GENERAL NOTES

LEGEND

- Trade Sewers
- Trade Connections to buildings (Unsurveyed)
- Foul Sewers
- Surface Water Sewers
- Gulley Connections
- Assumed Gulley Connections
- Redundant
- New, Stainless Steel

NOTE 1 : SHOWS TRADE TO FOUL FURTHER CLARIFICATION REQUIRED.
NOTE 2 : SHOWS SURFACE WATER TO FOUL FURTHER CLARIFICATION REQUIRED.
NOTE 3 : ASSUMED ROUTE TO SHIP LANE (TO BE CONFIRMED)

No.	DATE	DESCRIPTION OF REVISION OR ISSUE	BY	CK.	PROJ. ENGR. APPROVAL
D	3.12.04	TRADE SEWER AT TRASH COMPACTION ADDED	TR	ACJ	
C	17.11.04	SITE BOUNDARY UPDATED.	TR	ACJ	
B	14.10.04	SITE UPDATED. FILTER ROOM SURVEY ADDED	TR	ACJ	
A	4.10.04	SITE UPDATED. BOTTLING DRAINAGE ADDED	TR	ACJ	

PTS DRG. REF. P979/07/31

CONSULTANT

PENBORN TECHNICAL SERVICES
Garrett House, Mount Road
Brentford, Middlesex TW8 0QA
Tel. 020-8569-7979
Fax. 020-8568-1621
E-mail: pts@penborn.co.uk

PTS PROJ. REF.

ESR	
DESIGNED	
DRAWN	
CHECKED	
SCALE	1:500 @ A0
DATE	
KEY PLAN	

ANHEUSER–BUSCH COMPANIES

PROJ. BID

SITE PLAN SHOWING EXIST. SERVICES ALL SERVICES

BLDG. NAME | BLDG. No.

ENGINEER APPROVED | OWNER APPROVED

PLANT	BLDG. No.	DIV.	DWG. No.	REV.
STAG	O	M	1016	D

D. Greater London Authority Correspondence

Nora Balboni

From: Katherine Wood <Katherine.Wood@london.gov.uk>
Sent: 08 February 2019 17:12
To: Nora Balboni; Stuart McTaggart; Abby Crisostomo
Cc: Anna Gargan; Suzanne Robson
Subject: RE: Stag Brewery (GLA ref: 4172a/b) drainage strategy

Hi Nora,

Apologies, I should have confirmed with you that Stuart had reviewed this response and confirmed that it addressed outstanding issues on drainage.

Kind regards,

Katherine

Katherine Wood
Team Leader, Development Management
GREATER**LONDON**AUTHORITY
City Hall, The Queen's Walk, London SE1 2AA
020 7983 5743
www.london.gov.uk/what-we-do/planning
katherine.wood@london.gov.uk

From: Nora Balboni <nora.balboni@watermangroup.com>
Sent: 08 February 2019 17:07
To: Stuart McTaggart <Stuart.McTaggart@london.gov.uk>; Abby Crisostomo <Abby.Crisostomo@london.gov.uk>; Katherine Wood <Katherine.Wood@london.gov.uk>
Cc: Anna Gargan <AGargan@geraldeve.com>; Suzanne Robson <SRobson@geraldeve.com>
Subject: FW: Stag Brewery (GLA ref: 4172a/b) drainage strategy

Hi Stuart

Hope you are well. Have you had the chance to look at the Briefing Note?

Kind regards,

Nora Balboni
Flood Risk Engineer
Waterman Infrastructure & Environment Ltd

Pickfords Wharf | Clink Street | London SE1 9DG
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www.watermangroup.com | LinkedIn | Twitter

From: Nora Balboni
Sent: 08 January 2019 16:22
To: 'Stuart McTaggart' <Stuart.McTaggart@london.gov.uk>
Cc: 'Anna Gargan' <AGargan@geraldeve.com>; 'Abby Crisostomo' <Abby.Crisostomo@london.gov.uk>; 'Katherine Wood' <Katherine.Wood@london.gov.uk>; Ellen Smith <ellen.smith@watermangroup.com>; Donal O'Donovan

<donal.odonovan@watermangroup.com>; Harry Chetty <harry.chetty@watermangroup.com>
Subject: RE: Stag Brewery (GLA ref: 4172a/b) drainage strategy

Hi Stuart

Happy new year, I hope you had a great break.

Please find attached the Briefing Note outlining the amendments to the drainage strategy for the Stag Brewery development as per our agreements below.

Let me know if you have any queries.

Kind regards,

Nora Balboni
Flood Risk Engineer
Waterman Infrastructure & Environment Ltd

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From: Nora Balboni
Sent: 12 December 2018 09:24
To: Stuart McTaggart <Stuart.McTaggart@london.gov.uk>
Cc: Anna Gargan <AGargan@geraldeve.com>; Ellen Smith <ellen.smith@watermangroup.com>; Donal O'Donovan <donal.odonovan@watermangroup.com>; Abby Crisostomo <Abby.Crisostomo@london.gov.uk>; Katherine Wood <Katherine.Wood@london.gov.uk>
Subject: RE: Stag Brewery (GLA ref: 4172a/b) drainage strategy [Filed 12 Dec 2018 09:24]

Hi Stuart

Thank you for confirming.

As discussed, we will provide a Briefing Note which will cover the following:

- Amended drainage strategy plan to show permeable paving extents;
- Volume calculations to estimate the attenuation available within the permeable paving sub-base and rain garden feature to show that a restriction of surface water runoff beyond the minimum 50% requirement is achieved;
- Sports pitch in south-west of site removed from surface water calculations under the assumption that it would drain freely, subject to ground investigations during detailed design; and
- Summary of all SuDS included.

Kind regards,

Nora Balboni
Flood Risk Engineer
Waterman Infrastructure & Environment Ltd

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www.watermangroup.com | LinkedIn | Twitter

From: Stuart McTaggart <Stuart.McTaggart@london.gov.uk>
Sent: 11 December 2018 15:23
To: Nora Balboni <nora.balboni@watermangroup.com>
Cc: Anna Gargan <AGargan@geraldeve.com>; Ellen Smith <ellen.smith@watermangroup.com>; Donal O'Donovan <donal.odonovan@watermangroup.com>; Abby Crisostomo <Abby.Crisostomo@london.gov.uk>; Katherine Wood

<Katherine.Wood@london.gov.uk>
Subject: Re: Stag Brewery (GLA ref: 4172a/b) drainage strategy [Filed 12 Dec 2018 09:17]

Hi Nora,

To summarise our chat earlier:

1. The intent of the original drainage strategy was to show that it is possible within site constraints to meet the absolute minimum requirements of London Plan policy 5.13.
2. We would like to see that all efforts have been made to get as close to possible to the policy targets (i.e. greenfield runoff, drainage hierarchy, and a preference for SuDS with multiple benefits). We expect that on large sites such as this the policy targets should be able to be met in most cases.
3. Waterman will produce an addendum to the drainage strategy to more clearly show how the drainage will integrate SuDS with multiple benefits and identify an approximate maximum reduction in discharge rate. Where appropriate the reduction in discharge rate can be caveated with assumptions/risks that need confirmation during detailed design (e.g. infiltration rates of the subgrade below the 3G pitch).

