51 CALTHORPE STREET, LONDON

Flood Risk Assessment

Client: Simon Firth

Engineer: Create Consulting Engineers Limited

109-112 Temple Chambers

3-7 Temple Avenue

London EC4Y OHP

Tel: 0845 450 7908

Email: enquiries@createconsultingengineers.co.uk

Web: www.createconsultingengineers.co.uk

Report By: Graham Sinclair, BSc (Hons), MSc, DIC

Barrie Andersen, BEng (Hons)

Reviewed By: Julian Moore, BSc (Hons), MSc, DIC

Reference: GS/CC/P12-385/21

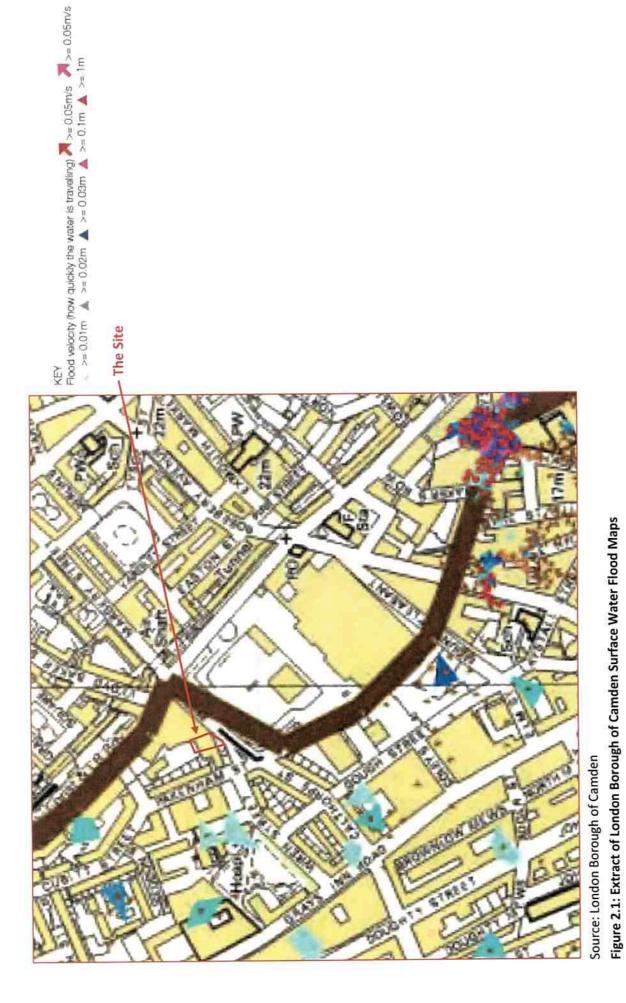
Date: February 2018

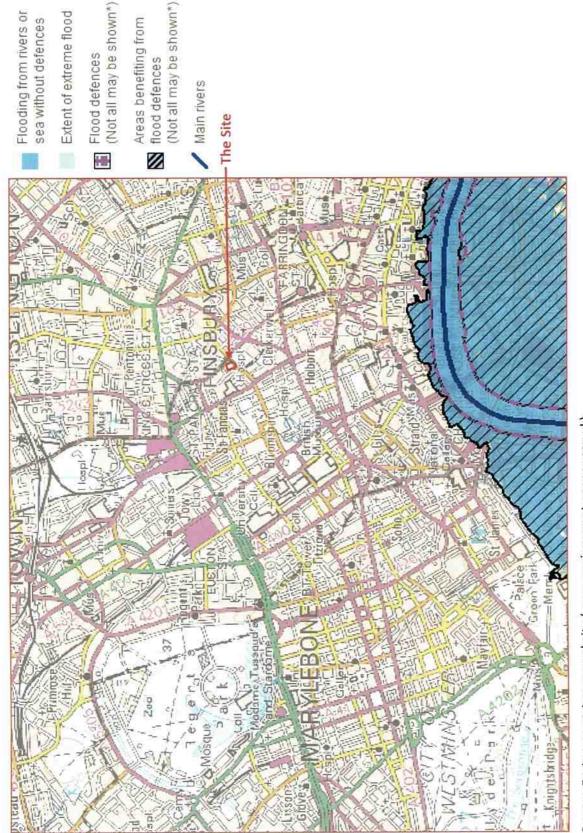
FIGURES



Source: Ordnance Survey (© Crown Copyright 2013. All Rights Reserved. Licence Number 100020449)

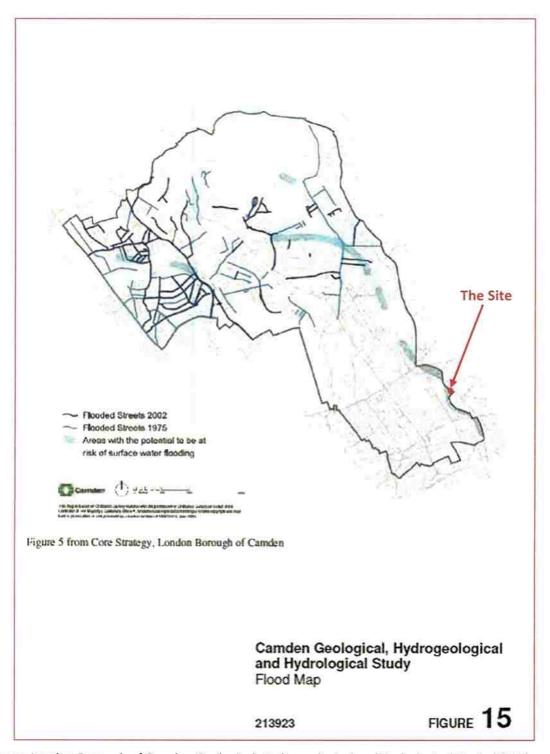
Figure 1.1: Site Location





Source: Environment Agency website (www.environment-agency.gov.uk)

