Adam Littler
Lead Local Flood Authority
Post Point CHN 215
Hertfordshire County Council
County Hall, Pegs Lane
HERTFORD
SG13 8DN

19 August 2022

CONFIDENTIAL

Dear Adam,

RE: RE: 6/2021/3422/MAJ - Salisbury Square, Hatfield, AL9 5AD

We are aware that Hertfordshire County Council, as the Lead Local Flood Authority (LLFA), issued an additional holding objection to the Planning Application for 6/2021/3422/MAJ – Salisbury Square, Hatfield in July 2022.

To overcome the objection, the report states the following:

"The applicant should address the points raised in the above in the form of a Sustainable Surface Water Management Strategy Compliance Report. This must clearly demonstrate how the proposal is aligned with Local and National Standards, CIRIA C753 and Local Policy" (LLFA Response: July 2022)

Each of the points raised in the letter have been addressed below:

1) The LLFA expect to see infiltration test results to BRE365 standards for the site at this stage in the design iteration. The use of infiltration has been ruled out by the applicant without robust evidence that this form of drainage, in line with the drainage hierarchy, cannot be utilised. The applicant should undertake such testing and submit results to the LLFA for technical assessment.

We have received correspondence from Affinity Water (attached, reference 6.2021.3422.MAJ 150422) with regard to water quality for the site, which strictly rules out the use of infiltration for the scheme due to the risk of groundwater pollutant migration, the relevant excerpt can be found below.

3. Infiltration
Surface water should not be disposed of via direct infiltration into the ground via a soakaway due to the potential impact that could be caused to the bromate plume.
Condition

70 Chancery Lane
London WC2A 1AF
Tel: +44 (0)20 7314 5000

wsp.com

C) Prior to the commencement of development, details of a Surface Water Drainage Scheme that does not include infiltration shall be submitted to and approved in writing by the Local Planning Authority in conjunction with Affinity Water.
Reason: To provide confirmation that direct infiltration via soakaways will not be used due to the potential presence of contamination and the risk for contaminants to migrate causing further groundwater pollution, potentially impacting public water supply.

We assume this fulfils the justification for no infiltration and as such will not be undertaking infiltration testing.

2) Furthermore, the soil type used in the Wallingford Procedure identifies soil type as 2. The applicant should validate why there is an assertion the site is based on clay, yet soil 2 is used for calculation purposes.

I believe this is a misreading of the greenfield run off rate appendix, the default value given for the site is Soil Type 2, however this has been overwritten with the custom 'edited' value of Soil Type 4 which represents the clay soil type.

Soil characteristics	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

Figure 1 – Greenfield Run-off Soil Characteristics

Please refer to enclosed Appendix F of the FRA (8003-WSP-ZZ-RP-D-0001-P03) – Greenfield Run Off Rates

3) The applicant should also re-run the calculation files for all impermeable area using a Cv value of 0.95 for roofed areas and 0.9 for all hardstanding, as a sensitivity test. The LLFA does not currently have confidence the default Cv values used accurately represent the site conditions. If the applicant does not agree with this, they should justify clearly why they believe this is not required.

We have undertaken a sensitivity check with Cv values of 0.9 for hardstanding and 0.95 for roof area respectively. However, we have used a lower value (0.84) for the areas of permeable asphalt as we feel is more representative, given that there is an element of migration through the permeable surface and storage sub-base and long-term storage. We feel that this is a conservative approach given the critical storm occurs in the summer and the CIRIA SuDS guide Table 11.4 suggests that run-off coefficients for paving when dry are of the order 0.75.
Please find enclosed updated source control calculations with the revised Cv values as a sensitivity test. This results in no flooding in the 1 in 30 or 1 in 100 year event with the EA central 25% climate change allowance applied. When the upper forecast of 40% climate change is applied this results in small quantities of flooding of 11.1m^3 and 6.8m^3 for catchments 1 and 2 respectively. This is not an

excessive quantum of flooding and will not produce undue effects on site. Any flooding that may occur will be directed towards the pedestrian access though to Park Street on the eastern side of the site for catchment 1 and will be directed to the localise low spot in the centre of the far southern area in catchment 2. Furthermore, we are providing betterment over the existing situation where no known attenuation or specific flow control exists, and therefore this potential flooding does not represent an increase in flood risk off site.

4) Suitable Drainage Strategy including assessment of the SuDS hierarchy. The applicant should now provide a compliance report detailing how the proposed Surface Water Drainage Strategy conform to local and national standards

The Drainage Strategy for the site follows both local and national policy, detailed explanation of compliance can be found below:

Runoff Rates

Hertfordshire (HCC) LLFA guidance and the Local Flood Risk Management Strategy (LFRMS) states that peak discharge rates from the site should not increase as a result of development, as detailed in our FRA we are providing betterment over existing rates in all return period events assessed up to the 1 in 100 year. HCC guidance also states that for Brownfield sites the run-off should aim to provide greenfield rates where possible, in our case Greenfield flows are matched for all events up to the 1 in 100-year storm as closely as possible. This also provides betterment in line with Welwyn-Hatfield SFRA, Hertfordshire LFRMS and DEFRA national requirements in the Non-statutory technical standards for sustainable drainage systems.

Storage Volumes

In line with HCC policy storage has been provided to attenuate for storm events up to and including the 1 in 100 year with a 40% allowance for climate change (the EA upper end allowance for the Upper Lee Management Catchment for developments with a lifespan exceeding 2100). No flooding occurs in the 1 in 30 or 1 in 100 year event with upper end climate change allowance. As previously explained when a sensitivity test is carried out for the elevated Cv values, flooding does occur but only in the 1 in 100year event with upper end climate change scenario and volumes are not significant. This is in line with the Welwyn Hatfield SFRA, LFRMS and NPPF and DEFRA guidance.

Sustainable Drainage Techniques

	SuDS Features	Flood Reduction	Pollution Reduction	Biodiversity Benefit
Most Sustainable	Living roofs and walls	☒	☒	☒
↓	Basins and ponds	☒	☒	☒
	Filter strips and swales	☒	☒	☒
	Infiltration devices	☒	☒	☒
	Permeable surfaces and filter drains	☒	☒	☐
Least Sustainable	Tanked and piped systems	☒	☐	☐

Figure 2 – SuDS Hierarchy

The SuDs regime for the site follows chapter 1 of the CIRIA SuDS Manual (C753), The Philosophy of SuDS and complies with the SuDS hierarchy as outlined in the HCC LLFA guidance (above):

- Green roofs/walls are not suitable for this site due to the provision of traditional pitched roofs on the scheme in response to the historic context of Salisbury Square. As a brownfield site, there is a lack of external space for basins/ponds due to the parking provision and access requirements of the scheme.
- As a brownfield site, there is a lack of external space for swales/filter strips due to the parking provision and access requirements of the scheme.
- Infiltration devices are not suitable as explained previously due to Affinity Waters assertion that there is a risk of potential for migration of contaminants within the underlying geology
- Permeable surfaces have been included for the scheme which will provide an element of attenuation and long-term storage.
- Tanked and piped systems have been included to attenuate and convey flows.

