.244</td><td>0.244</td><td>1.9</td><td>99.0</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.244</td><td>0.244</td><td>1.9</td><td>98.6</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.240</td><td>0.240</td><td>1.9</td><td>95.7</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.232</td><td>0.232</td><td>1.8</td><td>89.3</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.223</td><td>0.223</td><td>1.8</td><td>82.3</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.205</td><td>0.205</td><td>1.6</td><td>69.6</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.189</td><td>0.189</td><td>1.5</td><td>59.2</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>0.175</td><td>0.175</td><td>1.4</td><td>50.8</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>0.163</td><td>0.163</td><td>1.3</td><td>43.9</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>0.152</td><td>0.152</td><td>1.2</td><td>38.3</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>0.161</td><td>0.161</td><td>1.3</td><td>42.8</td><td>Flood Risk</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>76.290</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>49.584</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>30.811</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>18.584</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>13.680</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>10.960</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>8.001</td><td>0.0</td><td>360</td></tr><tr><td>480 min Summer</td><td>6.397</td><td>0.0</td><td>416</td></tr><tr><td>600 min Summer</td><td>5.375</td><td>0.0</td><td>476</td></tr><tr><td>720 min Summer</td><td>4.661</td><td>0.0</td><td>540</td></tr><tr><td>960 min Summer</td><td>3.719</td><td>0.0</td><td>672</td></tr><tr><td>1440 min Summer</td><td>2.704</td><td>0.0</td><td>940</td></tr><tr><td>2160 min Summer</td><td>1.963</td><td>0.0</td><td>1360</td></tr><tr><td>2880 min Summer</td><td>1.563</td><td>0.0</td><td>1756</td></tr><tr><td>4320 min Summer</td><td>1.133</td><td>0.0</td><td>2512</td></tr><tr><td>5760 min Summer</td><td>0.901</td><td>0.0</td><td>3288</td></tr><tr><td>7200 min Summer</td><td>0.754</td><td>0.0</td><td>4032</td></tr><tr><td>8640 min Summer</td><td>0.652</td><td>0.0</td><td>4752</td></tr><tr><td>10080 min Summer</td><td>0.576</td><td>0.0</td><td>5448</td></tr><tr><td>15 min Winter</td><td>76.290</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.148	0.148	1.2	36.1	Flood Risk	30 min Summer	0.177	0.177	1.4	52.2	Flood Risk	60 min Summer	0.203	0.203	1.6	68.1	Flood Risk	120 min Summer	0.224	0.224	1.8	82.9	Flood Risk	180 min Summer	0.233	0.233	1.8	90.0	Flood Risk	240 min Summer	0.238	0.238	1.9	93.9	Flood Risk	360 min Summer	0.242	0.242	1.9	97.2	Flood Risk	480 min Summer	0.243	0.243	1.9	98.3	Flood Risk	600 min Summer	0.244	0.244	1.9	98.8	Flood Risk	720 min Summer	0.244	0.244	1.9	99.0	Flood Risk	960 min Summer	0.244	0.244	1.9	98.6	Flood Risk	1440 min Summer	0.240	0.240	1.9	95.7	Flood Risk	2160 min Summer	0.232	0.232	1.8	89.3	Flood Risk	2880 min Summer	0.223	0.223	1.8	82.3	Flood Risk	4320 min Summer	0.205	0.205	1.6	69.6	Flood Risk	5760 min Summer	0.189	0.189	1.5	59.2	Flood Risk	7200 min Summer	0.175	0.175	1.4	50.8	Flood Risk	8640 min Summer	0.163	0.163	1.3	43.9	Flood Risk	10080 min Summer	0.152	0.152	1.2	38.3	Flood Risk	15 min Winter	0.161	0.161	1.3	42.8	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	76.290	0.0	19	30 min Summer	49.584	0.0	34	60 min Summer	30.811	0.0	64	120 min Summer	18.584	0.0	122	180 min Summer	13.680	0.0	182	240 min Summer	10.960	0.0	242	360 min Summer	8.001	0.0	360	480 min Summer	6.397	0.0	416	600 min Summer	5.375	0.0	476	720 min Summer	4.661	0.0	540	960 min Summer	3.719	0.0	672	1440 min Summer	2.704	0.0	940	2160 min Summer	1.963	0.0	1360	2880 min Summer	1.563	0.0	1756	4320 min Summer	1.133	0.0	2512	5760 min Summer	0.901	0.0	3288	7200 min Summer	0.754	0.0	4032	8640 min Summer	0.652	0.0	4752	10080 min Summer	0.576	0.0	5448	15 min Winter	76.290	0.0	19
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 3			
Date 29/06/2018 File Permeable paving 3.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<div>Summary of Results for 30 year Return Period</div>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.192	0.192	1.5	60.9	Flood Risk
60 min Winter	0.218	0.218	1.7	78.8	Flood Risk
120 min Winter	0.240	0.240	1.9	95.6	Flood Risk
180 min Winter	0.250	0.250	2.0	103.8	Flood Risk
240 min Winter	0.256	0.256	2.0	108.5	Flood Risk
360 min Winter	0.261	0.261	2.1	112.9	Flood Risk
480 min Winter	0.262	0.262	2.1	114.1	Flood Risk
600 min Winter	0.262	0.262	2.1	113.8	Flood Risk
720 min Winter	0.262	0.262	2.1	113.7	Flood Risk
960 min Winter	0.260	0.260	2.1	112.3	Flood Risk
1440 min Winter	0.254	0.254	2.0	106.7	Flood Risk
2160 min Winter	0.241	0.241	1.9	96.1	Flood Risk
2880 min Winter	0.227	0.227	1.8	85.7	Flood Risk
4320 min Winter	0.202	0.202	1.6	67.7	Flood Risk
5760 min Winter	0.180	0.180	1.4	54.0	Flood Risk
7200 min Winter	0.162	0.162	1.3	43.5	Flood Risk
8640 min Winter	0.146	0.146	1.2	35.6	Flood Risk
10080 min Winter	0.133	0.133	1.1	29.4	Flood Risk
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	49.584		0.0	33	
60 min Winter	30.811		0.0	62	
120 min Winter	18.584		0.0	120	
180 min Winter	13.680		0.0	178	
240 min Winter	10.960		0.0	236	
360 min Winter	8.001		0.0	348	
480 min Winter	6.397		0.0	454	
600 min Winter	5.375		0.0	506	
720 min Winter	4.661		0.0	566	
960 min Winter	3.719		0.0	720	
1440 min Winter	2.704		0.0	1024	
2160 min Winter	1.963		0.0	1452	
2880 min Winter	1.563		0.0	1872	
4320 min Winter	1.133		0.0	2676	
5760 min Winter	0.901		0.0	3408	
7200 min Winter	0.754		0.0	4176	
8640 min Winter	0.652		0.0	4920	
10080 min Winter	0.576		0.0	5640	
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Car Park 3	
Date 29/06/2018 File Permeable paving 3.srcx	Designed by NJ Checked by GT	
Micro Drainage 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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.395


Time (mins)	Area
From:	To: (ha)
0	4 0.395

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Micro Drainage		


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<p style="text-align: center;"><u>Summary of Results for 100 year Return Period (+40%)</u></p> <p style="text-align: center;">Half Drain Time : 805 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>0.222</td><td>0.222</td><td>1.8</td><td>81.9</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>0.261</td><td>0.261</td><td>2.1</td><td>112.5</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.294</td><td>0.294</td><td>2.3</td><td>143.1</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.323</td><td>0.323</td><td>2.6</td><td>171.6</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.337</td><td>0.337</td><td>2.7</td><td>185.7</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.345</td><td>0.345</td><td>2.7</td><td>193.5</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.352</td><td>0.352</td><td>2.8</td><td>201.2</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.355</td><td>0.355</td><td>2.8</td><td>203.7</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.355</td><td>0.355</td><td>2.8</td><td>203.8</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.355</td><td>0.355</td><td>2.8</td><td>203.6</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.353</td><td>0.353</td><td>2.8</td><td>202.3</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.348</td><td>0.348</td><td>2.8</td><td>197.2</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.337</td><td>0.337</td><td>2.7</td><td>186.4</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.325</td><td>0.325</td><td>2.6</td><td>174.5</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.303</td><td>0.303</td><td>2.4</td><td>152.0</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.283</td><td>0.283</td><td>2.2</td><td>132.8</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>0.266</td><td>0.266</td><td>2.1</td><td>116.9</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>0.250</td><td>0.250</td><td>2.0</td><td>103.5</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>0.236</td><td>0.236</td><td>1.9</td><td>92.3</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>0.238</td><td>0.238</td><td>1.9</td><td>94.1</td><td>Flood Risk</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>138.634</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>90.866</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>56.713</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>34.190</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>25.088</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>20.020</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>14.528</td><td>0.0</td><td>360</td></tr><tr><td>480 min Summer</td><td>11.570</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>9.690</td><td>0.0</td><td>546</td></tr><tr><td>720 min Summer</td><td>8.380</td><td>0.0</td><td>600</td></tr><tr><td>960 min Summer</td><td>6.658</td><td>0.0</td><td>722</td></tr><tr><td>1440 min Summer</td><td>4.807</td><td>0.0</td><td>982</td></tr><tr><td>2160 min Summer</td><td>3.465</td><td>0.0</td><td>1404</td></tr><tr><td>2880 min Summer</td><td>2.744</td><td>0.0</td><td>1816</td></tr><tr><td>4320 min Summer</td><td>1.973</td><td>0.0</td><td>2596</td></tr><tr><td>5760 min Summer</td><td>1.559</td><td>0.0</td><td>3400</td></tr><tr><td>7200 min Summer</td><td>1.298</td><td>0.0</td><td>4112</td></tr><tr><td>8640 min Summer</td><td>1.118</td><td>0.0</td><td>4848</td></tr><tr><td>10080 min Summer</td><td>0.985</td><td>0.0</td><td>5640</td></tr><tr><td>15 min Winter</td><td>138.634</td><td>0.0</td><td>19</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.222	0.222	1.8	81.9	Flood Risk	30 min Summer	0.261	0.261	2.1	112.5	Flood Risk	60 min Summer	0.294	0.294	2.3	143.1	Flood Risk	120 min Summer	0.323	0.323	2.6	171.6	Flood Risk	180 min Summer	0.337	0.337	2.7	185.7	Flood Risk	240 min Summer	0.345	0.345	2.7	193.5	Flood Risk	360 min Summer	0.352	0.352	2.8	201.2	Flood Risk	480 min Summer	0.355	0.355	2.8	203.7	Flood Risk	600 min Summer	0.355	0.355	2.8	203.8	Flood Risk	720 min Summer	0.355	0.355	2.8	203.6	Flood Risk	960 min Summer	0.353	0.353	2.8	202.3	Flood Risk	1440 min Summer	0.348	0.348	2.8	197.2	Flood Risk	2160 min Summer	0.337	0.337	2.7	186.4	Flood Risk	2880 min Summer	0.325	0.325	2.6	174.5	Flood Risk	4320 min Summer	0.303	0.303	2.4	152.0	Flood Risk	5760 min Summer	0.283	0.283	2.2	132.8	Flood Risk	7200 min Summer	0.266	0.266	2.1	116.9	Flood Risk	8640 min Summer	0.250	0.250	2.0	103.5	Flood Risk	10080 min Summer	0.236	0.236	1.9	92.3	Flood Risk	15 min Winter	0.238	0.238	1.9	94.1	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	138.634	0.0	19	30 min Summer	90.866	0.0	34	60 min Summer	56.713	0.0	64	120 min Summer	34.190	0.0	122	180 min Summer	25.088	0.0	182	240 min Summer	20.020	0.0	242	360 min Summer	14.528	0.0	360	480 min Summer	11.570	0.0	480	600 min Summer	9.690	0.0	546	720 min Summer	8.380	0.0	600	960 min Summer	6.658	0.0	722	1440 min Summer	4.807	0.0	982	2160 min Summer	3.465	0.0	1404	2880 min Summer	2.744	0.0	1816	4320 min Summer	1.973	0.0	2596	5760 min Summer	1.559	0.0	3400	7200 min Summer	1.298	0.0	4112	8640 min Summer	1.118	0.0	4848	10080 min Summer	0.985	0.0	5640	15 min Winter	138.634	0.0	19
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																			
15 min Summer	0.222	0.222	1.8	81.9	Flood Risk																																																																																																																																																																																																																			
30 min Summer	0.261	0.261	2.1	112.5	Flood Risk																																																																																																																																																																																																																			
60 min Summer	0.294	0.294	2.3	143.1	Flood Risk																																																																																																																																																																																																																			
120 min Summer	0.323	0.323	2.6	171.6	Flood Risk																																																																																																																																																																																																																			
180 min Summer	0.337	0.337	2.7	185.7	Flood Risk																																																																																																																																																																																																																			
240 min Summer	0.345	0.345	2.7	193.5	Flood Risk																																																																																																																																																																																																																			
360 min Summer	0.352	0.352	2.8	201.2	Flood Risk																																																																																																																																																																																																																			
480 min Summer	0.355	0.355	2.8	203.7	Flood Risk																																																																																																																																																																																																																			
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720 min Summer	0.355	0.355	2.8	203.6	Flood Risk																																																																																																																																																																																																																			
960 min Summer	0.353	0.353	2.8	202.3	Flood Risk																																																																																																																																																																																																																			
1440 min Summer	0.348	0.348	2.8	197.2	Flood Risk																																																																																																																																																																																																																			
2160 min Summer	0.337	0.337	2.7	186.4	Flood Risk																																																																																																																																																																																																																			
2880 min Summer	0.325	0.325	2.6	174.5	Flood Risk																																																																																																																																																																																																																			
4320 min Summer	0.303	0.303	2.4	152.0	Flood Risk																																																																																																																																																																																																																			
5760 min Summer	0.283	0.283	2.2	132.8	Flood Risk																																																																																																																																																																																																																			
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15 min Winter	0.238	0.238	1.9	94.1	Flood Risk																																																																																																																																																																																																																			
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30 min Summer	90.866	0.0	34																																																																																																																																																																																																																					
60 min Summer	56.713	0.0	64																																																																																																																																																																																																																					
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480 min Summer	11.570	0.0	480																																																																																																																																																																																																																					
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 3			
Date 29/06/2018 File Permeable paving 3.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<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	0.278	0.278	2.2	128.5	Flood Risk
60 min Winter	0.314	0.314	2.5	163.0	Flood Risk
120 min Winter	0.346	0.346	2.7	195.2	Flood Risk
180 min Winter	0.363	0.363	2.8	211.4	Flood Risk
240 min Winter	0.372	0.372	2.8	220.7	Flood Risk
360 min Winter	0.383	0.383	2.8	230.9	Flood Risk
480 min Winter	0.389	0.389	2.8	235.5	Flood Risk
600 min Winter	0.390	0.390	2.8	236.7	Flood Risk
720 min Winter	0.389	0.389	2.8	235.9	Flood Risk
960 min Winter	0.385	0.385	2.8	232.1	Flood Risk
1440 min Winter	0.375	0.375	2.8	223.4	Flood Risk
2160 min Winter	0.357	0.357	2.8	205.8	Flood Risk
2880 min Winter	0.339	0.339	2.7	188.2	Flood Risk
4320 min Winter	0.307	0.307	2.4	156.5	Flood Risk
5760 min Winter	0.280	0.280	2.2	130.4	Flood Risk
7200 min Winter	0.257	0.257	2.0	109.5	Flood Risk
8640 min Winter	0.237	0.237	1.9	92.7	Flood Risk
10080 min Winter	0.218	0.218	1.7	79.1	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	90.866	0.0	33		
60 min Winter	56.713	0.0	62		
120 min Winter	34.190	0.0	120		
180 min Winter	25.088	0.0	180		
240 min Winter	20.020	0.0	238		
360 min Winter	14.528	0.0	352		
480 min Winter	11.570	0.0	464		
600 min Winter	9.690	0.0	574		
720 min Winter	8.380	0.0	678		
960 min Winter	6.658	0.0	770		
1440 min Winter	4.807	0.0	1068		
2160 min Winter	3.465	0.0	1512		
2880 min Winter	2.744	0.0	1956		
4320 min Winter	1.973	0.0	2768		
5760 min Winter	1.559	0.0	3576		
7200 min Winter	1.298	0.0	4328		
8640 min Winter	1.118	0.0	5096		
10080 min Winter	0.985	0.0	5848		
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Car Park 3	
Date 29/06/2018 File Permeable paving 3.srcx	Designed by NJ Checked by GT	
Micro Drainage		