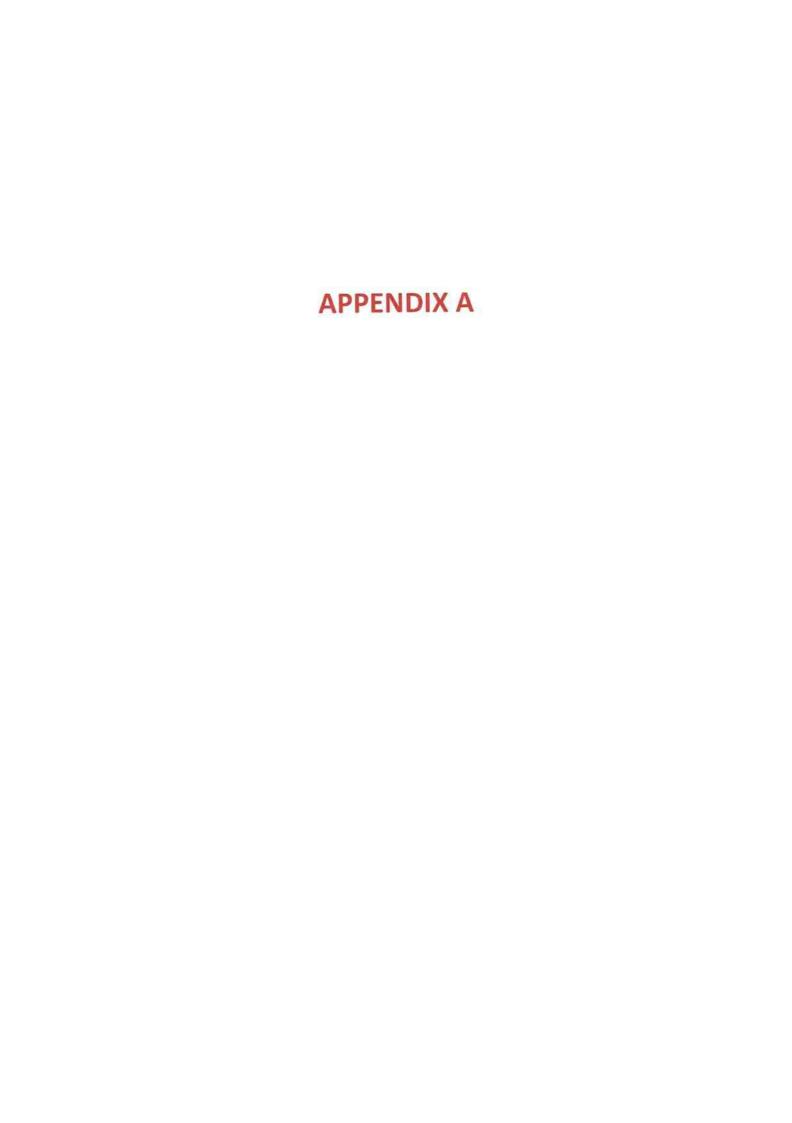
Figure 3.1: Environment Agency Flood Map



Source: London Borough of Camden Geological, Hydrogeological and Hydrological Study (2010).

Figure 3.2: Camden Geological, Hydrogeological and Hydrological Study 2010 Flood Map

APPENDICES



Graham Sinclair

From: Farthing, Amy [Amy.Farthing@camden.gov.uk]

 Sent:
 23 April 2015 15:11

 To:
 Graham Sinclair

Subject: RE: Surface water flooding hazard maps for Camden

Hi Graham.

Your email has been forwarded to me.

We don't hold any records of particular properties that have been flooded in this area, but our strategic flood risk assessment (2014) holds the most up to date surface water flooding maps for Camden, and also indicates flooded streets in previous events.

http://www.camden.gov.uk/ccm/content/environment/planning-and-built-environment/two/planning-policy/local-development-framework/core-strategy/evidence-and-supporting-documents.en (under the heading 'basements and flooding')

Further information is available on our website www.camden.gov.uk/flooding for the Flood Risk Management Strategy

Both documents are underpinned by the Preliminary Flood Risk Assessment and Surface Water Management Plan.

I'd also draw your attention to our planning policies relating to flood risk and basements – also available on the website Camden Planning Guidance 3 and 4 are the key documents http://www.camden.gov.uk/ccm/content/environment/planning-and-built-environment/two/planning-policy/supplementary-planning-documents/camden-planning-guidance/

Finally, if the development you are looking into is a major development, then this webpage relating to Sustainable drainage policy requirements will be of relevance too:

http://www.camden.gov.uk/ccm/content/environment/planning-and-built-environment/two/planning-applications/making-an-application/supporting-documentation/sustainable-urban-drainage-systems.en

I hope this is all helpful.

Best Wishes

Amy Farthing Sustainability Officer

Telephone: 020 7974 7611

From: Humfrey, Nick Sent: 20 April 2015 17:21 To: Farthing, Amy

Subject: FW: Surface water flooding hazard maps for Camden

FYI

Nick Humfrey Higher Apprenticeship Programme Manager Telephone: 0207 974 4027

From: Graham Sinclair [mailto:graham.sinclair@createconsultingengineers.co.uk]

Sent: 20 April 2015 17:19 To: Jasper, Graham

Cc: Humfrey, Nick; Julian Moore

Subject: RE: Surface water flooding hazard maps for Camden

Hi Graham,

We had some correspondence with Nick Humfrey on this site back in 2013. We are now revising our reports with an updated scheme and I wonder if you might be able to let me know whether Camden holds any records of flooding in the locality of Calthorpe Street since April 2013?

If you have any queries please do get in touch.

Many thanks,

Graham.



Hydrologist Create Consulting Engineers Ltd



T 0845 450 7908

F 0845 409 4520

E graham.sinclair@createconsultingengineers.co.uk

W www.createconsultingengineers.co.uk

NORWICH BRAINTREE LONDON GLASGOW

Create Consulting Engineers Ltd 15 Princes Street Norwich Norfolk NR3 1AF

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From: Humfrey, Nick [mailto:Nick.Humfrey@camden.gov.uk]

Sent: 18 April 2013 10:35

To: Julian Moore

Subject: RE: Surface water flooding hazard maps for Camden

Julian,

Sorry for the typo.