Water Quality

The drainage strategy meets the water quality requirements for discharge to surface water in the CIRIA SuDS Manual (C753) Chapter 26 – Water Quality Management and the Simple Index Approach. The worst-case hazard indices represented for the site are ‘non-residential car parks with frequent change and all low traffic roads’ This gives indices of 0.7, 0.6 and 0.7 for Total Suspended Solids (TSS), Metals and Hydrocarbons respectively. The use of permeable pavement gives mitigation indices that provide sufficient treatment with indices of 0.7, 0.6 & 0.7 respectively.

5) As previously highlighted to the applicant the site is deemed to be at low, medium and high risk of surface water flooding. We require further clarification establishing the location/extent of any existing and potential surface water flood risk alongside surface water flood maps. In areas where flooding from surface water is identified, we require clarification on the mitigation methods

used to overcome this to ensure there is no increase in flooding both on and off site from the proposed development. Pre and post development mitigated surface water flow paths should be identified on plan, this should
include explanation of safe ingress/egress in times of exceedance.

As per surface water flood risk mapping (figure 3, below) safe access/egress of the site will be possible through the identified vehicular access in the north-western corner of the site from Arm and Sword Lane and pedestrian access from the A1000 on the western side of the site in all return period events up to the 1 in 1000 year return period. No significant re-profiling of the site is proposed, and the proposed drainage strategy captures and attenuates flows – therefore betterment is anticipated over the scenarios shown in these flood risk maps. We have included arrows on the drainage strategy drawing (enclosed) indicating exceedance flow routes in flooding scenarios, flows from catchment 2 are directed to a localised low spot in the south of the site adjacent to a pedestrian access to Park Street and for catchment 1 the additional pedestrian access through to Park Street on the eastern side of site respectively.

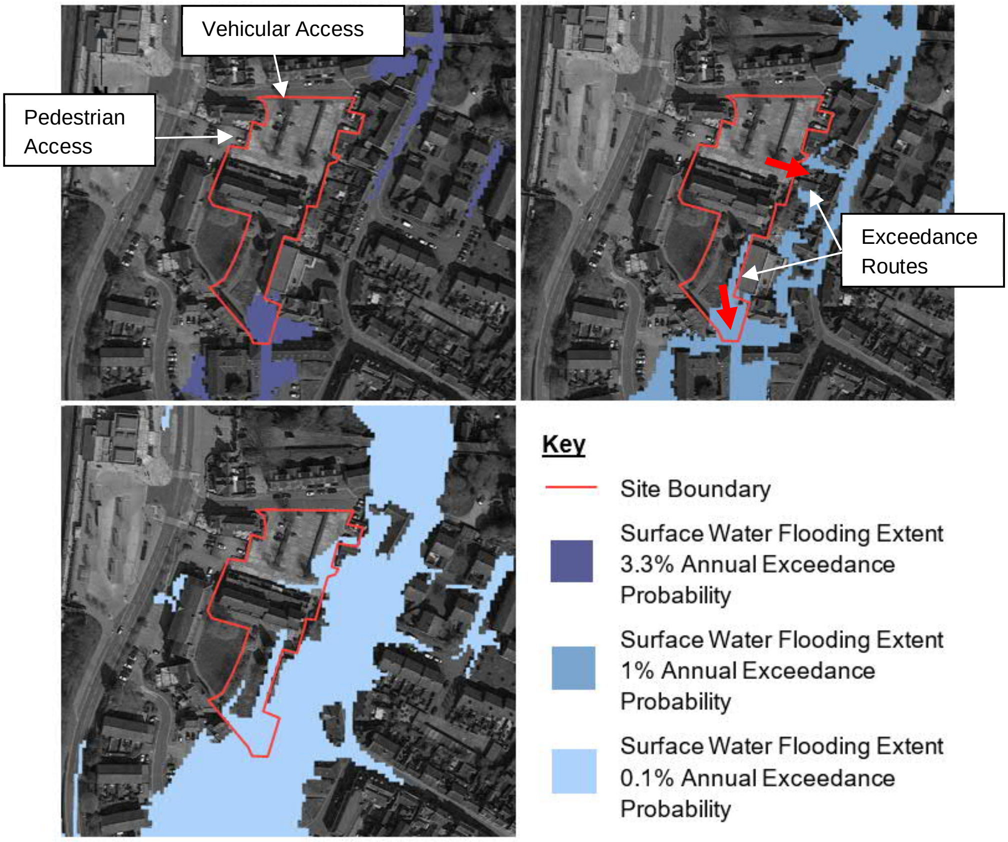


Figure 3 – Surface Water Flood Risk Maps

Comparing the extents shown to the surveyed topography of the site gives the following approximate flood levels represented on the site;

Annual Exceedance Probability	Approximate Maximum Flood level (mAOD) Catchment 1	Approximate Maximum Flood level (mAOD) Catchment 2
3.3%	n/a	72.2
1%	71.1	72.5
0.1%	71.8	72.9

Finished Floor Levels (FFLs) will be set a minimum of 150mm above the maximum surface water flood level of 72.9mAOD. The topographical survey has been enclosed.

We have enclosed documentation referred to within our response. We hope you concur with our opinion, and we trust that on the basis of the above additional information the LLFA can now withdraw its objection to the planning application without further delay. If there are any aspects of the above that you need clarification on, or if there are any issues which you wish to discuss further, then please do not hesitate to contact me.

Yours sincerely

[redacted]

Joe Leslie

Senior Engineer

Enclosures.:

Affinity Water Correspondence, reference 6.2021.3422.MAJ 150422

Additional Microdrainage Modelling Outputs

Appendix F of the FRA (8003-WSP-ZZ-RP-D-0001-P03) – Greenfield Run Off Rates

Topographical Survey by Plowman Craven 30279T-01-1

Affinity Water
Taking care of your water

Welwyn Hatfield Borough Council,
The Campus,
Welwyn Garden City,
Herts
AL8 6AE

Reference Number: 6/2021/3422/MAJ

14 April 2022

Dear Madam/Sir

DESCRIPTION: Erection of 1 x building containing 3 x flats, 11 x offices and 1 x retail unit (Use Class E), erection of 5 x terrace houses with parking and associated works, involving demolition of existing shopping parade with 7 x maisonettes above, alterations to existing parking area and erection of a parking area

LOCATION: Salisbury Square Hatfield AL9 5AD

Thank you for notification of the above planning application. Planning applications are referred to us where our input on issues relating to water quality or quantity may be required.

You should be aware that the proposed development site is located within an area that is impacted by Bromate contamination.

Our main concern is the potential for deep excavation works for foundations and drainage (e.g. soakaways) to require penetration through the Lowestoft formation creating a pathway between to two aquifers, **which must be avoided**. The Bromate plume is present in the upper aquifer and connections between the two risk the migration of bromate plume into the Chalk/lower aquifer towards other abstractions.

