F. London Borough Richmond upon Thames (LBRuT) Correspondence

O'Donovan, Donal

From: Brian Humphris <brian.humphris@richmond.gov.uk>
Sent: 03 March 2016 15:32
To: O'Donovan, Donal
Subject: RE: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry
Attachments: Gully reports.xlsx

Donal

In response to your questions below:-

1 Not sure who would be the best contact but they have area teams, so any enquiry relating to Stag site would be referred to them.
2 I can find no record of a name either. OS plan indicates that the culvert is fed by open ditches along both sides of Sheen Common, but nothing is indicated south of the common, within Richmond Park.
3 Please see attached – reports as logged on our system.

Regards Brian

Brian Humphris
Highway Asset Co-ordinator

020 8891 7738

From: O'Donovan, Donal [mailto:donal.odonovan@watermangroup.com]
Sent: 03 March 2016 12:03
To: Brian Humphris
Subject: RE: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry

Hi Brian,

Many thanks for the response, I have a few follow up queries that I hope you will be able to answer.

1. You mentioned that we would need to confirmed if the Site had passed the Sequential Test with the Planners. Do you have the contact details for the best person/team to contact in relation to this.

2. You provided plan showing a culverted watercourse that has an outlet adjacent to the Site. Do you know what this watercourse is called? I have had a look online but not had any luck.

3. You mentioned that there have been some records of flooding due to blocked gullies. Can you provide any further information in relation to these (ie. extent, date, location etc.).

If you have any queries please feel free to give me a call.

Cheers,

Donal

From: Brian Humphris [mailto:brian.humphris@richmond.gov.uk]
Sent: 24 February 2016 16:23
To: O'Donovan, Donal <donal.odonovan@watermangroup.com>
Subject: RE: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry

Hi Donal

Please accept my apologies for the delay in responding to your enquiry. Unfortunately some of the information that you requested has taken some time to obtain. Please see comments below.

Regards Brian

Brian Humphris
Highway Asset Co-ordinator

020 8891 7738

From: O'Donovan, Donal [mailto:donal.odonovan@watermangroup.com]
Sent: 22 January 2016 14:34
To: Brian Humphris
Subject: WIE10667 160122 DOBH Stag Brewery Flood Risk Enquiry

Hi Brian,

Thanks for speaking to me earlier.

Stag Brewery – Flood Risk Enquiry

I'm writing regarding the proposed redevelopment of Stag Brewery, located within the London Borough of Richmond upon Thames. The Site is approximately 9ha in size, and is located at approximate postcode SW14 7ET, please find attached a location plan for your information. The proposals comprise construction of a residential led mixed use development.

We have been commissioned to investigate the risk of flooding to the proposed development. I would be grateful if you could provide information relating to the following:

1. The Environment Agency mapping shows that the Site lies within Flood Zones 2 and 3, and is generally shown as being defended The River Thames defences are identified as being continuous in this location, please could you confirm that the Site is fully defended from tidal and fluvial flooding.
   We do not have detailed records of River Defences. However photographs on pages 24 & 25 of the SPD show that there are no defences at Ship Lane. Street View images from the river appear to show river levels approx. 1m below the towpath level, although there is no way of knowing what the Tide Status was at that time. There are defences at Bulls Alley, as indicated on Page 13 of the SPD.

2. The Stag Brewery SPD sets out the planning brief for potential development at the Site. Please could you confirm that the Sequential Test has been passed.
   This would need to be confirmed by our Planners.

3. As it is very early in the decision process it is currently unknown where development would be located. However, the design would ensure that appropriate mitigation steps would be incorporated. In line with other Sites within London we currently assume that commercial and retail ('less vulnerable') uses would be acceptable on the ground floor. We also assume that duplex residential uses would be acceptable on the ground and first floor (bedrooms location on the first floor), as a means of egress would be available to ensure safety. Please could you confirm this. We will further consul once the scheme plans have evolved.
   This approach is reasonable but Planners would make final approval. At other developments within Flood Zones floor levels are usually raised to at least 300mm above ground level to reduce flood risk.

4. Could you please provide a map showing the location of any Ordinary Watercourses near the Site, and note any development restrictions that would therefore apply.

Please note plans attached. Watercourses plan shows a watercourse under the site, although the alignment is probably only indicative. OS plan is marked with the known extents of relevant section – 'outlet' is marked on the plan.

5. Please could you confirm whether or not there are any 'lost rivers' in the vicinity of the Site. Please could you provide any information you have relating to this, to include a map.
   See above

6. Please could you provide your Risk of Flooding from Surface Water map in the vicinity of the Site, as the EA's online version is difficult to interpret due to the scale.
   Richmond does not have its own Flood risk maps, we use the EA plans.

7. Please provide us with details of any historic tidal, fluvial, groundwater, surface water or sewer flooding affecting or in the vicinity of the Site. Alternatively, please confirm that you have no records of flooding in the vicinity.
   Our Highways Enquiry System has no record of any flooding reports at Mortlake High Street, Lower Richmond Road, Ship Lane or Williams Lane, other than blocked gully reports.

8. Please could you confirm the likely groundwater levels in the vicinity of the Site.
   Unfortunately we do not have records of likely Groundwater Levels.

9. It is still very early in the design process and at this stage the drainage strategy is still being developed. We are currently looking at all options available to drain surface water runoff from the Site. Our approach will follow the drainage hierarchy where possible, with the preference of draining the site to the River Thames (unrestricted due to the tidal nature of the River). Should it not be possible to drain to the River Thames due to Site constraints, we would connect to the public sewer network. Following the requirements of the London Plan, we would limit surface water runoff from the Site to 50% of the existing rate, for the 1 in 100 year event, including for the predicted increase in rainfall intensity over the lifetime of the development due to climate change. Please could you confirm that this approach is acceptable.
   This approach is acceptable.

