

Appendix C

Borehole Records

Hayes and Harlington WS1 WLS

X: 509718 Y: 179408.62 Level:

Start: End:

Client: Hochtief

Contractor: Phil Carr

Engineer: Max Lindsay

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DEPTH METRES	Depth	Level	Log	Description
				NO RECOVERY Driller notes Hand Pit pre dug by client Drilled from Ground Level
	0.60	-0.60		
1.0	1.00	-1.00		MADE GROUND Soft to firm brown orangish slightly gravelly slightly sandy CLAY with occasional wood fragments Sand is fine to coarse Gravel is angular to sub angular fine to coarse quartzite granite bituminous material
	1.50	-1.50		
	1.70	-1.70		NO RECOVERY Driller notes soft to firm brown sandy
2.0	2.00	-2.00		MADE GROUND Soft to firm brown orangish very gravelly slightly sandy CLAY with a low cobble content of flint Sand is fine to coarse Gravel is angular to sub rounded fine to coarse flint and occasional black bituminous material
3.0	3.00	-3.00		Firm brown CLAY
				Firm brown silty CLAY
				Firm brown slightly sandy CLAY Sand is fine to coarse
	3.80	-3.80		
	3.90	-3.90		
4.0	4.14	-4.14		Firm brown gravelly very sandy CLAY Gravel is fine to coarse angular to sub rounded flint Sand is fine to coarse
				Dense light brown sandy sub angular to sub rounded fine to coarse flint GRAVEL Sand is fine to coarse

IMPORTANT: This is a basic log auto-generated from AGS data held by the National Geoscience Data Centre (NGDC) and does not necessarily include all of the information supplied in the original AGS file. If you wish to deposit AGS files to the NGDC please see www.bgs.ac.uk/services/ngdc. Generated 23-11-2021 at 16:58 by BGS Groundhog (BETA). BGS Reference 2020022810022400

GENERAL REMARKS

Inspection Pit to 1.20m pre-dug and back-filled by client. No groundwater encountered. Windowless sample borehole refused at 4.14m. Borehole backfilled with bentonite seal. Dynamic probe refused immediately at 4.2m bgl. Coordinates are approximate and inferred from OS mapping.

Appendix D

Thames Water Asset Plans

Ardent Consulting Engineers
Hallmark Building
Leadenhall Street
LONDON
EC3M 5JE

Search address supplied 14
Sandow Crescent
Hayes
UB3 4QH

Your reference Former Victoria

Our reference ALS/ALS Standard/2021_4547253

Search date 24 November 2021

Knowledge of features below the surface is essential for every development

The benefits of this knowledge not only include ensuring due diligence and avoiding risk, but also being able to ascertain the feasibility of any development.

Did you know that Thames Water Property Searches can also provide a variety of utility searches including a more comprehensive view of utility providers' assets (across up to 35-45 different providers), as well as more focused searches relating to specific major utility companies such as National Grid (gas and electric).

Contact us to find out more.



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



0800 009 4540

Search address supplied: 14, Sandow Crescent, Hayes, UB3 4QH

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 0800 009 4540, 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.

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.

With regard to the fresh water supply, this site falls within the boundary of another water company. For more information, please redirect your enquiry to the following address:

Affinity Water Ltd
Tamblin Way
Hatfield
AL10 9EZ
Tel: 0345 3572401



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

Asset Location Search Sewer Map - ALS/ALS Standard/2021 4547253



The width of the displayed area is 500 m and the centre of the map is located at OS coordinates 509658,179201
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.

Based on the Ordnance Survey Map with the Sanction of the controller of H.M. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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
792H	n/a	n/a
792I	n/a	n/a
70ZA	n/a	n/a
7033	31.72	29.22
721C	n/a	n/a
621K	n/a	n/a
89XH	n/a	n/a
89XB	n/a	n/a
89XC	n/a	n/a
89XA	n/a	n/a
89XN	n/a	n/a
8007	31.87	29.11
90LN	n/a	n/a
80LS	n/a	n/a
80LM	n/a	n/a
80LN	n/a	n/a
80LP	n/a	n/a
80LF	n/a	n/a
80LG	n/a	n/a
801A	n/a	n/a
801B	n/a	n/a
8109	31.97	30.78
8121	30.9	29.6
8002	31.01	29.2
8029	32.23	30.03
8009	30.93	30.25
8004	31.35	29.14
8008	30.9	30.3
8001	31	29.4
8107	30.98	30.46
8105	31.03	30.56
8102	31.02	29.75
8108	30.94	29.62
8104	30.96	29.64
80LB	n/a	n/a
80LC	n/a	n/a
8006	32.05	28.97
80HH	n/a	n/a
80LA	n/a	n/a
8013	32.87	31.22
80HJ	n/a	n/a
8005	32.62	30.32
801LD	n/a	n/a
8026	32.1	29.92
80LR	n/a	n/a
81LA	n/a	n/a
80XB	n/a	n/a
80LQ	n/a	n/a
80LE	n/a	n/a
8024	31.9	30.9
89HH	n/a	n/a
89XG	n/a	n/a
7906	n/a	n/a
89XF	n/a	n/a
89XN	n/a	n/a
89XO	n/a	n/a
89XP	n/a	n/a
89XQ	n/a	n/a
89HA	n/a	n/a
7908	n/a	n/a
89XM	n/a	n/a
79FF	n/a	n/a
7907	n/a	n/a
89XX	n/a	n/a
89HC	n/a	n/a
7909	n/a	n/a
79FH	n/a	n/a
7910	n/a	n/a
79ZI	n/a	n/a
7901	31.98	29.3
89XD	n/a	n/a
80A1	n/a	n/a
79FK	n/a	n/a
70ZI	n/a	n/a
7035	n/a	n/a
80XE	n/a	n/a
80XL	n/a	n/a
89XL	n/a	n/a
89HJ	n/a	n/a
89HK	n/a	n/a
89HI	n/a	n/a
7905	n/a	n/a
79FE	n/a	n/a
8101	31.02	30
7125	31.12	29.95
8103	30.96	29.81
7108	31.03	30.27
711E	n/a	n/a
7107	31.17	29.69
7121	31.05	30.34
7114	31.08	30.35