We ask that the above concern is considered throughout further plans of the development and for the following conditions are implemented:

1. Contamination

Any works involving excavations that penetrate into the Lowestoft formation should be avoided. If these are necessary, then the following condition needs to be implemented:

Condition

A) No works involving excavations shall be carried until the following has been submitted to and approved in writing by the Local Planning Authority in conjunction with Affinity Water:

- **i)** An **Intrusive Ground Investigation** to identify the current state of the site and appropriate techniques to avoid displacing any shallow contamination to a greater depth.
- **ii)** A **Risk Assessment** identifying both the aquifer and the abstraction points as potential receptors of contamination.
- **iii)** A **Method Statement** detailing the **depth** and **type** of excavations (e.g. piling) to be undertaken including **mitigation measures** (e.g. appropriate piling design, off site monitoring boreholes etc.) to prevent and/or minimise any potential migration of pollutants to public water supply. Any excavations must be undertaken in accordance with the terms of the approved method statement.

Reason: Excavation works into the Lowestoft formation have the potential to cause migration of contaminants into the lower aquifer and towards public water supply abstractions. This can cause critical abstractions to switch off resulting in the immediate need for water to be sourced from another location, which incurs significant costs and risks of loss of supply.

2. Contamination during construction

Construction works may exacerbate any known or previously unidentified contamination. If any pollution is found at the site, then works should cease immediately and appropriate monitoring and remediation will need to be undertaken to avoid any impact on water quality in the chalk aquifer.

Condition

B) If, during development, contamination not previously identified is found to be present at the site, then no further development shall be carried out until a **Remediation Strategy** detailing how this contamination will be dealt with has been submitted to and approved in writing by the Local Planning Authority in conjunction with Affinity Water. The remediation strategy shall be implemented as approved with a robust pre and post monitoring plan to determine its effectiveness.

Reason: To ensure that the development does not contribute to unacceptable concentrations of pollution posing a risk to public water supply from previously unidentified contamination sources at the development site and to prevent deterioration of groundwater and/or surface water.

3. Infiltration

Surface water should not be disposed of via direct infiltration into the ground via a soakaway due to the potential impact that could be caused to the bromate plume.

Condition

C) Prior to the commencement of development, details of a Surface Water **Drainage Scheme** that **does not include infiltration** shall be submitted to and approved in writing by the Local Planning Authority in conjunction with Affinity Water.

Reason: To provide confirmation that direct infiltration via soakaways will not be used due to the potential presence of contamination and the risk for contaminants to migrate causing further groundwater pollution, potentially impacting public water supply.

The construction works and operation of the proposed development site should be done in accordance with the relevant British Standards and Best Management Practices, thereby significantly reducing the groundwater pollution risk.

For further information we refer you to CIRIA Publication C532 "Control of water pollution from construction - guidance for consultants and contractors".

Water efficiency
Being within a water stressed area, we expect that the development includes water efficient fixtures and fittings. Measures such as rainwater harvesting and grey water recycling help the environment by reducing pressure for abstractions in chalk stream catchments. They also minimise potable water use by reducing the amount of potable water used for washing, cleaning and watering gardens. This in turn reduces the carbon emissions associated with treating this water to a standard suitable for drinking, and will help in our efforts to get emissions down in the borough.

Infrastructure connections and diversions
There are potentially water mains running through or near to part of proposed development site. If the development goes ahead as proposed, the developer will need to get in contact with our Developer Services Team to discuss asset protection or diversionary measures. This can be done through the My Developments Portal (https://affinitywater.custhelp.com/) or aw_developerservices@custhelp.com.

In this location Affinity Water will supply drinking water to the development. To apply for a new or upgraded connection, please contact our Developer Services Team by going through their My Developments Portal (https://affinitywater.custhelp.com/) or aw_developerservices@custhelp.com. The Team also handle C3 and C4 requests to cost potential water mains diversions. If a water mains plan is required, this can also be obtained by emailing maps@affinitywater.co.uk. Please note that charges may apply.

Thank you for your consideration.

Yours sincerely

Affinity Water
Taking care of your water
Laurence Chalk
Catchment Officer
Catchment Management
planning@affinitywater.co.uk
laurence.chalk@affinitywater.co.uk

Summary of Results for 100 year Return Period (+25%)

Half Drain Time : 217 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	1.443	0.443	0.0	3.7	3.7	47.1	O K
30 min Summer	1.580	0.580	0.0	3.8	3.8	61.7	O K
60 min Summer	1.698	0.698	0.0	4.0	4.0	74.2	O K
120 min Summer	1.799	0.799	0.0	4.1	4.1	85.0	Flood Risk
180 min Summer	1.847	0.847	0.0	4.1	4.1	90.2	Flood Risk
240 min Summer	1.876	0.876	0.0	4.1	4.1	93.2	Flood Risk
360 min Summer	1.913	0.913	0.0	4.2	4.2	97.1	Flood Risk
480 min Summer	1.933	0.933	0.0	4.2	4.2	99.3	Flood Risk
600 min Summer	1.938	0.938	0.0	4.2	4.2	99.8	Flood Risk
720 min Summer	1.933	0.933	0.0	4.2	4.2	99.2	Flood Risk
960 min Summer	1.898	0.898	0.0	4.2	4.2	95.5	Flood Risk
1440 min Summer	1.788	0.788	0.0	4.1	4.1	83.9	Flood Risk
2160 min Summer	1.606	0.606	0.0	3.9	3.9	64.5	O K
2880 min Summer	1.447	0.447	0.0	3.7	3.7	47.6	O K
4320 min Summer	1.209	0.209	0.0	3.4	3.4	22.3	O K
5760 min Summer	1.070	0.070	0.0	3.2	3.2	7.4	O K
15 min Winter	1.444	0.444	0.0	3.7	3.7	47.2	O K
30 min Winter	1.581	0.581	0.0	3.8	3.8	61.9	O K
60 min Winter	1.701	0.701	0.0	4.0	4.0	74.6	Flood Risk
120 min Winter	1.807	0.807	0.0	4.1	4.1	85.9	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	115.450	0.0	52.1	25
30 min Summer	77.125	0.0	69.7	39
60 min Summer	48.863	0.0	88.3	66
120 min Summer	30.888	0.0	111.8	122
180 min Summer	23.871	0.0	129.3	178
240 min Summer	19.978	0.0	144.4	208
360 min Summer	15.629	0.0	169.4	276
480 min Summer	13.095	0.0	189.5	346
600 min Summer	11.360	0.0	205.4	416
720 min Summer	10.075	0.0	218.7	486
960 min Summer	8.252	0.0	238.9	624
1440 min Summer	6.104	0.0	264.8	896
2160 min Summer	4.419	0.0	287.7	1284
2880 min Summer	3.488	0.0	302.6	1652
4320 min Summer	2.476	0.0	322.5	2376
5760 min Summer	1.945	0.0	337.7	3048
15 min Winter	115.450	0.0	52.1	25
30 min Winter	77.125	0.0	69.8	38
60 min Winter	48.863	0.0	88.1	66
120 min Winter	30.888	0.0	111.5	122

Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	1.860	0.860	0.0	4.1	4.1	91.5	Flood Risk
240 min Winter	1.887	0.887	0.0	4.2	4.2	94.4	Flood Risk
360 min Winter	1.917	0.917	0.0	4.2	4.2	97.6	Flood Risk
480 min Winter	1.924	0.924	0.0	4.2	4.2	98.3	Flood Risk
600 min Winter	1.917	0.917	0.0	4.2	4.2	97.6	Flood Risk
720 min Winter	1.898	0.898	0.0	4.2	4.2	95.5	Flood Risk
960 min Winter	1.832	0.832	0.0	4.1	4.1	88.5	Flood Risk
1440 min Winter	1.663	0.663	0.0	3.9	3.9	70.6	O K
2160 min Winter	1.417	0.417	0.0	3.6	3.6	44.4	O K
2880 min Winter	1.223	0.223	0.0	3.4	3.4	23.7	O K
4320 min Winter	1.002	0.002	0.0	3.1	3.1	0.2	O K
5760 min Winter	1.000	0.000	0.0	2.5	2.5	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
180 min Winter	23.871	0.0	129.3	176
240 min Winter	19.978	0.0	144.6	228
360 min Winter	15.629	0.0	169.7	286
480 min Winter	13.095	0.0	189.6	366
600 min Winter	11.360	0.0	205.3	444
720 min Winter	10.075	0.0	218.6	520
960 min Winter	8.252	0.0	238.8	670
1440 min Winter	6.104	0.0	265.1	952
2160 min Winter	4.419	0.0	287.6	1344
2880 min Winter	3.488	0.0	302.7	1704
4320 min Winter	2.476	0.0	322.5	2244
5760 min Winter	1.945	0.0	337.8	0

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 1.000 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	112.0	500.0	1.000	112.0	500.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-3100-1000-3100
Design Head (m)	1.000
Design Flow (l/s)	3.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	3.1
Flush-Flo™	0.297	3.1
Kick-Flo®	0.623	2.5
Mean Flow over Head Range	-	2.7

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	2.5	1.200	3.4	3.000	5.2	7.000	7.7
0.200	3.0	1.400	3.6	3.500	5.5	7.500	7.9
0.300	3.1	1.600	3.8	4.000	5.9	8.000	8.2
0.400	3.0	1.800	4.1	4.500	6.2	8.500	8.4
0.500	2.9	2.000	4.3	5.000	6.6	9.000	8.7
0.600	2.6	2.200	4.5	5.500	6.9	9.500	8.9
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.4		

Summary of Results for 100 year Return Period (+25%)

Half Drain Time : 395 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Σ Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.147	0.147	0.0	2.7	2.7	48.8	O K
30 min Summer	0.194	0.194	0.0	2.8	2.8	64.4	O K
60 min Summer	0.240	0.240	0.0	2.9	2.9	79.4	O K
120 min Summer	0.288	0.288	0.0	2.9	2.9	95.4	O K
180 min Summer	0.319	0.319	0.0	2.9	2.9	105.7	O K
240 min Summer	0.342	0.342	0.0	2.9	2.9	113.2	O K
360 min Summer	0.372	0.372	0.0	2.9	2.9	123.2	O K
480 min Summer	0.391	0.391	0.0	2.9	2.9	129.6	O K
600 min Summer	0.402	0.402	0.0	2.9	2.9	133.2	O K
720 min Summer	0.408	0.408	0.0	2.9	2.9	135.0	O K
960 min Summer	0.407	0.407	0.0	2.9	2.9	134.8	O K
1440 min Summer	0.382	0.382	0.0	2.9	2.9	126.7	O K
2160 min Summer	0.330	0.330	0.0	2.9	2.9	109.4	O K
2880 min Summer	0.280	0.280	0.0	2.9	2.9	92.9	O K
4320 min Summer	0.202	0.202	0.0	2.8	2.8	66.8	O K
5760 min Summer	0.152	0.152	0.0	2.7	2.7	50.2	O K
15 min Winter	0.147	0.147	0.0	2.7	2.7	48.9	O K
30 min Winter	0.194	0.194	0.0	2.8	2.8	64.4	O K
60 min Winter	0.240	0.240	0.0	2.9	2.9	79.4	O K
120 min Winter	0.288	0.288	0.0	2.9	2.9	95.5	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	115.450	0.0	48.3	25
30 min Summer	77.125	0.0	65.2	39
60 min Summer	48.863	0.0	85.0	68
120 min Summer	30.888	0.0	107.8	126
180 min Summer	23.871	0.0	125.1	184
240 min Summer	19.978	0.0	139.7	242
360 min Summer	15.629	0.0	164.1	328
480 min Summer	13.095	0.0	183.3	396
600 min Summer	11.360	0.0	198.8	464
720 min Summer	10.075	0.0	211.6	530
960 min Summer	8.252	0.0	231.0	668
1440 min Summer	6.104	0.0	255.9	942
2160 min Summer	4.419	0.0	280.4	1340
2880 min Summer	3.488	0.0	295.0	1728
4320 min Summer	2.476	0.0	313.3	2428
5760 min Summer	1.945	0.0	329.7	3120
15 min Winter	115.450	0.0	48.3	25
30 min Winter	77.125	0.0	65.2	39
60 min Winter	48.863	0.0	85.0	66
120 min Winter	30.888	0.0	107.8	124

Summary of Results for 100 year Return Period (+25%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.320	0.320	0.0	2.9	2.9	105.9	O K
240 min Winter	0.342	0.342	0.0	2.9	2.9	113.4	O K
360 min Winter	0.372	0.372	0.0	2.9	2.9	123.3	O K
480 min Winter	0.388	0.388	0.0	2.9	2.9	128.5	O K
600 min Winter	0.397	0.397	0.0	2.9	2.9	131.6	O K
720 min Winter	0.400	0.400	0.0	2.9	2.9	132.6	O K
960 min Winter	0.393	0.393	0.0	2.9	2.9	130.3	O K
1440 min Winter	0.354	0.354	0.0	2.9	2.9	117.1	O K
2160 min Winter	0.280	0.280	0.0	2.9	2.9	92.7	O K
2880 min Winter	0.216	0.216	0.0	2.8	2.8	71.7	O K
4320 min Winter	0.132	0.132	0.0	2.6	2.6	43.8	O K
5760 min Winter	0.097	0.097	0.0	2.3	2.3	32.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
180 min Winter	23.871	0.0	125.1	180
240 min Winter	19.978	0.0	139.7	236
360 min Winter	15.629	0.0	164.1	344
480 min Winter	13.095	0.0	183.4	432
600 min Winter	11.360	0.0	198.8	476
720 min Winter	10.075	0.0	211.6	556
960 min Winter	8.252	0.0	231.0	710
1440 min Winter	6.104	0.0	256.0	1004
2160 min Winter	4.419	0.0	280.4	1412
2880 min Winter	3.488	0.0	295.0	1788
4320 min Winter	2.476	0.0	313.4	2464
5760 min Winter	1.945	0.0	329.7	3064