Regards,

Stuart McTaggart
Flood Risk, Drainage & Water Policy Officer
Development, Enterprise & Environment
Greater London Authority
City Hall, The Queens Walk, London SE1 2AA

Email: stuart.mctaggart@london.gov.uk
Web: Greening London / Greater London Authority
Follow the GLA's Environment team on Twitter @LDN_Environment
Sign up to our e-newsletter

From: Nora Balboni <nora.balboni@watermangroup.com>
Sent: 04 December 2018 10:32
To: Stuart McTaggart <Stuart.McTaggart@london.gov.uk>
Cc: Anna Gargan <AGargan@geraldeve.com>; Ellen Smith <ellen.smith@watermangroup.com>; Donal O'Donovan <donal.odonovan@watermangroup.com>
Subject: RE: GLA Flood Feedback

Hi Stuart

Thanks for your comments. Please feel free to give me a call to discuss as I don't have your contact number.

We understand that developments should aim to achieve greenfield runoff rates, or as close as feasible. To endeavour to achieve this we took the following approach:

1. As per the drainage hierarchy, the amount of surface water that could be discharged into the River Thames was maximised by incorporating the innovative shallow conveyance channel system;

2. For the remaining site, where discharge into the Thames was not feasible due to levels or crossing third party land, as many tanks were incorporated as possible. The horizontal constraints for the tanks include the basement extent, proposed building outlines, and landscaping. The vertical constraints include the required soil depth for tree pits and achieving a gravity connection into the surrounding sewer network. London Borough of Richmond accepted the 50% restriction during pre-application consultation. Conscious that the constraints of the site preclude a greater reduction in runoff, Thames Water were consulted to ensure that the surrounding sewer network has sufficient capacity. Thames Water confirmed capacity for both surface and foul water flows. It is important to note that the surface water flows from the development are only conveyed within the Thames Water network for maximum of 350m before discharging into the River Thames.

We are keen to find a solution to reduce runoff further to find an agreeable solution. I would appreciate your thoughts on the following options:

- Allowing the proposed sports pitch to drain freely, i.e. excluding it from the surface water calculations and therefore reducing the size requirement for the tank beneath the MUGA pitch. Subject to levels I could explore the possibility of directing surface water from other areas into this tank, reducing the restriction beyond the 50% mark. In the current strategy we assumed that the pitch would need to be positively drained due to the underlying London Clay to avoid potential water logging beneath the pitch. However, if no other areas would drain towards the pitch, allowing it to free drain could be considered.

- We took a conservative approach when designing the current drainage strategy, assuming 100% impermeable proposed area (discounting the park area in the south eastern corner of the site). We did not quantify the attenuation available within the rain garden along the green link and within the permeable paving, to demonstrate the worst-case scenario that the minimum required restriction (i.e. 50%) can be achieved within the tanks themselves. I will do a quick calculation to demonstrate the additional attenuating volume that these features would hold, reducing the restriction beyond the 50% mark.

- Exploring further areas for incorporation of permeable paving.

- The current proposals do not include for blue roofs. However, green roofs are proposed throughout the development, which, although not quantifiable, provide a betterment to the surface water runoff regime.

Let me know whether you find the above agreeable, I will then amend the drainage strategy drawing to show the constraints to the attenuation volumes and incorporate any changes, and will re-issue for you to review.

Kind regards,

Nora Balboni
Flood Risk Engineer
Waterman Infrastructure & Environment Ltd

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www.watermangroup.com | LinkedIn | Twitter

From: Anna Gargan
Sent: 28 November 2018 16:51
To: 'Ellen Smith'; 'Nora Balboni'
Cc: Guy Duckworth; Susie Taylor; Neil Henderson
Subject: GLA Flood Feedback

Hi Ellen / Nora,

I hope you are well.

The GLA has provided the following response to Flood comments issued on 20 November 2018.

Please can you review and respond. The officer states that he is happy to speak with you directly.

Kind regards,
Anna

"I have reviewed the Applicant's second response to our Stage 1 comments. Following our previous response at the end of October the final point of contention appears to be the proposed discharge rate where the site will drain to the public sewer.

It is noted that the London Plan and DEFRA national guidance require a development to achieve as close to greenfield runoff rate as possible (approximately a >90% reduction from pre-development rates for a brownfield site). In this case the Applicant is proposing to reduce the discharge by 50%, well short of the policy requirements. The Applicant should calculate the greenfield runoff rate and provide calculations showing the attenuation storage required to meet this discharge rate. The Applicant should then seek to include additional attenuation storage to get as close to this value as possible. Our original comments suggested building the biodiverse roofs as green/blue roofs to provide additional storage and this has not been addressed to date. The Applicant should then provide a clear drawing or markup clearly showing the constraints to expanding attenuation storage if discharge at greenfield runoff rate is not proposed.

I am happy to discuss directly with the Applicant's consultant to resolve this if required.

Regards,

Stuart McTaggart
Flood Risk, Drainage & Water Policy Officer
Development, Enterprise & Environment
Greater London Authority
City Hall, The Queens Walk, London SE1 2AA