AKSWard Ltd				Page 1																																																																																																																																																																																																																			
Seacourt Tower West Way Oxford OX2 0JJ			Bicester Heritage Hotel Car Park 3																																																																																																																																																																																																																				
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<p><u>Summary of Results for 100 year Return Period</u></p> <p>Half Drain Time : 649 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>0.179</td><td>0.179</td><td>1.4</td><td>52.8</td><td>Flood Risk</td></tr><tr><td>30 min Summer</td><td>0.212</td><td>0.212</td><td>1.7</td><td>74.6</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.241</td><td>0.241</td><td>1.9</td><td>96.2</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.265</td><td>0.265</td><td>2.1</td><td>115.9</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.275</td><td>0.275</td><td>2.2</td><td>125.4</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.280</td><td>0.280</td><td>2.2</td><td>130.4</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.285</td><td>0.285</td><td>2.3</td><td>134.7</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.286</td><td>0.286</td><td>2.3</td><td>135.6</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.286</td><td>0.286</td><td>2.3</td><td>135.8</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.286</td><td>0.286</td><td>2.3</td><td>135.6</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.285</td><td>0.285</td><td>2.3</td><td>134.5</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.280</td><td>0.280</td><td>2.2</td><td>130.1</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.271</td><td>0.271</td><td>2.1</td><td>121.3</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.260</td><td>0.260</td><td>2.1</td><td>112.1</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.240</td><td>0.240</td><td>1.9</td><td>95.3</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.222</td><td>0.222</td><td>1.8</td><td>81.4</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>0.206</td><td>0.206</td><td>1.6</td><td>70.3</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>0.192</td><td>0.192</td><td>1.5</td><td>61.1</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>0.180</td><td>0.180</td><td>1.4</td><td>53.6</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>0.193</td><td>0.193</td><td>1.5</td><td>61.5</td><td>Flood Risk</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>99.025</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>64.904</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>40.510</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>24.421</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>17.920</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>14.300</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>10.377</td><td>0.0</td><td>360</td></tr><tr><td>480 min Summer</td><td>8.265</td><td>0.0</td><td>450</td></tr><tr><td>600 min Summer</td><td>6.922</td><td>0.0</td><td>502</td></tr><tr><td>720 min Summer</td><td>5.986</td><td>0.0</td><td>562</td></tr><tr><td>960 min Summer</td><td>4.756</td><td>0.0</td><td>690</td></tr><tr><td>1440 min Summer</td><td>3.434</td><td>0.0</td><td>964</td></tr><tr><td>2160 min Summer</td><td>2.475</td><td>0.0</td><td>1364</td></tr><tr><td>2880 min Summer</td><td>1.960</td><td>0.0</td><td>1784</td></tr><tr><td>4320 min Summer</td><td>1.409</td><td>0.0</td><td>2552</td></tr><tr><td>5760 min Summer</td><td>1.114</td><td>0.0</td><td>3336</td></tr><tr><td>7200 min Summer</td><td>0.927</td><td>0.0</td><td>4040</td></tr><tr><td>8640 min Summer</td><td>0.798</td><td>0.0</td><td>4760</td></tr><tr><td>10080 min Summer</td><td>0.703</td><td>0.0</td><td>5544</td></tr><tr><td>15 min Winter</td><td>99.025</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.179	0.179	1.4	52.8	Flood Risk	30 min Summer	0.212	0.212	1.7	74.6	Flood Risk	60 min Summer	0.241	0.241	1.9	96.2	Flood Risk	120 min Summer	0.265	0.265	2.1	115.9	Flood Risk	180 min Summer	0.275	0.275	2.2	125.4	Flood Risk	240 min Summer	0.280	0.280	2.2	130.4	Flood Risk	360 min Summer	0.285	0.285	2.3	134.7	Flood Risk	480 min Summer	0.286	0.286	2.3	135.6	Flood Risk	600 min Summer	0.286	0.286	2.3	135.8	Flood Risk	720 min Summer	0.286	0.286	2.3	135.6	Flood Risk	960 min Summer	0.285	0.285	2.3	134.5	Flood Risk	1440 min Summer	0.280	0.280	2.2	130.1	Flood Risk	2160 min Summer	0.271	0.271	2.1	121.3	Flood Risk	2880 min Summer	0.260	0.260	2.1	112.1	Flood Risk	4320 min Summer	0.240	0.240	1.9	95.3	Flood Risk	5760 min Summer	0.222	0.222	1.8	81.4	Flood Risk	7200 min Summer	0.206	0.206	1.6	70.3	Flood Risk	8640 min Summer	0.192	0.192	1.5	61.1	Flood Risk	10080 min Summer	0.180	0.180	1.4	53.6	Flood Risk	15 min Winter	0.193	0.193	1.5	61.5	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	99.025	0.0	19	30 min Summer	64.904	0.0	34	60 min Summer	40.510	0.0	64	120 min Summer	24.421	0.0	122	180 min Summer	17.920	0.0	182	240 min Summer	14.300	0.0	242	360 min Summer	10.377	0.0	360	480 min Summer	8.265	0.0	450	600 min Summer	6.922	0.0	502	720 min Summer	5.986	0.0	562	960 min Summer	4.756	0.0	690	1440 min Summer	3.434	0.0	964	2160 min Summer	2.475	0.0	1364	2880 min Summer	1.960	0.0	1784	4320 min Summer	1.409	0.0	2552	5760 min Summer	1.114	0.0	3336	7200 min Summer	0.927	0.0	4040	8640 min Summer	0.798	0.0	4760	10080 min Summer	0.703	0.0	5544	15 min Winter	99.025	0.0	19
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600 min Summer	6.922	0.0	502																																																																																																																																																																																																																				
720 min Summer	5.986	0.0	562																																																																																																																																																																																																																				
960 min Summer	4.756	0.0	690																																																																																																																																																																																																																				
1440 min Summer	3.434	0.0	964																																																																																																																																																																																																																				
2160 min Summer	2.475	0.0	1364																																																																																																																																																																																																																				
2880 min Summer	1.960	0.0	1784																																																																																																																																																																																																																				
4320 min Summer	1.409	0.0	2552																																																																																																																																																																																																																				
5760 min Summer	1.114	0.0	3336																																																																																																																																																																																																																				
7200 min Summer	0.927	0.0	4040																																																																																																																																																																																																																				
8640 min Summer	0.798	0.0	4760																																																																																																																																																																																																																				
10080 min Summer	0.703	0.0	5544																																																																																																																																																																																																																				
15 min Winter	99.025	0.0	19																																																																																																																																																																																																																				
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AKSWard Ltd				Page 2	
Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Car Park 3			
Date 29/06/2018 File Permeable paving 3.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.228	0.228	1.8	86.0	Flood Risk
60 min Winter	0.258	0.258	2.0	110.3	Flood Risk
120 min Winter	0.283	0.283	2.2	132.7	Flood Risk
180 min Winter	0.294	0.294	2.3	143.6	Flood Risk
240 min Winter	0.300	0.300	2.4	149.5	Flood Risk
360 min Winter	0.306	0.306	2.4	155.2	Flood Risk
480 min Winter	0.308	0.308	2.4	157.0	Flood Risk
600 min Winter	0.307	0.307	2.4	156.6	Flood Risk
720 min Winter	0.306	0.306	2.4	155.4	Flood Risk
960 min Winter	0.304	0.304	2.4	153.3	Flood Risk
1440 min Winter	0.297	0.297	2.3	145.9	Flood Risk
2160 min Winter	0.282	0.282	2.2	132.2	Flood Risk
2880 min Winter	0.267	0.267	2.1	118.6	Flood Risk
4320 min Winter	0.239	0.239	1.9	95.0	Flood Risk
5760 min Winter	0.215	0.215	1.7	76.7	Flood Risk
7200 min Winter	0.194	0.194	1.5	62.6	Flood Risk
8640 min Winter	0.176	0.176	1.4	51.6	Flood Risk
10080 min Winter	0.161	0.161	1.3	43.0	Flood Risk
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	64.904		0.0	33	
60 min Winter	40.510		0.0	62	
120 min Winter	24.421		0.0	120	
180 min Winter	17.920		0.0	178	
240 min Winter	14.300		0.0	236	
360 min Winter	10.377		0.0	350	
480 min Winter	8.265		0.0	458	
600 min Winter	6.922		0.0	560	
720 min Winter	5.986		0.0	586	
960 min Winter	4.756		0.0	732	
1440 min Winter	3.434		0.0	1038	
2160 min Winter	2.475		0.0	1476	
2880 min Winter	1.960		0.0	1904	
4320 min Winter	1.409		0.0	2720	
5760 min Winter	1.114		0.0	3464	
7200 min Winter	0.927		0.0	4248	
8640 min Winter	0.798		0.0	4936	
10080 min Winter	0.703		0.0	5656	
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Date 29/06/2018 File Permeable paving 3.srcx	Designed by NJ Checked by GT	
Micro Drainage		

AKSWard Ltd				Page 1																																																																																																																																																																																																																			
Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Drop off Area																																																																																																																																																																																																																					
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<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 264 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>0.064</td><td>0.064</td><td>0.1</td><td>1.7</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.081</td><td>0.081</td><td>0.2</td><td>2.8</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.095</td><td>0.095</td><td>0.2</td><td>3.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.107</td><td>0.107</td><td>0.2</td><td>4.9</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.112</td><td>0.112</td><td>0.2</td><td>5.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.115</td><td>0.115</td><td>0.2</td><td>5.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.118</td><td>0.118</td><td>0.2</td><td>5.9</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.119</td><td>0.119</td><td>0.2</td><td>6.1</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.120</td><td>0.120</td><td>0.2</td><td>6.1</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.120</td><td>0.120</td><td>0.2</td><td>6.2</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.120</td><td>0.120</td><td>0.2</td><td>6.1</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.117</td><td>0.117</td><td>0.2</td><td>5.8</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.111</td><td>0.111</td><td>0.2</td><td>5.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.105</td><td>0.105</td><td>0.2</td><td>4.7</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.093</td><td>0.093</td><td>0.2</td><td>3.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.084</td><td>0.084</td><td>0.2</td><td>3.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.077</td><td>0.077</td><td>0.2</td><td>2.5</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.070</td><td>0.070</td><td>0.1</td><td>2.1</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.065</td><td>0.065</td><td>0.1</td><td>1.8</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.071</td><td>0.071</td><td>0.1</td><td>2.2</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>31.093</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>20.252</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>12.800</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>7.926</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>5.960</td><td>0.0</td><td>180</td></tr><tr><td>240 min Summer</td><td>4.862</td><td>0.0</td><td>216</td></tr><tr><td>360 min Summer</td><td>3.628</td><td>0.0</td><td>276</td></tr><tr><td>480 min Summer</td><td>2.939</td><td>0.0</td><td>340</td></tr><tr><td>600 min Summer</td><td>2.495</td><td>0.0</td><td>410</td></tr><tr><td>720 min Summer</td><td>2.183</td><td>0.0</td><td>478</td></tr><tr><td>960 min Summer</td><td>1.768</td><td>0.0</td><td>616</td></tr><tr><td>1440 min Summer</td><td>1.314</td><td>0.0</td><td>882</td></tr><tr><td>2160 min Summer</td><td>0.977</td><td>0.0</td><td>1276</td></tr><tr><td>2880 min Summer</td><td>0.791</td><td>0.0</td><td>1648</td></tr><tr><td>4320 min Summer</td><td>0.588</td><td>0.0</td><td>2380</td></tr><tr><td>5760 min Summer</td><td>0.476</td><td>0.0</td><td>3112</td></tr><tr><td>7200 min Summer</td><td>0.405</td><td>0.0</td><td>3824</td></tr><tr><td>8640 min Summer</td><td>0.354</td><td>0.0</td><td>4576</td></tr><tr><td>10080 min Summer</td><td>0.317</td><td>0.0</td><td>5248</td></tr><tr><td>15 min Winter</td><td>31.093</td><td>0.0</td><td>18</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.064	0.064	0.1	1.7	O K	30 min Summer	0.081	0.081	0.2	2.8	O K	60 min Summer	0.095	0.095	0.2	3.9	O K	120 min Summer	0.107	0.107	0.2	4.9	O K	180 min Summer	0.112	0.112	0.2	5.3	O K	240 min Summer	0.115	0.115	0.2	5.6	O K	360 min Summer	0.118	0.118	0.2	5.9	O K	480 min Summer	0.119	0.119	0.2	6.1	O K	600 min Summer	0.120	0.120	0.2	6.1	O K	720 min Summer	0.120	0.120	0.2	6.2	O K	960 min Summer	0.120	0.120	0.2	6.1	O K	1440 min Summer	0.117	0.117	0.2	5.8	O K	2160 min Summer	0.111	0.111	0.2	5.2	O K	2880 min Summer	0.105	0.105	0.2	4.7	O K	4320 min Summer	0.093	0.093	0.2	3.7	O K	5760 min Summer	0.084	0.084	0.2	3.0	O K	7200 min Summer	0.077	0.077	0.2	2.5	O K	8640 min Summer	0.070	0.070	0.1	2.1	O K	10080 min Summer	0.065	0.065	0.1	1.8	O K	15 min Winter	0.071	0.071	0.1	2.2	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	31.093	0.0	19	30 min Summer	20.252	0.0	33	60 min Summer	12.800	0.0	62	120 min Summer	7.926	0.0	122	180 min Summer	5.960	0.0	180	240 min Summer	4.862	0.0	216	360 min Summer	3.628	0.0	276	480 min Summer	2.939	0.0	340	600 min Summer	2.495	0.0	410	720 min Summer	2.183	0.0	478	960 min Summer	1.768	0.0	616	1440 min Summer	1.314	0.0	882	2160 min Summer	0.977	0.0	1276	2880 min Summer	0.791	0.0	1648	4320 min Summer	0.588	0.0	2380	5760 min Summer	0.476	0.0	3112	7200 min Summer	0.405	0.0	3824	8640 min Summer	0.354	0.0	4576	10080 min Summer	0.317	0.0	5248	15 min Winter	31.093	0.0	18
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Drop off Area			
Date 29/06/2018 File Permeable paving Drop o...		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 1 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.089	0.089	0.2	3.4	O K
60 min Winter	0.104	0.104	0.2	4.6	O K
120 min Winter	0.116	0.116	0.2	5.7	O K
180 min Winter	0.122	0.122	0.2	6.3	O K
240 min Winter	0.124	0.124	0.3	6.6	O K
360 min Winter	0.127	0.127	0.3	6.8	O K
480 min Winter	0.128	0.128	0.3	7.0	O K
600 min Winter	0.128	0.128	0.3	7.0	O K
720 min Winter	0.127	0.127	0.3	6.9	O K
960 min Winter	0.125	0.125	0.3	6.7	O K
1440 min Winter	0.120	0.120	0.2	6.1	O K
2160 min Winter	0.110	0.110	0.2	5.2	O K
2880 min Winter	0.101	0.101	0.2	4.3	O K
4320 min Winter	0.085	0.085	0.2	3.1	O K
5760 min Winter	0.073	0.073	0.1	2.3	O K
7200 min Winter	0.064	0.064	0.1	1.8	O K
8640 min Winter	0.057	0.057	0.1	1.4	O K
10080 min Winter	0.052	0.052	0.1	1.1	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	20.252	0.0	33		
60 min Winter	12.800	0.0	62		
120 min Winter	7.926	0.0	118		
180 min Winter	5.960	0.0	174		
240 min Winter	4.862	0.0	228		
360 min Winter	3.628	0.0	288		
480 min Winter	2.939	0.0	364		
600 min Winter	2.495	0.0	440		
720 min Winter	2.183	0.0	516		
960 min Winter	1.768	0.0	664		
1440 min Winter	1.314	0.0	950		
2160 min Winter	0.977	0.0	1344		
2880 min Winter	0.791	0.0	1732		
4320 min Winter	0.588	0.0	2464		
5760 min Winter	0.476	0.0	3176		
7200 min Winter	0.405	0.0	3896		
8640 min Winter	0.354	0.0	4584		
10080 min Winter	0.317	0.0	5240		
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Drop off Area	
Date 29/06/2018 File Permeable paving Drop o...	Designed by NJ Checked by GT	
Micro Drainage Source Control 2018.1		