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.33
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	1004.0	0.0	0.451	0.0	0.0
0.450	1004.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0081-2900-1000-2900
Design Head (m)	1.000
Design Flow (l/s)	2.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	81
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	2.9
Flush-Flo™	0.299	2.9
Kick-Flo®	0.623	2.3
Mean Flow over Head Range	-	2.5

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	2.4	1.200	3.2	3.000	4.8	7.000	7.2
0.200	2.8	1.400	3.4	3.500	5.2	7.500	7.4
0.300	2.9	1.600	3.6	4.000	5.5	8.000	7.7
0.400	2.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.7	2.000	4.0	5.000	6.1	9.000	8.1
0.600	2.4	2.200	4.2	5.500	6.4	9.500	8.3
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 245 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	1.501	0.501	0.0	3.7	3.7	53.3	O K
30 min Summer	1.657	0.657	0.0	3.9	3.9	69.9	O K
60 min Summer	1.794	0.794	0.0	4.1	4.1	84.5	Flood Risk
120 min Summer	1.919	0.919	0.0	4.2	4.2	97.8	Flood Risk
180 min Summer	1.984	0.984	0.0	4.3	4.3	104.7	Flood Risk
240 min Summer	2.021	1.021	0.0	4.3	4.3	108.7	FLOOD
360 min Summer	2.070	1.070	0.0	4.3	4.3	113.8	FLOOD
480 min Summer	2.095	1.095	0.0	4.4	4.4	116.5	FLOOD
600 min Summer	2.104	1.104	0.0	4.4	4.4	117.5	FLOOD
720 min Summer	2.101	1.101	0.0	4.4	4.4	117.1	FLOOD
960 min Summer	2.068	1.068	0.0	4.3	4.3	113.7	FLOOD
1440 min Summer	1.956	0.956	0.0	4.2	4.2	101.8	Flood Risk
2160 min Summer	1.764	0.764	0.0	4.0	4.0	81.3	Flood Risk
2880 min Summer	1.591	0.591	0.0	3.8	3.8	62.9	O K
4320 min Summer	1.320	0.320	0.0	3.5	3.5	34.0	O K
5760 min Summer	1.146	0.146	0.0	3.3	3.3	15.6	O K
15 min Winter	1.502	0.502	0.0	3.7	3.7	53.4	O K
30 min Winter	1.659	0.659	0.0	3.9	3.9	70.1	O K
60 min Winter	1.798	0.798	0.0	4.1	4.1	84.9	Flood Risk
120 min Winter	1.928	0.928	0.0	4.2	4.2	98.7	Flood Risk

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	129.304	0.0	58.4	25
30 min Summer	86.380	0.0	78.1	39
60 min Summer	54.726	0.0	99.1	66
120 min Summer	34.594	0.0	125.2	124
180 min Summer	26.735	0.0	145.2	180
240 min Summer	22.376	2.3	161.8	216
360 min Summer	17.505	7.4	190.1	284
480 min Summer	14.667	10.1	212.3	352
600 min Summer	12.723	11.1	230.3	422
720 min Summer	11.284	10.7	245.1	492
960 min Summer	9.243	7.3	267.4	632
1440 min Summer	6.837	0.0	296.7	906
2160 min Summer	4.949	0.0	322.4	1300
2880 min Summer	3.907	0.0	339.3	1676
4320 min Summer	2.773	0.0	361.2	2388
5760 min Summer	2.178	0.0	378.2	3072
15 min Winter	129.304	0.0	58.4	25
30 min Winter	86.380	0.0	78.1	39
60 min Winter	54.726	0.0	98.9	66
120 min Winter	34.594	0.0	124.9	122

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	1.997	0.997	0.0	4.3	4.3	106.1	Flood Risk
240 min Winter	2.036	1.036	0.0	4.3	4.3	110.3	FLOOD
360 min Winter	2.079	1.079	0.0	4.3	4.3	114.8	FLOOD
480 min Winter	2.093	1.093	0.0	4.4	4.4	116.3	FLOOD
600 min Winter	2.088	1.088	0.0	4.4	4.4	115.8	FLOOD
720 min Winter	2.072	1.072	0.0	4.3	4.3	114.1	FLOOD
960 min Winter	2.009	1.009	0.0	4.3	4.3	107.4	FLOOD
1440 min Winter	1.836	0.836	0.0	4.1	4.1	88.9	Flood Risk
2160 min Winter	1.571	0.571	0.0	3.8	3.8	60.7	O K
2880 min Winter	1.353	0.353	0.0	3.6	3.6	37.5	O K
4320 min Winter	1.061	0.061	0.0	3.2	3.2	6.5	O K
5760 min Winter	1.000	0.000	0.0	2.8	2.8	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
180 min Winter	26.735	0.0	145.2	178
240 min Winter	22.376	3.9	161.7	230
360 min Winter	17.505	8.4	190.2	292
480 min Winter	14.667	9.9	212.4	370
600 min Winter	12.723	9.4	230.0	450
720 min Winter	11.284	7.7	245.1	526
960 min Winter	9.243	1.0	267.3	678
1440 min Winter	6.837	0.0	296.6	966
2160 min Winter	4.949	0.0	322.4	1368
2880 min Winter	3.907	0.0	339.2	1736
4320 min Winter	2.773	0.0	361.1	2380
5760 min Winter	2.178	0.0	378.3	0

Model Details

Storage is Online Cover Level (m) 2.000

Cellular Storage Structure

Invert Level (m) 1.000 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	112.0	500.0	1.000	112.0	500.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0084-3100-1000-3100
Design Head (m)	1.000
Design Flow (l/s)	3.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	84
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	1.000	3.1
Flush-Flo™	0.297	3.1
Kick-Flo®	0.623	2.5
Mean Flow over Head Range	-	2.7

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	2.5	1.200	3.4	3.000	5.2	7.000	7.7
0.200	3.0	1.400	3.6	3.500	5.5	7.500	7.9
0.300	3.1	1.600	3.8	4.000	5.9	8.000	8.2
0.400	3.0	1.800	4.1	4.500	6.2	8.500	8.4
0.500	2.9	2.000	4.3	5.000	6.6	9.000	8.7
0.600	2.6	2.200	4.5	5.500	6.9	9.500	8.9
0.800	2.8	2.400	4.6	6.000	7.1		
1.000	3.1	2.600	4.8	6.500	7.4		

Summary of Results for 100 year Return Period (+40%)