Manhole Reference	Manhole Cover Level	Manhole Invert Level
711F	n/a	n/a
7120	31.16	30.78
811A	n/a	n/a
811B	n/a	n/a
811F	n/a	n/a
711D	n/a	n/a
811C	n/a	n/a
811D	n/a	n/a
8106	31.06	29.08
711A	n/a	n/a
7111	31.13	30.13
711B	n/a	n/a
711C	n/a	n/a
8122	n/a	n/a
7130	31.21	29.92
7205	31.25	29.64
7207	31.06	30.01
7204	31.34	29.78
7206	31.27	30.09
70XF	n/a	n/a
7122	31	28.8
7006	31.67	29.39
7113	31.19	30.34
70XL	n/a	n/a
70XG	n/a	n/a
7123	31.07	30.32
7026	32.14	28.68
70ZH	n/a	n/a
7027	32.14	30.19
7007	30.97	29.81
70XK	n/a	n/a
7010	31.25	30.19
7109	31.09	30.14
7025	30.94	30.31
7028	32.16	30.18
7115	30.98	30.27
7008	30.97	30.19
7022	32.06	28.95
7023	32.06	30.39
70XI	n/a	n/a
70XJ	n/a	n/a
7021	32.42	29.07
70XH	n/a	n/a
7009	31	29.07
8028	30.94	30.13
80XK	n/a	n/a
79ZC	n/a	n/a
70ZD	n/a	n/a
7912	n/a	n/a
79ZB	n/a	n/a
70ZC	n/a	n/a
70ZB	n/a	n/a
79ZL	n/a	n/a
79ZK	n/a	n/a
7913	n/a	n/a
7902	31.85	29.24
6103	32.32	28.77
6121	32.19	30.45
6102	31.9	30.63
60ZA	n/a	n/a
60ZF	n/a	n/a
86ZG	n/a	n/a
60XA	n/a	n/a
70XB	n/a	n/a
7135	32.24	30.39
7112	n/a	n/a
70XE	n/a	n/a
70XC	n/a	n/a
70XD	n/a	n/a
7132	31.75	31
702G	n/a	n/a
702F	n/a	n/a
7024	32.05	28.95
7034	32.12	30.06
7005	30.95	30.09
7129	31.28	30.73
7002	31.55	31.1
7104	31.47	27.72
7127	31.19	29.85
7106	31.24	29.61
70XM	n/a	n/a
70XA	n/a	n/a
7116	31.52	30.69
6203	31.64	30.62
62LC	n/a	n/a
621J	n/a	n/a
621I	n/a	n/a
7202	31.49	30.19
7203	31.47	30.15
62LB	31.82	31.17
6202	31.82	31.02
7209	n/a	n/a
621B	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
621A	n/a	n/a
6204	31.95	30.88
721B	n/a	n/a
8204	31.49	30.1
8202	31.49	30.51
8301	31.66	30.7
8302	31.69	30.39
6305	36.65	34.99
7403	n/a	n/a
7105	31.52	30.21
7126	31.43	30.6
6105	31.55	30.45
6108	32.06	30.64
7103	31.59	30.62
7134	31.61	30.56
61LA	n/a	n/a
7102	31.68	30.71
6104	31.61	29.34
61LB	n/a	n/a
6107	31.57	29.68
7133	31.65	30.35
61LD	n/a	n/a
7131	31.73	30.68
7101	31.73	29.98
61LC	n/a	n/a
611A	n/a	n/a
611B	n/a	n/a
611C	n/a	n/a
721D	n/a	n/a
721A	n/a	n/a
7201	31.44	30.34
721E	n/a	n/a
62LA	n/a	n/a
621E	n/a	n/a
621F	n/a	n/a
59XA	n/a	n/a
59XB	n/a	n/a
69XM	n/a	n/a
60XN	n/a	n/a
69XL	n/a	n/a
60XK	n/a	n/a
60XJ	n/a	n/a
60XE	n/a	n/a
60XS	n/a	n/a
69ZK	n/a	n/a
69ZG	n/a	n/a
69ZL	n/a	n/a
6903	31.47	29.51
69ZI	n/a	n/a
69ZA	n/a	n/a
960ZE	n/a	n/a
60ZB	n/a	n/a
6007	n/a	n/a
60FK	n/a	n/a
60FJ	n/a	n/a
6005	31.95	29.35
60FI	n/a	n/a
60XZ	n/a	n/a
60FH	n/a	n/a
61XY	n/a	n/a
6003	31.84	30.54
6001	31.87	30.01
6006	n/a	n/a
61XW	n/a	n/a
6002	32.16	28.76
60XY	n/a	n/a
60XD	n/a	n/a
60XH	n/a	n/a
60XI	n/a	n/a
60XB	n/a	n/a
6122	32.13	30.33
6101	31.95	28.16
60XC	n/a	n/a
60XX	n/a	n/a
60XG	n/a	n/a
61XG	n/a	n/a
61XK	n/a	n/a
61LF	n/a	n/a
61XH	n/a	n/a
60XF	n/a	n/a
511D	n/a	n/a
511E	n/a	n/a
5106	31.9	30.62
511Q	n/a	n/a
611G	n/a	n/a
51XB	n/a	n/a
411C	n/a	n/a
61JD	n/a	n/a
5105	32.06	30.73
5123	32.38	31.05
51XA	n/a	n/a
411B	n/a	n/a
511N	n/a	n/a

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5102	31.98	27.88
51LB	n/a	n/a
51LA	n/a	n/a
5107	31.77	30.17
5104	31.94	30.81
51LC	n/a	n/a
5101	31.88	27.54
4213	31.74	26.74
4211	31.67	26.82
4212	31.64	28.93
521A	n/a	n/a
4209	31.84	29.84
52A1	n/a	n/a
4210	31.79	27.66
591L	n/a	n/a
4903	30.54	28.74
69XF	n/a	n/a
69XC	n/a	n/a
59XG	n/a	n/a
5902	n/a	n/a
59XD	n/a	n/a
6902	31.55	30.71
59XE	n/a	n/a
5901	31.61	30
6901	31.62	29.94
591J	n/a	n/a
50XH	n/a	n/a
59XI	n/a	n/a
50XJ	n/a	n/a
50KE	n/a	n/a
50XD	n/a	n/a
50XC	n/a	n/a
50XB	n/a	n/a
5003	n/a	n/a
5002	31.35	29.38
50KA	n/a	n/a
5004	n/a	n/a
50XG	n/a	n/a
4007	31.32	29.05
60FC	n/a	n/a
401B	n/a	n/a
4008	31.52	29.18
60FB	n/a	n/a
4005	31.15	29.39
4003	31.37	27.98
60FA	n/a	n/a
4002	31.15	29.31
5005	n/a	n/a
50XE	n/a	n/a
60FF	n/a	n/a
60FG	n/a	n/a
60FE	n/a	n/a
50XA	n/a	n/a
5001	31.62	30.03
4001	31.49	26.59
401A	n/a	n/a
501F	n/a	n/a
51XC	n/a	n/a
5109	31.78	30.65
411A	n/a	n/a
61XX	n/a	n/a
5108	31.95	30.57
51XD	n/a	n/a
511O	n/a	n/a
611R	n/a	n/a
511F	n/a	n/a
4102	31.69	28.56
4101	31.64	29.62
4902	30.63	28.38
4208	31.58	28.79
4203	31.57	27.99
4202	31.63	29.05
4207	31.61	31.06
4206	31.71	31.09
4205	31.68	29.05
5202	32.12	30.02
421B	n/a	n/a
421A	n/a	n/a
4204	31.61	29.94
5203	31.97	30.77
4201	31.01	29.66
5201	32.25	27.79
5307	32.28	31.19
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
	Bio-solids (Sludge)
	Vent Pipe
	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 'D' 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

- 6) The text appearing alongside a sewer line indicates the internal diameter of the pipe in millimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Searches on 0800 009 4540.