However I can confirm that we do not consider the vicinity of Calthorpe street and Mount Pleasant as an area of significant surface water flood risk and have no records of flooding there (although our records are limited and shouldn't be taken as comprehensive).

Thanks

Nick Humfrey Sustainability Officer

Telephone: 0207 974 4027

From: Julian Moore [mailto:Julian.Moore@createconsultingengineers.co.uk]

Sent: 18 April 2013 10:32

To: Humfrey, Nick

Subject: RE: Surface water flooding hazard maps for Camden

Thanks Nick – Please can you add a reference to our site in Calthorpe Street in the text below – perhaps by adding "Calthorpe street" where I have highlighted below.

Regards,

Julian



Associate, Water Create Consulting Engineers Ltd

- T 0207 822 2306 (Direct)
- T 0207 822 2300 (Switchboard)
- M 07850 209761
- F 0845 409 4520
- E julian.moore@createconsultingengineers.co.uk
- W www.createconsultingengineers.co.uk

LONDON

NORWICH

IPSWICH

CAMBRIDGE

GLASGOW

Create Consulting Engineers Ltd 109-112 Temple Chambers 3-7 Temple Avenue London EC4Y OHP

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From: Humfrey, Nick [mailto:Nick.Humfrey@camden.gov.uk]

Sent: 18 April 2013 10:20

To: Julian Moore

Subject: RE: Surface water flooding hazard maps for Camden

Hi Julian.

Please find attached the surface water flooding model for South Camden. Please do not take the high resolution as showing accuracy to property level. However I can confirm that we do not consider an area of significant surface water flood risk and have no records of flooding there (although our records are limited and shouldn't be taken as comprehensive).

I would however stress these lines from the flood risk strategy:

Surface water run-off from significant areas of Camden drains into the former Fleet River, which has now been fully incorporated into the Fleet sewer. Overloading of this sewer during an event with a 3.3% chance of happening in any one year (1 in 30 year rainfall event) could result in localised sewer flooding in Farringdon Street and New Bridge Street in the City of London and the Cowcross Street area of Islington. Actions in Camden which minimise rainwater run-off into the sewer network will assist in reducing flood risk in neighbouring boroughs. This could include the incorporation of sustainable drainage systems (SuDS) into

buildings, open spaces and the public realm.

Consequently we ask that in any design full and early consideration is given to how SuDS can be incorporated as they will have an important impact on flooding directly downstream.

Thanks

Nick Humfrey Sustainability Officer

Telephone: 0207 974 4027

From: Julian Moore [mailto:Julian.Moore@createconsultingengineers.co.uk]

Sent: 17 April 2013 15:25 To: Humfrey, Nick

Subject: Surface water flooding hazard maps for Camden

Hi Nick,

I write to request a copy of your latest Surface water flooding hazard maps for Camden. I understand that you were undertaking some enhanced modelling work to refine the original work which was done for drain London - Is this available yet?

Kind regards,

Julian



Associate, Water Create Consulting Engineers Ltd

T 0207 822 2306 (Direct)

T 0207 822 2300 (Switchboard)

M 07850 209761

F 0845 409 4520

E julian.moore@createconsultingengineers.co.uk

W www.createconsultingengineers.co.uk

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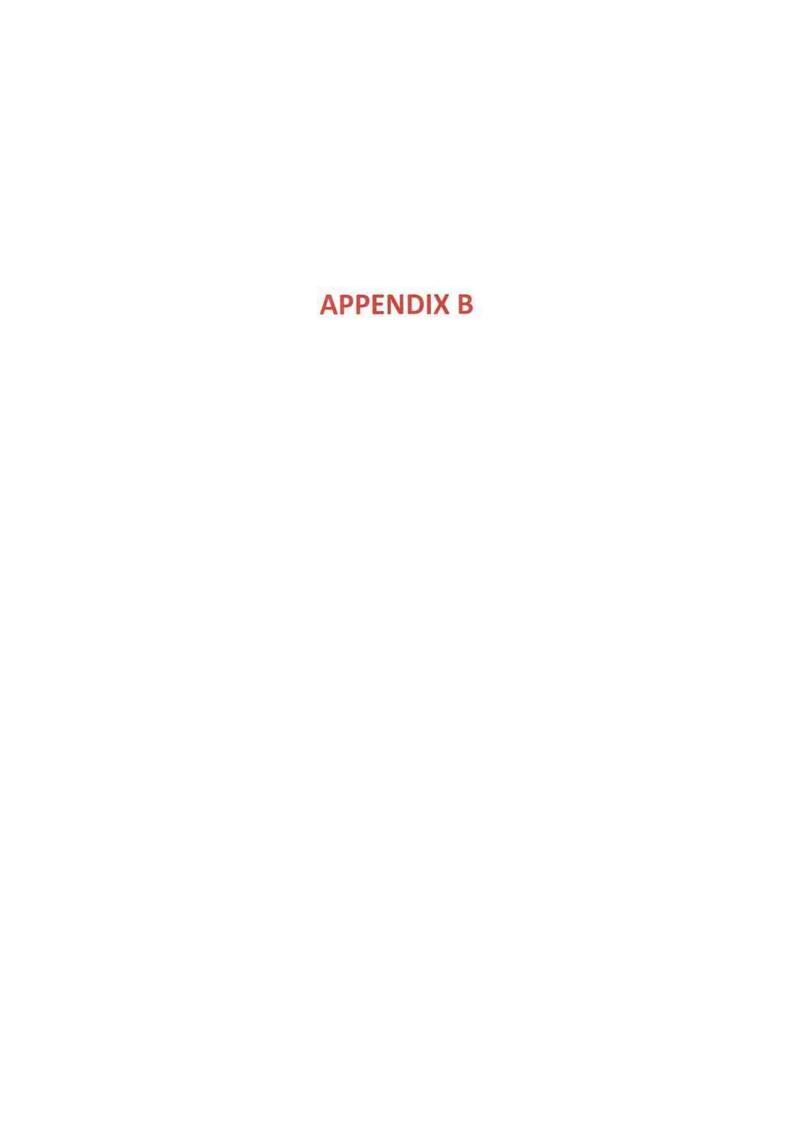
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Thames Water Property Searches 12 Vastern Road READING RG1 8DB