Rainfall Details


Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.065


Time (mins)	Area
From:	To: (ha)
0	4 0.065


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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Drop off Area																									
Date 29/06/2018 File Permeable paving Drop o...	Designed by NJ Checked by GT																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Porous Car Park Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Width (m)</td> <td>28.4</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>14.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>110.4</td> <td>Slope (1:X)</td> <td>100.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Volume Depth (m)</td> <td>0.400</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4	Membrane Percolation (mm/hr)	1000	Length (m)	14.0	Max Percolation (l/s)	110.4	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	0.000	Cap Volume Depth (m)	0.400
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<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.164	0.164	0.3	11.2	O K
60 min Winter	0.189	0.189	0.3	14.1	O K
120 min Winter	0.212	0.212	0.3	16.9	Flood Risk
180 min Winter	0.223	0.223	0.3	18.3	Flood Risk
240 min Winter	0.230	0.230	0.3	19.1	Flood Risk
360 min Winter	0.237	0.237	0.3	19.9	Flood Risk
480 min Winter	0.239	0.239	0.3	20.2	Flood Risk
600 min Winter	0.239	0.239	0.3	20.2	Flood Risk
720 min Winter	0.237	0.237	0.3	19.9	Flood Risk
960 min Winter	0.233	0.233	0.3	19.5	Flood Risk
1440 min Winter	0.223	0.223	0.3	18.2	Flood Risk
2160 min Winter	0.203	0.203	0.3	15.9	Flood Risk
2880 min Winter	0.183	0.183	0.3	13.5	O K
4320 min Winter	0.150	0.150	0.3	9.5	O K
5760 min Winter	0.130	0.130	0.3	7.2	O K
7200 min Winter	0.115	0.115	0.2	5.7	O K
8640 min Winter	0.103	0.103	0.2	4.6	O K
10080 min Winter	0.093	0.093	0.2	3.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	49.584	0.0	33		
60 min Winter	30.811	0.0	62		
120 min Winter	18.584	0.0	120		
180 min Winter	13.680	0.0	178		
240 min Winter	10.960	0.0	236		
360 min Winter	8.001	0.0	350		
480 min Winter	6.397	0.0	462		
600 min Winter	5.375	0.0	568		
720 min Winter	4.661	0.0	664		
960 min Winter	3.719	0.0	750		
1440 min Winter	2.704	0.0	1054		
2160 min Winter	1.963	0.0	1492		
2880 min Winter	1.563	0.0	1900		
4320 min Winter	1.133	0.0	2636		
5760 min Winter	0.901	0.0	3344		
7200 min Winter	0.754	0.0	4040		
8640 min Winter	0.652	0.0	4760		
10080 min Winter	0.576	0.0	5456		
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Summer</td><td>25.088</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>20.020</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>14.528</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.570</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>9.690</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.380</td><td>0.0</td><td>720</td></tr><tr><td>960 min Summer</td><td>6.658</td><td>0.0</td><td>936</td></tr><tr><td>1440 min Summer</td><td>4.807</td><td>0.0</td><td>1152</td></tr><tr><td>2160 min Summer</td><td>3.465</td><td>0.0</td><td>1532</td></tr><tr><td>2880 min Summer</td><td>2.744</td><td>0.0</td><td>1932</td></tr><tr><td>4320 min Summer</td><td>1.973</td><td>0.0</td><td>2728</td></tr><tr><td>5760 min Summer</td><td>1.559</td><td>0.0</td><td>3520</td></tr><tr><td>7200 min Summer</td><td>1.298</td><td>0.0</td><td>4320</td></tr><tr><td>8640 min Summer</td><td>1.118</td><td>0.0</td><td>5016</td></tr><tr><td>10080 min 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Summer	0.238	0.238	0.3	20.0	Flood Risk	8640 min Summer	0.213	0.213	0.3	17.0	Flood Risk	10080 min Summer	0.191	0.191	0.3	14.4	O K	15 min Winter	0.210	0.210	0.3	16.7	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	138.634	0.0	19	30 min Summer	90.866	0.0	34	60 min Summer	56.713	0.0	64	120 min Summer	34.190	0.0	124	180 min Summer	25.088	0.0	182	240 min Summer	20.020	0.0	242	360 min Summer	14.528	0.0	362	480 min Summer	11.570	0.0	482	600 min Summer	9.690	0.0	602	720 min Summer	8.380	0.0	720	960 min Summer	6.658	0.0	936	1440 min Summer	4.807	0.0	1152	2160 min Summer	3.465	0.0	1532	2880 min Summer	2.744	0.0	1932	4320 min Summer	1.973	0.0	2728	5760 min Summer	1.559	0.0	3520	7200 min Summer	1.298	0.0	4320	8640 min Summer	1.118	0.0	5016	10080 min Summer	0.985	0.0	5744	15 min Winter	138.634	0.0	19
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Drop off Area			
Date 29/06/2018 File Permeable paving Drop o...		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<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	0.258	0.258	0.3	22.4	Flood Risk
60 min Winter	0.306	0.306	0.3	28.2	Flood Risk
120 min Winter	0.353	0.353	0.3	33.7	Flood Risk
180 min Winter	0.378	0.378	0.3	36.7	Flood Risk
240 min Winter	0.393	0.393	0.3	38.5	Flood Risk
360 min Winter	0.411	0.411	0.3	40.7	Flood Risk
480 min Winter	0.424	0.424	0.3	42.0	Flood Risk
600 min Winter	0.431	0.431	0.3	42.7	Flood Risk
720 min Winter	0.435	0.435	0.3	43.0	Flood Risk
960 min Winter	0.434	0.434	0.3	43.0	Flood Risk
1440 min Winter	0.419	0.419	0.3	41.5	Flood Risk
2160 min Winter	0.394	0.394	0.3	38.7	Flood Risk
2880 min Winter	0.369	0.369	0.3	35.7	Flood Risk
4320 min Winter	0.318	0.318	0.3	29.5	Flood Risk
5760 min Winter	0.270	0.270	0.3	23.8	Flood Risk
7200 min Winter	0.227	0.227	0.3	18.8	Flood Risk
8640 min Winter	0.191	0.191	0.3	14.5	O K
10080 min Winter	0.162	0.162	0.3	11.0	O K
Storm Event	Rain (mm/hr)		Flooded Volume (m³)	Time-Peak (mins)	
30 min Winter	90.866		0.0	33	
60 min Winter	56.713		0.0	64	
120 min Winter	34.190		0.0	122	
180 min Winter	25.088		0.0	180	
240 min Winter	20.020		0.0	240	
360 min Winter	14.528		0.0	356	
480 min Winter	11.570		0.0	472	
600 min Winter	9.690		0.0	588	
720 min Winter	8.380		0.0	700	
960 min Winter	6.658		0.0	924	
1440 min Winter	4.807		0.0	1340	
2160 min Winter	3.465		0.0	1648	
2880 min Winter	2.744		0.0	2104	
4320 min Winter	1.973		0.0	2984	
5760 min Winter	1.559		0.0	3800	
7200 min Winter	1.298		0.0	4544	
8640 min Winter	1.118		0.0	5272	
10080 min Winter	0.985		0.0	5856	
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Drop off Area	
Date 29/06/2018 File Permeable paving Drop o...	Designed by NJ Checked by GT	
Micro Drainage 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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40


Time Area Diagram


Total Area (ha) 0.065


Time (mins)	Area
From:	To: (ha)
0	4 0.065


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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Drop off Area																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Porous Car Park Structure</u></p> <table style="width: 100%; border: none;"> <tr> <td style="width: 30%;">Infiltration Coefficient Base (m/hr)</td> <td style="width: 20%;">0.00515</td> <td style="width: 20%;">Width (m)</td> <td style="width: 30%;">28.4</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>14.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>110.4</td> <td>Slope (1:X)</td> <td>100.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Volume Depth (m)</td> <td>0.400</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4	Membrane Percolation (mm/hr)	1000	Length (m)	14.0	Max Percolation (l/s)	110.4	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	0.000	Cap Volume Depth (m)	0.400
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Summer</td><td>14.300</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>10.377</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>8.265</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>6.922</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>5.986</td><td>0.0</td><td>656</td></tr><tr><td>960 min Summer</td><td>4.756</td><td>0.0</td><td>762</td></tr><tr><td>1440 min Summer</td><td>3.434</td><td>0.0</td><td>1012</td></tr><tr><td>2160 min Summer</td><td>2.475</td><td>0.0</td><td>1424</td></tr><tr><td>2880 min Summer</td><td>1.960</td><td>0.0</td><td>1820</td></tr><tr><td>4320 min Summer</td><td>1.409</td><td>0.0</td><td>2596</td></tr><tr><td>5760 min Summer</td><td>1.114</td><td>0.0</td><td>3344</td></tr><tr><td>7200 min Summer</td><td>0.927</td><td>0.0</td><td>4040</td></tr><tr><td>8640 min Summer</td><td>0.798</td><td>0.0</td><td>4680</td></tr><tr><td>10080 min Summer</td><td>0.703</td><td>0.0</td><td>5440</td></tr><tr><td>15 min 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Summer	0.130	0.130	0.3	7.2	O K	15 min Winter	0.165	0.165	0.3	11.3	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	99.025	0.0	19	30 min Summer	64.904	0.0	34	60 min Summer	40.510	0.0	64	120 min Summer	24.421	0.0	122	180 min Summer	17.920	0.0	182	240 min Summer	14.300	0.0	242	360 min Summer	10.377	0.0	362	480 min Summer	8.265	0.0	480	600 min Summer	6.922	0.0	600	720 min Summer	5.986	0.0	656	960 min Summer	4.756	0.0	762	1440 min Summer	3.434	0.0	1012	2160 min Summer	2.475	0.0	1424	2880 min Summer	1.960	0.0	1820	4320 min Summer	1.409	0.0	2596	5760 min Summer	1.114	0.0	3344	7200 min Summer	0.927	0.0	4040	8640 min Summer	0.798	0.0	4680	10080 min Summer	0.703	0.0	5440	15 min Winter	99.025	0.0	19
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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Drop off Area			
Date 29/06/2018 File Permeable paving Drop o...		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.199	0.199	0.3	15.4	O K
60 min Winter	0.233	0.233	0.3	19.4	Flood Risk
120 min Winter	0.264	0.264	0.3	23.2	Flood Risk
180 min Winter	0.280	0.280	0.3	25.1	Flood Risk
240 min Winter	0.290	0.290	0.3	26.2	Flood Risk
360 min Winter	0.300	0.300	0.3	27.4	Flood Risk
480 min Winter	0.305	0.305	0.3	28.0	Flood Risk
600 min Winter	0.306	0.306	0.3	28.1	Flood Risk
720 min Winter	0.305	0.305	0.3	28.0	Flood Risk
960 min Winter	0.300	0.300	0.3	27.4	Flood Risk
1440 min Winter	0.287	0.287	0.3	25.9	Flood Risk
2160 min Winter	0.265	0.265	0.3	23.2	Flood Risk
2880 min Winter	0.241	0.241	0.3	20.4	Flood Risk
4320 min Winter	0.197	0.197	0.3	15.2	O K
5760 min Winter	0.162	0.162	0.3	11.0	O K
7200 min Winter	0.139	0.139	0.3	8.2	O K
8640 min Winter	0.125	0.125	0.3	6.6	O K
10080 min Winter	0.113	0.113	0.2	5.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	64.904	0.0	33		
60 min Winter	40.510	0.0	62		
120 min Winter	24.421	0.0	122		
180 min Winter	17.920	0.0	180		
240 min Winter	14.300	0.0	238		
360 min Winter	10.377	0.0	354		
480 min Winter	8.265	0.0	468		
600 min Winter	6.922	0.0	580		
720 min Winter	5.986	0.0	688		
960 min Winter	4.756	0.0	892		
1440 min Winter	3.434	0.0	1098		
2160 min Winter	2.475	0.0	1556		
2880 min Winter	1.960	0.0	1988		
4320 min Winter	1.409	0.0	2768		
5760 min Winter	1.114	0.0	3512		
7200 min Winter	0.927	0.0	4112		
8640 min Winter	0.798	0.0	4840		
10080 min Winter	0.703	0.0	5544		
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Drop off Area																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Porous Car Park Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Width (m)</td> <td>28.4</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>14.0</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>110.4</td> <td>Slope (1:X)</td> <td>100.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Volume Depth (m)</td> <td>0.400</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Width (m)	28.4	Membrane Percolation (mm/hr)	1000	Length (m)	14.0	Max Percolation (l/s)	110.4	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	0.000	Cap Volume Depth (m)	0.400
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<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 1736 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>0.088</td><td>0.088</td><td>0.0</td><td>3.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.106</td><td>0.106</td><td>0.0</td><td>4.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.125</td><td>0.125</td><td>0.0</td><td>5.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.143</td><td>0.143</td><td>0.1</td><td>6.8</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.154</td><td>0.154</td><td>0.1</td><td>7.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.161</td><td>0.161</td><td>0.1</td><td>8.1</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.171</td><td>0.171</td><td>0.1</td><td>8.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.177</td><td>0.177</td><td>0.1</td><td>9.3</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.181</td><td>0.181</td><td>0.1</td><td>9.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.184</td><td>0.184</td><td>0.1</td><td>9.9</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.188</td><td>0.188</td><td>0.1</td><td>10.2</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.191</td><td>0.191</td><td>0.1</td><td>10.4</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.193</td><td>0.193</td><td>0.1</td><td>10.6</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.193</td><td>0.193</td><td>0.1</td><td>10.6</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.190</td><td>0.190</td><td>0.1</td><td>10.4</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.186</td><td>0.186</td><td>0.1</td><td>10.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.182</td><td>0.182</td><td>0.1</td><td>9.7</td><td>O K</td></tr><tr><td>8640 min 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Summer	0.106	0.106	0.0	4.4	O K	60 min Summer	0.125	0.125	0.0	5.6	O K	120 min Summer	0.143	0.143	0.1	6.8	O K	180 min Summer	0.154	0.154	0.1	7.5	O K	240 min Summer	0.161	0.161	0.1	8.1	O K	360 min Summer	0.171	0.171	0.1	8.8	O K	480 min Summer	0.177	0.177	0.1	9.3	O K	600 min Summer	0.181	0.181	0.1	9.6	O K	720 min Summer	0.184	0.184	0.1	9.9	O K	960 min Summer	0.188	0.188	0.1	10.2	O K	1440 min Summer	0.191	0.191	0.1	10.4	O K	2160 min Summer	0.193	0.193	0.1	10.6	O K	2880 min Summer	0.193	0.193	0.1	10.6	O K	4320 min Summer	0.190	0.190	0.1	10.4	O K	5760 min Summer	0.186	0.186	0.1	10.0	O K	7200 min Summer	0.182	0.182	0.1	9.7	O K	8640 min Summer	0.177	0.177	0.1	9.3	O K	10080 min Summer	0.172	0.172	0.1	8.9	O K	15 min Winter	0.096	0.096	0.0	3.8	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	31.093	0.0	19	30 min Summer	20.252	0.0	34	60 min Summer	12.800	0.0	64	120 min Summer	7.926	0.0	124	180 min Summer	5.960	0.0	184	240 min Summer	4.862	0.0	242	360 min Summer	3.628	0.0	362	480 min Summer	2.939	0.0	482	600 min Summer	2.495	0.0	602	720 min Summer	2.183	0.0	722	960 min Summer	1.768	0.0	960	1440 min Summer	1.314	0.0	1254	2160 min Summer	0.977	0.0	1624	2880 min Summer	0.791	0.0	2020	4320 min Summer	0.588	0.0	2856	5760 min Summer	0.476	0.0	3688	7200 min Summer	0.405	0.0	4536	8640 min Summer	0.354	0.0	5280	10080 min Summer	0.317	0.0	6144	15 min Winter	31.093	0.0	19
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AKSWard				Page 2	
Seacourt Tower		Bicester Heritage Hotel			
West Way		Access Road			
Oxford		Swale 1			
Date 29/06/2018		Designed by NJ			
File Swale 1.srcx		Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 1 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.115	0.115	0.0	5.0	O K
60 min Winter	0.135	0.135	0.0	6.2	O K
120 min Winter	0.155	0.155	0.1	7.6	O K
180 min Winter	0.166	0.166	0.1	8.5	O K
240 min Winter	0.175	0.175	0.1	9.1	O K
360 min Winter	0.185	0.185	0.1	9.9	O K
480 min Winter	0.192	0.192	0.1	10.5	O K
600 min Winter	0.197	0.197	0.1	10.9	O K
720 min Winter	0.200	0.200	0.1	11.2	Flood Risk
960 min Winter	0.205	0.205	0.1	11.6	Flood Risk
1440 min Winter	0.209	0.209	0.1	12.0	Flood Risk
2160 min Winter	0.210	0.210	0.1	12.0	Flood Risk
2880 min Winter	0.209	0.209	0.1	12.0	Flood Risk
4320 min Winter	0.205	0.205	0.1	11.6	Flood Risk
5760 min Winter	0.198	0.198	0.1	11.0	O K
7200 min Winter	0.191	0.191	0.1	10.4	O K
8640 min Winter	0.184	0.184	0.1	9.8	O K
10080 min Winter	0.177	0.177	0.1	9.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	20.252	0.0	34		
60 min Winter	12.800	0.0	64		
120 min Winter	7.926	0.0	122		
180 min Winter	5.960	0.0	180		
240 min Winter	4.862	0.0	240		
360 min Winter	3.628	0.0	356		
480 min Winter	2.939	0.0	474		
600 min Winter	2.495	0.0	590		
720 min Winter	2.183	0.0	702		
960 min Winter	1.768	0.0	930		
1440 min Winter	1.314	0.0	1358		
2160 min Winter	0.977	0.0	1708		
2880 min Winter	0.791	0.0	2164		
4320 min Winter	0.588	0.0	3108		
5760 min Winter	0.476	0.0	3984		
7200 min Winter	0.405	0.0	4832		
8640 min Winter	0.354	0.0	5704		
10080 min Winter	0.317	0.0	6552		
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Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 1	
Date 29/06/2018 File Swale 1.srcx	Designed by NJ Checked by GT	
Micro Drainage		Source Control 2018.1