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 0800 009 4540 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

Thames Water Utilities Ltd Registered in England & Wales No. 2366661 Registered Office Clearwater Court, Vastern Rd, Reading, Berks, RG1 8DB.

Appendix E

Hillingdon SuDS proforma

1. Project & Site Details	Project / Site Name (including sub-catchment / stage / phase where appropriate)	Project no: 2105050
	Address & post code	Former Victoria Public House, 32 North Hyde Road, Hayes, UB3 4NE
	OS Grid ref. (Easting, Northing)	E 509631 , N 179183
	LPA reference (if applicable)	
	Brief description of proposed work	The scheme proposals comprise the demolition of the building and construction of a new residential development providing 38 residential units spread across two blocks
	Total site Area	3606 m ²
	Total existing impervious area	3606 m ²
	Total proposed impervious area	3300 m ²
	Is the site in a surface water flood risk catchment (ref. local Surface Water Management Plan)?	No
	Existing drainage connection type and location	Assumed private gravity connection to MH6108 surface water, MH62LA foul water
Designer Name	Faye Hammer	
Designer Position	Engineer	
Designer Company	Arden Consulting Engineers	

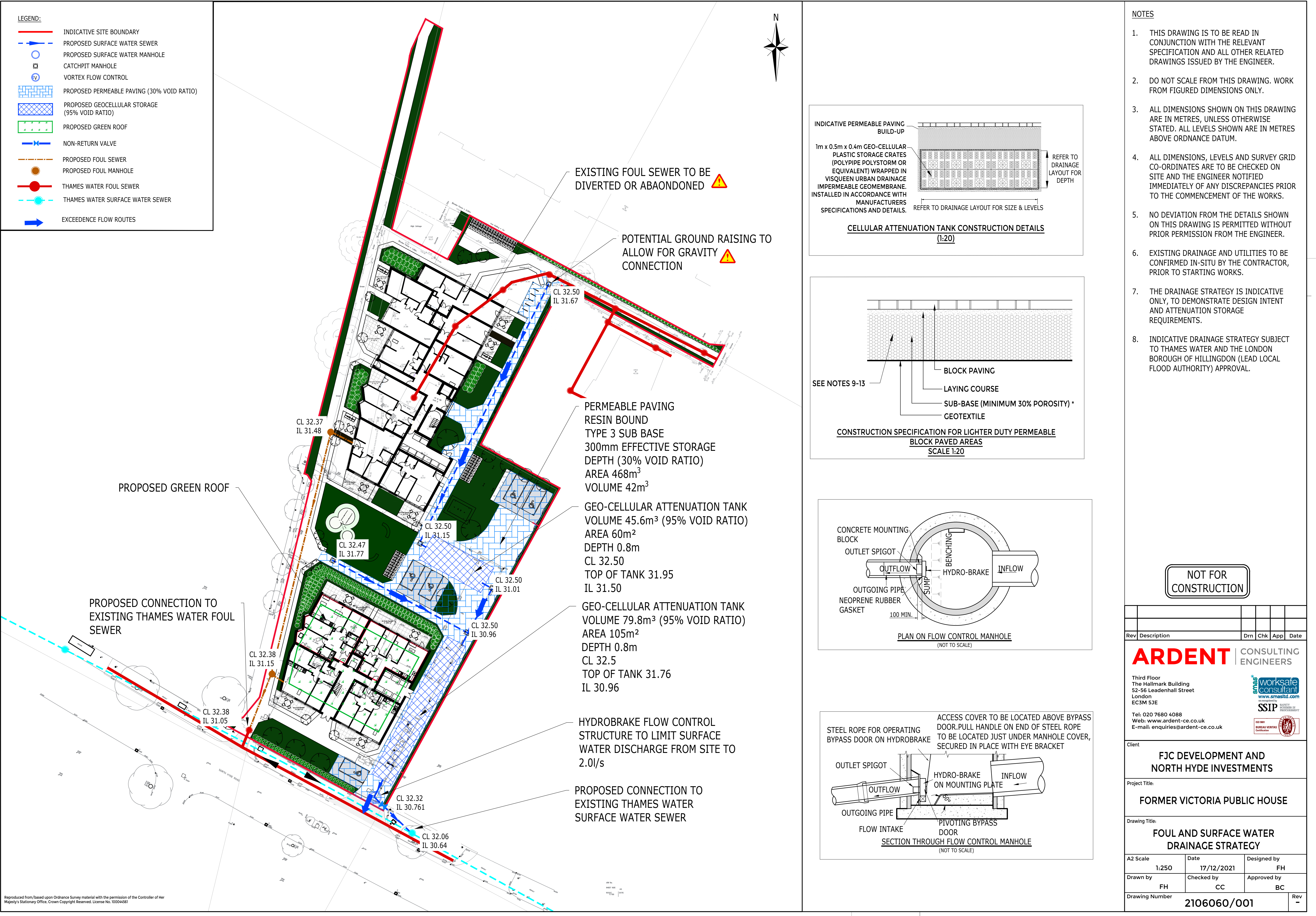
2. Proposed Discharge Arrangements	2a. Infiltration Feasibility		
	Superficial geology classification	Lynch Hill Gravel Member (Sand and Gravel)	
	Bedrock geology classification	The London Clay Formation (Clay, Silt, Sand)	
	Site infiltration rate	N/A	m/s
	Depth to groundwater level	2.4	m below ground level
	Is infiltration feasible?	No	
	2b. Drainage Hierarchy		
		Feasible (Y/N)	Proposed (Y/N)
	1 store rainwater for later use	Y	N
	2 use infiltration techniques, such as porous surfaces in non-clay areas	N	N
	3 attenuate rainwater in ponds or open water features for gradual release	N	N
	4 attenuate rainwater by storing in tanks or sealed water features for gradual release	Y	Y
	5 discharge rainwater direct to a watercourse	N	N
	6 discharge rainwater to a surface water sewer/drain	Y	Y
	7 discharge rainwater to the combined sewer.	N	N
2c. Proposed Discharge Details			
Proposed discharge location	North Hyde Road		
Has the owner/regulator of the discharge location been consulted?	Yes, contacted waiting on response.		