Half Drain Time : 457 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	0.165	0.165	0.0	2.7	2.7	54.8	O K
30 min Summer	0.218	0.218	0.0	2.8	2.8	72.4	O K
60 min Summer	0.270	0.270	0.0	2.9	2.9	89.5	O K
120 min Summer	0.326	0.326	0.0	2.9	2.9	108.1	O K
180 min Summer	0.363	0.363	0.0	2.9	2.9	120.3	O K
240 min Summer	0.390	0.390	0.0	2.9	2.9	129.4	O K
360 min Summer	0.428	0.428	0.0	2.9	2.9	141.8	O K
480 min Summer	0.863	0.863	0.0	2.9	2.9	149.6	Flood Risk
600 min Summer	1.004	1.004	0.0	2.9	2.9	153.4	FLOOD
720 min Summer	1.006	1.006	0.0	2.9	2.9	155.6	FLOOD
960 min Summer	1.006	1.006	0.0	2.9	2.9	156.0	FLOOD
1440 min Summer	0.449	0.449	0.0	2.9	2.9	148.7	O K
2160 min Summer	0.393	0.393	0.0	2.9	2.9	130.3	O K
2880 min Summer	0.338	0.338	0.0	2.9	2.9	112.1	O K
4320 min Summer	0.247	0.247	0.0	2.9	2.9	81.8	O K
5760 min Summer	0.186	0.186	0.0	2.8	2.8	61.5	O K
15 min Winter	0.166	0.166	0.0	2.7	2.7	54.8	O K
30 min Winter	0.219	0.219	0.0	2.8	2.8	72.4	O K
60 min Winter	0.270	0.270	0.0	2.9	2.9	89.5	O K
120 min Winter	0.327	0.327	0.0	2.9	2.9	108.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	129.304	0.0	54.4	26
30 min Summer	86.380	0.0	73.3	40
60 min Summer	54.726	0.0	95.3	68
120 min Summer	34.594	0.0	120.8	126
180 min Summer	26.735	0.0	140.2	184
240 min Summer	22.376	0.0	156.6	242
360 min Summer	17.505	0.0	183.8	360
480 min Summer	14.667	0.0	205.4	432
600 min Summer	12.723	4.2	222.8	482
720 min Summer	11.284	6.4	237.1	548
960 min Summer	9.243	6.8	258.8	682
1440 min Summer	6.837	0.0	286.5	966
2160 min Summer	4.949	0.0	314.1	1364
2880 min Summer	3.907	0.0	330.5	1756
4320 min Summer	2.773	0.0	351.1	2472
5760 min Summer	2.178	0.0	369.3	3176
15 min Winter	129.304	0.0	54.4	25
30 min Winter	86.380	0.0	73.3	39
60 min Winter	54.726	0.0	95.3	68
120 min Winter	34.594	0.0	120.8	124

Summary of Results for 100 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
180 min Winter	0.364	0.364	0.0	2.9	2.9	120.5	O K
240 min Winter	0.391	0.391	0.0	2.9	2.9	129.6	O K
360 min Winter	0.429	0.429	0.0	2.9	2.9	142.2	O K
480 min Winter	0.785	0.785	0.0	2.9	2.9	149.5	Flood Risk
600 min Winter	1.002	1.002	0.0	2.9	2.9	152.2	FLOOD
720 min Winter	1.004	1.004	0.0	2.9	2.9	154.0	FLOOD
960 min Winter	1.003	1.003	0.0	2.9	2.9	152.6	FLOOD
1440 min Winter	0.423	0.423	0.0	2.9	2.9	140.0	O K
2160 min Winter	0.343	0.343	0.0	2.9	2.9	113.6	O K
2880 min Winter	0.270	0.270	0.0	2.9	2.9	89.4	O K
4320 min Winter	0.166	0.166	0.0	2.7	2.7	54.9	O K
5760 min Winter	0.111	0.111	0.0	2.5	2.5	36.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
180 min Winter	26.735	0.0	140.2	180
240 min Winter	22.376	0.0	156.6	238
360 min Winter	17.505	0.0	183.9	348
480 min Winter	14.667	0.0	205.4	460
600 min Winter	12.723	3.0	222.8	492
720 min Winter	11.284	4.8	237.1	568
960 min Winter	9.243	3.4	258.8	722
1440 min Winter	6.837	0.0	286.6	1030
2160 min Winter	4.949	0.0	314.1	1448
2880 min Winter	3.907	0.0	330.5	1824
4320 min Winter	2.773	0.0	351.2	2512
5760 min Winter	2.178	0.0	369.3	3128

Model Details

Storage is Online Cover Level (m) 1.000

Cellular Storage Structure

Invert Level (m) 0.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.33
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	1004.0	0.0	0.451	0.0	0.0
0.450	1004.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0081-2900-1000-2900
Design Head (m)	1.000
Design Flow (l/s)	2.9
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	81
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.000	2.9
Flush-Flo™	0.299	2.9
Kick-Flo®	0.623	2.3
Mean Flow over Head Range	-	2.5

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	2.4	1.200	3.2	3.000	4.8	7.000	7.2
0.200	2.8	1.400	3.4	3.500	5.2	7.500	7.4
0.300	2.9	1.600	3.6	4.000	5.5	8.000	7.7
0.400	2.9	1.800	3.8	4.500	5.8	8.500	7.9
0.500	2.7	2.000	4.0	5.000	6.1	9.000	8.1
0.600	2.4	2.200	4.2	5.500	6.4	9.500	8.3
0.800	2.6	2.400	4.3	6.000	6.7		
1.000	2.9	2.600	4.5	6.500	6.9		

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Joseph Leslie
Site name:	Salisbury Square
Site location:	Old Hatfield

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

Site Details

Latitude:	51.76320° N
Longitude:	0.21418° W
Reference:	2066103417
Date:	Oct 07 2021 15:45

Runoff estimation approach IH124

Site characteristics

Total site area (ha): 1.0

Methodology

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

Soil characteristics	Default	Edited
SOIL type:	2	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.3	0.47

Hydrological characteristics	Default	Edited
SAAR (mm):	661	661
Hydrological region:	6	6
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