Email: stuart.mctaggart@london.gov.uk

Anna Gargan
Planning Consultant

Tel. +44 (0)20 7518 7240
Mobile. +44 (0) 7979532721
AGargan@geraldeve.com

Gerald Eve LLP
72 Welbeck Street London W1G 0AY
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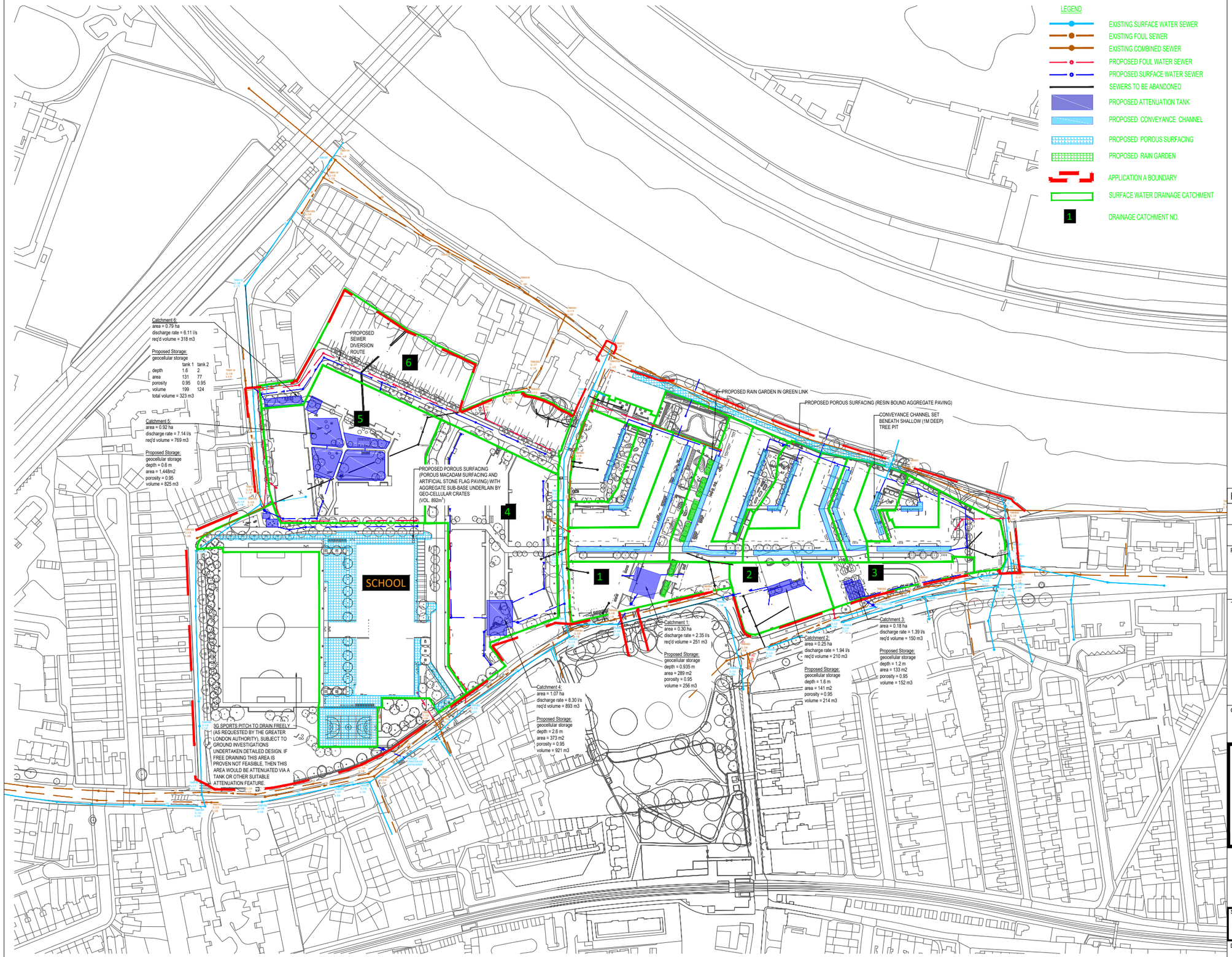
E. Existing and Proposed Drainage Strategy Plan



GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.
6. EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF P979/07/31).
7. EXISTING FOUL AND SURFACE WATER CONNECTIONS TO BE RE-USED WHERE FEASIBLE, SUBJECT TO DETAILED DESIGN.
8. GREEN ROOFS AND WATER BUTTS ARE TO BE INCORPORATED ACROSS THE SITE TO PROVIDE SOURCE CONTROL AND FACILITATE WATER REUSE. THE PROPOSED LOCATION OF GREEN ROOFS CAN BE FOUND ON THE SITEWIDE URBAN GREEN FACTOR DRAWING (P10736-00-004-GIL-0802), WHICH IS AVAILABLE IN APPENDIX K OF THE DRAINAGE STRATEGY REPORT. THE PROPOSED LOCATION OF WATER BUTTS IS TO BE DETERMINED AT DETAILED DESIGN STAGE BUT CAN BE INDICATIVELY ASSUMED BASED ON THE LOCATION OF THE DEVELOPMENT BLOCKS, AS SHOWN WITHIN THE DEVELOPMENT PROPOSALS.

REV	Status	Date	Description	By	Chk
S0		28.07.22	ISSUED	SW	BM

Amendments

Project

STAG BREWERY

Title

PROPOSED SURFACE WATER DRAINAGE STRATEGY

Client

RESELTON PROPERTIES LIMITED

Office Address

Telephone & Fax numbers
mail@watermangroup.com www.watermangroup.com

Suitability: INITIAL STATUS (WIP) S0

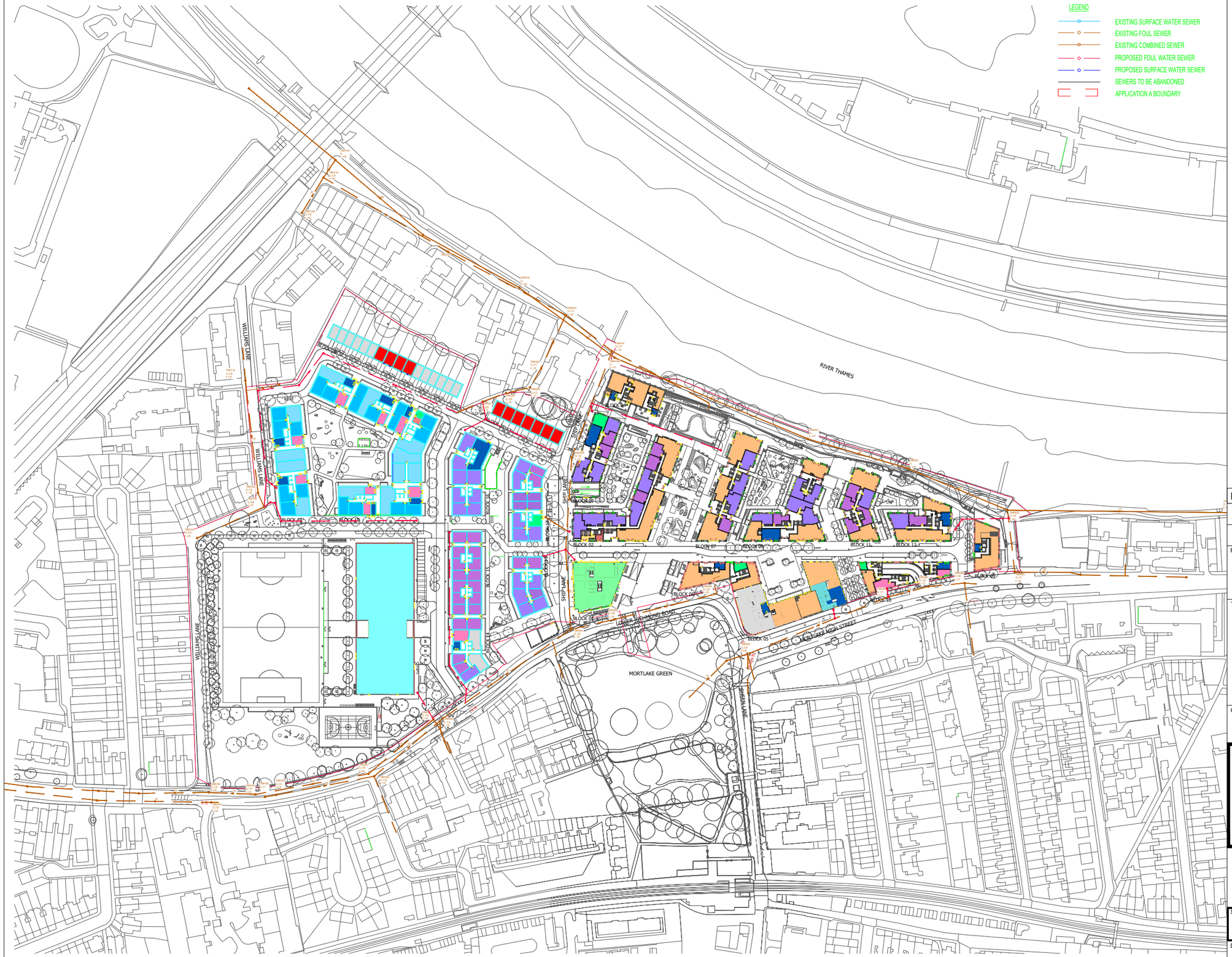
Designed By	Director	Waterman Ref
Designer	BM	I\Projec
Drawn By	**Date**	**Scales @ A3**
SW	August 2022	1:25,000