3. Drainage Strategy	3a. Discharge Rates & Required Storage				
		Greenfield (GF) runoff rate (l/s)	Existing discharge rate (l/s)	Required storage for GF rate (m ³)	Proposed discharge rate (l/s)
	Q _{bar}	0.6			
	1 in 1	0.5	50.93		2
	1 in 30	1.4	113.3		2
	1 in 100	1.9	144.26		2
	1 in 100 + CC			61	2
	Climate change allowance used		40%		
	3b. Principal Method of Flow Control		Hydrobrake/orifice plate		
	3c. Proposed SuDS Measures				
			Catchment area (m ²)	Plan area (m ³)	Storage vol. (m ³)
	Rainwater harvesting		0		0
	Infiltration systems		0		0
	Green roofs		0	0	0
	Blue roofs		0	0	0
	Filter strips		0	0	0
	Filter drains		0	0	0
Bioretention / tree pits		0	0	0	
Pervious pavements		705	0	63	
Swales		0	0	0	
Basins/ponds		0	0	0	
Attenuation tanks		2901		61	
Total		3606	0	124	

4. Supporting Information	4a. Discharge & Drainage Strategy	Page/section of drainage report
	Infiltration feasibility (2a) – geotechnical factual and interpretive reports, including infiltration results	2.11-2.13 and 4.4 to 4.9
	Drainage hierarchy (2b)	4.4 to 4.9
	Proposed discharge details (2c) – utility plans, correspondence / approval from owner/regulator of discharge location	Section 4 and Appendix F
	Discharge rates & storage (3a) – detailed hydrologic and hydraulic calculations	Section 4 and Appendices F, G and H
	Proposed SuDS measures & specifications (3b)	Section 4 and Appendix F
	4b. Other Supporting Details	Page/section of drainage report
	Detailed Development Layout	Appendix A
	Detailed drainage design drawings, including exceedance flow routes	Appendix F
	Detailed landscaping plans	Appendix A
	Maintenance strategy	Appendix I
	Demonstration of how the proposed SuDS measures improve:	
	a) water quality of the runoff?	Appendix I
	b) biodiversity?	
	c) amenity?	

Appendix F

Foul and Surface Water Drainage Strategy



Appendix G

Runoff Calculations

EXISTING SURFACE WATER

Existing site information:

Site Boundary Area	3606	m ²
Developable Area	0.3606	ha
Impermeable Area	0.3606	ha

Modified Rational Method Equation:

$$Q_n = 2.78 CiA$$

where:

C	Runoff Coeffic =	1 (in this case 1 as using impermeable area)
i_n	Rainfall Intensity for n return period (mm/hr)	
A	Impermeable Area (Ha)	
Q_n	Runoff for n return period (l/s)	

Rainfall Intensity:

The rainfall intensities for various return periods were extracted from Table 1(a) of the Transport and Road Research Laboratory Report - Estimated rainfall for drainage calculations in the United Kingdom (TRRL Report LR 595) by C. P. Young. For the 5 min duration.

i_1	50.8 mm/hr
i_{30}	113.02 mm/hr
i_{100}	143.9 mm/hr

Existing Surface Water Runoff:

Therefore:

			C		i_n		A		Q_n
Q_1	2.78	x	1	x	50.8	x	0.3606	=	50.93 l/s
Q_{30}	2.78	x	1	x	113.0	x	0.3606	=	113.30 l/s
Q_{100}	2.78	x	1	x	143.9	x	0.3606	=	144.26 l/s

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<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 SAAR (mm) 645 Urban 0.000 Area (ha) 0.361 Soil 0.300 Region Number Region 6 Results 1/s QBAR Rural 0.6 QBAR Urban 0.6 Q100 years 1.9 Q1 year 0.5 Q30 years 1.4 Q100 years 1.9		
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Appendix H

Microdrainge Calculations

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Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.004		32.060	30.663	0.000	0	0

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 Offline Controls	0	Number of Time/Area Diagrams	0
Number of Online Controls	1	Number of Storage Structures	4	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.402		

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Innovyze Network 2020.1																																																																																															
Online Controls for Storm Hydro-Brake® Optimum Manhole: 6, DS/PN: 1.004, Volume (m³): 2.9 Unit Reference MD-SHE-0070-2000-0800-2000 Design Head (m)0.800 Design Flow (l/s)2.0 Flush-Flo™Calculated ObjectiveMinimise upstream storage ApplicationSurface Sump AvailableYes Diameter (mm)70 Invert Level (m)30.687 Minimum Outlet Pipe Diameter (mm)100 Suggested Manhole Diameter (mm)1200 <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>0.800</td><td>2.0</td><td>Kick-Flo®</td><td>0.504</td><td>1.6</td></tr><tr><td>Flush-Flo™</td><td>0.240</td><td>2.0</td><td>Mean Flow over Head Range</td><td>-</td><td>1.7</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><tr><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td><td>Depth (m)</td><td>Flow (l/s)</td></tr><tr><td>0.100</td><td>1.8</td><td>1.200</td><td>2.4</td><td>3.000</td><td>3.7</td><td>7.000</td><td>5.5</td></tr><tr><td>0.200</td><td>2.0</td><td>1.400</td><td>2.6</td><td>3.500</td><td>3.9</td><td>7.500</td><td>5.6</td></tr><tr><td>0.300</td><td>2.0</td><td>1.600</td><td>2.7</td><td>4.000</td><td>4.2</td><td>8.000</td><td>5.8</td></tr><tr><td>0.400</td><td>1.9</td><td>1.800</td><td>2.9</td><td>4.500</td><td>4.4</td><td>8.500</td><td>6.0</td></tr><tr><td>0.500</td><td>1.6</td><td>2.000</td><td>3.0</td><td>5.000</td><td>4.7</td><td>9.000</td><td>6.2</td></tr><tr><td>0.600</td><td>1.8</td><td>2.200</td><td>3.2</td><td>5.500</td><td>4.9</td><td>9.500</td><td>6.3</td></tr><tr><td>0.800</td><td>2.0</td><td>2.400</td><td>3.3</td><td>6.000</td><td>5.1</td><td></td><td></td></tr><tr><td>1.000</td><td>2.2</td><td>2.600</td><td>3.4</td><td>6.500</td><td>5.3</td><td></td><td></td></tr></table> <tr><td colspan="3">©1982-2020 Innovyze</td></tr>			Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	0.800	2.0	Kick-Flo®	0.504	1.6	Flush-Flo™	0.240	2.0	Mean Flow over Head Range	-	1.7	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	1.8	1.200	2.4	3.000	3.7	7.000	5.5	0.200	2.0	1.400	2.6	3.500	3.9	7.500	5.6	0.300	2.0	1.600	2.7	4.000	4.2	8.000	5.8	0.400	1.9	1.800	2.9	4.500	4.4	8.500	6.0	0.500	1.6	2.000	3.0	5.000	4.7	9.000	6.2	0.600	1.8	2.200	3.2	5.500	4.9	9.500	6.3	0.800	2.0	2.400	3.3	6.000	5.1			1.000	2.2	2.600	3.4	6.500	5.3			©1982-2020 Innovyze		
Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)																																																																																										
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Storage Structures for Storm