Search address supplied John Stewart

51

Calthorpe Street

London WC1X 0HH

Your reference P12-385

Our reference ALS/ALS Standard/2012_2367582

Search date 29 November 2012

You are now able to order your Asset Location Search requests online by visiting www.thameswater-propertysearches.co.uk

Thames Water Utilities Ltd

Property Searches PO Box 3189 Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148

E_searches@thameswater.co.uk | www.thameswaterpropertysearches.co.uk

Registered in England and Wales No. 236661, Registered office Clearwater Court, Vastern Road Reading RG1 8DB



Search address supplied: John Stewart, 51, Calthorpe Street, London, WC1X 0HH

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.

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

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

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

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

Contact Us

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

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

Email: searches@thameswater.co.uk

Web: www.thameswater-propertysearches.co.uk

Thames Water Utilities Ltd.

Property Searches PO Box 3189 Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148

E_searches@thameswater.co.uk I_www.thameswaterpropertysearches.co.uk

Registered in England and Wales No. 2366661, Registered office Clearwater Court, Vastern Road Reading RG1 8DB



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.

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

For your information, there will be a pressure of at least 10m head at the outside stop valve. If you would like to know the static pressure, please contact our Customer Centre on 0845 920 0800. The Customer Centre can

Thames Water Utilities Ltd

Property Searches PO Box 3189 Slough SL1 4WW

DX 151280 Slough 13

T 0845 070 9148

E_searches@thameswater.co.uk I_www.thameswaterpropertysearches.co.uk

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also arrange for a full flow and pressure test to be carried out for a fee.

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Thames Water Utilities Ltd

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DX 151280 Slough 13

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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, 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: 0845 850 2777

Email: developer.services@thameswater.co.uk

Should you require any further information regarding budget estimates, diversions or stopping up notices then please contact:

DevCon Team Asset Investment Thames Water Maple Lodge STW Denham Way Rickmansworth Hertfordshire WD3 9SQ

Tel: 01923 898 072

Email: devcon.team@thameswater.co.uk

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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: 0845 850 2777

Email: developer.services@thameswater.co.uk

Thames Water Utilities Ltd

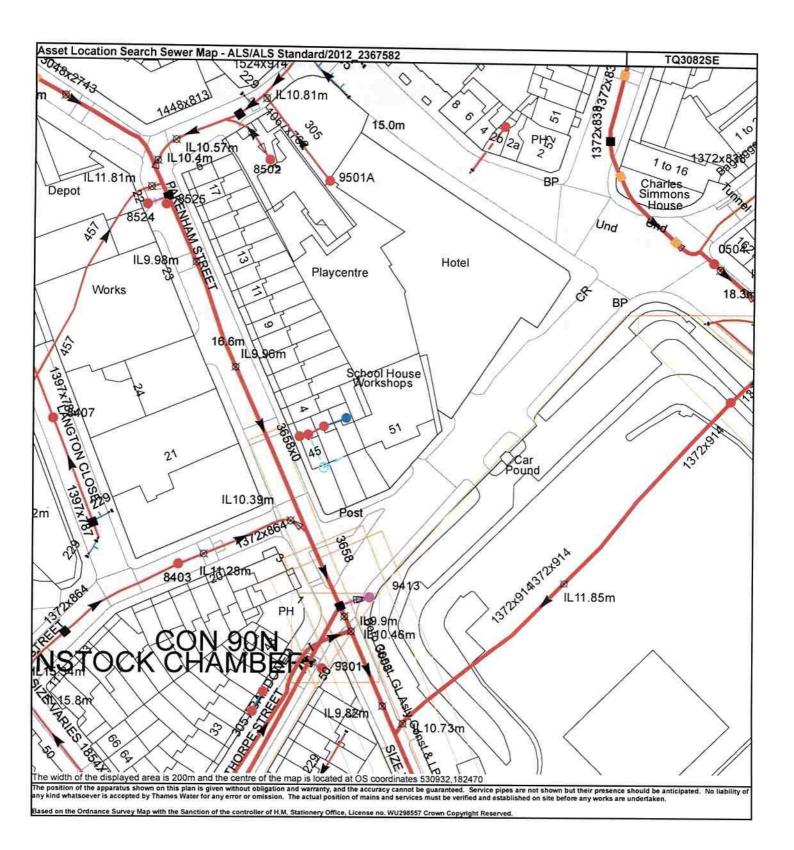
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NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
8407	17.94	13.41
8524	n/a	n/a
8525	n/a	n/a
8403	18.69	n/a
83HJ	n/a	n/a
83IA	n/a	n/a
8502	14.98	12.51
94BG	n/a	n/a
94BF	n/a	n/a
0402A	n/a	n/a
0504	n/a	15.01
9512	n/a	n/a
9301	n/a	n/a
94BB	n/a	n/a
94BI	n/a	n/a
9501A	n/a	n/a
94BA	n/a	n/a
	(a=)	
9413	19.15	13.24

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.



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.

Dam Chase

Fitting Meter

Air Valve

Combined: A sewer designed to convey both waste water and surface water from domestic and industrial sources to a treatment works.

M 0

--- Trunk Foul

Trunk Surface Water

1-0-

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 Vaive

Drop Pipe Ancillary

Bio-solids (Sludge)

Vent Pipe

Trunk Combined

Storm Relief

Weir (m)

Proposed Thames Water Foul Sewer

Proposed Thames Surface Water Sewer

End Items

Foul Rising Main

Gallery

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 or a surface water sewer indicates that the pipe discharges into a stream or niver.