Project - Originator - Volume - Level - Type - Role - Number: 18671-WIE-ZZ-ZZ-DR-D-92001

Revision: P01

File Path \\H-Incs\wie\Projects\WIE18671\100\7_CAD\92_Drainage\

A3-Wat-BS-S, x-drainagestrategy, x-OS



GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.
6. EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF P979/07/31).
7. EXISTING FOUL AND SURFACE WATER CONNECTIONS TO BE RE-USED WHERE FEASIBLE, SUBJECT TO DETAILED DESIGN.

REV	Status	Date	Description	By	Chk
S0		28.07.22	ISSUED	SW	BM

Amendments

Project

STAG BREWERY

Title

PROPOSED FOUL WATER DRAINAGE STRATEGY

Client

RESELTON PROPERTIES LIMITED

Office Address

Telephone & Fax numbers
mail@watermangroup.com www.watermangroup.com

Suitability: INITIAL STATUS (WIP) — S0

Designed By	Director	Waterman Ref
Designer	BM	I\Projec
Drawn By	**Date**	**Scales @ A3**
SW	August 2022	1:25,000

Project - Originator - Volume - Level - Type - Role - Number: 18671-WIE-ZZ-ZZ-DR-D-92002

Revision: P01

File Path \\H-Incs\wie\Projects\WIE18671\100\7_CAD\92_Drainage\

A3-Wat-BS-S, x-drainagestrategy, x-OS

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TWMH2201

225

TWMH1104
CL: 4.53
IL: 0.29

150

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CL: 5.06
IL: 4.00

300

600

TWMH2101

TWMH1103
CL: 5.88
IL: 1.73

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CL:
IL: -4.82

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IL: 0.92

225

600

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IL: -4.73

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IL: 4.19

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TWMH3002
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ASSUMED CONNECTION TO THAMES WATER SEWER NETWORK

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TWMH3008

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225

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IL: 2.79

TWMH3003
CL: 6.06
IL: 2.01

225

TWMH1005
CL: 6.30
IL: 3.86

600

TWMH1901

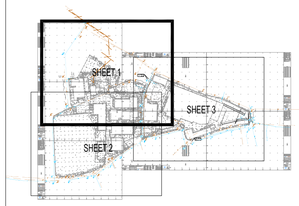
TWMH3007
CL: 5.99
IL: 1.99

LEGEND

- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL SEWER
- EXISTING PRIVATE COMBINED SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PUBLIC RISING MAIN

NOTES

1) EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF: P979/07/31).



Rev	Date	Description	By
A01	20.10.16	PRELIMINARY ISSUE	DO

Amendments

Project
STAG BREWERY

Title
EXISTING FOUL AND SURFACE WATER DRAINAGE LAYOUT
SHEET 1 OF 3

Client
DARTMOUTH CAPITAL ADVISORS LIMITED

Waterman
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mail@watermangroup.com www.watermangroup.com

Drawing Status
PRELIMINARY

Designed by -	Checked by DO	Project No	WIE10667
Drawn by DO	Date OCTOBER 2016		
Scales @ A1 work to figured dimensions only 1:500		Computer File No	WIE10667CSA920001.dwg

Publisher	Zone	Category	Number	Revision
WIE	SA	92	0001	A01

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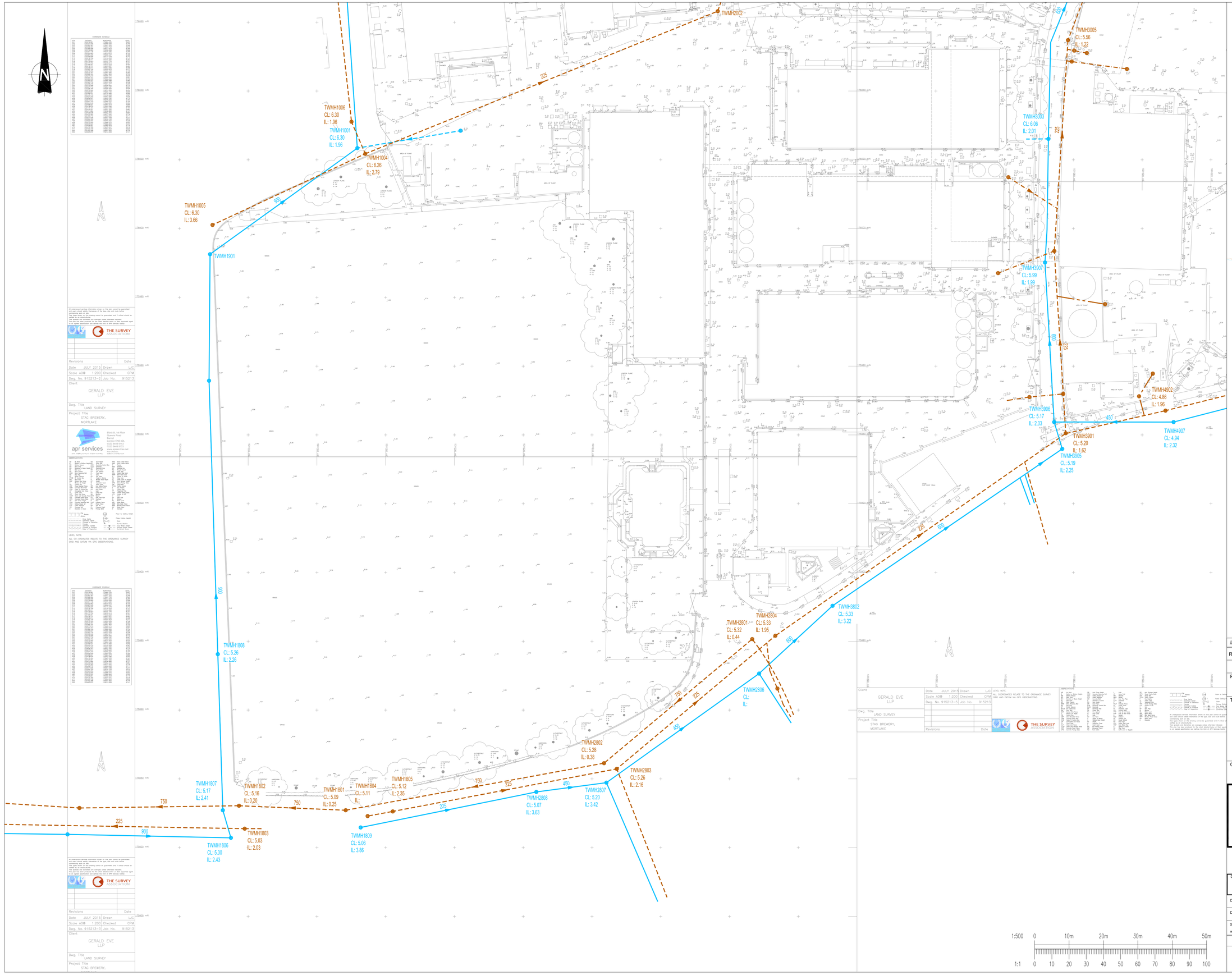
1:1 0 10 20 30 40 50 60 70 80 90 100