Porous Car Park Manhole: 1, DS/PN: 1.000

Infiltration Coefficient Base (m/hr)

0.00000

Width (m)

3.0

Membrane Percolation (mm/hr)

1000

Length (m)

78.0

Max Percolation (l/s)

65.0

Slope (1:X)

100.0

Safety Factor

2.0

Depression Storage (mm)

5

Porosity

0.30

Evaporation (mm/day)

3

Invert Level (m)

31.669

Cap Volume Depth (m)

0.300

Porous Car Park Manhole: 3, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)

0.00000

Width (m)

78.0

Membrane Percolation (mm/hr)

1000

Length (m)

3.0

Max Percolation (l/s)

65.0

Slope (1:X)

100.0

Safety Factor

2.0

Depression Storage (mm)

5

Porosity

0.30

Evaporation (mm/day)

3

Invert Level (m)

30.936

Cap Volume Depth (m)

0.300

Cellular Storage Manhole: 4, DS/PN: 1.003

Invert Level (m)

30.770

Safety Factor

2.0

Infiltration Coefficient Base (m/hr)

0.00000

Porosity

0.95

Infiltration Coefficient Side (m/hr)

0.00000

Depth (m)

Area (m²)

Inf. Area (m²)

Depth (m)

Area (m²)

Inf. Area (m²)

0.000

80.0

0.0

0.801

0.0

0.0

0.800

80.0

0.0

Porous Car Park Manhole: 6, DS/PN: 1.004

Infiltration Coefficient Base (m/hr)

0.00000

Width (m)

3.0

Membrane Percolation (mm/hr)

1000

Length (m)

78.0

Max Percolation (l/s)

65.0

Slope (1:X)

100.0

Safety Factor

2.0

Depression Storage (mm)

5

Porosity

0.30

Evaporation (mm/day)

3

Invert Level (m)

30.668

Membrane Depth (mm)

0

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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 Offline Controls 0

Number of Time/Area Diagrams 0

Number of Online Controls 1

Number of Storage Structures 4

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 ON

DVD Status ON

Inertia Status OFF

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

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

Climate Change (%) 0, 0, 40

	US/MH		Return Climate	First (X)	First (Y)	First (Z)	Overflow	Water Level
PN	Name	Storm	Period Change	Surcharge	Flood	Overflow	Act.	(m)
1.000	1	15 Winter	100	+40%	100/15 Summer			31.926
1.001	2	15 Winter	100	+40%	30/15 Summer			32.054
1.002	3	360 Winter	100	+40%	30/60 Winter			31.912
2.000	4	360 Winter	100	+40%	100/240 Winter			31.911
1.003	4	360 Winter	100	+40%	30/30 Winter			31.910
1.004	6	360 Winter	100	+40%	1/60 Summer			31.904

	US/MH	Depth	Volume	Flow / Overflow	Half Drain	Pipe		Level
PN	Name	(m)	(m³)	Cap. (l/s)	Time (mins)	Flow (l/s)	Status	Exceeded
1.000	1	0.106	0.000	0.78		5	13.6	FLOOD RISK
1.001	2	0.755	0.000	2.50			40.7	SURCHARGED
1.002	3	0.751	0.000	0.36			11.6	SURCHARGED
2.000	4	0.041	0.000	0.13			2.1	SURCHARGED

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

PN	US/MH Name	Surcharged		Flooded		Half Drain		Pipe	Status	Level Exceeded
		Depth (m)	Volume (m ³)	Flow / Cap.	Overflow (l/s)	Time (mins)	Flow (l/s)			
1.003	4	0.803	0.000	0.33			12.6		SURCHARGED	
1.004	6	0.992	0.000	0.09		362	2.4		FLOOD RISK	

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STORM SEWER DESIGN by the Modified Rational Method

Pipe Sizes STANDARD Manhole Sizes STANDARD

Designed with Level Soffits

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.212	4-8	0.053

Total Pipe Volume (m³) = 4.906

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow	k (l/s)	HYD SECT	DIA (mm)	Section	Type	Auto Design
1.000	52.075	0.521	100.0	0.018	4.00	0.0	0.600	o	225	Pipe/Conduit		
1.001	13.788	0.138	100.0	0.074	0.00	0.0	0.600	o	225	Pipe/Conduit		
1.002	9.034	0.054	168.4	0.055	0.00	0.0	0.600	o	225	Pipe/Conduit		

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	50.00	4.66	31.669	0.018	0.0	0.0	0.0	1.31	52.0	2.4
1.001	50.00	4.84	31.148	0.091	0.0	0.0	0.0	1.31	52.0	12.4
1.002	50.00	4.99	31.010	0.147	0.0	0.0	0.0	1.00	39.9	19.9

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Online Controls for Storm

Orifice Manhole: 4, DS/PN: 1.003, Volume (m³): 2.5

Diameter (m) 0.200 Discharge Coefficient 0.600 Invert Level (m) 30.956

Hydro-Brake® Optimum Manhole: 6, DS/PN: 1.004, Volume (m³): 3.0

Unit Reference	MD-SHE-0062-2000-1350-2000
Design Head (m)	1.350
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	62
Invert Level (m)	30.761
Minimum Outlet Pipe Diameter (mm)	75
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.350	2.0	Kick-Flo®	0.557	1.3
Flush-Flo™	0.274	1.6	Mean Flow over Head Range	-	1.6