Outfall シ

Proposed Thames Water Rising Main

44

Sludge Rising Main

Vacuum

Combined Rising Main

Rising

Water

Surface

Undefined End <u>ļ</u>

Inlet

6) The text appearing alongside a sewer line indicates the internal diameter of 3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of

Other Symbols

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

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.

Sewer Fittings

Public/Private Pumping Station

Change of characteristic indicator (C.O.C.I.)

Invert Level Ø

Summit V

Areas

Lines denoting areas of underground surveys, etc.

Operational Site Agreement

Chamber Tunnel

Conduit Bridge

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

Surface Water Sewer

Culverted Watercourse Combined Sewer Foul Sewer

Proposed Gulley

Abandoned Sewer X O X

6

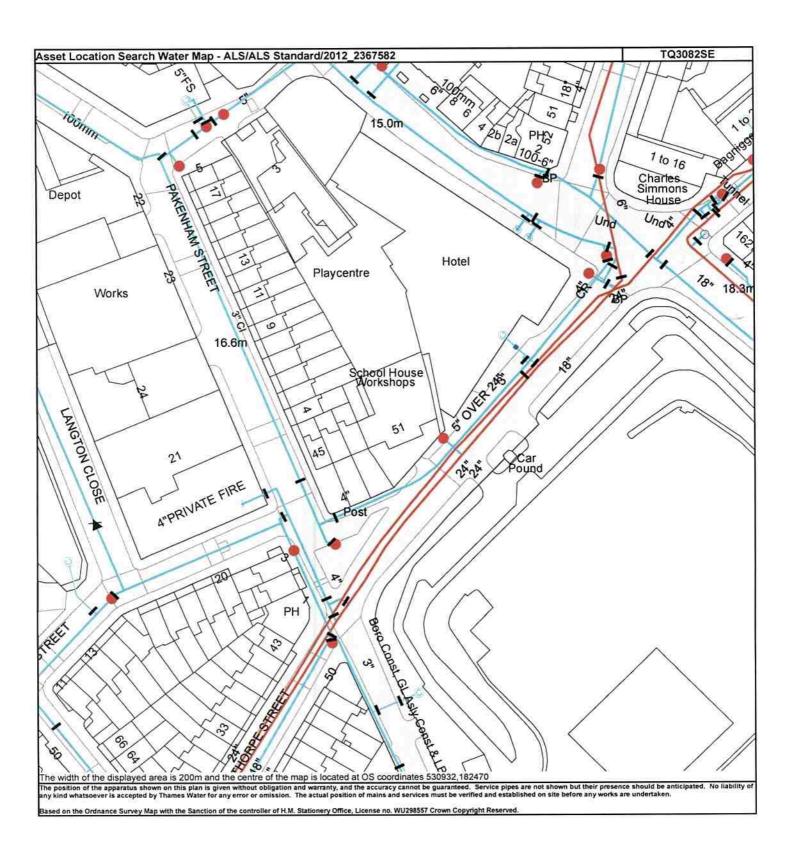
the pipe in milimetres. Text next to a manhole indicates the manhole reference number and should not be taken as a measurement. If you are unsure about any text or symbology present on the plan, please contact a member of Property Insight on 0845.070.9148.

4) Most private pipes are not shown on our plans, as in the past, this information has

na or 0 on a manhole level indicates that data is unavailable

1) All levels associated with the plans are to Ordnance Datum Newlyn.

2) All measurements on the plans are metric.





ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

- **Distribution Main:** The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.
- Trunk Main: A main carrying water from a source of supply to a treatment plant or reservor, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water nains used for supplying individual customers.
- Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties J'BUPHLY
- Fire Main: Wherea pipe is used as a fire supply, the word FIRE will be displayed along the pipe. YFRE
- Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown. 7 WETENED
- Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided
- Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

DEPTH BELOW GROUND

PIPE DIAMETER Up to 300mm (12") 1100mm (3° 8") 1200mm (4")

600mm and bigger (24" plus)

300mm - 600mm (12" - 24")

Valves

General PurposeValve Air Valve Pressure ControlValve

CustomerValve

Hydrants

Single Hydrant

Meters

End Items

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

Other Symbols

Data Logger

Blank Flange

Emptying Pit

Manifold

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

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

Service Reservoir

Treatment Works Shaft Inspection

0

Water Tower

Unknown

• K

Other (Proposed) Pumping Station

Booster Station

Φ

Other

Operational Sites

Meter

Capped End

Undefined End

Customer Supply

Fire Supply



Search Code

IMPORTANT CONSUMER PROTECTION INFORMATION

This search has been produced by Thames Water Property Searches, Clearwater Court, Vastern Road, Reading RG1 8DB, which is registered with the Property Codes Compliance Board (PCCB) as a subscriber to the Search Code. The PCCB independently monitors how registered search firms maintain compliance with the Code.

The Search Code:

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 rely on the information included in property search reports undertaken by subscribers on residential
 and commercial property within the United Kingdom
- sets out minimum standards which firms compiling and selling search reports have to meet
- promotes the best practise and quality standards within the industry for the benefit of consumers and property professionals
- enables consumers and property professionals to have confidence in firms which subscribe to the code, their products and services.