We are also writing to the Environment Agency and Thames Water requesting details of recorded flooding incidents and relevant information. If you are aware of any other parties that may have useful information please let me know.

This information is required as soon as possible and we would be grateful if you could provide your written response by 5th February 2016. If this is unlikely to be achievable or you require any further information please feel free to get in contact.

Please feel free to give me a call if you wish to discuss the above.

Cheers,

Donal

C. Donal O'Donovan
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G. Tide Locking Calculations

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	1 of 1	Project No:	WIE10667
By	N Balboni	Date	27.09.2017
Checked:	D O'Donovan	Date	27.09.2017

Project Title: **Former Stag Brewery, Mortlake**

Calculations Title: **Tide Locking Calculation**

CALCULATIONS

The 'rule of twelfths' is a rule of thumb that allows the tide level to be estimated based on the high and low water levels. The rule is an approxiamtion assuming six hours between high and low water, and does not take account of geographical location.

Source: Port of London Authority, 2017. *Tide Tables and Port Information*

Closest tidal stations: Barnes and Chiswick.

Barnes MHWS (m AOD)	4.13
Chiswick MHWS (m AOD)	4.08

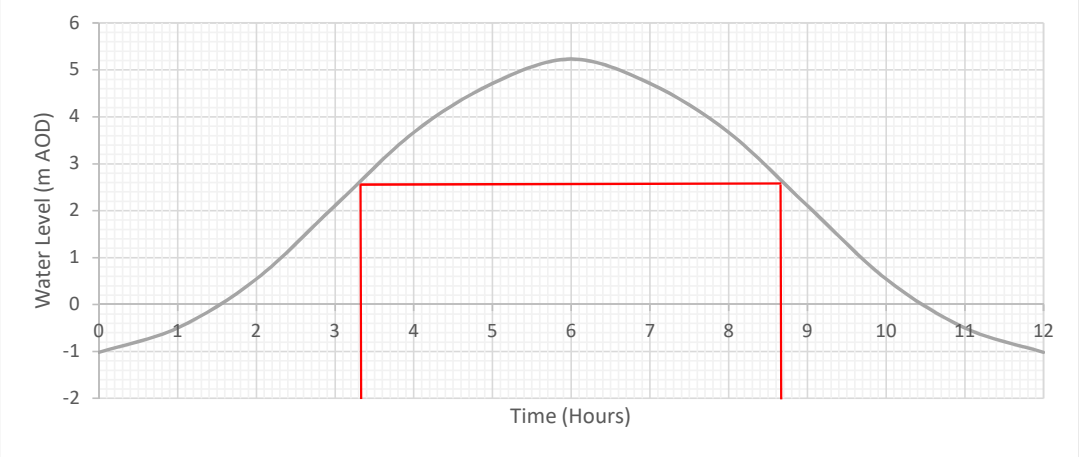
Inputs

Mean High Water Spring	=	5.23	m AOD
Mean Low Water Spring	=	-1.02	m AOD
Invert Level of Outfall	=	2.60	m AOD

Rule of Twelfths

Hour	Change	Water Level
0	-	-1.02
1	1/12	-0.50
2	1/6	0.54
3	1/4	2.11
4	1/4	3.67
5	1/6	4.71
6	1/12	5.23
7	1/12	4.71
8	1/6	3.67
9	1/4	2.11
10	1/4	0.54
11	1/6	-0.50
12	1/12	-1.02

Output



Time that outfall becomes submerged (hrs)	=	3.3
Time that outfall becomes unsubmerged (hrs)	=	8.6
Total time that outfall is submerged (hrs)	**=**	**5.3**

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FEH Rainfall Model

Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 520450 176000 TQ 20450 76000
C (1km)	-0.024
D1 (1km)	0.322
D2 (1km)	0.262
D3 (1km)	0.219
E (1km)	0.306
F (1km)	2.539
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	5
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
PIMP (%)	100
Add Flow / Climate Change (%)	40
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	124.000	0.012	10333.3	0.300	5.00	0.0	0.600	[]	-1	Pipe/Conduit	
1.001	2.949	0.590	5.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
1.002	7.594	0.051	150.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	
1.003	25.890	1.295	20.0	0.000	0.00	0.0	0.600	o	675	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	0.00	5.00	5.480	0.300	0.0	0.0	0.0	0.14	67.5	0.0
1.001	0.00	5.00	4.945	0.300	0.0	0.0	0.0	11.77	4211.0	0.0
1.002	0.00	5.00	4.355	0.300	0.0	0.0	0.0	2.14	765.0	0.0
1.003	0.00	5.00	4.305	0.300	0.0	0.0	0.0	5.88	2103.1	0.0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	[]	-1	1	6.030	5.480	0.400	Open Manhole	3000
1.001	o	675	2	6.030	4.945	0.410	Open Manhole	3000
1.002	o	675	3	6.030	4.355	1.000	Open Manhole	1500
1.003	o	675	3	6.030	4.305	1.050	Open Manhole	2100

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
1.000	124.000	10333.3	2	6.030	5.468	0.412	Open Manhole	3000
1.001	2.949	5.0	3	6.030	4.355	1.000	Open Manhole	1500
1.002	7.594	150.0	3	6.030	4.305	1.050	Open Manhole	2100
1.003	25.890	20.0		4.500	3.010	0.815	Open Manhole	675

Surcharged Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.003		4.500	3.010	2.625	675	0

Datum (m) 0.000 Offset (mins) 0

Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)	Time (mins)	Depth (m)
30	5.230	90	5.230	150	5.230	210	5.230	270	5.230	330	5.230
60	5.230	120	5.230	180	5.230	240	5.230	300	5.230	360	5.230