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	1.4	1.200	1.9	3.000	2.9	7.000	4.3
0.200	1.6	1.400	2.0	3.500	3.1	7.500	4.4
0.300	1.6	1.600	2.2	4.000	3.3	8.000	4.6
0.400	1.6	1.800	2.3	4.500	3.5	8.500	4.7
0.500	1.5	2.000	2.4	5.000	3.7	9.000	4.8
0.600	1.4	2.200	2.5	5.500	3.8	9.500	4.9
0.800	1.6	2.400	2.6	6.000	4.0		
1.000	1.7	2.600	2.7	6.500	4.1		

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Storage Structures for Storm

Porous Car Park Manhole: 2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	80.0
Max Percolation (l/s)	66.7	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	32.000	Cap Volume Depth (m)	0.300

Complex Manhole: 3, DS/PN: 1.002

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	80.0
Membrane Percolation (mm/hr)	1000	Length (m)	3.0
Max Percolation (l/s)	66.7	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	32.000	Cap Volume Depth (m)	0.300

Cellular Storage

Invert Level (m)	31.010	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	30.0	0.0	0.801	0.0	0.0
0.800	30.0	0.0			

Cellular Storage Manhole: 4, DS/PN: 1.003

Invert Level (m)	30.956	Safety Factor	2.0
Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.95
Infiltration Coefficient Side (m/hr)	0.00000		

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	130.0	0.0	0.801	0.0	0.0
0.800	130.0	0.0			

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Ardent Consulting Engineers		Page 5																								
Suite 207 One Alie Street London E1 8DE																										
Date 03/12/2021 12:34 File NETWORK1.MDX	Designed by fhammer Checked by																									
Innovyze Network 2020.1																										
<u>Porous Car Park Manhole: 6, DS/PN: 1.004</u> <table><tr><td>Infiltration Coefficient Base (m/hr)</td><td>0.00000</td><td>Width (m)</td><td>3.0</td></tr><tr><td>Membrane Percolation (mm/hr)</td><td>1000</td><td>Length (m)</td><td>80.0</td></tr><tr><td>Max Percolation (l/s)</td><td>66.7</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>31.643</td><td>Cap Volume Depth (m)</td><td>0.300</td></tr></table>			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0	Membrane Percolation (mm/hr)	1000	Length (m)	80.0	Max Percolation (l/s)	66.7	Slope (1:X)	100.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	31.643	Cap Volume Depth (m)	0.300
Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0																							
Membrane Percolation (mm/hr)	1000	Length (m)	80.0																							
Max Percolation (l/s)	66.7	Slope (1:X)	100.0																							
Safety Factor	2.0	Depression Storage (mm)	5																							
Porosity	0.30	Evaporation (mm/day)	3																							
Invert Level (m)	31.643	Cap Volume Depth (m)	0.300																							
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Suite 207
One Alie Street
London E1 8DE

Date 03/12/2021 12:34
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Designed by fhammer
Checked by

Micro Drainage

Innovyze

Network 2020.1

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 Offline Controls 0

Number of Time/Area Diagrams 0

Number of Online Controls 2

Number of Storage Structures 4

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 OFF

DTS Status ON

Profile(s) Summer and Winter

Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440

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

Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	360 Winter	100	+40%	100/120 Winter				32.159
1.001	2	360 Winter	100	+40%	30/120 Winter				32.160
1.002	3	360 Winter	100	+40%	30/15 Summer				32.158
2.000	4	360 Winter	100	+40%	100/120 Winter				32.159
1.003	4	360 Winter	100	+40%	30/15 Winter				32.164
1.004	6	480 Winter	100	+40%	1/60 Winter				32.150

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap. (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.265	0.000	0.03		1.5	SURCHARGED	
1.001	2	0.787	0.000	0.16		7.0	SURCHARGED	
1.002	3	0.923	0.000	0.24		7.9	SURCHARGED	
2.000	4	0.239	0.000	0.10		2.1	SURCHARGED	
1.003	4	0.983	0.000	0.19		7.1	SURCHARGED	
1.004	6	1.164	0.000	0.07	168	2.0	FLOOD RISK	

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Appendix I

Maintenance Management Plan and C753 Simple Index Treatment Method

**C753 SIMPLE INDEX TREATMENT
METHOD**
December 2021

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	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, home zones 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 (e.g. hospitals, retail), all roads except low traffic roads and trunk roads/motorways	Medium	0.7	0.6	0.7
Sites with heavy pollution (e.g. 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	High	0.8	0.8	0.9

Table 1: Pollution hazard indices for different land use classifications

(land use in bold applicable for the development).

Type of SuDS component	Mitigation indices		
	TSS	Metals	Hydrocarbons
Filter strip	0.4	0.4	0.5
Filter drain	0.4	0.4	0.4
Swale	0.5	0.6	0.6
Bio retention system	0.8	0.8	0.8
Permeable pavement	0.7	0.6	0.7
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5
Wetland	0.8	0.8	0.8
Proprietary treatment systems	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 2: Indicative SuDS mitigation indices for discharges to surface waters

(bold text is applicable to this development).

For surface water discharge from Residential Parking Areas and Low Traffic Roads <300 traffic movements/day			
	Required mitigation indices		
Source	TSS	Metals	Hydrocarbons
Low	0.5	0.4	0.4
Type of SuDS component provided			
Permeable pavement	0.7	0.6	0.7
Total	0.7	0.6	0.7
Check	+0.20	+0.20	+0.3

Table 3: SuDS mitigation indices provided

1.0 INTRODUCTION

- 1.1 The development at the Former Victoria Public House includes a number of Sustainable Drainage Systems (SuDS) as part of the surface water drainage system including green roofs, permeable paving and geocellular tanks. This Technical Note sets out an outline management plan for the aforementioned SuDS components.
- 1.2 The proposed SuDS components in addition to addressing climate change will bring a number of benefits in terms of water quality, environmental, and social amenity.
- 1.3 The maintenance of all SuDS components will be in accord with the best practices and CIRIA document C753 "The SuDS Manual". Typical maintenance activities for the proposed SuDS components have been reproduced from Table 32.1 of "The SuDS Manual" in **Table 1** below. A private management company will be set up to maintain the surface water drainage network, including on-site SuDS. .

Table 1: Typical SuDS Maintenance Activities

Operation and maintenance activity	SuDS component		
	Geo-cellular Tank	Permeable paving	Green roof
Regular maintenance			
Inspection	■	■	■
Litter and debris removal	□	■	■
Grass cutting			■
Weed and invasive plant control		□	■
Shrub management		□	
Shoreline vegetation			
Aquatic vegetation management			
Occasional maintenance			
Sediment management	■	■	
Vegetation replacement			■
Vacuum sweeping and brushing		■	
Remedial maintenance			
Structure rehabilitation / repair	□	□	□
■ will be required □ may be required			

2.0 SuDS MANAGEMENT PLAN

- 2.1 This plan is intended to cover all on-site drainage structures. The Site Management Team should oversee and implement the SuDS Management Plan and designate a qualified person who will be responsible for the proper operation and maintenance of the surface water drainage structures.