Rainfall Details


Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.059

Time (mins)	Area
From:	To: (ha)
0	4 0.059

AKSWard		Page 4																								
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 1																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>50.9</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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<p style="text-align: center;"><u>Summary of Results for 30 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 2686 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>0.166</td><td>0.166</td><td>0.1</td><td>8.4</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.196</td><td>0.196</td><td>0.1</td><td>10.9</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.225</td><td>0.225</td><td>0.1</td><td>13.5</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.252</td><td>0.252</td><td>0.1</td><td>16.1</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.266</td><td>0.266</td><td>0.1</td><td>17.6</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.276</td><td>0.276</td><td>0.1</td><td>18.6</td><td>Flood Risk</td></tr><tr><td>360 min 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Summer</td><td>13.680</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>10.960</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>8.001</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>6.397</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>5.375</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>4.661</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>3.719</td><td>0.0</td><td>962</td></tr><tr><td>1440 min Summer</td><td>2.704</td><td>0.0</td><td>1440</td></tr><tr><td>2160 min Summer</td><td>1.963</td><td>0.0</td><td>1884</td></tr><tr><td>2880 min Summer</td><td>1.563</td><td>0.0</td><td>2276</td></tr><tr><td>4320 min Summer</td><td>1.133</td><td>0.0</td><td>3028</td></tr><tr><td>5760 min Summer</td><td>0.901</td><td>0.0</td><td>3864</td></tr><tr><td>7200 min Summer</td><td>0.754</td><td>0.0</td><td>4688</td></tr><tr><td>8640 min Summer</td><td>0.652</td><td>0.0</td><td>5528</td></tr><tr><td>10080 min 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Summer	0.298	0.298	0.1	21.1	Flood Risk	8640 min Summer	0.291	0.291	0.1	20.3	Flood Risk	10080 min Summer	0.284	0.284	0.1	19.5	Flood Risk	15 min Winter	0.179	0.179	0.1	9.4	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	76.290	0.0	19	30 min Summer	49.584	0.0	34	60 min Summer	30.811	0.0	64	120 min Summer	18.584	0.0	124	180 min Summer	13.680	0.0	184	240 min Summer	10.960	0.0	244	360 min Summer	8.001	0.0	362	480 min Summer	6.397	0.0	482	600 min Summer	5.375	0.0	602	720 min Summer	4.661	0.0	722	960 min Summer	3.719	0.0	962	1440 min Summer	2.704	0.0	1440	2160 min Summer	1.963	0.0	1884	2880 min Summer	1.563	0.0	2276	4320 min Summer	1.133	0.0	3028	5760 min Summer	0.901	0.0	3864	7200 min Summer	0.754	0.0	4688	8640 min Summer	0.652	0.0	5528	10080 min Summer	0.576	0.0	6352	15 min Winter	76.290	0.0	19
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AKSWard		Page 2			
Seacourt Tower	Bicester Heritage Hotel				
West Way	Access Road				
Oxford	Swale 1				
Date 29/06/2018	Designed by NJ				
File Swale 1.srcx	Checked by GT				
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.211	0.211	0.1	12.2	Flood Risk
60 min Winter	0.242	0.242	0.1	15.1	Flood Risk
120 min Winter	0.270	0.270	0.1	18.0	Flood Risk
180 min Winter	0.286	0.286	0.1	19.8	Flood Risk
240 min Winter	0.296	0.296	0.1	20.9	Flood Risk
360 min Winter	0.310	0.310	0.1	22.5	Flood Risk
480 min Winter	0.319	0.319	0.1	23.7	Flood Risk
600 min Winter	0.326	0.326	0.1	24.5	Flood Risk
720 min Winter	0.331	0.331	0.1	25.1	Flood Risk
960 min Winter	0.337	0.337	0.1	25.9	Flood Risk
1440 min Winter	0.343	0.343	0.1	26.7	Flood Risk
2160 min Winter	0.344	0.344	0.1	26.9	Flood Risk
2880 min Winter	0.341	0.341	0.1	26.5	Flood Risk
4320 min Winter	0.335	0.335	0.1	25.7	Flood Risk
5760 min Winter	0.327	0.327	0.1	24.6	Flood Risk
7200 min Winter	0.317	0.317	0.1	23.5	Flood Risk
8640 min Winter	0.308	0.308	0.1	22.3	Flood Risk
10080 min Winter	0.298	0.298	0.1	21.1	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	49.584	0.0	34		
60 min Winter	30.811	0.0	64		
120 min Winter	18.584	0.0	122		
180 min Winter	13.680	0.0	182		
240 min Winter	10.960	0.0	240		
360 min Winter	8.001	0.0	358		
480 min Winter	6.397	0.0	476		
600 min Winter	5.375	0.0	594		
720 min Winter	4.661	0.0	708		
960 min Winter	3.719	0.0	942		
1440 min Winter	2.704	0.0	1396		
2160 min Winter	1.963	0.0	2036		
2880 min Winter	1.563	0.0	2368		
4320 min Winter	1.133	0.0	3244		
5760 min Winter	0.901	0.0	4160		
7200 min Winter	0.754	0.0	5048		
8640 min Winter	0.652	0.0	5968		
10080 min Winter	0.576	0.0	6856		
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AKSWard		Page 3
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 1	
Date 29/06/2018 File Swale 1.srcx	Designed by NJ Checked by GT	
Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.059

Time (mins)	Area
From:	To: (ha)
0	4 0.059

AKSWard		Page 4																								
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>50.9</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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<p style="text-align: center;"><u>Summary of Results for 100 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 3041 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>0.197</td><td>0.197</td><td>0.1</td><td>10.9</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.233</td><td>0.233</td><td>0.1</td><td>14.3</td><td>Flood Risk</td></tr><tr><td>60 min Summer</td><td>0.267</td><td>0.267</td><td>0.1</td><td>17.7</td><td>Flood Risk</td></tr><tr><td>120 min Summer</td><td>0.298</td><td>0.298</td><td>0.1</td><td>21.2</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.315</td><td>0.315</td><td>0.1</td><td>23.1</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.325</td><td>0.325</td><td>0.1</td><td>24.4</td><td>Flood Risk</td></tr><tr><td>360 min 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Summer</td><td>17.920</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>14.300</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>10.377</td><td>0.0</td><td>364</td></tr><tr><td>480 min Summer</td><td>8.265</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>6.922</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>5.986</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>4.756</td><td>0.0</td><td>962</td></tr><tr><td>1440 min Summer</td><td>3.434</td><td>0.0</td><td>1440</td></tr><tr><td>2160 min Summer</td><td>2.475</td><td>0.0</td><td>2056</td></tr><tr><td>2880 min Summer</td><td>1.960</td><td>0.0</td><td>2368</td></tr><tr><td>4320 min Summer</td><td>1.409</td><td>0.0</td><td>3112</td></tr><tr><td>5760 min Summer</td><td>1.114</td><td>0.0</td><td>3928</td></tr><tr><td>7200 min Summer</td><td>0.927</td><td>0.0</td><td>4760</td></tr><tr><td>8640 min Summer</td><td>0.798</td><td>0.0</td><td>5616</td></tr><tr><td>10080 min 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Summer	0.347	0.347	0.1	27.2	Flood Risk	8640 min Summer	0.339	0.339	0.1	26.1	Flood Risk	10080 min Summer	0.331	0.331	0.1	25.1	Flood Risk	15 min Winter	0.212	0.212	0.1	12.2	Flood Risk	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	99.025	0.0	19	30 min Summer	64.904	0.0	34	60 min Summer	40.510	0.0	64	120 min Summer	24.421	0.0	124	180 min Summer	17.920	0.0	184	240 min Summer	14.300	0.0	244	360 min Summer	10.377	0.0	364	480 min Summer	8.265	0.0	482	600 min Summer	6.922	0.0	602	720 min Summer	5.986	0.0	722	960 min Summer	4.756	0.0	962	1440 min Summer	3.434	0.0	1440	2160 min Summer	2.475	0.0	2056	2880 min Summer	1.960	0.0	2368	4320 min Summer	1.409	0.0	3112	5760 min Summer	1.114	0.0	3928	7200 min Summer	0.927	0.0	4760	8640 min Summer	0.798	0.0	5616	10080 min Summer	0.703	0.0	6448	15 min Winter	99.025	0.0	19
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Oxford	Swale 1				
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File Swale 1.srcx	Checked by GT				
Micro Drainage	Source Control 2018.1				
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.251	0.251	0.1	16.0	Flood Risk
60 min Winter	0.287	0.287	0.1	19.9	Flood Risk
120 min Winter	0.320	0.320	0.1	23.8	Flood Risk
180 min Winter	0.337	0.337	0.1	26.0	Flood Risk
240 min Winter	0.349	0.349	0.1	27.4	Flood Risk
360 min Winter	0.364	0.364	0.1	29.4	Flood Risk
480 min Winter	0.374	0.374	0.1	30.8	Flood Risk
600 min Winter	0.381	0.381	0.1	31.8	Flood Risk
720 min Winter	0.386	0.386	0.1	32.6	Flood Risk
960 min Winter	0.394	0.394	0.1	33.7	Flood Risk
1440 min Winter	0.401	0.401	0.1	34.7	Flood Risk
2160 min Winter	0.402	0.402	0.1	34.9	Flood Risk
2880 min Winter	0.399	0.399	0.1	34.4	Flood Risk
4320 min Winter	0.391	0.391	0.1	33.2	Flood Risk
5760 min Winter	0.381	0.381	0.1	31.9	Flood Risk
7200 min Winter	0.371	0.371	0.1	30.4	Flood Risk
8640 min Winter	0.360	0.360	0.1	29.0	Flood Risk
10080 min Winter	0.349	0.349	0.1	27.5	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	64.904	0.0	34		
60 min Winter	40.510	0.0	64		
120 min Winter	24.421	0.0	122		
180 min Winter	17.920	0.0	182		
240 min Winter	14.300	0.0	240		
360 min Winter	10.377	0.0	358		
480 min Winter	8.265	0.0	476		
600 min Winter	6.922	0.0	594		
720 min Winter	5.986	0.0	710		
960 min Winter	4.756	0.0	942		
1440 min Winter	3.434	0.0	1400		
2160 min Winter	2.475	0.0	2056		
2880 min Winter	1.960	0.0	2676		
4320 min Winter	1.409	0.0	3324		
5760 min Winter	1.114	0.0	4256		
7200 min Winter	0.927	0.0	5120		
8640 min Winter	0.798	0.0	6048		
10080 min Winter	0.703	0.0	6952		
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Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.059


Time (mins)	Area
From:	To: (ha)
0	4 0.059

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Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 1																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>50.9</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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Micro Drainage		Source Control 2018.1			
<p><u>Summary of Results for 100 year Return Period (+40%)</u></p> <p>Half Drain Time : 3698 minutes.</p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	0.244	0.244	0.1	15.3	Flood Risk
30 min Summer	0.288	0.288	0.1	20.0	Flood Risk
60 min Summer	0.329	0.329	0.1	24.9	Flood Risk
120 min Summer	0.366	0.366	0.1	29.8	Flood Risk
180 min Summer	0.386	0.386	0.1	32.5	Flood Risk
240 min Summer	0.399	0.399	0.1	34.4	Flood Risk
360 min Summer	0.416	0.416	0.1	37.0	Flood Risk
480 min Summer	0.427	0.427	0.1	38.8	Flood Risk
600 min Summer	0.436	0.436	0.1	40.1	Flood Risk
720 min Summer	0.442	0.442	0.1	41.1	Flood Risk
960 min Summer	0.451	0.451	0.1	42.5	Flood Risk
1440 min Summer	0.460	0.460	0.1	44.0	Flood Risk
2160 min Summer	0.463	0.463	0.1	44.4	Flood Risk
2880 min Summer	0.460	0.460	0.1	44.0	Flood Risk
4320 min Summer	0.454	0.454	0.1	43.1	Flood Risk
5760 min Summer	0.448	0.448	0.1	42.0	Flood Risk
7200 min Summer	0.440	0.440	0.1	40.8	Flood Risk
8640 min Summer	0.432	0.432	0.1	39.5	Flood Risk
10080 min Summer	0.424	0.424	0.1	38.3	Flood Risk
15 min Winter	0.262	0.262	0.1	17.1	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
15 min Summer	138.634	0.0	19		
30 min Summer	90.866	0.0	34		
60 min Summer	56.713	0.0	64		
120 min Summer	34.190	0.0	124		
180 min Summer	25.088	0.0	184		
240 min Summer	20.020	0.0	244		
360 min Summer	14.528	0.0	364		
480 min Summer	11.570	0.0	482		
600 min Summer	9.690	0.0	602		
720 min Summer	8.380	0.0	722		
960 min Summer	6.658	0.0	962		
1440 min Summer	4.807	0.0	1442		
2160 min Summer	3.465	0.0	2160		
2880 min Summer	2.744	0.0	2568		
4320 min Summer	1.973	0.0	3288		
5760 min Summer	1.559	0.0	4088		
7200 min Summer	1.298	0.0	4896		
8640 min Summer	1.118	0.0	5712		
10080 min Summer	0.985	0.0	6552		
15 min Winter	138.634	0.0	19		
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Micro Drainage		Source Control 2018.1			
<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	0.309	0.309	0.1	22.4	Flood Risk
60 min Winter	0.352	0.352	0.1	27.9	Flood Risk
120 min Winter	0.392	0.392	0.1	33.4	Flood Risk
180 min Winter	0.413	0.413	0.1	36.5	Flood Risk
240 min Winter	0.426	0.426	0.1	38.6	Flood Risk
360 min Winter	0.445	0.445	0.1	41.5	Flood Risk
480 min Winter	0.457	0.457	0.1	43.6	Flood Risk
600 min Winter	0.467	0.467	0.1	45.1	Flood Risk
720 min Winter	0.474	0.474	0.1	46.3	Flood Risk
960 min Winter	0.483	0.483	0.1	48.0	Flood Risk
1440 min Winter	0.494	0.494	0.1	49.8	Flood Risk
2160 min Winter	0.499	0.499	0.1	50.7	Flood Risk
2880 min Winter	0.498	0.498	0.1	50.5	Flood Risk
4320 min Winter	0.490	0.490	0.1	49.1	Flood Risk
5760 min Winter	0.481	0.481	0.1	47.6	Flood Risk
7200 min Winter	0.472	0.472	0.1	46.0	Flood Risk
8640 min Winter	0.461	0.461	0.1	44.2	Flood Risk
10080 min Winter	0.450	0.450	0.1	42.4	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	90.866	0.0	34		
60 min Winter	56.713	0.0	64		
120 min Winter	34.190	0.0	122		
180 min Winter	25.088	0.0	182		
240 min Winter	20.020	0.0	242		
360 min Winter	14.528	0.0	360		
480 min Winter	11.570	0.0	478		
600 min Winter	9.690	0.0	596		
720 min Winter	8.380	0.0	714		
960 min Winter	6.658	0.0	944		
1440 min Winter	4.807	0.0	1410		
2160 min Winter	3.465	0.0	2076		
2880 min Winter	2.744	0.0	2736		
4320 min Winter	1.973	0.0	3456		
5760 min Winter	1.559	0.0	4328		
7200 min Winter	1.298	0.0	5264		
8640 min Winter	1.118	0.0	6144		
10080 min Winter	0.985	0.0	7064		
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AKSWard		Page 3
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 1	
Date 29/06/2018 File Swale 1.srcx	Designed by NJ Checked by GT	
Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40