LEGEND

- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL SEWER
- EXISTING PRIVATE COMBINED SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PUBLIC RISING MAIN

NOTES

1) EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF: P979/07/31).

1:500 0 10m 20m 30m 40m 50m

1:1 0 10 20 30 40 50 60 70 80 90 100

Rev	Date	Description	By
A01	20.10.16	PRELIMINARY ISSUE	DO

Amendments

Project
STAG BREWERY

Title
EXISTING FOUL AND SURFACE WATER DRAINAGE LAYOUT SHEET 2 OF 3

Client
DARTMOUTH CAPITAL ADVISORS LIMITED

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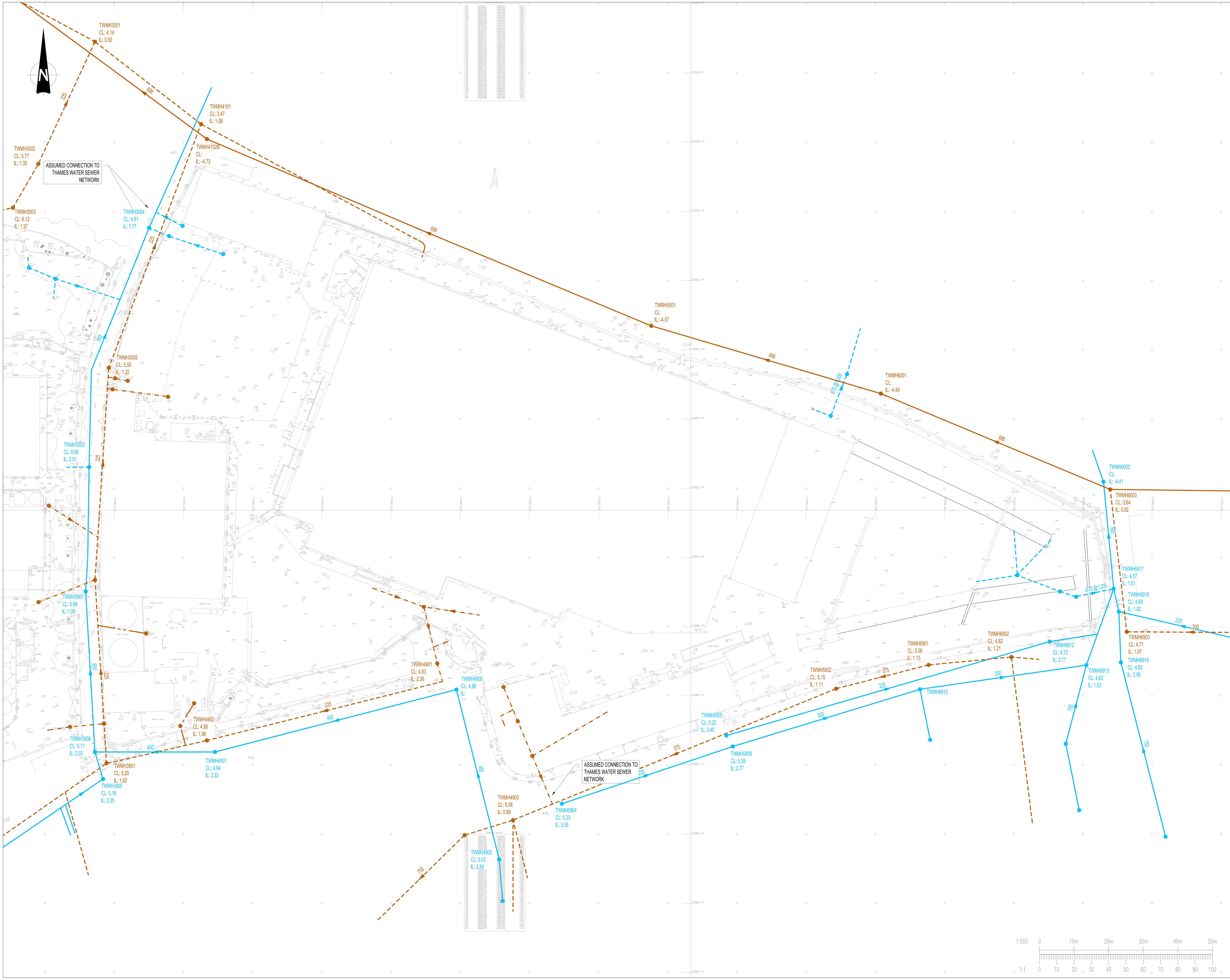
mail@watermangroup.com www.watermangroup.com

Drawing Status
PRELIMINARY

Designed by	-	Checked by	DO	Project No	WIE10667
Drawn by	DO	Date	OCTOBER 2016		
Scales @ A1 work to figured dimensions only	1:500			Computer File No	WIE10667CSA920002.dwg