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	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	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 520450 176000 TQ 20450 76000
C (1km)	-0.024
D1 (1km)	0.322
D2 (1km)	0.262
D3 (1km)	0.219
E (1km)	0.306
F (1km)	2.539
Summer Storms	Yes
Winter Storms	No
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	1999
Site Location	GB 520450 176000 TQ 20450 76000
C (1km)	-0.024
D1 (1km)	0.322
D2 (1km)	0.262
D3 (1km)	0.219
E (1km)	0.306
F (1km)	2.539
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years)	100
Climate Change (%)	40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%	100/15 Summer				5.824
1.001	2	60 Summer	100	+40%					5.274
1.002	3	60 Summer	100	+40%	100/30 Summer				5.267
1.003	3	60 Summer	100	+40%	100/30 Summer				5.254

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.194	0.000	1.29		285.9	FLOOD RISK	
1.001	2	-0.346	0.000	0.15		147.8	OK	
1.002	3	0.237	0.000	0.35		148.7	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.003	3	0.274	0.000	0.10		149.6	SURCHARGED	

CHART DATUMS & STANDARD LEVELS IN THE PORT OF LONDON

1. **Chart Datum** is set to approximately the level of Lowest Astronomical Tide (L.A.T.)
2. **Low Water levels** in the upper reaches of the tidal Thames are greatly affected by the land water flow at Teddington Weir. **They frequently fall below chart datum** when this flow is significantly reduced, typically during the summer months.
3. **Maintained level** and chart datum above Richmond half tide weir are both 1.72 metres above Ordnance Datum (Newlyn).
4. **Trinity High Water (T.H.W.)** is deemed, by the Port of London Act, 1968, to be a level having a value of 11.4 feet **(i.e. 3.475 metres)** above Ordnance Datum (Newlyn).

Tidal Station	Level of Chart Datum below Ordnance Datum (Newlyn) m	Standard levels above local C.D.				
		Mean Low Water Springs MLWS	Mean Low Water Neaps MLWN	Mean High Water Neaps MHWN	Mean High Water Springs MHWS	Highest Astronomical Tide (HAT)
WALTON	2.16	0.5	1.1	3.5	4.3	4.7
MARGATE	2.50	0.6	1.3	4.0	4.8	5.1
SHIVERING SAND	-	0.6	1.4	4.4	5.4	5.7
SOUTHEND	2.90	0.6	1.4	4.8	5.9	6.3
CANVEY	2.97	0.6	1.4	5.0	6.1	6.6
CORYTON	3.05	0.6	1.5	5.1	6.2	6.7
TILBURY	3.12	0.6	1.5	5.4	6.6	7.0
GREENHITHE	3.20	0.6	1.6	5.6	6.7	7.2
DAGENHAM	3.28	0.6	1.6	5.8	7.0	7.5
NORTH WOOLWICH	3.35	0.6	1.6	5.9	7.2	7.7
TOWER	3.20	0.5	1.5	5.9	7.1	7.6
BLACKFRIARS	3.05	0.5	1.4	5.8	7.0	7.5
WESTMINSTER	2.90	0.5	1.3	5.7	6.9	7.4
VAUXHALL	2.59	0.3	1.0	5.4	6.6	7.1
VICTORIA RAIL	2.44	0.3	0.9	5.3	6.5	6.9
ALBERT BRIDGE	2.29	0.3	0.9	5.1	6.3	6.8
WANDSWORTH	2.13	0.3	0.9	5.0	6.2	6.7
PUTNEY	1.98	0.3	0.8	4.9	6.1	6.6
HAMMERSMITH	1.68	0.3	0.7	4.7	5.8	6.4
BARNES	1.37	0.2	0.6	4.4	5.5	6.1
CHISWICK	1.22	0.2	0.5	4.3	5.3	6.0
KEW	1.07	0.2	0.5	4.2	5.2	5.9
BRENTFORD	0.91	0.1	0.4	4.0	5.0	5.7
RICHMOND	0.61	0.1	0.2	3.8	4.8	5.5
TWICKENHAM	Note 3	-		1.5	2.5	3.2

H. Surface Water Calculations

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	1 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	D O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface Water Management - Summary Sheet**

LOCATION | CALCULATIONS | OPTIONS

Surface water at the Site will be managed in accordance with the Local Authority requirements, i.e. surface water discharge restricted to the existing existing rate, including for the impacts of climate change.

Existing Surface Water Discharge Regime (M100_60)

	Area (ha)	Calculation method	Discharge Rate
Site Area*	4.82	Wallingford (Page 2)	688 l/s
(calculated with PIMP of 100 %)			143 l/s/ha
Site Area**	5.89	Wallingford (Page 3)	841 l/s
(calculated with PIMP of 100 %)			143 l/s/ha

*excludes area of the site which is proposed to discharge unrestricted into the River Thames

**area that discharges into the Thames Water network in the existing case

Proposed Surface Water Discharge Regime

Minimum requirement = 50% of existing rate 420.4 l/s

Attenuation is maximised within each catchment, providing the following reduction in flows:

Catchment	Area (ha)	Ex. Rate (l/s)	Pr. Rate (l/s)	Att. (m3)	Betterment (%)
East - 1	0.30	42.8	20.0	143	53
East - 2	0.25	35.7	17.8	117	50
East - 3	0.18	25.7	12.8	84	50
West - school	1.31	187.0	16.0	992	91
West - 4	1.07	152.7	76.2	499	50
West - 5	0.92	131.3	49.5	465	62
West - 6	0.79	112.8	56.3	369	50
Sub-Total	4.82	688	249	2667	64

The proposed drainage strategy maximises the area of the site that is drained into the River Thames, directing surface water into the River Thames that in the existing situation drains into the Thames Water sewer network, thus providing a further betterment in surface water discharge rates, as below.