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

The Code's core principles

Firms which subscribe to the Search Code will:

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

Complaints

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

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

TPOs Contact Details

The Property Ombudsman scheme Milford House 43-55 Milford Street Salisbury Wiltshire SP1 2BP

Tel: 01722 333306 Fax: 01722 332296 Email: admin@tpos.co.uk

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

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

APPENDIX C

Sewer Flooding History Enquiry



Create Consulting Engineers Ltd

Search address supplied Unit I

51

Calthorpe Street

London WC1X 0HH

Your reference P12-385

Our reference SFH/SFH Standard/2015_3023678

Received date 22 April 2015

Search date 22 April 2015

Thames Water Utilities Ltd

Property Searches PO Box 3189 Slough SL1 4WW

DX 151280 Slough 13

T 0118 925 1504
E searches@thameswater.co.uk
www.thameswaterpropertysearches.co.uk

Registered in England and Wales No. 236661, Registered office Clearwater Court, Vestern Road Reading RG1 8DB

Sewer Flooding History Enquiry



Search address supplied: Unit I,51,Calthorpe Street,London,WC1X 0HH

This search is recommended to check for any sewer flooding in a specific address or area

TWUL, trading as Property Searches, are responsible in respect of the following:-

- (i) any negligent or incorrect entry in the records searched;
- (ii) any negligent or incorrect interpretation of the records searched;
- (iii) and any negligent or incorrect recording of that interpretation in the search report
- (iv) compensation payments

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Registered in England and Wales No. 236861, Registered office Clearwater Court, Vestern Road Reading RG1 8DB

Sewer Flooding

History Enquiry



History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is "overloaded" when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter).
 Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- "Internal flooding" from public sewers is defined as flooding, which enters
 a building or passes below a suspended floor. For reporting purposes,
 buildings are restricted to those normally occupied and used for
 residential, public, commercial, business or industrial purposes.
- "At Risk" properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company's reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

Thames Water Utilities Ltd

Property Searches PO Box 3189 Slough SL1 4VWV

DX 151280 Slough 13

T 0118 925 1504 E searches@thameswater.co.uk I www.thameswaterpropertysearches.co.uk

Registered in England and Wales No. 236661, Registered office Clearwater Court, Vastern Road Reading RG1 8DB

APPENDIX D

Calc for expected Foul Water

CALCULATION OF NEW DEMAND ON FOUL SEWERS USING PROPERTY TYPE.

			2	Į.	
	Dry weather flow (in litres per day)	Daily Discharge (in litres)	No. of :-	Total Discharge (in litres per day)	Housing Equivalent
General Housing per property	009	4000			0
School per rumil	80	528			0
Assembly Hall per seat	10	99			0 0
Cinema per seat	10	99			0 0
Theatre per seat	10	99)	0
Sports Hall per person	90	330			0
Hotel per room	550	3630			0
Guest House per room	200	1320			0 0
Motel per room	300	1980)	0
Holiday Apartment per person	150	066			0
	066	1452			0
Commercial Designation of space	250				0
Caravan Site serviced per space	450	3.1			0
Camping site standard per space	200	1320			0 0
Camping site serviced per space	350	2310			0
Public House per seat	150				0
Restaurant/Day Care Centre per person	270				0
Drive in restaurant per seat	380	2508			0
Hospital per bed	750	4950			0
Nursing/Care Home per bed	375	2475			0
Offices ner 100m so	750	4950	11	54450	13.6125
Shopping Centre per 100m sq	400	2640			0
	450	000			
Warehouse per 100m sq	200				0 0
Commercial premises per 100 m sq	000				

Dry weather flow				
(in litres per day)	Daily Discharge (in litres)	No. of :-	Total Discharge (in litres per day)	Housing Equivalent
009	4000	41	00089	5
OB	428		0	0
10			0	0
10			0	0
10	99		0	0
20	330		0	0
750	0896		C	0
200			0	0
300			0	0
150	990		0	0
220			0	
250			0	
450			0	
200			0	
35(2310		0	0
150	066		0	
270			0	0
380	2508		0	0
750			0	
375	2475		0	
750	1 4950		0	
400			0	
150	066		0	
300	1980)	0
550	3630		0	0
-	L		00089	
l otal Discharge / Housing Equivalent	iousing Equivalent		20000	

0.79 1/8	13550 3.3875	0.16 l/s
	Net gain to system per day/property equivalent	Net foul water increase to system =

Total Discharge / Housing Equivalent

APPENDIX E

Create Consulting Engineers Ltd		Page 1	
15 Princes Street Norwich Norfolk NR3 1AF	Calthorpe Street Hydrobrake Outflow 5.0 1/s Cellular Storage - 100 yr + CC	Micro	
Date 20.05.15	Designed by GS	Drainage	
File HYDROBRAKE CELLULAR STO	Checked by BWA	File III (als) F	
XP Solutions	Source Control 2015.1		

Summary of Results for 100 year Return Period (+30%)

Half Drain Time : 26 minutes.

	Stor		Max	Max	Max	Max	Max	Max	Status
	Even	t	Level	Depth	Infiltration	Control	Σ Outflow	Volume	
			(m)	(m)	(1/s)	(1/s)	(1/s)	(m ³)	
15	min	Summer	15.531	1.071	0.0	4.9	4.9	10.7	ОК
30	min	Summer	15.638	1.178	0.0	4.9	4.9	11.7	OK
60	min	Summer	15.599	1.139	0.0	4.9	4.9	11.4	OK
120	min	Summer	15.403	0.943	0.0	4.9	4.9	9.4	OK
180	min	Summer	15.147	0.687	0.0	4.9	4.9	6.9	OK
240	min	Summer	14.956	0.496	0.0	4.9	4.9		
360	min	Summer	14.733	0.273	0.0	4.7	4.7	2.7	OK
480	min	Summer	14.631	0.171	0.0	4.3	4.3	1.7	O K
600	min	Summer	14.584	0.124	0.0	3.9	3.9	1.2	ОК
720	min	Summer	14.566	0.106	0.0	3.4	3.4	1.1	O K
960	min	Summer	14.545	0.085	0.0	2.7	2.7	0.9	OK
1440	min	Summer	14.528	0.068	0.0	2.0	2.0	0.7	O K
2160	min	Summer	14.515	0.055	0.0	1.4	1.4	0.5	OK
2880	min	Summer	14.508	0.048	0.0	1.1	1.1	0.5	OK
4320	min	Summer	14.500	0.040	0.0	0.8	0.8	0.4	OK
5760	min	Summer	14.495	0.035	0.0	0.6	0.6	0.3	OK
7200	min	Summer	14.492	0.032	0.0	0.5	0.5	0.3	ОК
8640	min	Summer	14.489	0.029	0.0	0.4	0.4	0.3	ОК
		Summer	14.487				0.4		O K
15	min	Winter	15.688	1.228	0.0	4.9	4.9	12.2	OK