Water Quality Management

- 2.2 In line with Tables 26.2 and 26.3 of the CIRIA C753 The SuDS Manual, it can be seen that the proposed greenroofs and permeable paving would provide sufficient treatment for the surface water runoff from the Site.
- 2.3 The surface drainage network would also be designed to protect and enhance the quality of surface water runoff through the removal of sediment and pollutants. Catchpit manholes and silt trapped gullies will reduce the amount of pollutants entering the system. Preventive maintenance of the system will include a comprehensive source reduction program of regular sweeping and litter removal, prohibitions on the use of pesticides, and maintenance of bin areas.

Maintenance Program

- 2.4 The Site Management Team will conduct the SuDS Management Plan set forth in this document. The Site Management will ensure that inspections and record keeping are timely and accurate. Inspection & Maintenance Log Forms should include the date and physical conditions of the structures, depth of sediment in structures, evidence of overtopping or debris blockage and maintenance required of each structure. Records of maintenance will be kept on file on-site and copies of Inspection & Maintenance Log sheets indicating all work and inspections will be available to the Council upon request. A model Maintenance log is appended for reference.
- 2.5 Regular maintenance should include:
- Inspect channel and gully inlet grates and remove any debris every 6 months or as determined to be reasonable based on experience with the installed

systems to ensure that the gullies are working in their intended fashion and that they are free of debris;

- Inspect gully sumps and bottom of drain manholes quarterly; if depth of sediment in sumps exceeds 50% capacity, sediment must be removed. Excessive sediment shall be removed and properly disposed by a licensed drainage cleaning company.
- All litter shall be picked up and removed from the parking areas, external bin store, wetland areas, green roofs, and soft landscaping.
- Inspect all green roofs. Replant bare areas or areas with sparse growth.
- Inspect external bin stores for spillage and scattered litter must be performed on a regular basis to prevent the spread of pollutants into the surface water drainage network.
- Green roofs will require regular inspection and maintenance on a weekly or fortnightly basis, especially during the establishment stage (first 12 – 15 months). Maintenance during the establishment stage should be made the responsibility of the green roof provider, to ensure healthy growth and satisfactory establishment. Regular inspections of the green roof area should also include the soil substrate for the presence of erosion and drainage inlets to ensure run-off can discharge unrestricted.
- The inlets, outlet and vents and overflows of SuDS components should be checked annually and after large storms to ensure that they are in good condition and operating as designed. Regular maintenance includes inspection and identification of any areas that are not operating correctly monthly for the first 3 months and then every 6 months after.

Winter Maintenance Program

- 2.6 Ensure that drainage structures are not blocked by ice, snow, debris or rubbish during winter months.

Operation and Maintenance requirements

2.7 Recommendations for the operation and maintenance including typical frequencies are included in **Tables 2, 3** and **4** below.

Table 2: SuDS Operation and Maintenance Requirements- Green Roofs

SUDS Element	Green Roofs	
Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	6 monthly and annually, or as required
	During establishment (i.e. year one) replace dead plants	Monthly
	Post establishment, replace dead plants as required (where >5% coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required – clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial Work	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required.
	If erosion channels are evident, these should be stabilised with extra soil substrate similar to the original material, and sources or erosion damage should be identified and controlled	As required.

Monitoring	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability.	Annually and after severe storms.
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources.	Annually and after severe storms.
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system.	Annually and after severe storms.
	Inspect underside of roof for evidence of leakage.	Annually and after severe storms.

Table 3: SuDS Operation and Maintenance Requirements- Permeable paving

SUDS Element	Permeable Paving	
Maintenance Period	Maintenance Task	Frequency
Regular Maintenance	Brushing and vacuuming	Once a year or as required
Occasional Maintenance	Stabilise and mow contributing adjacent area	As required
	Removal of weed or management using glyphosate applied directly into weeds by an applicator rather than spraying	As required
Remedial Work	Remediate any landscaping which has been raised to within 50mm of the level of the paving	As required.
	Remedial work to any depressions, rutting and cracked or broken	As required.

	blocks considered detrimental to structural performance or a hazard to users.	
Monitoring	Rehabilitation of surface or upper structure by remedial sweeping	Every 10 to 15 years, or as required
	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth – if required, take remedial action	3 monthly, 48hrs after large storms in first 6 months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table 4: SuDS Operation and Maintenance Requirements- Attenuation tank

SUDS Element	Attenuation Tank	
Maintenance Period	Maintenance Task	Frequency
Maintenance Work	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risk to performance)	Monthly
	Remove sediment from pre-treatment structures and/or internal forebays.	Annually, or as required
Remedial Work	Repair/rehabilitate inlets, outlets, 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.
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required.

Suds Management Plan- Appendix A
Drainage Operation and Maintenance Log

Site Maintenance Supervisor: _____ Date: _____

☐ Routine ☐ Response to rainfall event _ in ☐ Other: _____

BMP	Frequency	Date Performed	Comments
Gullies and Manholes	Monthly Inspections		
	Maintenance Quarterly and as necessary		
Pavement Areas (parking, driveways, service areas)	Quarterly Sweeping		
	Rubbish & Litter Removal as Necessary		
Green Roofs	Annual inspection		
Green Roofs Geocellular attenuation (permavoid)	Bi-annual maintenance as necessary		
	Inspect and identify areas not operating properly every 3 months (for the first 3 months) and every 6 months after		
Geocellular attenuation (permavoid)	Full bi-annual inspection		

Appendix J

Pre-development Enquiries



Ms Faye Hammer

Ardent Consulting Engineers
The Hallmark Building,
52-56 Leadenhall Street,
London,
EC3M 5JE

**Wastewater
pre-planning**



Our ref **DS6090614, DTS-71667**

01 December 2021

Pre-planning enquiry: Confirmation of sufficient capacity

Site: Former Victoria Public House, 14 Sandow Crescent, London - UB3 4QH

Dear Faye

Thank you for providing information on your development.

Existing site: Public House (50 people).

Proposed site: Flats (42 units).

Proposed foul water discharge by gravity into manhole TQ09796202.

Proposed surface water discharge 2.0 l/s for storm events up to and including 1:100yr+40%CC into manhole TQ09796108 (Surface sewer network).

We have completed the assessment of the foul water flows and surface water run-off based on the information submitted in your application with the purpose of assessing sewerage capacity within the existing Thames Water sewer network.