Time Area Diagram


Total Area (ha) 0.059

Time (mins)	Area
From:	To: (ha)
0	4 0.059

AKSWard		Page 4																								
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 1																									
Date 29/06/2018 File Swale 1.srcx	Designed by NJ Checked by GT																									
Micro Drainage Source Control 2018.1																										
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>50.9</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	50.9																							
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<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 1685 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>0.084</td><td>0.084</td><td>0.0</td><td>2.0</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.102</td><td>0.102</td><td>0.0</td><td>2.6</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.120</td><td>0.120</td><td>0.0</td><td>3.3</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.138</td><td>0.138</td><td>0.0</td><td>4.0</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.148</td><td>0.148</td><td>0.0</td><td>4.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.155</td><td>0.155</td><td>0.0</td><td>4.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.164</td><td>0.164</td><td>0.0</td><td>5.2</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.170</td><td>0.170</td><td>0.0</td><td>5.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.174</td><td>0.174</td><td>0.0</td><td>5.7</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.177</td><td>0.177</td><td>0.0</td><td>5.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.180</td><td>0.180</td><td>0.0</td><td>6.0</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.183</td><td>0.183</td><td>0.0</td><td>6.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.185</td><td>0.185</td><td>0.0</td><td>6.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.185</td><td>0.185</td><td>0.0</td><td>6.2</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.182</td><td>0.182</td><td>0.0</td><td>6.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.178</td><td>0.178</td><td>0.0</td><td>5.9</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.173</td><td>0.173</td><td>0.0</td><td>5.6</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.168</td><td>0.168</td><td>0.0</td><td>5.4</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.163</td><td>0.163</td><td>0.0</td><td>5.2</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.092</td><td>0.092</td><td>0.0</td><td>2.3</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>31.093</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>20.252</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>12.800</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>7.926</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>5.960</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>4.862</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>3.628</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>2.939</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>2.495</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>2.183</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>1.768</td><td>0.0</td><td>960</td></tr><tr><td>1440 min Summer</td><td>1.314</td><td>0.0</td><td>1238</td></tr><tr><td>2160 min Summer</td><td>0.977</td><td>0.0</td><td>1620</td></tr><tr><td>2880 min Summer</td><td>0.791</td><td>0.0</td><td>2016</td></tr><tr><td>4320 min Summer</td><td>0.588</td><td>0.0</td><td>2852</td></tr><tr><td>5760 min Summer</td><td>0.476</td><td>0.0</td><td>3688</td></tr><tr><td>7200 min Summer</td><td>0.405</td><td>0.0</td><td>4472</td></tr><tr><td>8640 min Summer</td><td>0.354</td><td>0.0</td><td>5280</td></tr><tr><td>10080 min Summer</td><td>0.317</td><td>0.0</td><td>6056</td></tr><tr><td>15 min Winter</td><td>31.093</td><td>0.0</td><td>19</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.084	0.084	0.0	2.0	O K	30 min Summer	0.102	0.102	0.0	2.6	O K	60 min Summer	0.120	0.120	0.0	3.3	O K	120 min Summer	0.138	0.138	0.0	4.0	O K	180 min Summer	0.148	0.148	0.0	4.5	O K	240 min Summer	0.155	0.155	0.0	4.8	O K	360 min Summer	0.164	0.164	0.0	5.2	O K	480 min Summer	0.170	0.170	0.0	5.5	O K	600 min Summer	0.174	0.174	0.0	5.7	O K	720 min Summer	0.177	0.177	0.0	5.8	O K	960 min Summer	0.180	0.180	0.0	6.0	O K	1440 min Summer	0.183	0.183	0.0	6.1	O K	2160 min Summer	0.185	0.185	0.0	6.2	O K	2880 min Summer	0.185	0.185	0.0	6.2	O K	4320 min Summer	0.182	0.182	0.0	6.1	O K	5760 min Summer	0.178	0.178	0.0	5.9	O K	7200 min Summer	0.173	0.173	0.0	5.6	O K	8640 min Summer	0.168	0.168	0.0	5.4	O K	10080 min Summer	0.163	0.163	0.0	5.2	O K	15 min Winter	0.092	0.092	0.0	2.3	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	31.093	0.0	19	30 min Summer	20.252	0.0	34	60 min Summer	12.800	0.0	64	120 min Summer	7.926	0.0	124	180 min Summer	5.960	0.0	184	240 min Summer	4.862	0.0	242	360 min Summer	3.628	0.0	362	480 min Summer	2.939	0.0	482	600 min Summer	2.495	0.0	602	720 min Summer	2.183	0.0	722	960 min Summer	1.768	0.0	960	1440 min Summer	1.314	0.0	1238	2160 min Summer	0.977	0.0	1620	2880 min Summer	0.791	0.0	2016	4320 min Summer	0.588	0.0	2852	5760 min Summer	0.476	0.0	3688	7200 min Summer	0.405	0.0	4472	8640 min Summer	0.354	0.0	5280	10080 min Summer	0.317	0.0	6056	15 min Winter	31.093	0.0	19
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AKSWard Ltd				Page 2	
Seacourt Tower		Bicester Heritage Hotel			
West Way Oxford		Access Road			
OX2 0JJ		Swale 2			
Date 29/06/2018		Designed by NJ			
File Swale 2.srcx		Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 1 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.111	0.111	0.0	2.9	O K
60 min Winter	0.130	0.130	0.0	3.7	O K
120 min Winter	0.149	0.149	0.0	4.5	O K
180 min Winter	0.160	0.160	0.0	5.0	O K
240 min Winter	0.168	0.168	0.0	5.4	O K
360 min Winter	0.178	0.178	0.0	5.9	O K
480 min Winter	0.184	0.184	0.0	6.2	O K
600 min Winter	0.189	0.189	0.0	6.4	O K
720 min Winter	0.192	0.192	0.0	6.6	O K
960 min Winter	0.196	0.196	0.0	6.8	O K
1440 min Winter	0.200	0.200	0.0	7.0	O K
2160 min Winter	0.201	0.201	0.0	7.1	Flood Risk
2880 min Winter	0.200	0.200	0.0	7.0	Flood Risk
4320 min Winter	0.195	0.195	0.0	6.8	O K
5760 min Winter	0.188	0.188	0.0	6.4	O K
7200 min Winter	0.181	0.181	0.0	6.1	O K
8640 min Winter	0.174	0.174	0.0	5.7	O K
10080 min Winter	0.167	0.167	0.0	5.3	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	20.252	0.0	34		
60 min Winter	12.800	0.0	64		
120 min Winter	7.926	0.0	122		
180 min Winter	5.960	0.0	180		
240 min Winter	4.862	0.0	240		
360 min Winter	3.628	0.0	356		
480 min Winter	2.939	0.0	472		
600 min Winter	2.495	0.0	588		
720 min Winter	2.183	0.0	702		
960 min Winter	1.768	0.0	926		
1440 min Winter	1.314	0.0	1356		
2160 min Winter	0.977	0.0	1692		
2880 min Winter	0.791	0.0	2160		
4320 min Winter	0.588	0.0	3072		
5760 min Winter	0.476	0.0	3976		
7200 min Winter	0.405	0.0	4832		
8640 min Winter	0.354	0.0	5704		
10080 min Winter	0.317	0.0	6552		
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Access Road Swale 2	
Date 29/06/2018 File Swale 2.srcx	Designed by NJ Checked by GT	
Micro Drainage		Source Control 2018.1


Rainfall Details


Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.035

Time (mins)	Area
From:	To: (ha)
0	4 0.035

AKSWard Ltd		Page 4																								
Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Access Road Swale 2																									
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Micro Drainage		Source Control 2018.1			
<p style="text-align: center;"><u>Summary of Results for 30 year Return Period</u></p>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.204	0.204	0.0	7.2	Flood Risk
60 min Winter	0.233	0.233	0.0	8.9	Flood Risk
120 min Winter	0.261	0.261	0.0	10.7	Flood Risk
180 min Winter	0.276	0.276	0.1	11.7	Flood Risk
240 min Winter	0.286	0.286	0.1	12.4	Flood Risk
360 min Winter	0.299	0.299	0.1	13.3	Flood Risk
480 min Winter	0.308	0.308	0.1	14.0	Flood Risk
600 min Winter	0.314	0.314	0.1	14.5	Flood Risk
720 min Winter	0.318	0.318	0.1	14.8	Flood Risk
960 min Winter	0.325	0.325	0.1	15.3	Flood Risk
1440 min Winter	0.330	0.330	0.1	15.8	Flood Risk
2160 min Winter	0.331	0.331	0.1	15.8	Flood Risk
2880 min Winter	0.328	0.328	0.1	15.6	Flood Risk
4320 min Winter	0.321	0.321	0.1	15.1	Flood Risk
5760 min Winter	0.313	0.313	0.1	14.4	Flood Risk
7200 min Winter	0.303	0.303	0.1	13.7	Flood Risk
8640 min Winter	0.293	0.293	0.1	13.0	Flood Risk
10080 min Winter	0.284	0.284	0.1	12.3	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	49.584	0.0	34		
60 min Winter	30.811	0.0	64		
120 min Winter	18.584	0.0	122		
180 min Winter	13.680	0.0	182		
240 min Winter	10.960	0.0	240		
360 min Winter	8.001	0.0	358		
480 min Winter	6.397	0.0	476		
600 min Winter	5.375	0.0	592		
720 min Winter	4.661	0.0	708		
960 min Winter	3.719	0.0	942		
1440 min Winter	2.704	0.0	1388		
2160 min Winter	1.963	0.0	2032		
2880 min Winter	1.563	0.0	2336		
4320 min Winter	1.133	0.0	3240		
5760 min Winter	0.901	0.0	4152		
7200 min Winter	0.754	0.0	5048		
8640 min Winter	0.652	0.0	5960		
10080 min Winter	0.576	0.0	6760		
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Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.035

Time (mins)	Area
From:	To: (ha)
0	4 0.035

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Risk</td></tr><tr><td>480 min Summer</td><td>0.413</td><td>0.413</td><td>0.1</td><td>23.0</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.421</td><td>0.421</td><td>0.1</td><td>23.7</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.427</td><td>0.427</td><td>0.1</td><td>24.3</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.435</td><td>0.435</td><td>0.1</td><td>25.1</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.443</td><td>0.443</td><td>0.1</td><td>26.0</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.445</td><td>0.445</td><td>0.1</td><td>26.2</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.443</td><td>0.443</td><td>0.1</td><td>25.9</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.437</td><td>0.437</td><td>0.1</td><td>25.3</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.430</td><td>0.430</td><td>0.1</td><td>24.6</td><td>Flood Risk</td></tr><tr><td>7200 min 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Summer</td><td>14.528</td><td>0.0</td><td>364</td></tr><tr><td>480 min Summer</td><td>11.570</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>9.690</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.380</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>6.658</td><td>0.0</td><td>962</td></tr><tr><td>1440 min Summer</td><td>4.807</td><td>0.0</td><td>1442</td></tr><tr><td>2160 min Summer</td><td>3.465</td><td>0.0</td><td>2160</td></tr><tr><td>2880 min Summer</td><td>2.744</td><td>0.0</td><td>2508</td></tr><tr><td>4320 min Summer</td><td>1.973</td><td>0.0</td><td>3244</td></tr><tr><td>5760 min Summer</td><td>1.559</td><td>0.0</td><td>4040</td></tr><tr><td>7200 min Summer</td><td>1.298</td><td>0.0</td><td>4896</td></tr><tr><td>8640 min Summer</td><td>1.118</td><td>0.0</td><td>5704</td></tr><tr><td>10080 min Summer</td><td>0.985</td><td>0.0</td><td>6464</td></tr><tr><td>15 min 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Seacourt Tower West Way Oxford OX2 0JJ		Bicester Heritage Hotel Access Road Swale 2			
Date 29/06/2018 File Swale 2.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<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	0.298	0.298	0.1	13.3	Flood Risk
60 min Winter	0.340	0.340	0.1	16.5	Flood Risk
120 min Winter	0.378	0.378	0.1	19.8	Flood Risk
180 min Winter	0.399	0.399	0.1	21.6	Flood Risk
240 min Winter	0.412	0.412	0.1	22.9	Flood Risk
360 min Winter	0.430	0.430	0.1	24.6	Flood Risk
480 min Winter	0.442	0.442	0.1	25.8	Flood Risk
600 min Winter	0.451	0.451	0.1	26.7	Flood Risk
720 min Winter	0.457	0.457	0.1	27.4	Flood Risk
960 min Winter	0.467	0.467	0.1	28.4	Flood Risk
1440 min Winter	0.477	0.477	0.1	29.4	Flood Risk
2160 min Winter	0.481	0.481	0.1	29.9	Flood Risk
2880 min Winter	0.479	0.479	0.1	29.7	Flood Risk
4320 min Winter	0.471	0.471	0.1	28.8	Flood Risk
5760 min Winter	0.462	0.462	0.1	27.9	Flood Risk
7200 min Winter	0.452	0.452	0.1	26.9	Flood Risk
8640 min Winter	0.442	0.442	0.1	25.8	Flood Risk
10080 min Winter	0.431	0.431	0.1	24.7	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	90.866	0.0	34		
60 min Winter	56.713	0.0	64		
120 min Winter	34.190	0.0	122		
180 min Winter	25.088	0.0	182		
240 min Winter	20.020	0.0	240		
360 min Winter	14.528	0.0	360		
480 min Winter	11.570	0.0	478		
600 min Winter	9.690	0.0	596		
720 min Winter	8.380	0.0	712		
960 min Winter	6.658	0.0	944		
1440 min Winter	4.807	0.0	1402		
2160 min Winter	3.465	0.0	2076		
2880 min Winter	2.744	0.0	2712		
4320 min Winter	1.973	0.0	3412		
5760 min Winter	1.559	0.0	4328		
7200 min Winter	1.298	0.0	5256		
8640 min Winter	1.118	0.0	6144		
10080 min Winter	0.985	0.0	7056		
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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Access Road Swale 2	
Date 29/06/2018 File Swale 2.srcx	Designed by NJ Checked by GT	
Micro Drainage 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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram


Total Area (ha) 0.035


Time (mins)	Area
From:	To: (ha)
0	4 0.035


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Seacourt Tower West Way Oxford OX2 0JJ	Bicester Heritage Hotel Access Road Swale 2																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>32.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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1440 min Winter	0.386	0.386	0.1	20.5	Flood Risk																																																																																																																																																																																														
2160 min Winter	0.387	0.387	0.1	20.5	Flood Risk																																																																																																																																																																																														
2880 min Winter	0.383	0.383	0.1	20.2	Flood Risk																																																																																																																																																																																														
4320 min Winter	0.375	0.375	0.1	19.5	Flood Risk																																																																																																																																																																																														
5760 min Winter	0.365	0.365	0.1	18.7	Flood Risk																																																																																																																																																																																														
7200 min Winter	0.355	0.355	0.1	17.8	Flood Risk																																																																																																																																																																																														
8640 min Winter	0.344	0.344	0.1	16.9	Flood Risk																																																																																																																																																																																														
10080 min Winter	0.333	0.333	0.1	16.0	Flood Risk																																																																																																																																																																																														
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																
30 min Winter	64.904	0.0	34																																																																																																																																																																																																
60 min Winter	40.510	0.0	64																																																																																																																																																																																																
120 min Winter	24.421	0.0	122																																																																																																																																																																																																
180 min Winter	17.920	0.0	182																																																																																																																																																																																																
240 min Winter	14.300	0.0	240																																																																																																																																																																																																
360 min Winter	10.377	0.0	358																																																																																																																																																																																																
480 min Winter	8.265	0.0	476																																																																																																																																																																																																
600 min Winter	6.922	0.0	594																																																																																																																																																																																																
720 min Winter	5.986	0.0	710																																																																																																																																																																																																
960 min Winter	4.756	0.0	942																																																																																																																																																																																																
1440 min Winter	3.434	0.0	1398																																																																																																																																																																																																
2160 min Winter	2.475	0.0	2056																																																																																																																																																																																																
2880 min Winter	1.960	0.0	2652																																																																																																																																																																																																
4320 min Winter	1.409	0.0	3288																																																																																																																																																																																																
5760 min Winter	1.114	0.0	4208																																																																																																																																																																																																
7200 min Winter	0.927	0.0	5120																																																																																																																																																																																																
8640 min Winter	0.798	0.0	6048																																																																																																																																																																																																
10080 min Winter	0.703	0.0	6864																																																																																																																																																																																																
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Date 29/06/2018 File Swale 2.srcx	Designed by NJ Checked by GT																									
Micro Drainage Source Control 2018.1																										
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>32.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	32.0																							
Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0																							
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Porosity	1.00	Cap Volume Depth (m)	0.000																							
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<p style="text-align: center;"><u>Summary of Results for 1 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 992 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>0.045</td><td>0.045</td><td>0.0</td><td>0.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.056</td><td>0.056</td><td>0.0</td><td>0.7</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.067</td><td>0.067</td><td>0.0</td><td>0.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.077</td><td>0.077</td><td>0.0</td><td>1.1</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.083</td><td>0.083</td><td>0.0</td><td>1.2</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.087</td><td>0.087</td><td>0.0</td><td>1.3</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.092</td><td>0.092</td><td>0.0</td><td>1.4</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.094</td><td>0.094</td><td>0.0</td><td>1.5</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.096</td><td>0.096</td><td>0.0</td><td>1.5</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.097</td><td>0.097</td><td>0.0</td><td>1.5</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.098</td><td>0.098</td><td>0.0</td><td>1.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.099</td><td>0.099</td><td>0.0</td><td>1.6</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.099</td><td>0.099</td><td>0.0</td><td>1.6</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.097</td><td>0.097</td><td>0.0</td><td>1.5</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.093</td><td>0.093</td><td>0.0</td><td>1.4</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.088</td><td>0.088</td><td>0.0</td><td>1.3</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.083</td><td>0.083</td><td>0.0</td><td>1.3</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.079</td><td>0.079</td><td>0.0</td><td>1.2</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.075</td><td>0.075</td><td>0.0</td><td>1.1</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.050</td><td>0.050</td><td>0.0</td><td>0.6</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>31.093</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>20.252</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>12.800</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>7.926</td><td>0.0</td><td>122</td></tr><tr><td>180 min Summer</td><td>5.960</td><td>0.0</td><td>182</td></tr><tr><td>240 min Summer</td><td>4.862</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>3.628</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>2.939</td><td>0.0</td><td>480</td></tr><tr><td>600 min Summer</td><td>2.495</td><td>0.0</td><td>600</td></tr><tr><td>720 min Summer</td><td>2.183</td><td>0.0</td><td>672</td></tr><tr><td>960 min Summer</td><td>1.768</td><td>0.0</td><td>788</td></tr><tr><td>1440 min Summer</td><td>1.314</td><td>0.0</td><td>1040</td></tr><tr><td>2160 min Summer</td><td>0.977</td><td>0.0</td><td>1452</td></tr><tr><td>2880 min Summer</td><td>0.791</td><td>0.0</td><td>1872</td></tr><tr><td>4320 min Summer</td><td>0.588</td><td>0.0</td><td>2680</td></tr><tr><td>5760 min Summer</td><td>0.476</td><td>0.0</td><td>3464</td></tr><tr><td>7200 min Summer</td><td>0.405</td><td>0.0</td><td>4256</td></tr><tr><td>8640 min Summer</td><td>0.354</td><td>0.0</td><td>5016</td></tr><tr><td>10080 min Summer</td><td>0.317</td><td>0.0</td><td>5752</td></tr><tr><td>15 min Winter</td><td>31.093</td><td>0.0</td><td>19</td></tr></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.045	0.045	0.0	0.6	O K	30 min Summer	0.056	0.056	0.0	0.7	O K	60 min Summer	0.067	0.067	0.0	0.9	O K	120 min Summer	0.077	0.077	0.0	1.1	O K	180 min Summer	0.083	0.083	0.0	1.2	O K	240 min Summer	0.087	0.087	0.0	1.3	O K	360 min Summer	0.092	0.092	0.0	1.4	O K	480 min Summer	0.094	0.094	0.0	1.5	O K	600 min Summer	0.096	0.096	0.0	1.5	O K	720 min Summer	0.097	0.097	0.0	1.5	O K	960 min Summer	0.098	0.098	0.0	1.6	O K	1440 min Summer	0.099	0.099	0.0	1.6	O K	2160 min Summer	0.099	0.099	0.0	1.6	O K	2880 min Summer	0.097	0.097	0.0	1.5	O K	4320 min Summer	0.093	0.093	0.0	1.4	O K	5760 min Summer	0.088	0.088	0.0	1.3	O K	7200 min Summer	0.083	0.083	0.0	1.3	O K	8640 min Summer	0.079	0.079	0.0	1.2	O K	10080 min Summer	0.075	0.075	0.0	1.1	O K	15 min Winter	0.050	0.050	0.0	0.6	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	31.093	0.0	19	30 min Summer	20.252	0.0	34	60 min Summer	12.800	0.0	64	120 min Summer	7.926	0.0	122	180 min Summer	5.960	0.0	182	240 min Summer	4.862	0.0	242	360 min Summer	3.628	0.0	362	480 min Summer	2.939	0.0	480	600 min Summer	2.495	0.0	600	720 min Summer	2.183	0.0	672	960 min Summer	1.768	0.0	788	1440 min Summer	1.314	0.0	1040	2160 min Summer	0.977	0.0	1452	2880 min Summer	0.791	0.0	1872	4320 min Summer	0.588	0.0	2680	5760 min Summer	0.476	0.0	3464	7200 min Summer	0.405	0.0	4256	8640 min Summer	0.354	0.0	5016	10080 min Summer	0.317	0.0	5752	15 min Winter	31.093	0.0	19
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AKSWard		Page 3
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 3	
Date 29/06/2018 File Swale 3.srcx	Designed by NJ Checked by GT	
Micro Drainage		Source Control 2018.1


Rainfall Details


Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.010

Time (mins)	Area
From:	To: (ha)
0	4 0.010

AKSWard		Page 4																								
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 3																									
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<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>20.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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Summer</td><td>5.375</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>4.661</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>3.719</td><td>0.0</td><td>960</td></tr><tr><td>1440 min Summer</td><td>2.704</td><td>0.0</td><td>1212</td></tr><tr><td>2160 min Summer</td><td>1.963</td><td>0.0</td><td>1580</td></tr><tr><td>2880 min Summer</td><td>1.563</td><td>0.0</td><td>1988</td></tr><tr><td>4320 min Summer</td><td>1.133</td><td>0.0</td><td>2812</td></tr><tr><td>5760 min Summer</td><td>0.901</td><td>0.0</td><td>3632</td></tr><tr><td>7200 min Summer</td><td>0.754</td><td>0.0</td><td>4464</td></tr><tr><td>8640 min Summer</td><td>0.652</td><td>0.0</td><td>5272</td></tr><tr><td>10080 min Summer</td><td>0.576</td><td>0.0</td><td>6048</td></tr><tr><td>15 min Winter</td><td>76.290</td><td>0.0</td><td>19</td></tr></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	0.092	0.092	0.0	1.4	O K	30 min 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Summer	8.001	0.0	362	480 min Summer	6.397	0.0	482	600 min Summer	5.375	0.0	602	720 min Summer	4.661	0.0	722	960 min Summer	3.719	0.0	960	1440 min Summer	2.704	0.0	1212	2160 min Summer	1.963	0.0	1580	2880 min Summer	1.563	0.0	1988	4320 min Summer	1.133	0.0	2812	5760 min Summer	0.901	0.0	3632	7200 min Summer	0.754	0.0	4464	8640 min Summer	0.652	0.0	5272	10080 min Summer	0.576	0.0	6048	15 min Winter	76.290	0.0	19
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																															
15 min Summer	0.092	0.092	0.0	1.4	O K																																																																																																																																																																																																															
30 min Summer	0.111	0.111	0.0	1.8	O K																																																																																																																																																																																																															
60 min Summer	0.128	0.128	0.0	2.3	O K																																																																																																																																																																																																															
120 min Summer	0.144	0.144	0.0	2.7	O K																																																																																																																																																																																																															
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30 min Summer	49.584	0.0	34																																																																																																																																																																																																																	
60 min Summer	30.811	0.0	64																																																																																																																																																																																																																	
120 min Summer	18.584	0.0	124																																																																																																																																																																																																																	
180 min Summer	13.680	0.0	184																																																																																																																																																																																																																	
240 min Summer	10.960	0.0	242																																																																																																																																																																																																																	
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AKSWard				Page 2	
Seacourt Tower West Way Oxford		Bicester Heritage Hotel Access Road Swale 3			
Date 29/06/2018 File Swale 3.srcx		Designed by NJ Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 30 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.120	0.120	0.0	2.1	O K
60 min Winter	0.139	0.139	0.0	2.5	O K
120 min Winter	0.156	0.156	0.0	3.0	O K
180 min Winter	0.165	0.165	0.0	3.3	O K
240 min Winter	0.171	0.171	0.0	3.5	O K
360 min Winter	0.179	0.179	0.0	3.7	O K
480 min Winter	0.184	0.184	0.0	3.9	O K
600 min Winter	0.187	0.187	0.0	4.0	O K
720 min Winter	0.189	0.189	0.0	4.0	O K
960 min Winter	0.191	0.191	0.0	4.1	O K
1440 min Winter	0.191	0.191	0.0	4.1	O K
2160 min Winter	0.188	0.188	0.0	4.0	O K
2880 min Winter	0.185	0.185	0.0	3.9	O K
4320 min Winter	0.176	0.176	0.0	3.6	O K
5760 min Winter	0.166	0.166	0.0	3.3	O K
7200 min Winter	0.156	0.156	0.0	3.0	O K
8640 min Winter	0.147	0.147	0.0	2.8	O K
10080 min Winter	0.139	0.139	0.0	2.5	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	49.584	0.0	34		
60 min Winter	30.811	0.0	64		
120 min Winter	18.584	0.0	122		
180 min Winter	13.680	0.0	180		
240 min Winter	10.960	0.0	240		
360 min Winter	8.001	0.0	356		
480 min Winter	6.397	0.0	472		
600 min Winter	5.375	0.0	588		
720 min Winter	4.661	0.0	702		
960 min Winter	3.719	0.0	924		
1440 min Winter	2.704	0.0	1352		
2160 min Winter	1.963	0.0	1684		
2880 min Winter	1.563	0.0	2136		
4320 min Winter	1.133	0.0	3028		
5760 min Winter	0.901	0.0	3920		
7200 min Winter	0.754	0.0	4760		
8640 min Winter	0.652	0.0	5616		
10080 min Winter	0.576	0.0	6448		
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AKSWard		Page 3
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 3	
Date 29/06/2018 File Swale 3.srcx	Designed by NJ Checked by GT	
Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.010