Publisher	Zone	Category	Number	Revision
WIE	SA	92	0002	A01

A1-Wat-S, Topographical Survey, WIE10667-X-EX-DRAINAGE

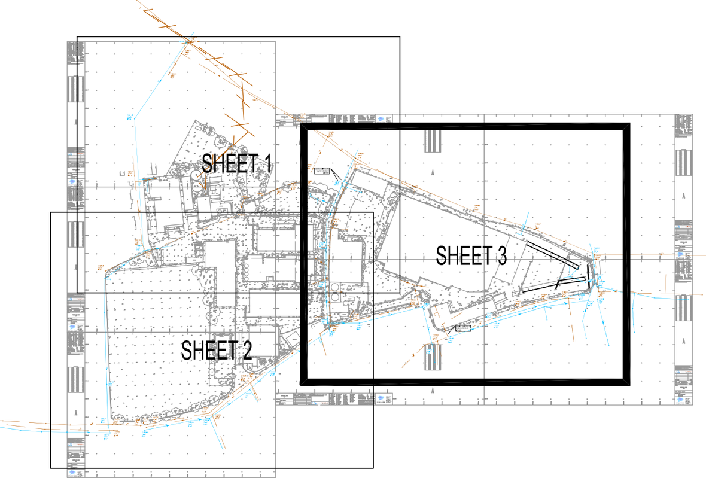


LEGEND

- EXISTING PRIVATE SURFACE WATER SEWER
- EXISTING PRIVATE FOUL SEWER
- EXISTING PRIVATE COMBINED SEWER
- EXISTING PUBLIC SURFACE WATER SEWER
- EXISTING PUBLIC FOUL SEWER
- EXISTING PUBLIC COMBINED SEWER
- EXISTING PUBLIC RISING MAIN

NOTES

1) EXISTING DRAINAGE LAYOUT BASED ON THAMES WATER SEWER RECORDS AND PENBORN TECHNICAL SERVICES DRAWING (REF: P979/07/31).



Rev	Date	Description	By
A03	21.11.16	INVERT/COVER LEVELS ADDED	DO
A02	24.10.16	VIEWPORT AMENDED	DO
A01	20.10.16	PRELIMINARY ISSUE	DO

Amendments

Project

STAG BREWERY

Title

EXISTING FOUL AND SURFACE WATER DRAINAGE LAYOUT SHEET 3 OF 3

Client

DARTMOUTH CAPITAL ADVISORS LIMITED

Waterman

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mail@watermangroup.com www.watermangroup.com

Drawing Status

PRELIMINARY

Designed by	-	Checked by	DO	Project No WIE10667
Drawn by	DO	Date	OCTOBER 2016	
Scales @ A1 work to figured dimensions only		1:500		Computer File No WIE10667CSA920003.dwg

Publisher	Zone	Category	Number	Revision
WIE	SA	92	0003	A03

A1-Wat-S, Topographical Survey, WIE10667-X-EX-DRAINAGE

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
Engineer
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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

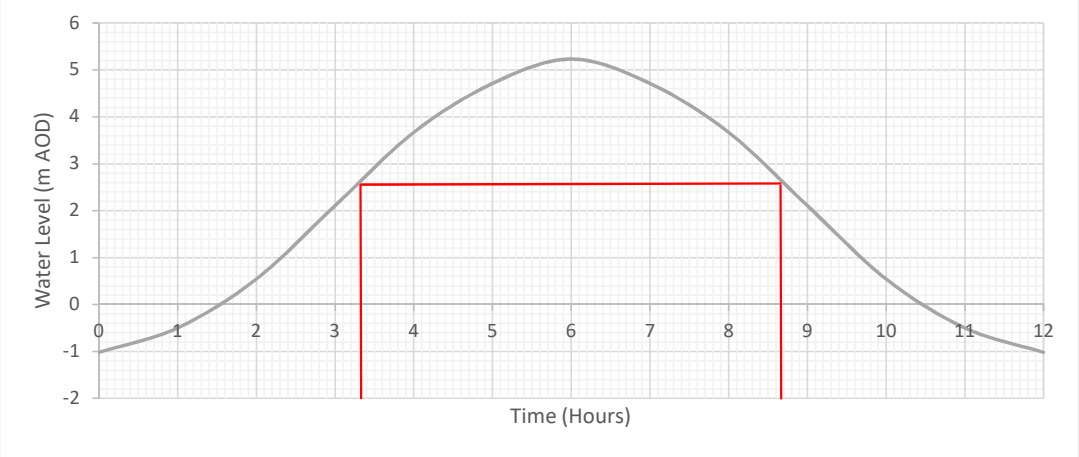
Inputs

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

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Sean Whelan
Site name:	Stag Brewery
Site location:	Stag Brewery

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

Site Details

Latitude:	51.47029° N
Longitude:	0.26635° W
Reference:	922927723
Date:	Jul 12 2022 09:19

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	2	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	598	605
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	1.52	2.42
1 in 1 year (l/s):	1.29	2.06
1 in 30 years (l/s):	3.49	5.57
1 in 100 year (l/s):	4.84	7.73
1 in 200 years (l/s):	5.67	9.06

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	1 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Existing Discharge Rate - 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 5.69 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 = 812.3 l/s or 142.8 l/s/ha	
	50% of the existing runoff rate= 405.0 l/s 71.3 l/s/ha	

waterman

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	2 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume, IH124 Greenfield Runoff Rate**

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;

IH124 Greenfield Runoff Rate - Q100

7.7 l/s/ha

Summary **Attenuation volumes required by Drainage Catchment**

Catchment	Area (ha)	Allowable runoff Rate (l/s)	Required attenuation (m^3)
East - 1	0.30	2.4	251
East - 2	0.25	1.9	210
East - 3	0.18	1.4	150
West - school	1.31	10.1	1095
West - 4	1.07	8.3	893
West - 5	0.92	7.1	769
West - 6	0.79	6.1	319
Total	4.84	37.4	3686

	Greenfield runoff rate (l/s/ha)	Existing (l/s/ha)	Req'd storage (m3)	Proposed discharge rate* (l/s)	Percentage Reduction
Qbar	2.42	43.3	-	7.7	82%
1 in 1	2.06	35.0	-	7.7	78%
1 in 30	5.57	98.4	-	7.7	92%
1 in 100	7.73	142.8	-	7.7	95%
1 in 100+40CC	10.82	199.8	3686.0	7.7	96%