Total	**5.89***	**841**	**249**	**2667**	**70**

*includes area of the Site which is proposed to discharge unrestricted into the River Thames

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	2 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	D O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Existing Discharge Rate (excluding area proposed to discharge into River Thames) - Modified Rational Method**

LOCATION	CALCULATIONS				OPTIONS
	Calculations based on: Design and Analysis of urban storm drainage. The Wallingford Procedure, Volume 1 Principles methods and practice.				
	User Input Data				
	Total site area	**4.82**	ha		
	SAAR (From FEH)	605			
	Rainfall Intensity (From FEH)	51.80			
	PIMP (% impervious)	100	%		
	Soil Type	0.40			
	Very Low Runoff (well drained sandy, loamy or earthy peat soils)	0.15			
	Low Runoff (Very permeable soils (e.g. gravel, sand)	0.30			
	Moderate (Very fine sands, silts and sedimentary clays)	0.40			
	High Runoff (Clayey or loamy soils)	0.45			
	Very High Runoff (Soils of the wet uplands)	0.50			
Fig. 9.7	UCWI (From Figure 9.7 of Wallingford Method)	52			
Eqn. 13	Qp (peak discharge) = 2.78 Cv CR i A				
	Where: Qp (Peak Discharge) i = rainfall intensity A = Total Area				
From FEH	Average rainfall Intensity (i)				
	M100_60 is: 51.80 mm				
Eqn 7.20	Cv = PR/100				
Eqn 7.3	PR = (0.829 PIMP) + (25.0 SOIL) + (0.078 UCWI) - 20.7				
	PIMP (Percentage of catchment which is impervious)	100	%		
Page 52	Note: PIMP can not be less than 40%	40	%		
	Thus value of PIMP to be used	100	%		
	Soil: 0.40 UCWI: 52				
	PR =	76.26			
	Thus Cv =	0.76			
Sec 7.10	CR (Recommended for simulation and design)	1.3			
	Qp for 1 in 100 year 60 minute duration =	**688.1**	**l/s**	**142.8**	**l/s/ha**

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	3 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	D O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Existing Discharge Rate (whole site currently draining to Thames Water network) - Modified Rational Method**

LOCATION	CALCULATIONS			OPTIONS
	Calculations based on: Design and Analysis of urban storm drainage. The Wallingford Procedure, Volume 1 Principles methods and practice.			
	User Input Data			
	Total site area	**5.89**	ha	
	SAAR (From FEH)	605		
	Rainfall Intensity (From FEH)	51.80		
	PIMP (% impervious)	100	%	
	Soil Type	0.40		
	Very Low Runoff (well drained sandy, loamy or earthy peat soils)	0.15		
	Low Runoff (Very permeable soils (e.g. gravel, sand)	0.30		
	Moderate (Very fine sands, silts and sedimentary clays)	0.40		
	High Runoff (Clayey or loamy soils)	0.45		
	Very High Runoff (Soils of the wet uplands)	0.50		
Fig. 9.7	UCWI (From Figure 9.7 of Wallingford Method)	52		
Eqn. 13	Qp (peak discharge) = 2.78 Cv CR i A			
	Where: Qp (Peak Discharge) i = rainfall intensity A = Total Area			
From FEH	Average rainfall Intensity (i)			
	M100_60 is: 51.80 mm			
Eqn 7.20	Cv = PR/100			
Eqn 7.3	PR = (0.829 PIMP) + (25.0 SOIL) + (0.078 UCWI) - 20.7			
	PIMP (Percentage of catchment which is impervious)	100	%	
Page 52	Note: PIMP can not be less than 40%	40	%	
	Thus value of PIMP to be used	100	%	
	Soil: 0.40 UCWI: 52			
	PR =	76.26		
	Thus Cv =	0.76		
Sec 7.10	CR (Recommended for simulation and design)	1.3		
	Qp for 1 in 100 year 60 minute duration =	**840.8**	**l/s**	**142.8** **l/s/ha**
	50% of the existing runoff rate=	**420.4**	**l/s**	**71.4** **l/s/ha**

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	4 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	D O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Greenfield Runoff Rate (IoH 124)**

LOCATION	CALCULATIONS	OPTIONS

In order to calculate the rate of surface water discharge from the permeable portion of the Site, the Windes Microdrainage version 2017.1.2 Source Control module has been utilised. Rural runoff has been calculated using the IoH 124 Methodology. The input and output data for which are shown below;

An area of 50ha has been used in the calculations as this is the lowest catchment area which the IoH 124 method can calculate. The 50ha output is then prorated as set out in IoH 124

Waterman Group	Page 1
Pickfords Wharf Clink Street London, SE1 9DG	
Date 10/09/2019 09:37 File	Designed by csnb2 Checked by
Innovyze	Source Control 2019.1

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	50.000	Urban	0.000
SAAR (mm)	605	Region Number	Region 6

Results l/s

QBAR Rural	143.4
QBAR Urban	143.4
Q100 years	457.5
Q1 year	121.9
Q2 years	126.4
Q5 years	183.6
Q10 years	232.4
Q20 years	287.3
Q25 years	308.1
Q30 years	325.1
Q50 years	375.8
Q100 years	457.5
Q200 years	537.9
Q250 years	563.7
Q1000 years	740.1

1 in 1	121.9	l/s/50ha	2.4	l/s/ha	11.8 l/s
Qbar (1 in 2.333)	143.4	l/s/50ha	2.9	l/s/ha	13.8 l/s
1 in 100	457.5	l/s/50ha	9.2	l/s/ha	44.1 l/s