Time (mins)	Area
From:	To: (ha)
0	4 0.010

AKSWard		Page 4																								
Seacourt Tower	Bicester Heritage Hotel																									
West Way	Access Road																									
Oxford	Swale 3																									
Date 29/06/2018	Designed by NJ																									
File Swale 3.srcx	Checked by GT																									
Micro Drainage		Source Control 2018.1																								
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>20.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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AKSWard				Page 1																																																																																																																																																																																																																			
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<p style="text-align: center;"><u>Summary of Results for 100 year Return Period</u></p> <p style="text-align: center;">Half Drain Time : 1862 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>0.111</td><td>0.111</td><td>0.0</td><td>1.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.134</td><td>0.134</td><td>0.0</td><td>2.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.155</td><td>0.155</td><td>0.0</td><td>3.0</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.174</td><td>0.174</td><td>0.0</td><td>3.6</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.184</td><td>0.184</td><td>0.0</td><td>3.9</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.190</td><td>0.190</td><td>0.0</td><td>4.1</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.198</td><td>0.198</td><td>0.0</td><td>4.3</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.202</td><td>0.202</td><td>0.0</td><td>4.5</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.205</td><td>0.205</td><td>0.0</td><td>4.6</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.207</td><td>0.207</td><td>0.0</td><td>4.6</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.209</td><td>0.209</td><td>0.0</td><td>4.7</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.208</td><td>0.208</td><td>0.0</td><td>4.7</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.206</td><td>0.206</td><td>0.0</td><td>4.6</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.203</td><td>0.203</td><td>0.0</td><td>4.5</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.195</td><td>0.195</td><td>0.0</td><td>4.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.187</td><td>0.187</td><td>0.0</td><td>4.0</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.180</td><td>0.180</td><td>0.0</td><td>3.7</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.172</td><td>0.172</td><td>0.0</td><td>3.5</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.165</td><td>0.165</td><td>0.0</td><td>3.3</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.120</td><td>0.120</td><td>0.0</td><td>2.1</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>99.025</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>64.904</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>40.510</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>24.421</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>17.920</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>14.300</td><td>0.0</td><td>242</td></tr><tr><td>360 min Summer</td><td>10.377</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>8.265</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>6.922</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>5.986</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>4.756</td><td>0.0</td><td>960</td></tr><tr><td>1440 min Summer</td><td>3.434</td><td>0.0</td><td>1310</td></tr><tr><td>2160 min Summer</td><td>2.475</td><td>0.0</td><td>1664</td></tr><tr><td>2880 min Summer</td><td>1.960</td><td>0.0</td><td>2044</td></tr><tr><td>4320 min Summer</td><td>1.409</td><td>0.0</td><td>2856</td></tr><tr><td>5760 min Summer</td><td>1.114</td><td>0.0</td><td>3688</td></tr><tr><td>7200 min Summer</td><td>0.927</td><td>0.0</td><td>4536</td></tr><tr><td>8640 min Summer</td><td>0.798</td><td>0.0</td><td>5280</td></tr><tr><td>10080 min Summer</td><td>0.703</td><td>0.0</td><td>6056</td></tr><tr><td>15 min 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K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	99.025	0.0	19	30 min Summer	64.904	0.0	34	60 min Summer	40.510	0.0	64	120 min Summer	24.421	0.0	124	180 min Summer	17.920	0.0	184	240 min Summer	14.300	0.0	242	360 min Summer	10.377	0.0	362	480 min Summer	8.265	0.0	482	600 min Summer	6.922	0.0	602	720 min Summer	5.986	0.0	722	960 min Summer	4.756	0.0	960	1440 min Summer	3.434	0.0	1310	2160 min Summer	2.475	0.0	1664	2880 min Summer	1.960	0.0	2044	4320 min Summer	1.409	0.0	2856	5760 min Summer	1.114	0.0	3688	7200 min Summer	0.927	0.0	4536	8640 min Summer	0.798	0.0	5280	10080 min Summer	0.703	0.0	6056	15 min Winter	99.025	0.0	19
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10080 min Summer	0.165	0.165	0.0	3.3	O K																																																																																																																																																																																																																		
15 min Winter	0.120	0.120	0.0	2.1	O K																																																																																																																																																																																																																		
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																				
15 min Summer	99.025	0.0	19																																																																																																																																																																																																																				
30 min Summer	64.904	0.0	34																																																																																																																																																																																																																				
60 min Summer	40.510	0.0	64																																																																																																																																																																																																																				
120 min Summer	24.421	0.0	124																																																																																																																																																																																																																				
180 min Summer	17.920	0.0	184																																																																																																																																																																																																																				
240 min Summer	14.300	0.0	242																																																																																																																																																																																																																				
360 min Summer	10.377	0.0	362																																																																																																																																																																																																																				
480 min Summer	8.265	0.0	482																																																																																																																																																																																																																				
600 min Summer	6.922	0.0	602																																																																																																																																																																																																																				
720 min Summer	5.986	0.0	722																																																																																																																																																																																																																				
960 min Summer	4.756	0.0	960																																																																																																																																																																																																																				
1440 min Summer	3.434	0.0	1310																																																																																																																																																																																																																				
2160 min Summer	2.475	0.0	1664																																																																																																																																																																																																																				
2880 min Summer	1.960	0.0	2044																																																																																																																																																																																																																				
4320 min Summer	1.409	0.0	2856																																																																																																																																																																																																																				
5760 min Summer	1.114	0.0	3688																																																																																																																																																																																																																				
7200 min Summer	0.927	0.0	4536																																																																																																																																																																																																																				
8640 min Summer	0.798	0.0	5280																																																																																																																																																																																																																				
10080 min Summer	0.703	0.0	6056																																																																																																																																																																																																																				
15 min Winter	99.025	0.0	19																																																																																																																																																																																																																				
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AKSWard				Page 2	
Seacourt Tower		Bicester Heritage Hotel			
West Way		Access Road			
Oxford		Swale 3			
Date 29/06/2018		Designed by NJ			
File Swale 3.srcx		Checked by GT			
Micro Drainage		Source Control 2018.1			
<u>Summary of Results for 100 year Return Period</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	0.145	0.145	0.0	2.7	O K
60 min Winter	0.167	0.167	0.0	3.3	O K
120 min Winter	0.188	0.188	0.0	4.0	O K
180 min Winter	0.198	0.198	0.0	4.3	O K
240 min Winter	0.205	0.205	0.0	4.6	Flood Risk
360 min Winter	0.213	0.213	0.0	4.9	Flood Risk
480 min Winter	0.219	0.219	0.0	5.1	Flood Risk
600 min Winter	0.222	0.222	0.0	5.2	Flood Risk
720 min Winter	0.224	0.224	0.0	5.3	Flood Risk
960 min Winter	0.227	0.227	0.0	5.4	Flood Risk
1440 min Winter	0.227	0.227	0.0	5.4	Flood Risk
2160 min Winter	0.223	0.223	0.0	5.2	Flood Risk
2880 min Winter	0.220	0.220	0.0	5.1	Flood Risk
4320 min Winter	0.210	0.210	0.0	4.7	Flood Risk
5760 min Winter	0.199	0.199	0.0	4.4	O K
7200 min Winter	0.189	0.189	0.0	4.0	O K
8640 min Winter	0.179	0.179	0.0	3.7	O K
10080 min Winter	0.169	0.169	0.0	3.4	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	64.904	0.0	34		
60 min Winter	40.510	0.0	64		
120 min Winter	24.421	0.0	122		
180 min Winter	17.920	0.0	180		
240 min Winter	14.300	0.0	240		
360 min Winter	10.377	0.0	358		
480 min Winter	8.265	0.0	474		
600 min Winter	6.922	0.0	590		
720 min Winter	5.986	0.0	706		
960 min Winter	4.756	0.0	932		
1440 min Winter	3.434	0.0	1370		
2160 min Winter	2.475	0.0	1728		
2880 min Winter	1.960	0.0	2188		
4320 min Winter	1.409	0.0	3108		
5760 min Winter	1.114	0.0	3984		
7200 min Winter	0.927	0.0	4832		
8640 min Winter	0.798	0.0	5704		
10080 min Winter	0.703	0.0	6552		
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Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 3	
Date 29/06/2018 File Swale 3.srcx	Designed by NJ Checked by GT	
Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+0


Time Area Diagram


Total Area (ha) 0.010


Time (mins)	Area
From:	To: (ha)

0	4 0.010
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AKSWard		Page 4																								
Seacourt Tower	Bicester Heritage Hotel																									
West Way	Access Road																									
Oxford	Swale 3																									
Date 29/06/2018	Designed by NJ																									
File Swale 3.srcx	Checked by GT																									
Micro Drainage		Source Control 2018.1																								
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>20.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0																							
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Porosity	1.00	Cap Volume Depth (m)	0.000																							
Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000																							
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AKSWard				Page 1																																																																																																																																																																																																																			
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Micro Drainage		Source Control 2018.1																																																																																																																																																																																																																					
<p><u>Summary of Results for 100 year Return Period (+40%)</u></p> <p>Half Drain Time : 2258 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>0.140</td><td>0.140</td><td>0.0</td><td>2.6</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.168</td><td>0.168</td><td>0.0</td><td>3.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.194</td><td>0.194</td><td>0.0</td><td>4.2</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.217</td><td>0.217</td><td>0.0</td><td>5.0</td><td>Flood Risk</td></tr><tr><td>180 min Summer</td><td>0.229</td><td>0.229</td><td>0.0</td><td>5.4</td><td>Flood Risk</td></tr><tr><td>240 min Summer</td><td>0.237</td><td>0.237</td><td>0.0</td><td>5.7</td><td>Flood Risk</td></tr><tr><td>360 min Summer</td><td>0.247</td><td>0.247</td><td>0.0</td><td>6.1</td><td>Flood Risk</td></tr><tr><td>480 min Summer</td><td>0.253</td><td>0.253</td><td>0.0</td><td>6.4</td><td>Flood Risk</td></tr><tr><td>600 min Summer</td><td>0.257</td><td>0.257</td><td>0.0</td><td>6.5</td><td>Flood Risk</td></tr><tr><td>720 min Summer</td><td>0.260</td><td>0.260</td><td>0.0</td><td>6.7</td><td>Flood Risk</td></tr><tr><td>960 min Summer</td><td>0.263</td><td>0.263</td><td>0.0</td><td>6.8</td><td>Flood Risk</td></tr><tr><td>1440 min Summer</td><td>0.265</td><td>0.265</td><td>0.0</td><td>6.8</td><td>Flood Risk</td></tr><tr><td>2160 min Summer</td><td>0.262</td><td>0.262</td><td>0.0</td><td>6.7</td><td>Flood Risk</td></tr><tr><td>2880 min Summer</td><td>0.259</td><td>0.259</td><td>0.0</td><td>6.6</td><td>Flood Risk</td></tr><tr><td>4320 min Summer</td><td>0.252</td><td>0.252</td><td>0.0</td><td>6.3</td><td>Flood Risk</td></tr><tr><td>5760 min Summer</td><td>0.244</td><td>0.244</td><td>0.0</td><td>6.0</td><td>Flood Risk</td></tr><tr><td>7200 min Summer</td><td>0.236</td><td>0.236</td><td>0.0</td><td>5.7</td><td>Flood Risk</td></tr><tr><td>8640 min Summer</td><td>0.229</td><td>0.229</td><td>0.0</td><td>5.4</td><td>Flood Risk</td></tr><tr><td>10080 min Summer</td><td>0.221</td><td>0.221</td><td>0.0</td><td>5.1</td><td>Flood Risk</td></tr><tr><td>15 min Winter</td><td>0.152</td><td>0.152</td><td>0.0</td><td>2.9</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>138.634</td><td>0.0</td><td>19</td></tr><tr><td>30 min Summer</td><td>90.866</td><td>0.0</td><td>34</td></tr><tr><td>60 min Summer</td><td>56.713</td><td>0.0</td><td>64</td></tr><tr><td>120 min Summer</td><td>34.190</td><td>0.0</td><td>124</td></tr><tr><td>180 min Summer</td><td>25.088</td><td>0.0</td><td>184</td></tr><tr><td>240 min Summer</td><td>20.020</td><td>0.0</td><td>244</td></tr><tr><td>360 min Summer</td><td>14.528</td><td>0.0</td><td>362</td></tr><tr><td>480 min Summer</td><td>11.570</td><td>0.0</td><td>482</td></tr><tr><td>600 min Summer</td><td>9.690</td><td>0.0</td><td>602</td></tr><tr><td>720 min Summer</td><td>8.380</td><td>0.0</td><td>722</td></tr><tr><td>960 min Summer</td><td>6.658</td><td>0.0</td><td>962</td></tr><tr><td>1440 min Summer</td><td>4.807</td><td>0.0</td><td>1440</td></tr><tr><td>2160 min Summer</td><td>3.465</td><td>0.0</td><td>1772</td></tr><tr><td>2880 min Summer</td><td>2.744</td><td>0.0</td><td>2136</td></tr><tr><td>4320 min Summer</td><td>1.973</td><td>0.0</td><td>2940</td></tr><tr><td>5760 min Summer</td><td>1.559</td><td>0.0</td><td>3752</td></tr><tr><td>7200 min Summer</td><td>1.298</td><td>0.0</td><td>4608</td></tr><tr><td>8640 min Summer</td><td>1.118</td><td>0.0</td><td>5440</td></tr><tr><td>10080 min Summer</td><td>0.985</td><td>0.0</td><td>6248</td></tr><tr><td>15 min 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Summer	0.221	0.221	0.0	5.1	Flood Risk	15 min Winter	0.152	0.152	0.0	2.9	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	138.634	0.0	19	30 min Summer	90.866	0.0	34	60 min Summer	56.713	0.0	64	120 min Summer	34.190	0.0	124	180 min Summer	25.088	0.0	184	240 min Summer	20.020	0.0	244	360 min Summer	14.528	0.0	362	480 min Summer	11.570	0.0	482	600 min Summer	9.690	0.0	602	720 min Summer	8.380	0.0	722	960 min Summer	6.658	0.0	962	1440 min Summer	4.807	0.0	1440	2160 min Summer	3.465	0.0	1772	2880 min Summer	2.744	0.0	2136	4320 min Summer	1.973	0.0	2940	5760 min Summer	1.559	0.0	3752	7200 min Summer	1.298	0.0	4608	8640 min Summer	1.118	0.0	5440	10080 min Summer	0.985	0.0	6248	15 min Winter	138.634	0.0	19
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AKSWard				Page 2	
Seacourt Tower		Bicester Heritage Hotel			
West Way		Access Road			
Oxford		Swale 3			
Date 29/06/2018		Designed by NJ			
File Swale 3.srcx		Checked by GT			
Micro Drainage		Source Control 2018.1			
<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	0.181	0.181	0.0	3.8	O K
60 min Winter	0.209	0.209	0.0	4.7	Flood Risk
120 min Winter	0.234	0.234	0.0	5.6	Flood Risk
180 min Winter	0.247	0.247	0.0	6.1	Flood Risk
240 min Winter	0.255	0.255	0.0	6.4	Flood Risk
360 min Winter	0.266	0.266	0.0	6.9	Flood Risk
480 min Winter	0.272	0.272	0.0	7.2	Flood Risk
600 min Winter	0.277	0.277	0.0	7.4	Flood Risk
720 min Winter	0.281	0.281	0.0	7.5	Flood Risk
960 min Winter	0.285	0.285	0.0	7.7	Flood Risk
1440 min Winter	0.287	0.287	0.0	7.8	Flood Risk
2160 min Winter	0.285	0.285	0.0	7.7	Flood Risk
2880 min Winter	0.281	0.281	0.0	7.5	Flood Risk
4320 min Winter	0.272	0.272	0.0	7.1	Flood Risk
5760 min Winter	0.261	0.261	0.0	6.7	Flood Risk
7200 min Winter	0.251	0.251	0.0	6.3	Flood Risk
8640 min Winter	0.240	0.240	0.0	5.9	Flood Risk
10080 min Winter	0.230	0.230	0.0	5.5	Flood Risk
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	90.866	0.0	34		
60 min Winter	56.713	0.0	64		
120 min Winter	34.190	0.0	122		
180 min Winter	25.088	0.0	182		
240 min Winter	20.020	0.0	240		
360 min Winter	14.528	0.0	358		
480 min Winter	11.570	0.0	476		
600 min Winter	9.690	0.0	592		
720 min Winter	8.380	0.0	708		
960 min Winter	6.658	0.0	936		
1440 min Winter	4.807	0.0	1384		
2160 min Winter	3.465	0.0	2008		
2880 min Winter	2.744	0.0	2252		
4320 min Winter	1.973	0.0	3160		
5760 min Winter	1.559	0.0	4088		
7200 min Winter	1.298	0.0	4968		
8640 min Winter	1.118	0.0	5800		
10080 min Winter	0.985	0.0	6656		
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AKSWard		Page 3
Seacourt Tower	Bicester Heritage Hotel	
West Way	Access Road	
Oxford	Swale 3	
Date 29/06/2018	Designed by NJ	
File Swale 3.srcx	Checked by GT	
Micro Drainage		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)	20.000	Shortest Storm (mins)	15
Ratio R	0.404	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.010

Time (mins)	Area
From:	To: (ha)
0	4 0.010

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AKSWard		Page 4																								
Seacourt Tower West Way Oxford	Bicester Heritage Hotel Access Road Swale 3																									
Date 29/06/2018 File Swale 3.srcx	Designed by NJ Checked by GT																									
Micro Drainage Source Control 2018.1																										
<p style="text-align: center;"><u>Model Details</u></p> <p style="text-align: center;">Storage is Online Cover Level (m) 0.500</p> <p style="text-align: center;"><u>Swale Structure</u></p> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.00515</td> <td>Length (m)</td> <td>20.0</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.00515</td> <td>Side Slope (1:X)</td> <td>3.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Porosity</td> <td>1.00</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>0.000</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Base Width (m)</td> <td>0.5</td> <td></td> <td></td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.00515	Length (m)	20.0	Infiltration Coefficient Side (m/hr)	0.00515	Side Slope (1:X)	3.0	Safety Factor	2.0	Slope (1:X)	0.0	Porosity	1.00	Cap Volume Depth (m)	0.000	Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000	Base Width (m)	0.5		
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Invert Level (m)	0.000	Cap Infiltration Depth (m)	0.000																							
Base Width (m)	0.5																									
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Appendix E

Surface Water Drainage Pro-Forma

Surface Water Drainage Pro-forma for new developments

This pro-forma accompanies our “Surface Water Drainage; Local Guidance for Planning Applications” note. It is expected that applicants/developers should complete and submit the pro-forma to present a summary of the surface water drainage strategy for the site and demonstrate compliance with the National Planning Policy Guidance and Non-Statutory Technical Standards. The pro-forma will then be used to support the LPA in making a decision on the suitability of the proposal and, if the LPA is minded to find the completed pro-forma acceptable, then it may be used as an evidence base for a relevant surface water condition to be appended to the decision notice, stating that the developments drainage proposal will be constructed in accordance with the details set out in the relevant pro-forma.

It must however be noted that this pro-forma submitted alone, will not be considered a suitable surface water drainage strategy. It should be clearly referenced within the pro-forma where in the other submission documents the details provided are taken from.