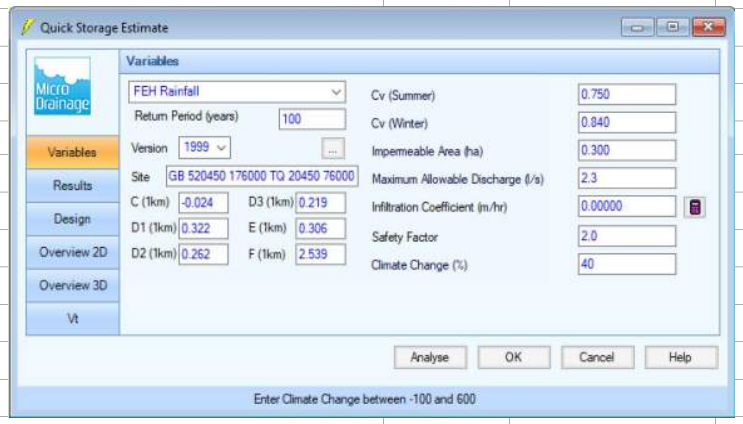
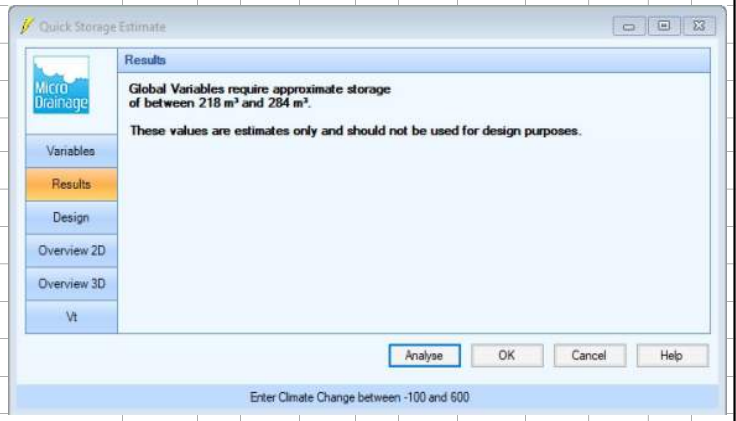
* A constant proposed discharge rate has been assumed as a worst-case discharge for lower return period events. Despite the assumed higher discharge rate, 1 in 1 year runoff from the site is seen to reduce by 78%.

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	3 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume to achieve IH124 greenfield runoff rate**

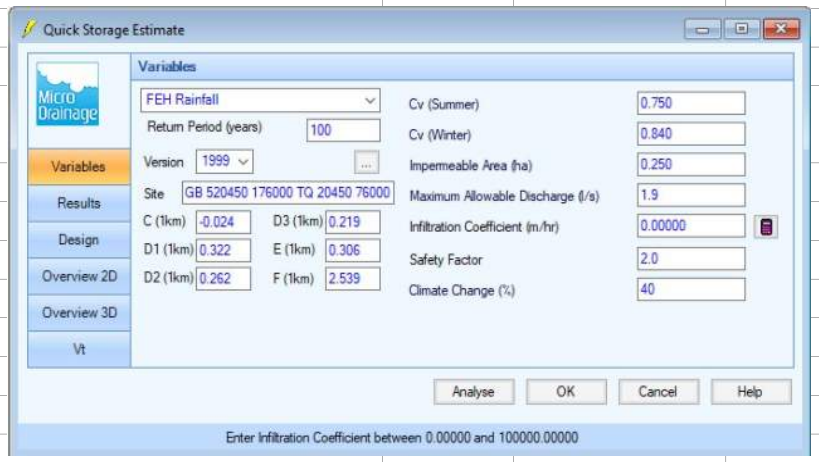
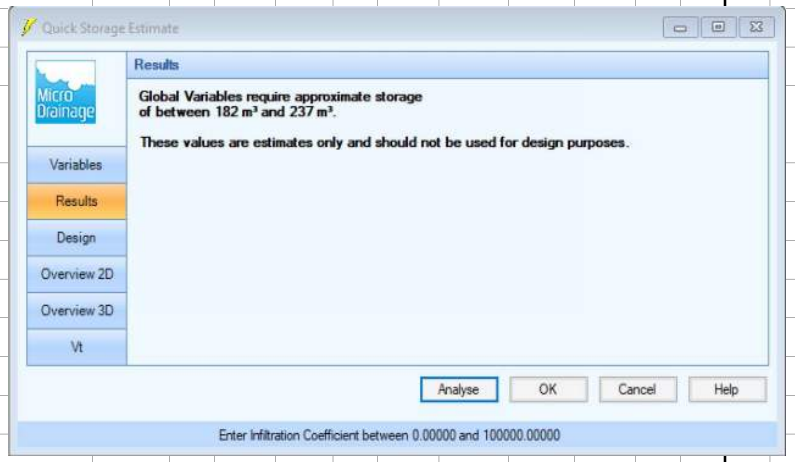
LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - East 1			
	Area	0.30	ha	
	IH124 Greenfield Runoff Rate - Q10	7.73	l/s/ha	
	Maximum allowable discharge	2.35	l/s	
				
				
	50% attenuation volume (m^3)	140		
	Greenfield attenuation volume (m^3)	251		

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	4 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume to achieve IH124 greenfield runoff rate**

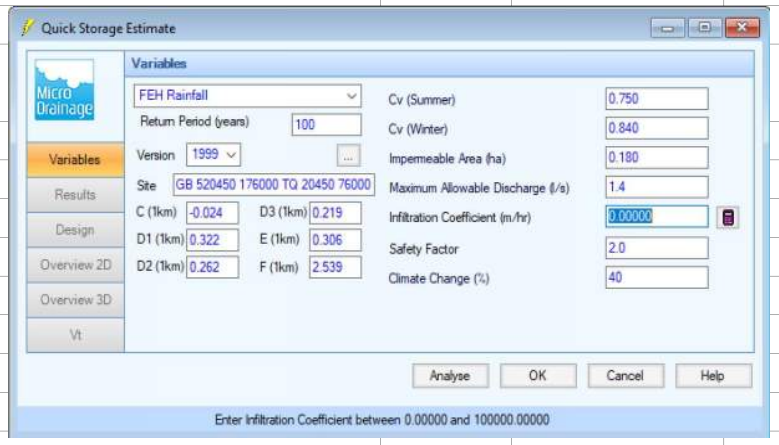
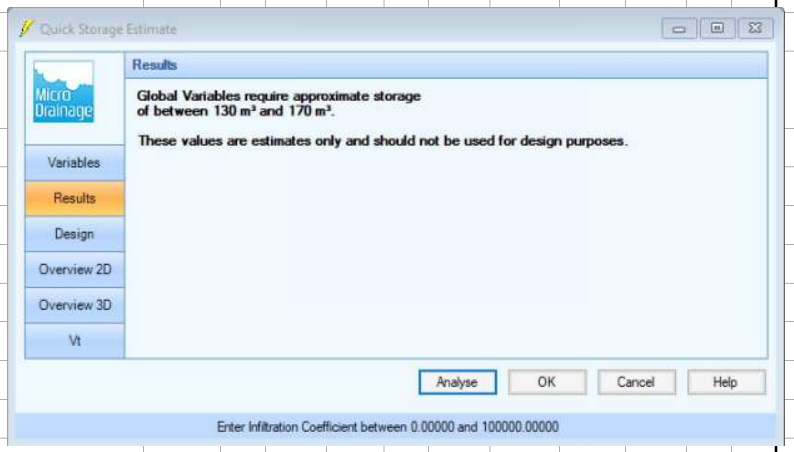
LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - East 2			
	Area	0.25	ha	
	IH124 Greenfield Runoff Rate - Q10	7.73	l/s/ha	
	Maximum allowable discharge	1.94	l/s	
				