	Storm		Rain (mm/hr)	Flooded Volume	The state of the s	Time-Peak (mins)	
				(m ³)	(m³)		
15	min	Summer	136.877	0.0	14.1	16	
30	min	Summer	88.387	0.0	18.2	27	
60	min	Summer	54.281	0.0	22.4	44	
120	min	Summer	32.206	0.0	26.6	78	
180	min	Summer	23.430	0.0	29.0	108	
240	min	Summer	18.596	0.0	30.7	138	
360	min	Summer	13.394	0.0	33.1	194	
480	min	Summer	10.611	0.0	35.0	250	
600	min	Summer	8.852	0.0	36.5	308	
720	min	Summer	7.630	0.0	37.8	368	
960	min	Summer	6.032	0.0	39.8	488	
1440	min	Summer	4.325	0.0	42.8	730	
2160	min	Summer	3,097	0.0	46.0	1096	
2880	min	Summer	2.442	0.0	48.3	1468	
4320	min	Summer	1.745	0.0	51.8	2184	
5760	min	Summer	1.373	0.0	54.4	2840	
7200	min	Summer	1.140	0.0	56.4	3544	
8640	min	Summer	0.979	0.0	58.2	4320	
10080	min	Summer	0.861	0.0	59.6	4976	
15	min	Winter	136.877	0.0	15.8	16	

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Create Consulting Engineers Ltd		Page 2
15 Princes Street Norwich Norfolk NR3 1AF	Calthorpe Street Hydrobrake Outflow 5.0 1/s Cellular Storage - 100 yr + CC	The same
Date 20.05.15 File HYDROBRAKE CELLULAR STO	Designed by GS	- Micro Drainage
XP Solutions	Source Control 2015.1	- January

Summary of Results for 100 year Return Period (+30%)

	Stor		Max Level (m)	Max Depth (m)	Max Infiltration (1/s)	Max Max Control Σ Outflow (1/s) (1/s)		Max Volume (m³)	Status
30	min	Winter	15.823	1.363	0.0	4.9	4.9	13.6	OK
60	min	Winter	15.759	1.299	0.0	4.9	4.9	13.0	OK
120	min	Winter	15.457	0.997	0.0	4.9	4.9	9.9	ОК
180	min	Winter	15.066	0.606	0.0	4.9	4.9	6.0	ОК
240	min	Winter	14.819	0.359	0.0	4.9	4.9	3.6	ОК
360	min	Winter	14.616	0.156	0.0	4.1	4.1	1.6	ОК
480	min	Winter	14.567	0.107	0.0	3.4	3.4	1.1	ОК
600	min	Winter	14.550	0.090	0.0	2.9	2.9	0.9	OK
720	mín	Winter	14.540	0.080	0.0	2.5	2.5	0.8	ОК
960	min	Winter	14.528	0.068	0.0	2.0	2.0	0.7	OK
1440	min	Winter	14.515	0.055	0.0	1.4	1.4	0.5	O K
2160	min	Winter	14.506	0.046	0.0	1.0	1.0	0.5	OK
2880	min	Winter	14.500	0.040	0.0	0.8	0.8	0.4	OK
4320	min	Winter	14.493	0.033	0.0	0.6	0.6	0.3	OK
5760	min	Winter	14.489	0.029	0.0	0.4	0.4	0.3	OK
7200	min	Winter	14.487	0.027	0.0	0.4	0.4	0.3	ОК
8640	min	Winter	14.485	0.025	0.0	0.3	0.3	0.2	ОК
10080	min	Winter	14.483	0.023	0.0	0.3	0.3	0.2	ОК

Storm		Rain	Flooded	Discharge	Time-Peak	
Event		(mm/hr)	Volume	Volume	(mins)	
				(m³)	(m ³)	
30	min	Winter	88.387	0.0	20.4	29
60	min	Winter	54.281	0.0	25.1	46
120	min	Winter	32.206	0.0	29.8	84
180	min	Winter	23.430	0.0	32.5	114
240	min	Winter	18.596	0.0	34.4	140
360	min	Winter	13.394	0.0	37.1	194
480	min	Winter	10.611	0.0	39.2	248
600	min	Winter	8.852	0.0	40.9	308
720	min	Winter	7.630	0.0	42.3	366
960	min	Winter	6.032	0.0	44.6	486
1440	min	Winter	4.325	0.0	48.0	718
2160	min	Winter	3.097	0.0	51.5	1072
2880	min	Winter	2.442	0.0	54.1	1444
4320	min	Winter	1.745	0.0	58.0	2132
5760	min	Winter	1.373	0.0	60.9	2888
7200	min	Winter	1.140	0.0	63.2	3600
8640	min	Winter	0.979	0.0	65.1	4336
10080	min	Winter	0.861	0.0	66.8	5072

Create Consulting Engineers Ltd	Page 3	
15 Princes Street Norwich Norfolk NR3 1AF	Calthorpe Street Hydrobrake Outflow 5.0 1/s Cellular Storage - 100 yr + CC	Mirro
Date 20.05.15	Designed by GS	Drainage
File HYDROBRAKE CELLULAR STO XP Solutions	Checked by BWA Source Control 2015.1	

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.600	Shortest Storm (mins)	15
Ratio R	0.439	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+30

Time Area Diagram

Total Area (ha) 0.055

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

0 4 0.055

Create Consulting Engineers Ltd	Page 4	
15 Princes Street Norwich Norfolk NR3 1AF	Calthorpe Street Hydrobrake Outflow 5.0 1/s Cellular Storage - 100 yr + CC	Milita
Date 20.05.15 File HYDROBRAKE CELLULAR STO	Designed by GS Checked by BWA	Drainage
XP Solutions	Source Control 2015.1	