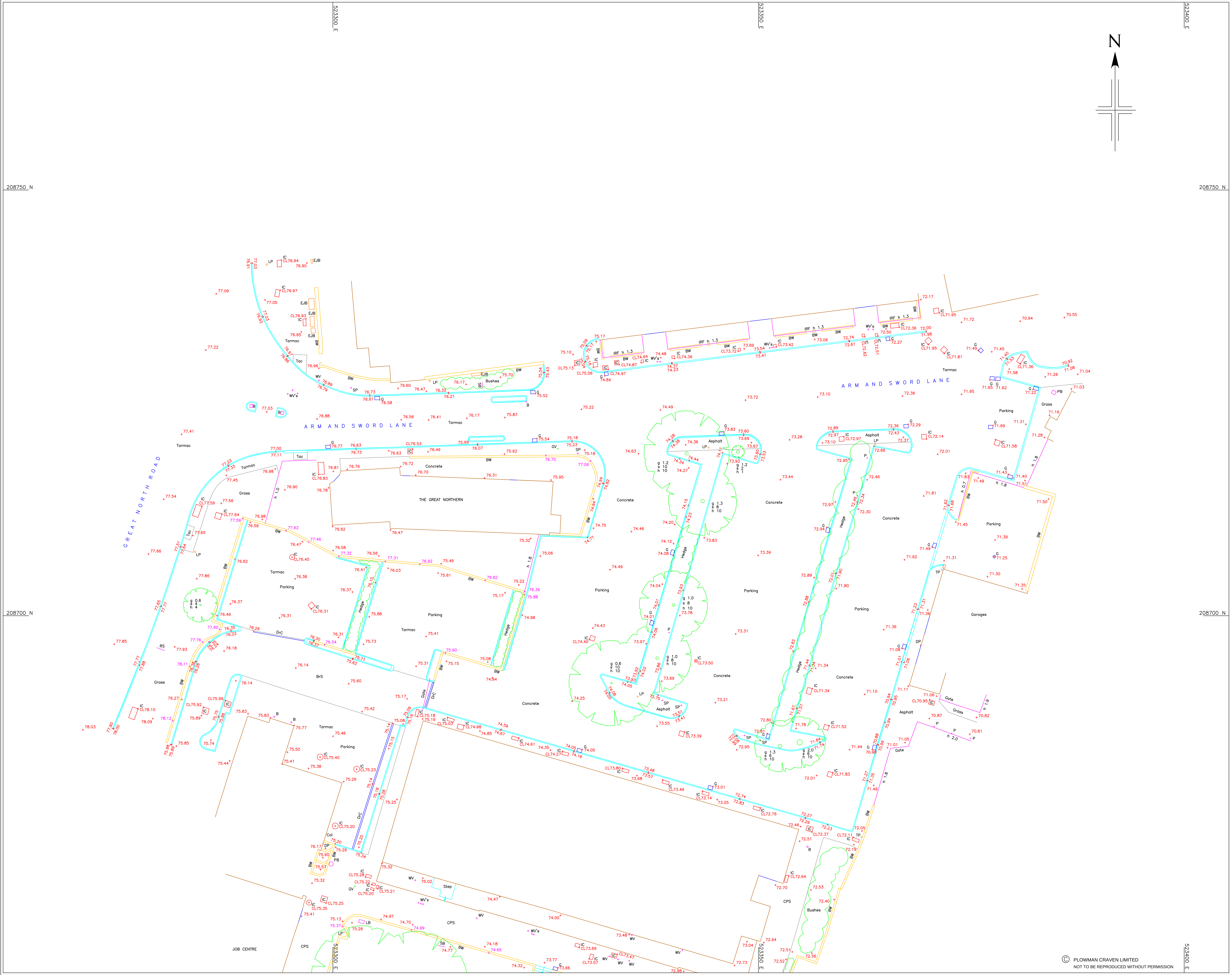
(2) Are flow rates < 5.0 l/s?

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):	1.7	4.51
1 in 1 year (l/s):	1.45	3.84
1 in 30 years (l/s):	3.92	10.38
1 in 100 year (l/s):	5.44	14.4
1 in 200 years (l/s):	6.37	16.88



STANDARD ABBREVIATIONS

A/C	Air Conditioner	LB	Litter Bin
ATM	Automated Telling Machine	LP	Lamp Post
B	Bollard	Max	Maximum
BB	Belisha Beacon	Mb	Multibole
Bh	Borehole	MH	Manhole
Br	Brick	Min	Minimum
BrS	Brick Setts	Mkr	Marker
BRW	Brick Retaining Wall	NB	Notice Board
BS	Bus Stop	NP	Name Plate
BT	British Telecom	OBF	Open Boarded Fence
BW	Brick Wall	O/H	Overhead
BWF	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
CBF	Close Boarded Fence	P	Post
CCTV	Closed Circuit Television	PB	Pillar Box
CIF	Corrugated Iron Fence	PGM	Permanent Ground Marker
CL	Cover Level	PLt	Pavement Light
CLF	Chain Link Fence	PM	Parking Meter
Col	Column	PRF	Post and Rail Fence
Conc	Concrete	PS	Paving Stones
CoW	Cable on Wall	PWF	Post and Wire Fence
CPS	Concrete Paving Slabs	RE	Rodding Eye
CTV	Cable Television IC	RG	Road Gully
d	depth	RS	Road Sign
DC	Duct Cover	RSJ	Rolled Steel Joist
DH	Duct Height	RWP	Rain Water Pipe
DP	Down Pipe	s	spread
DrC	Drainage Channel	SB	Sign Board
EIC	Electrical Inspection Cover	SBM	Site Bench Mark
EJB	Electrical Junction Box	SC	Stop Cock
EP	Electricity Pole	SF	Security Fence
ER	Earthing Rod	ShB	Shrub Bed
ESG	Electrical Switchgear	SL	Sump Level
FB	Flower Bed	SO	Smoke Outlet
FH	Fire Hydrant	SP	Sign Post
FL	Floor Level	SV	Stop Valve
Flt	Floodlight	T	Telephone
g	girth	Tac	Tactile Paving
G	Gully	TBM	Temporary Bench Mark
GC	Gas Cock	TCB	Telephone Call Box
GM	Gas Meter	TCP	Traffic Control Post
GP	Gate Post	TIC	Telephone Inspection Cover
GV	Gas Valve	TJB	Telephone Junction Box
h	height	TL	Traffic Light
HR	Handrail	TLCB	Traffic Light Control Box
IB	Illuminated Bollard	TLIC	Traffic Light Inspection Cover
IC	Inspection Cover	TP	Telephone Pole
IL	Invert Level	Typ	Typical
IRF	Iron Railing Fence	V	Vent
IRS	Illuminated Road Sign	VP	Vent Pipe
JB	Junction Box	WV	Water Valve

LEGEND

→ STAIR/STEP ARROWS POINT UP

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ISSUES & REVISIONS

Issue	Details	By	Date
A	Original Issue	CGM	18/12/13

SHEET LAYOUT

30279T-01-1

30279T-01-2

THIS SURVEY HAS BEEN CARRIED OUT TO AN ACCURACY CONSISTENT WITH A PRESENTATION SCALE OF 1:200 . INTERROGATED DIMENSIONS WILL BE WITHIN THE TOLERANCE ASSOCIATED WITH THIS AND SMALLER SCALES ONLY.

ALL LEVELS ARE IN METRES AND ARE ABOVE ORDNANCE SURVEY NEWLYN DATUM DERIVED BY MULTIPLE NETWORK RTK GPS OBSERVATIONS.

THE SURVEY GRID SHOWN ON THIS DRAWING IS ONLY REFERENCED TO ORDNANCE SURVEY (OS) NATIONAL GRID AT THE FOLLOWING POINT: 523286.762E, 208711.293N / STN 2S, OBTAINED BY MULTIPLE NETWORK RTK GPS OBSERVATIONS.