				
	50% attenuation volume (m^3)	116.5		
	Greenfield attenuation volume (m^3)	210		

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	5 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume to achieve IH124 greenfield runoff rate**

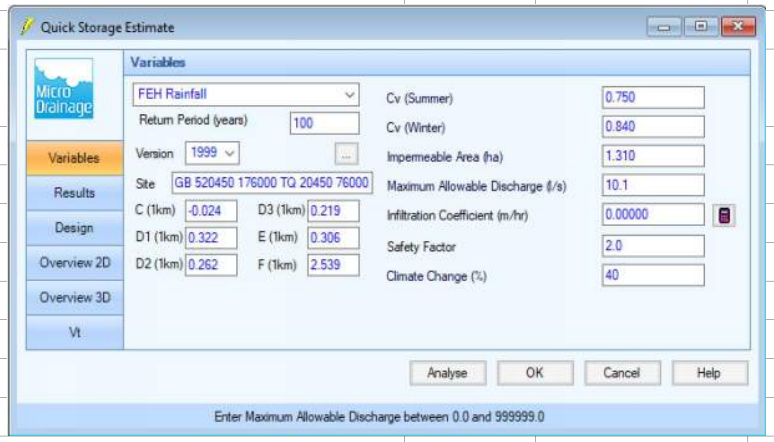
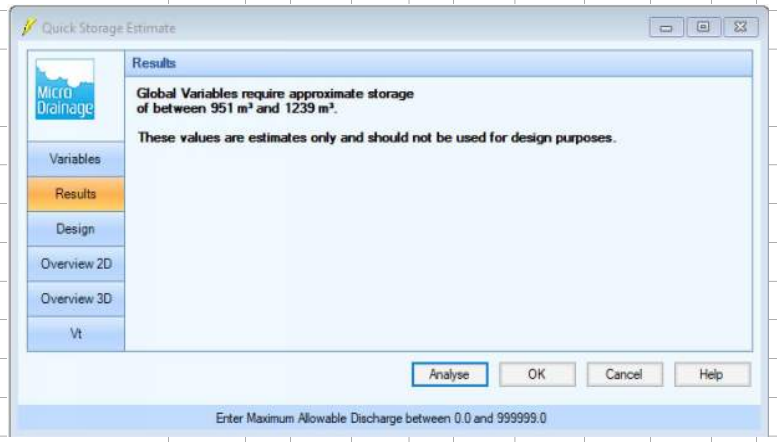
LOCATION	CALCULATIONS			OPTIONS
	In order to calculate the volume of surface water attenuation required for the Site, Windes Microdrainage version 2016.1, Source Control module, Quick Storage Estimate has been used. The input and output data for which are shown below;			
	Drainage Catchment - East 3			
	Area	0.18	ha	
	IH124 Greenfield Runoff Rate - Q10	7.73	l/s/ha	
	Maximum allowable discharge	1.39	l/s	
				
				
	50% attenuation volume (m^3)	84		
	Greenfield attenuation volume (m^3)	150		

CALCULATIONS

Company:	WIE	Office:	London
Sheet No:	6 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume to achieve IH124 greenfield runoff rate**

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 - School			
	Area	1.31	ha	
	IH124 Greenfield Runoff Rate - Q10	7.73	l/s/ha	
	Maximum allowable discharge	10.14	l/s	
				
				
	50% attenuation volume (m^3)	NA		
	Greenfield attenuation volume (m^3)	1095		

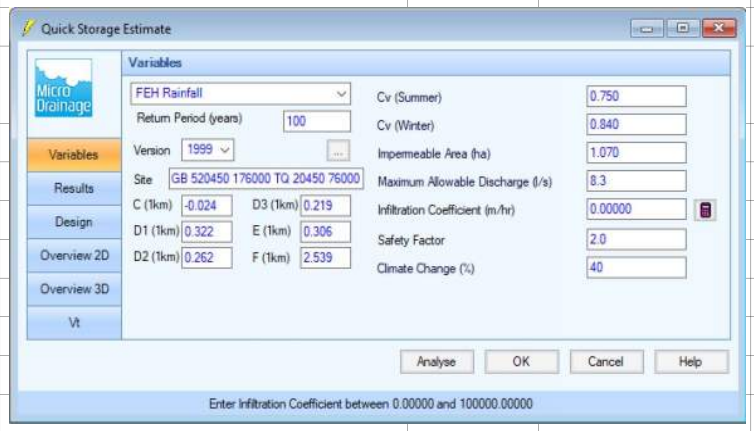
CALCULATIONS

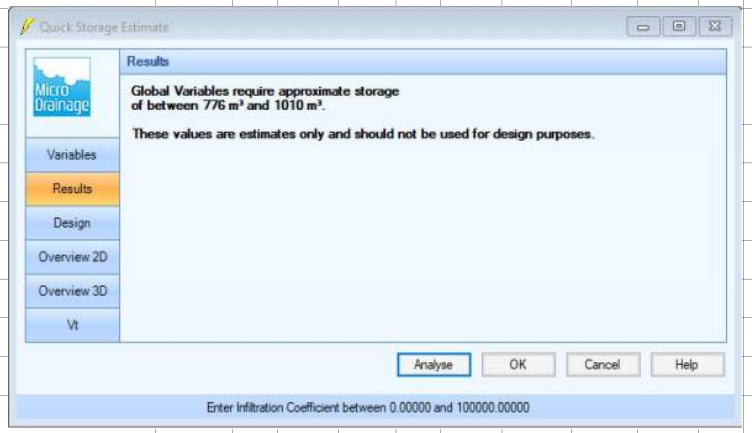
Company:	WIE	Office:	London
Sheet No:	7 of 9	Project No:	WIE18671
By	S Whelan	Date	29/07/2022
Checked:	B McCarthy	Date	29/07/2022

Project Title **Former Stag Brewery, Mortlake**

Calculations Title **Surface water attenuation volume to achieve IH124 greenfield runoff rate**

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	
	IH124 Greenfield Runoff Rate - Q10	7.73	l/s/ha	
	Maximum allowable discharge	8.30	l/s	





	50% attenuation volume (m^3)	499	
	Greenfield attenuation volume (m^3)	893	