The pro-forma is supported by the [Defra/EA guidance on Rainfall Runoff Management](#), and uses the storage calculator on www.UKsuds.com. The pro-forma should be considered alongside other supporting SuDS Guidance, but focuses on ensuring flood risk is not made worse elsewhere. This proforma is based upon current industry standard practice.

1. Site Details

Site	Bicester Heritage Hotel
Address & post code or LPA reference	A4421, Bicester OX26 5HA
Grid reference	SP 59258 24680
Is the existing site developed or Greenfield?	Greenfield
Total Site Area	3.34 Hectares
Total Site Area served by drainage system (excluding open space) (Ha)*	1.80 Hectares
Pre-application sought? (Ref)	

* The Greenfield runoff off rate from the development which is to be used for assessing the requirements for limiting discharge flow rates and attenuation storage from a site should be calculated for the area that forms the drainage network for the site whatever size of site and type of drainage technique. Please refer to the Rainfall Runoff Management document or CIRIA manual for detail on this.

2. Impermeable Area

	Existing	Proposed	Difference (Proposed-Existing)	Notes for developers
Impermeable area (ha)	0 Hectares	1.80 Hectares	1.80 Hectares	If proposed > existing, then runoff rates and volumes will be increasing. Section 6 must be filled in. If proposed ≤ existing, then section 6 can be skipped & section 7 filled in.
Drainage Method (infiltration/sewer/watercourse)	Infiltration	Infiltration	N/A	If different from the existing, please fill in section 3. If existing drainage is by infiltration and the proposed is not, discharge volumes may increase. Fill in section 6.

3. Proposing to Discharge Surface Water via

	Yes	No	Justification and Evidence that this is possible	Notes for developers
Infiltration	X		Soakage tests have been carried out within Bicester Heritage. Infiltration rate 1.43×10^{-6} m/s	Soakage tests will need to be provided and results included in drainage strategy. Section 7 (infiltration) must be filled in if infiltration is proposed.
To watercourse	X			If infiltration is not possible - is there a watercourse nearby? Have the EA or IDB provided input where necessary?
To surface water sewer	X		.	This should be a last resort. If required, has sewer provider confirmed that sufficient capacity exists for this connection? Has an appropriate connection detail been agreed?
Combination of above	X			e.g. part infiltration, part discharge to sewer or watercourse. Provide evidence as above.

4. Peak Discharge Rates – This is the maximum flow rate at which storm water runoff leaves the site during a particular storm event.

	Existing Rates (l/s)	Proposed Rates (l/s)	Difference (l/s) (Proposed-Existing)	Notes for developers
Greenfield QBAR	0.7 l/s	N/A	N/A	QBAR is approx. 1 in 2 storm event. Provide this if Section 7 (QBAR) is proposed.
1 in 1	0.6 l/s	0 l/s	-0.6 l/s	Proposed discharge rates (with mitigation) should be no greater than existing rates for all corresponding storm events. E.g. discharging all flow from site at the existing 1 in 100 event increases flood risk during smaller events.
1 in 30	1.6 l/s	0 l/s	-1.6 l/s	
1 in 100	2.3 l/s	0 l/s	-2.3 l/s	
1 in 100 plus climate change	N/A	0 l/s	-2.3 l/s	To mitigate for climate change the proposed 1 in 100 +CC must be no greater than the existing 1 in 100 runoff rate. If not, flood risk increases under climate change. <ul style="list-style-type: none"> - Where lifetime of development is 100 years (residential) 30% should be added to the peak rainfall intensity. - Where lifetime of development is 60 years (residential) 20% should be added to the peak rainfall intensity.

5. Calculate additional volumes for storage –The total volume of water leaving the development site. New hard surfaces potentially restrict the amount of storm water that can go to the ground, so this needs to be controlled so not to make flood risk worse to properties downstream.

	Existing Volume (m ³)	Proposed Volume (m ³)	Difference (m ³) (Proposed-Existing)	Notes for developers
1 in 1	16.946 m ³	0 m ³	-16.946 m ³	Proposed discharge volumes (without mitigation) should be no greater than existing volumes for all corresponding storm events. Any increase in volume increases flood risk elsewhere. Where volumes are increased section 6 must be filled in.
1 in 30	54.053 m ³	0 m ³	-54.053 m ³	
1 in 100	92.734 m ³	0 m ³	-92.734 m ³	
1 in 100 plus climate change	N/A	0 m ³	-92.734 m ³	To mitigate for climate change the volume discharge from site must be no greater than the existing 1 in 100 storm event. If not, flood risk will increase under climate change.

6. Calculate attenuation storage – Attenuation storage is provided to enable the rate of runoff from the site into the receiving watercourse to be limited to an acceptable rate to protect against erosion and flooding downstream. The attenuation storage volume is a function of the degree of development relative to the greenfield discharge rate.

		Notes for developers
What Storage Attenuation volume (Flow rate control) is required to retain rates as existing (m³) Where is the storage to be accommodated on site?	<p>New cellular soakaway will be installed under parking area to attenuate and infiltrate runoff volume from roof area and adjacent hard paving.</p> <p>In addition, permeable paving for all car parks will drain and infiltrate runoff water from this area.</p> <p>New access road will drain into 3 No. swales and infiltrate into the ground</p>	<p>Volume of water to attenuate on site if discharging at existing rates. Can't be used where discharge volumes are increasing</p>

7. How is Storm Water stored on site?

Storage is required for the additional volume from site but also for holding back water to slow down the rate from the site. This is known as attenuation storage and long term storage. The idea is that the additional volume does not get into the watercourses, or if it does it is at an exceptionally low rate. You can either infiltrate the stored water back to ground, or if this isn't possible hold it back with on site storage. Firstly, can infiltration work on site?

			Notes for developers
Infiltration	State the Site's Geology and known Source Protection Zones (SPZ)	Outside SPZ	<ul style="list-style-type: none"> - Infiltration rates are highly variable, soakage tests should be comprehensive. - Avoid infiltrating in made ground. - Refer to Environment Agency website to identify and source protection zones (SPZ)
	Infiltration Rate (m/s)?	1.43x10 ⁻⁶ m/s	Infiltration rates should be no lower than 1x10 ⁻⁶ m/s.
	State the distance between a proposed infiltration device base and the ground water (GW) level	No recorded	Need 1m (min) between the base of the infiltration device & the water table to protect Groundwater quality & ensure GW doesn't enter infiltration devices. Avoid infiltration where this isn't possible.

	Were infiltration rates obtained by desk study or infiltration test?	Infiltration test.	Infiltration rates can be estimated from desk studies at most stages of the planning system if a back up attenuation scheme is provided.
	Is the site contaminated? If yes, consider advice from others on whether infiltration can happen.	No.	Water should not be infiltrated through land that is contaminated. The Environment Agency may provide bespoke advice in planning consultations for contaminated sites that should be considered.
In light of the above, is infiltration feasible?	Yes/No? If the answer is No, please identify how the storm water will be stored prior to release	Yes.	If infiltration is not feasible how will the additional volume be stored? The applicant should consider the following options in the next section.

Storage requirements

The developer must confirm one of the two methods for dealing with the amount of water that needs to be stored on site.

Option 1 Simple – Store both the additional volume and attenuation volume in order to make a final discharge from site at **QBAR** (Mean annual flow rate). This is preferred if no infiltration can be made on site. This very simply satisfies the runoff rates and volume criteria.

Option 2 Complex – If some of the additional volume of water can be infiltrated back into the ground, the remainder can be discharged at a very low rate of 2 l/sec/hectare. A combined storage calculation using the partial permissible rate of 2 l/sec/hectare and the attenuation rate used to slow the runoff from site.

		Notes for developers
Please confirm what option has been chosen and how much storage is required on site.	<p>New cellular soakaway with a capacity of 729.6 m³ will be installed under soft landscape area to attenuate and infiltrate runoff volume from roof and adjacent.</p> <p>In addition, permeable sub-base in car parks will drain and infiltrate runoff water from this area.</p>	The developer at this stage should have an idea of the site characteristics and be able to explain what the storage requirements are on site and how it will be achieved.

	The new access road will drain into 3No. swales located to both sides of the road.	
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8. Please confirm

		Notes for developers
1. Which Drainage Systems measures have been used? Provide an overview of the SuDS design scheme used? - Is the runoff managed at, or close to, the surface wherever possible. - Where the system serves more than one property, is public space used and integrated with the drainage system in an appropriate and beneficial way?	- Permeable paving - Cellular tank - Swales	SUDS can be adapted for most situations even where infiltration isn't feasible e.g. impermeable liners beneath some SUDS devices allows treatment but not infiltration. See CIRIA SUDS Manual C697.
2. Functionality Are the design features sufficiently durable to ensure structural integrity over the system design life (residential 100 years and commercial 60 years), with reasonable maintenance requirements?	Yes	
Are all parts of the SuDS system outside any areas of flood risk?	Yes	If not, provide justification and evidence that performance will not be adversely affected.
Has runoff and flooding from all sources (both on and off site) been considered and taken into account in the design?	Yes	
Has residual risk been addressed?	Yes refer Drainage strategy	<ul style="list-style-type: none"> Does the drainage system contain the 1 in 30 storm event without any flooding (include description of how any exceedance of surface water systems will be routed exceptional rain fall away from property)? Are 1 in 100 year flows contained or stored on-site within safe exceedance storage areas and flow paths? Is any flooding between 1 in 30 and 100 +CC storm events safely contained on site, without causing property flooding or a hazard to site users? Has it been ensured that there is no flooding from the system to downstream property or access routes for the 100 year + climate change event?
How are rates being restricted (hydro brakes etc.)?	No rates to be restricted	<ul style="list-style-type: none"> Hydrobrakes to be used where rates are between 2l/s to 5l/s. Orifices not to be used below 5l/s as the pipes may

		<p>block.</p> <ul style="list-style-type: none"> - Pipes with flows < 2l/s are prone to blockage.
3. Please confirm the owners/adopters of the entire drainage systems throughout the development. Please list all the owners.	Bicester Heritage Hotel	If these are multiple owners then a drawing illustrating exactly what features will be within each owner's remit must be submitted with this Proforma.
How is the entire drainage system to be maintained? An acceptable maintenance plan, clearly defining the operating and maintenance requirements of the drainage system will need to be submitted and approved.	The drainage drawings and schedules will form part of the O&M manual along with a post completion CCTV survey to ensure the system is fully operational at handover.	<p>If the features are to be maintained directly by the owners as stated in answer to the above question please answer yes to this question and submit the relevant maintenance schedule for each feature. If it is to be maintained by others than those above, please give details of each feature and the maintenance schedule.</p> <p>Clear details of the maintenance proposals of all elements of the proposed drainage system must be provided.</p> <p>Poorly maintained drainage can lead to increased flooding problems in the future.</p>

9. Evidence Please identify where the details quoted in the sections above were taken from. i.e. Plans, reports etc. Please also provide relevant drawings that need to accompany your pro-forma, in particular exceedance routes, ownership and location of SuDS (maintenance access strips etc.)

Pro-forma Section	Document reference where details quoted above are taken from	Page Number
Section 2	Drainage Strategy	1, Appendix A & C
Section 3	Drainage Strategy	Appendix C
Section 4	Drainage Strategy	Appendix B & D
Section 5	Drainage Strategy	Appendix B & D
Section 6	Drainage Strategy	Appendix C
Section 7	Drainage Strategy	Appendix A & C

The above form is completed using factual information and evidence from the Surface Water Drainage Strategy, Flood Risk Assessment and site plans and can be used as a summary of the surface water drainage strategy on this site, clearly showing that the proposed surface water rate and volume will not be increasing as a result of the development. Where an increase in rate or volume is shown the appropriate sections of the pro-forma have been completed setting out how the additional rate/volume is being dealt with, to ensure no increased flood risk on or off site.

Where the pro-forma is found to be acceptable to the Local Planning Authority then the surface water drainage system design must be built in accordance with the details provided here.

Form completed by: Graham Taylor

Qualification of person responsible for signing of this pro-forma: IEng MICE

Company: AKS Ward

On behalf of (Client's details): Bicester Heritage

Date 11.07.18

Appendix F

SuDS Maintenance Schedule

Cellular Tanks Operation & Maintenance Requirements

Regular inspection and maintenance is required to ensure the effective long-term operation of below ground modular storage systems.

Specific maintenance needs of the system should be monitored, and maintenance schedules adjusted to suit requirements.

Modular systems – operation and maintenance requirements

Maintenance schedule	Required action	Recommended Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then six monthly
	Debris removal from catchment surface (where may cause risks to performance)	Monthly
	Where rainfall infiltrates into blocks from above, check surface of filter for blockage by silt, algae or other matter. Remove and replace surface infiltration medium as necessary.	Monthly (and after large storms)
	Remove sediment from pre-treatment structures	Annually, or as required
Remedial actions	Repair/rehabilitation of inlets, outlet , overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually and after large storms

Maintenance activities should be detailed in the health and safety plan and a risk assessment should be undertaken.

Permeable Paving Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of pervious pavements. The facility should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Pervious surfaces need to be regularly cleaned of silt and other sediments to preserve their infiltration capability. Manufacturers' recommendations should always be followed.

A brush cleaner, which can be a lorry-mounted device or a smaller precinct sweeper, should be used and the sweeping regime should be as follows:

1. End of winter (April) – to collect winter debris.
2. Mid-summer (July/August) – to collect dust, flower and grass-type deposits.
3. After autumn leaf fall (November).

Care should be taken in using vacuuming equipment to avoid removal of jointing material. Any lost material should be replaced.

If reconstruction is necessary, the following procedure should be followed:

1. Lift surface layer and laying course.
2. Remove any geo-textile filter layer.
3. Inspect sub-base and remove, and replace if required.
4. Renew any geo-textile layers.
5. Renew laying course, jointing material and concrete block paving.

The reconstruction of failed areas of concrete block pavement should be less costly and disruptive than the rehabilitation of continuous concrete or asphalt porous surfaces due to the reduced area that is likely to be affected. Materials removed from the voids or the layers below the surface may contain heavy metals and hydrocarbons and may need to be disposed of as controlled waste. Sediment testing should be carried out before disposal to confirm its classification and appropriate disposal methods.

Pervious pavement operation and maintenance requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Brushing	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilize and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosphate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements

Maintenance schedule	Required action	Frequency
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the paving	As required
	Remedial work to any depressions, rutting, and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every ten to fifteen years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	Three-monthly, 48hrs after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Maintenance activities should be detailed in the Health and Safety Plan and a risk assessment should be undertaken.

Swales Operation & Maintenance Requirements

Regular inspection and maintenance is important for the effective operation of swales as designed.

Adequate access must be provided to all swale areas for inspection and maintenance, including for appropriate equipment and vehicles. Operation and maintenance requirements for swales are described below.

Swales operation and maintenance requirements

Maintenance schedule	Required action	Frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets, and overflows for blockages and clear of required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for >48hrs	Monthly, or when required
	Inspect vegetation coverage	Monthly for six months, quarterly for two years, then bi-annually
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseed	As required
	Re-level uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits, and prevent compaction of the soil surface	As required
	Remove buildup of sediment on upstream gravel trench, flow spreader of the soil surface	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly

Maintenance schedule	Required action	Frequency
	Inspect infiltration surfaces for ponding, compaction, silt accumulation. Record areas where water is ponding for >48 hours	Monthly, or when required
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Half yearly

Sediments excavated from swales that receive runoff from residential or standard road and roof areas are generally not toxic or hazardous material and can be safely disposed of by either land application or land filling. However, consultation should take place with the environmental regulator to confirm appropriate protocols. Sediment testing may be required before sediment excavation to determine its classification and appropriate disposal methods. For industrial site runoff, sediment testing will be essential. In the majority of cases, it will be acceptable to distribute the sediment on site if there is an appropriate safe and acceptable location to do so.

Many of the specific maintenance activities for swales can be undertaken as part of a general landscaping contract and so if landscape management is already required at site, should have marginal cost implications.

Maintenance activities should be detailed in the health and safety plan and a risk assessment should be undertaken.