Foul Water

If your proposals progress in line with the details you've provided, we're pleased to confirm that there will be sufficient sewerage capacity in our foul water sewer network to serve your development.

This confirmation is valid for 12 months or for the life of any planning approval that this information is used to support, to a maximum of three years.

You'll need to keep us informed of any changes to your design – for example, an increase in the number or density of homes. Such changes could mean there is no longer sufficient capacity.

Surface Water

In accordance with the Building Act 2000 Clause H3.3, positive connection of surface water to a public sewer will only be consented when it can be demonstrated that the hierarchy of disposal methods have been examined and proven to be impracticable. Before we can consider your surface water needs, you'll need written approval from the lead local flood authority that you have followed the sequential approach to the disposal of surface water and considered all practical means.



When developing a site, policy SI 13 of the London Plan states “Development proposals should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed as close to its source as possible. There should also be a preference for green over grey features, in line with the following drainage hierarchy:”

The disposal hierarchy being:

1. rainwater use as a resource (for example rainwater harvesting, blue roofs for irrigation)
2. rainwater infiltration to ground at or close to source
3. rainwater attenuation in green infrastructure features for gradual release (for example green roofs, rain gardens)
4. rainwater discharge direct to a watercourse (unless not appropriate)
5. controlled rainwater discharge to a surface water sewer or drain
6. controlled rainwater discharge to a combined sewer

Where connection to the public sewerage network is still required to manage surface water flows, we will accept these flows at a discharge rate in line with CIRIA’s best practice guide on SuDS or that stated within the sites planning approval.

If the above surface water hierarchy has been followed and if the flows are restricted to 2.0 l/s, then Thames Water would not have any objections to the proposal.

Please see the attached ‘Planning your wastewater’ leaflet for additional information.

Trade Effluent

Please be advised a Trade Effluent consent will be required to discharge trade effluent into the public sewer. Trade effluent can be best described as anything other than domestic sewage (toilet, bath or sink waste and groundwater) or uncontaminated surface water and roof drainage (rainwater). Applications should be made at <https://www.thameswater.co.uk/wholesale/trade-effluent> and for enquiries, please contact our trade effluent team by phone on 0203 577 9200 or via email at trade.effluent@thameswater.co.uk.

Diversion

There are existing public sewers crossing the site. New buildings will need to be kept between 3 and 6.5m away from existing sewer depending on the size and depth of the sewer. Alternatively, it may be possible for sewers to be diverted around the new development. If you wish us to review a diversion proposal, please submit this via a Section 185 Diversion application. On some occasions it may be possible to abandon existing public sewers. Please contact us for further information on this process.

Source Protection Zone

The development site boundary falls within a Source Protection Zone for groundwater abstraction. These zones may be at particular risk from polluting activities on or below the land surface. To prevent pollution, the Environment Agency and Thames Water (or other local water undertaker) will use a tiered, risk-based approach to regulate activities that may impact groundwater resources, this may potentially affect your drainage or surface water strategies where deep or infiltration systems are proposed. The applicant is encouraged to read the Environment Agency’s approach to groundwater protection (available at <https://www.gov.uk/government/publications/groundwater-protection-position-statements>



and may wish to discuss the full implications for their development with a suitably qualified environmental consultant.

What happens next?

Please make sure you submit your connection application, giving us at least 21 days' notice of the date you wish to make your new connection/s.

If you have any further questions, please contact me on 07747647155.

Kind Regards,

Zaid Kazi

Developer Services – Project Engineer, Major Projects

zaid.kazi@thameswater.co.uk

Get advice on making your sewer connection correctly at connectright.org.uk

Clearwater Court, Vastern Road, Reading, RG1 8DB

Find us online at developers.thameswater.co.uk



Planning your wastewater

We've put together some information on sewerage to help you plan your new development.

How long does it take to get consent to connect to a sewer?

If you're applying for consent to connect to a sewer under Section 106 of the Water Industry Act 1991, you'll need to give us 21 days' notice.

I think I'll need to connect to a trunk sewer – is that possible?

Connecting directly to trunk sewers can be complex and dangerous, and we won't permit this at all in London. If you're considering a trunk sewer as a point of connection, please contact us as soon as possible to discuss.

How do I handle trade effluent and groundwater discharges?

You mustn't discharge non-domestic waste to our sewers without a valid trade effluent consent - doing this is an offence under Section 109(1) of the Water Industry Act 1991. You can call our trade effluent team on 0203 577 9200 to get help with trade effluent consents and ground water discharge permits.

Where can I discharge surface water?

The Lead Local Flood Authority, or if you are in a London Borough, 'The London Plan', advises that your development should utilise sustainable drainage systems (SuDS) unless there are practical reasons for not doing so. You should aim to achieve greenfield run-off rates and ensure you manage surface water run-off as close to its source as possible in line with the following drainage hierarchy:

- 1 Store rainwater for later use.
- 2 Use infiltration techniques, such as porous surfaces in non-clay areas.
- 3 Attenuate rainwater in ponds or open water features for gradual release.
- 4 Attenuate rainwater by storing in tanks or sealed water features for gradual release.
- 5 Discharge rainwater direct to a watercourse.
- 6 Discharge rainwater to a surface water sewer or drain.
- 7 Discharge rainwater to a combined sewer.

Please note that if you're discharging surface water anywhere other than to a public sewer – such as to a watercourse – you'll need approval from the relevant authority, for example the Environment Agency, the local authority or the Canals and Rivers Trust.

If you don't follow the surface water hierarchy you may not be granted planning permission, and Thames Water may seek to put conditions on the planning application.

There's no right of discharge of highway drainage into the public sewerage system, and we'd need to agree this with the relevant highway authority under Section 115 of the Water Industry Act 1991. You can contact us to discuss this further.

What can I do about redundant sewers and rising mains on my site?

On brownfield sites where existing sewers or rising mains need to be made redundant or diverted, the developer will need to fund the work, as set out in Section 185 of the Water Industry Act. If there's no practical way of making a diversion, we'll apply the standoff distances in Sewers for Adoption 7th edition to assess the width of easement required.

Appendix K

Foul Loading Calculations

EXISTING FOUL WATER



Unit Type	Existing Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
General Housing p	7 units	24	600 per property	6.6	0.0458333 per property	0.321

TOTAL EXISTING FOUL LOADING = 0.321

PROPOSED FOUL WATER

Unit Type	Proposed Area/Units	Hours (hrs)	Foul Water Flow Rate l/day	Peak Factor	Peaked Loading l/s	Loading (l/s)
General Housing p	41 units	24	600 per property	6.6	0.0458333 per property	1.879

TOTAL PROPOSED FOUL LOADING = 1.879