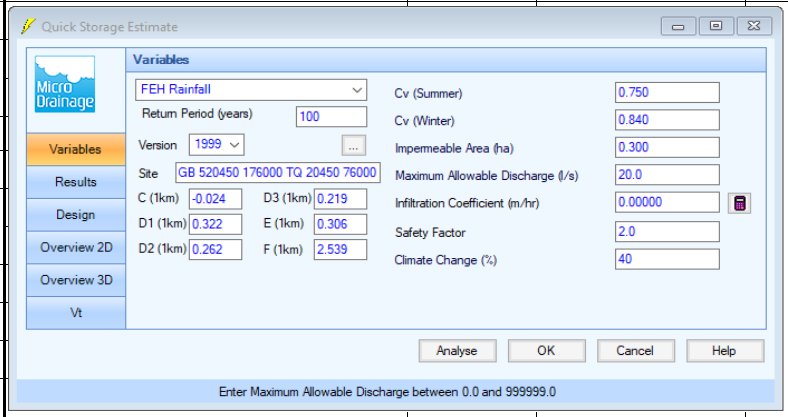
CALCULATIONS

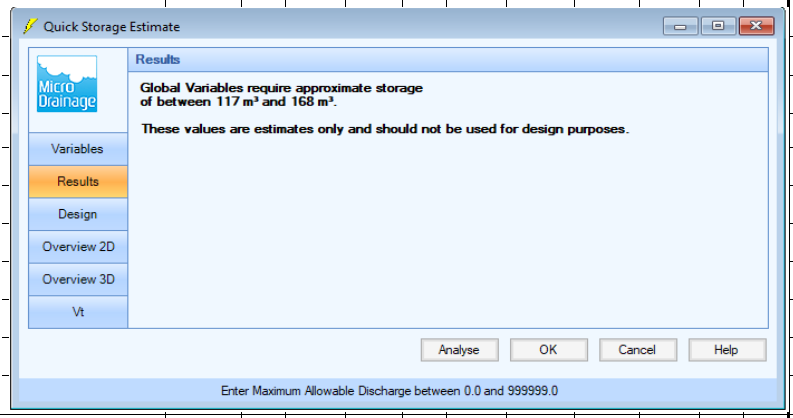
Company:	WIE	Office:	London
Sheet No:	5 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment East 1**

LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2018.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - East 1			
	Area	0.30	ha	
	Attenuation available	143	m3	
	Discharge rate	20.0	l/s	





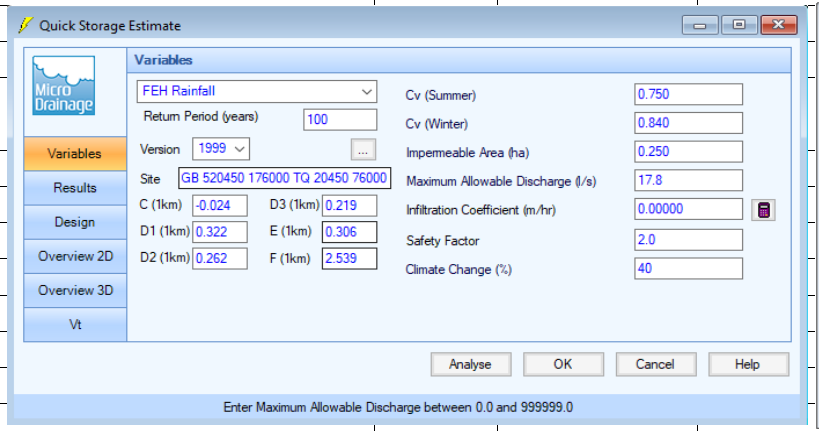
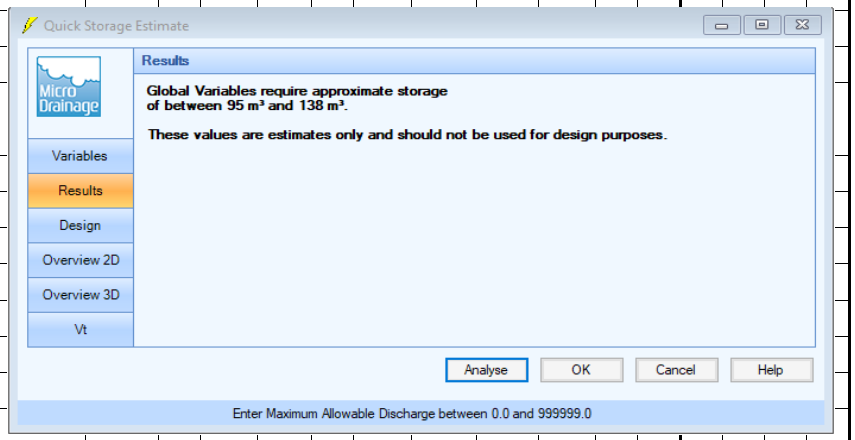
	Required volume to achieve 20.0 l/s		
	Attenuation volume (m3)	143	

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	6 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment East 2**

LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - East 2			
	Area	0.25	ha	
	Attenuation available	117	m3	
	Discharge rate	17.8	l/s	
				