ALL QUOTED DIMENSIONS ARE IN METRES

DRAWING UNITS ARE METRES

CLIENT

BROOKS / MURRAY

8-10 New North Place
London
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PROJECT TITLE

Salisbury Square Hatfield

3D Topographical Survey

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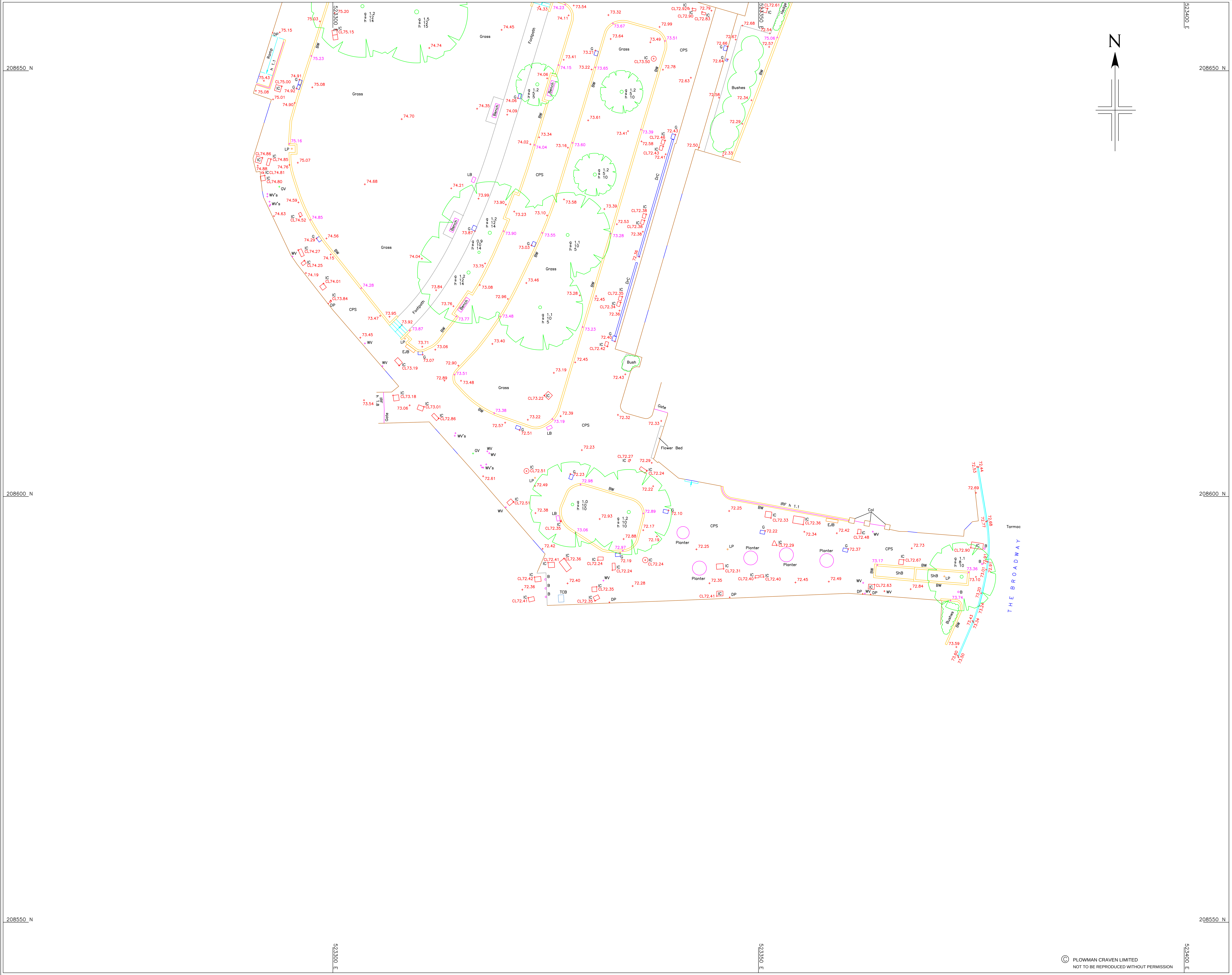
PRESENTATION SCALE: 1:200 @ A1

DATE OF ORIGINAL SURVEY: 06/12/2013

PC PROJECT No. 30279 | CHECKED GH

DRAWING No. 30279T-01-1

ISSUE A



STANDARD ABBREVIATIONS

A/C	Air Conditioner	LB	Litter Bin
ATM	Automated Telling Machine	LP	Lamp Post
B	Bollard	Max	Maximum
BB	Belisha Beacon	Mb	Multibole
Bh	Borehole	MH	Manhole
Br	Brick	Min	Minimum
BrS	Brick Setts	Mkr	Marker
BRW	Brick Retaining Wall	NB	Notice Board
BS	Bus Stop	NP	Name Plate
BT	British Telecom	OBF	Open Boarded Fence
BW	Brick Wall	O/H	Overhead
BWF	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
CBF	Close Boarded Fence	P	Post
CCTV	Closed Circuit Television	PB	Pillar Box
CIF	Corrugated Iron Fence	PGM	Permanent Ground Marker
CL	Cover Level	PLt	Pavement Light
CLF	Chain Link Fence	PM	Parking Meter
Col	Column	PRF	Post and Rail Fence
Conc	Concrete	PS	Paving Stones
CoW	Cable on Wall	PWF	Post and Wire Fence
CPS	Concrete Paving Slabs	RE	Rodding Eye
CTV	Cable Television IC	RG	Road Gully
d	depth	RS	Road Sign
DC	Duct Cover	RSJ	Rolled Steel Joist
DH	Duct Height	RWP	Rain Water Pipe
DP	Down Pipe	s	spread
DrC	Drainage Channel	SB	Sign Board
EIC	Electrical Inspection Cover	SBM	Site Bench Mark
EJB	Electrical Junction Box	SC	Stop Cock
EP	Electricity Pole	SF	Security Fence
ER	Earthing Rod	ShB	Shrub Bed
ESG	Electrical Switchgear	SL	Sump Level
FB	Flower Bed	SO	Smoke Outlet
FH	Fire Hydrant	SP	Sign Post
FL	Floor Level	SV	Stop Valve
Flt	Floodlight	T	Telephone
g	girth	Tac	Tactile Paving
G	Gully	TBM	Temporary Bench Mark
GC	Gas Cock	TCB	Telephone Call Box
GM	Gas Meter	TCP	Traffic Control Post
GP	Gate Post	TIC	Telephone Inspection Cover
GV	Gas Valve	TJB	Telephone Junction Box
h	height	TL	Traffic Light
HR	Handrail	TLCB	Traffic Light Control Box
IB	Illuminated Bollard	TLIC	Traffic Light Inspection Cover
IC	Inspection Cover	TP	Telephone Pole
IL	Invert Level	Typ	Typical
IRF	Iron Railing Fence	V	Vent
IRS	Illuminated Road Sign	VP	Vent Pipe
JB	Junction Box	WV	Water Valve

LEGEND

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