Model Details

Storage is Online Cover Level (m) 16.260

Cellular Storage Structure

Depth (m) Area (m²) Inf. Area (m²) Depth (m) Area (m²) Inf. Area (m²) 0.000 10.5 10.5 10.5 1.501 0.0 30.0

Hydro-Brake Optimum® Outflow Control

Unit Reference MD-SHE-0098-5000-1500-5000 1.500 Design Head (m) Design Flow (1/s) 5.0 Flush-Flo™ Calculated Objective Minimise upstream storage Diameter (mm) 98 14.460 Invert Level (m) Minimum Outlet Pipe Diameter (mm) 150 Suggested Manhole Diameter (mm) 1200

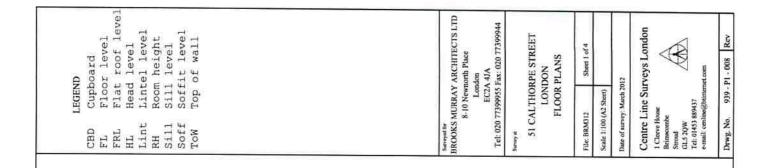
Control	Points	Head	(m)	Flow	(1/s)
Design Point	(Calculated)	1.	500		5.0
THE COLUMN THE PARTY OF THE PAR	Flush-Flo™	0.	431		4.9
	Kick-Flo®	0.	878		3.9
Mean Flow ove	r Head Range		95		4.3

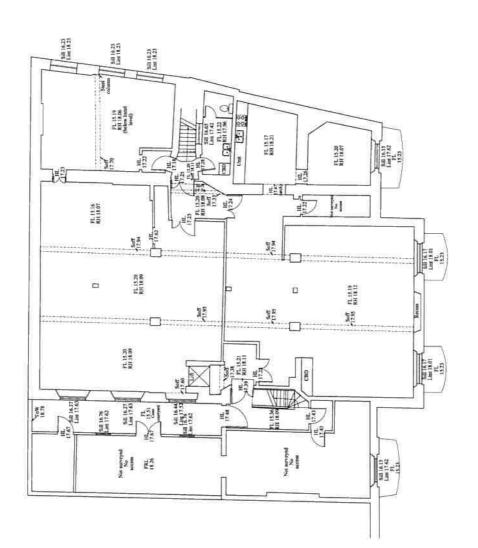
The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake Optimum® as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	Flow (1/s)	Depth (m) Flo	w (1/s)	Depth (m) Flo	w (1/s) D	epth (m) Fl	ow (1/s)
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10,3
0.200	4.4	1.400	4.8	3.500	7.4	7.500	10.7
0.300	4.8	1.600	5.1	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.4	4.500	8.4	8.500	11.3
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.6
0.600	4.8	2.200	6.0	5.500	9.2	9.500	11.9
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.1	2.600	6.5	6.500	10.0		

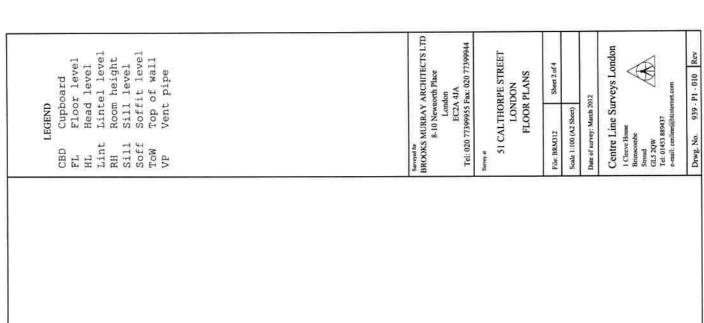
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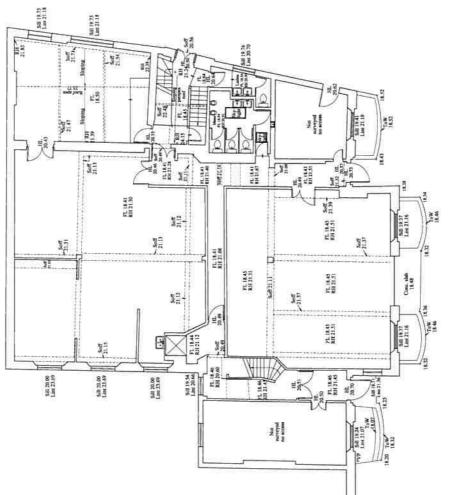
PLANS





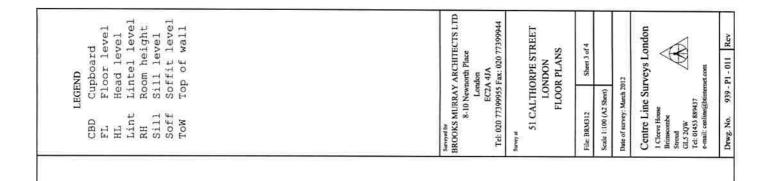
Basement

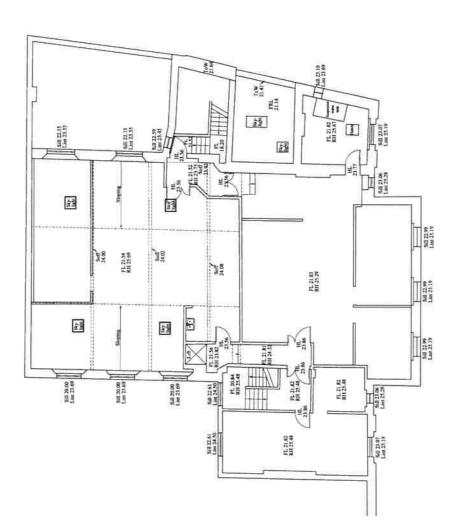




21

Ground floor





First floor

Z B