				
	Required volume to achieve 17.8 l/s			
	Attenuation volume (m3)	117		

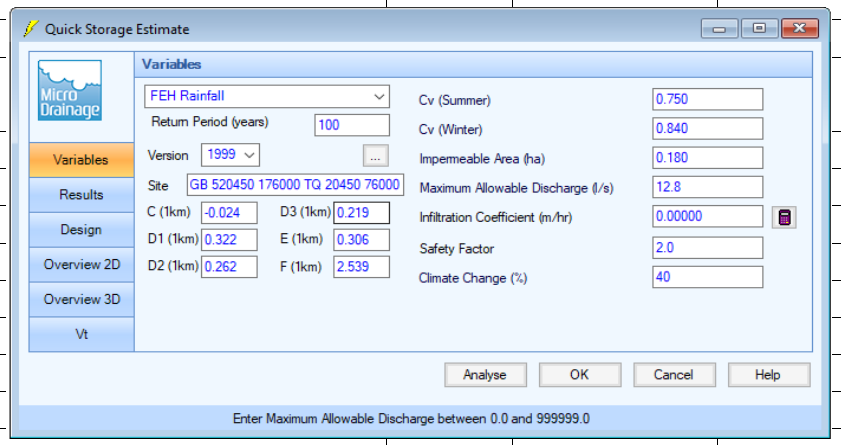
CALCULATIONS

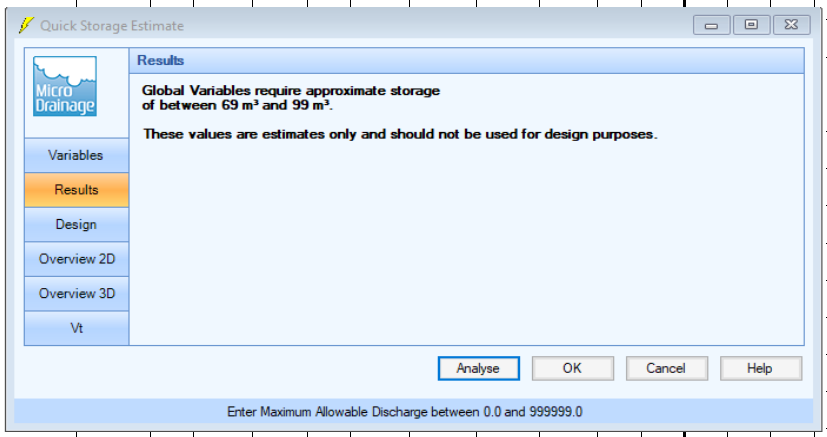
Company:	WIE	Office:	London
Sheet No:	7 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment East 3**

LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - East 3			
	Area	0.18	ha	
	Attenuation available	84	m3	
	Discharge rate	12.8	l/s	
	Required volume to achieve 12.8 l/s			
	Attenuation volume (m3)	84		



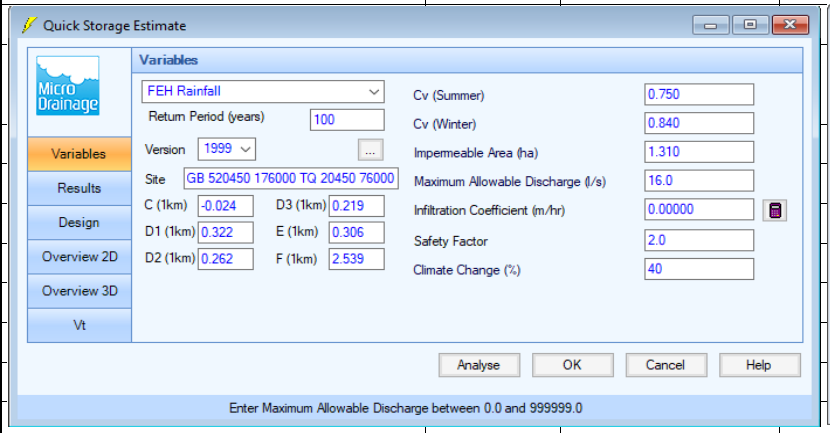
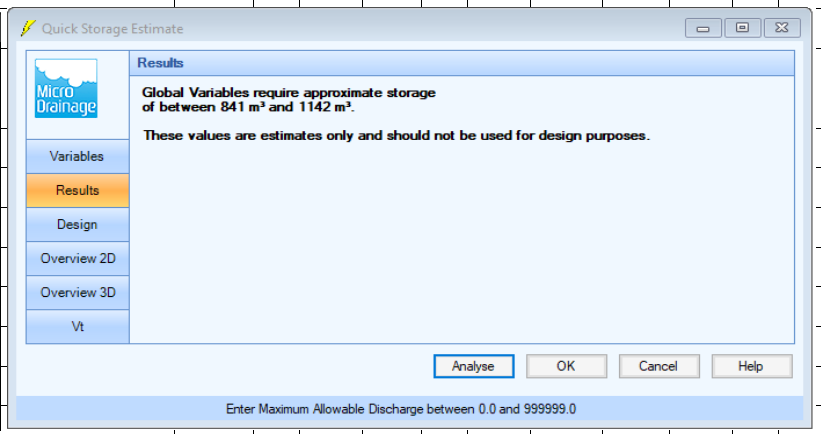


CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	8 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment West School**

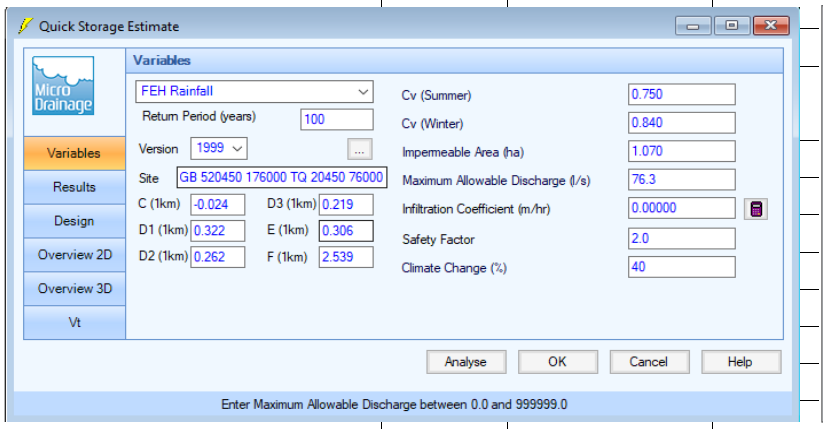
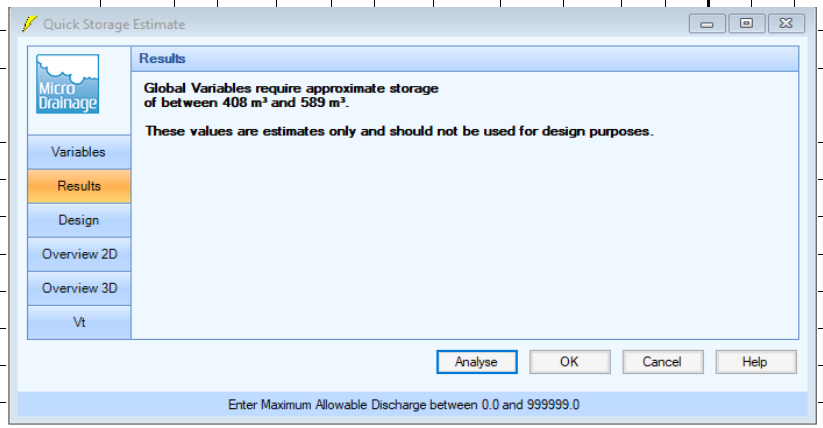
LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2018.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - West School			
	Area	1.31	ha	
	Attenuation available	992	m3	
	Discharge rate	16.0	l/s	
	 			
	Required volume to achieve 16.0 l/s			
	Attenuation volume (m3)	992		

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	9 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment West 4**

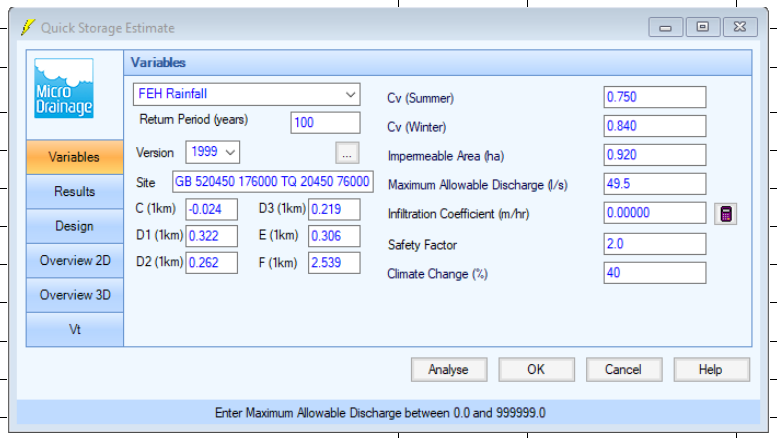
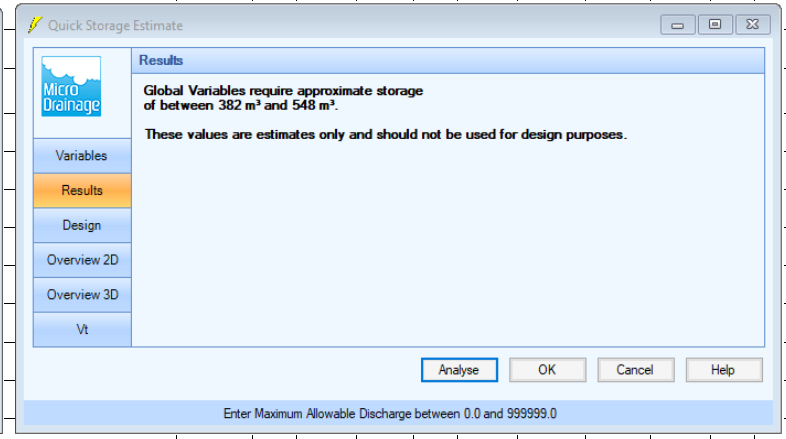
LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - West 4			
	Area	1.07	ha	
	Attenuation available	499	m3	
	Discharge rate	76.3	l/s	
				
				
	Required volume to achieve 76.3 l/s			
	Attenuation volume (m3)	499		

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	10 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment West 5**

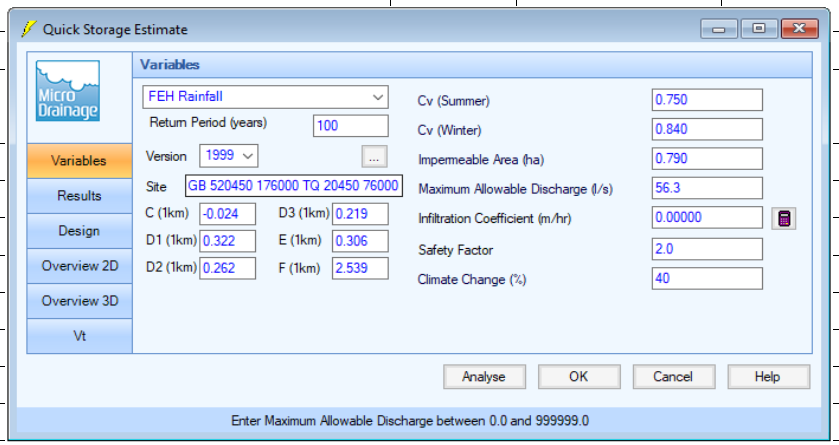
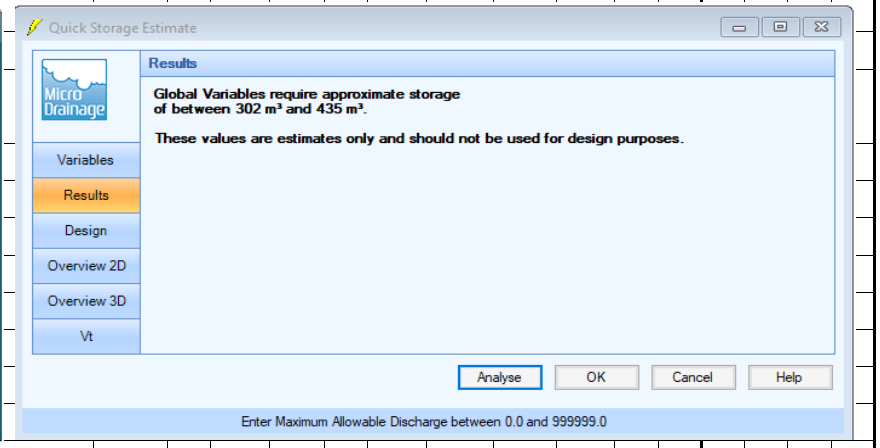
LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - West 5			
	Area	0.92	ha	
	Attenuation available	465	m3	
	Discharge rate	49.5	l/s	
				
				
	Required volume to achieve 49.5 l/s			
	Attenuation volume (m3)	465		

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	11 of 11	Project No:	WIE15582
By	N Balboni	Date	10/09/2019
Checked:	O O'Donovan	Date	10/09/2019

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume - catchment West 6**

LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - West 6			
	Area	0.79	ha	
	Attenuation available	369	m3	
	Discharge rate	56.3	l/s	
				
				
	Required volume to achieve 56.3 l/s			
	Attenuation volume (m3)	369		

I. Foul Flow Estimate

		Sheet No:	1 of 2	Project No:	WIE15582
Project Title:	**Stag Brewery**	By:	N Balboni	Date:	30/10/2019
Calculations Title:	**Existing Foul Flow Estimate**	Checked:	D O'Donovan	Date:	30/10/2019

	Dry Weather Flow Rate (per day)	Source	Number of	Factor	Profile (hours)	Peak Flow Rate (litres/second)
Residential				2.12	24	
Existing property = 160 litres/person/day	368.0 litres per unit	Thames Water Guidelines (2016)	0 existing units			0.0
New property = 125 litres/person/day	287.5 litres per unit	Thames Water Guidelines (2016)	0 proposed units			0.0
Occupancy = 2.3 persons						
Hotel	500.0 litres per room	British Water (2013)	15 rooms	3	24	0.3
Student Accommodation	200.0 litres per bed	Thames Water Guidelines (2016)	0 beds	3	24	0.0
Offices	750.0 litres per $100m^2$	Jones (1992)	2318 m^2	3	10	1.4
Retail	400.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
Cinema	10.0 litres per seat	Jones (1992)	0 seats*	3	8	0.0
Health Club/Sports Centre	50.0 litres per customer	British Water (2013)	168 customers**	3	16	0.4
Day School	90.0 litres per pupil	British Water (2013)	0 pupils	3	10	0.0
Boarding School	175.0 litres per pupil	British Water (2013)	0 pupils	3	24	0.0
Hospital	625.0 litres per bed	Jones (1992)	0 beds	3	24	0.0
Nursing Home	350.0 litres per bed	British Water (2013)	0 beds	3	24	0.0
Restaurant	30.0 litres per cover	British Water (2013)	0 covers	3	8	0.0
Pub/Club	15.0 litres per customer	Butler and Davies (2004)	0 customers***	3	12	0.0
Warehouse	150.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
Manufacturing	550.0 litres per $100m^2$	Jones (1992)	28671 m^2	3	12	11.0
Commercial	300.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
SUB TOTAL						13.1
Infiltration percentage 10%						1.3
TOTAL						**14.4**

* Foul flow rate needs to be calculated based on number of seats. An allowance of $4m^2$ has been made for each seat.

Floor area = 0 m^2 4 m^2 per person

** Foul flow rate needs to be calculated based on number of customers. An allowance of $4m^2$ has been made for each customer.

Floor area = 672 m^2 4 m^2 per person

*** Foul flow rate needs to be calculated based on number of customers. An allowance of $4m^2$ has been made for each customer.

Floor area = 0 m^2 4 m^2 per person

Sheet No:	2 of 2	Project No:	WIE15582		
By:	N Balboni	Date:	08/04/2020		
Checked:	D O'Donovan	Date:	08/04/2020		

Project Title: **Stag Brewery**
Calculations Title: **Proposed Foul Flow Estimate**

		Dry Weather Flow Rate (per day)	Source	Number of	Factor	Profile (hours)	Peak Flow Rate (litres/second)
Residential					2.12	24	
Existing property =	*160 litres/person/day*	400.0 litres per unit	Thames Water Guidelines (2016)	0 existing units			0.0
New property =	*125 litres/person/day*	312.5 litres per unit	Thames Water Guidelines (2016)	1250 proposed units			9.6
Occupancy =	*2.5 persons*						
Hotel		500.0 litres per room	British Water (2013)	16 rooms	3	24	0.3
Student Accommodation		200.0 litres per bed	Thames Water Guidelines (2016)	0 beds	3	24	0.0
Offices		750.0 litres per $100m^2$	Jones (1992)	10555 m^2	3	10	6.6
Retail		400.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
Cinema		10.0 litres per seat	Jones (1992)	402 seats*	3	8	0.4
Health Club/Sports Centre		50.0 litres per customer	British Water (2013)	0 customers**	3	16	0.0
Day School		90.0 litres per pupil	British Water (2013)	1200 pupils	3	10	9.0
Boarding School		175.0 litres per pupil	British Water (2013)	0 pupils	3	24	0.0
Hospital		625.0 litres per bed	Jones (1992)	0 beds	3	24	0.0
Nursing Home		350.0 litres per bed	British Water (2013)	0 beds	3	24	0.0
Restaurant		30.0 litres per cover	British Water (2013)	0 covers	3	8	0.0
Pub/Club		15.0 litres per customer	Butler and Davies (2004)	0 customers***	3	12	0.0
Warehouse		150.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
Manufacturing		550.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
Commercial		300.0 litres per $100m^2$	Jones (1992)	0 m^2	3	12	0.0
SUB TOTAL							25.9
Infiltration percentage	10%						2.6
TOTAL							**28.5**

* Foul flow rate needs to be calculated based on number of seats. An allowance of $4m^2$ has been made for each seat.

Floor area = 1606 m^2 4 m^2 per person

** Foul flow rate needs to be calculated based on number of customers. An allowance of $4m^2$ has been made for each customer.

Floor area = 0 m^2 4 m^2 per person

*** Foul flow rate needs to be calculated based on number of customers. An allowance of $4m^2$ has been made for each customer.

Floor area = 0 m^2 4 m^2 per person

UK and Ireland Office Locations