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Civil & Infrastructure Engineering Design

TECHNICAL NOTE

PROJECT	:	Auden House, Bury St, Ruislip
JOB NO.	:	Acl301/18017
NOTE TITLE	:	Proposed Drainage Strategy
AUTHOR	:	Mark Dyer
APPROVED	:	Tafari Lewis
DATE	:	3 rd July 2018

1.0 INTRODUCTION

This note has been prepared to provide sufficient information to discharge planning conditions relating to drainage in support of an application to Hillingdon London Borough Council (HLBC) for the erection of a three storey office building at Auden house, Bury Street Ruislip.

Planning consent was granted by HLBC under decision reference 890/APP/2016/2866 in September 2016, with condition 4 requiring details of measures to incorporate Sustainable Drainage Systems (SuDS) into the development to be approved in writing by the Local Planning Authority.

Planning condition 4 states:

No development approved by this permission shall be commenced until a scheme for the provision of sustainable water management has been submitted to and approved in writing by the Local Planning Authority. The scheme shall clearly demonstrate that sustainable drainage systems (SUDS) have been incorporated into the designs of the development in accordance with the hierarchy set out in accordance with Policy 5.15 of the London Plan and will:

- I. provide information about the design storm period and intensity, the method employed to delay and control the surface water discharged from the site and the measures taken to prevent pollution of the receiving groundwater and/or surface waters;*
- II. include a timetable for its implementation; and*
- III. provide a management and maintenance plan for the lifetime of the development which shall include the arrangements for adoption by any public authority or*

statutory undertaker and any other arrangements to secure the operation of the scheme throughout its lifetime.

The scheme shall also demonstrate the use of methods to minimise the use of potable water through water collection, reuse and recycling and will:

- IV. provide details of water collection facilities to capture excess rainwater;*
- V. provide details of how rain and grey water will be recycled and reused in the development.*

Thereafter the development shall be implemented and retained/maintained in accordance with these details for as long as the development remains in existence.

REASON

To ensure the development does not increase the risk of flooding in accordance with Policy OE8 of the Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012) and London Plan (2016) Policy 5.12.

It is assumed that planning condition 4 relates to the London Plan (2016) policy 5.13: Sustainable Drainage and not policy 5.15: Water use & Supplies as written. The details within this technical note are based upon this assumption.

2.0 PROPOSED DEVELOPMENT SITE

Site Location

The site is situated to the east of A4180, and south of Reservoir Road in Ruislip. The site can be found at National Grid Reference TQ 08443 88933.

The surrounding area is generally a mixture of commercial properties and residential estates with principal routes to nearby towns. (See **Figure 1**).

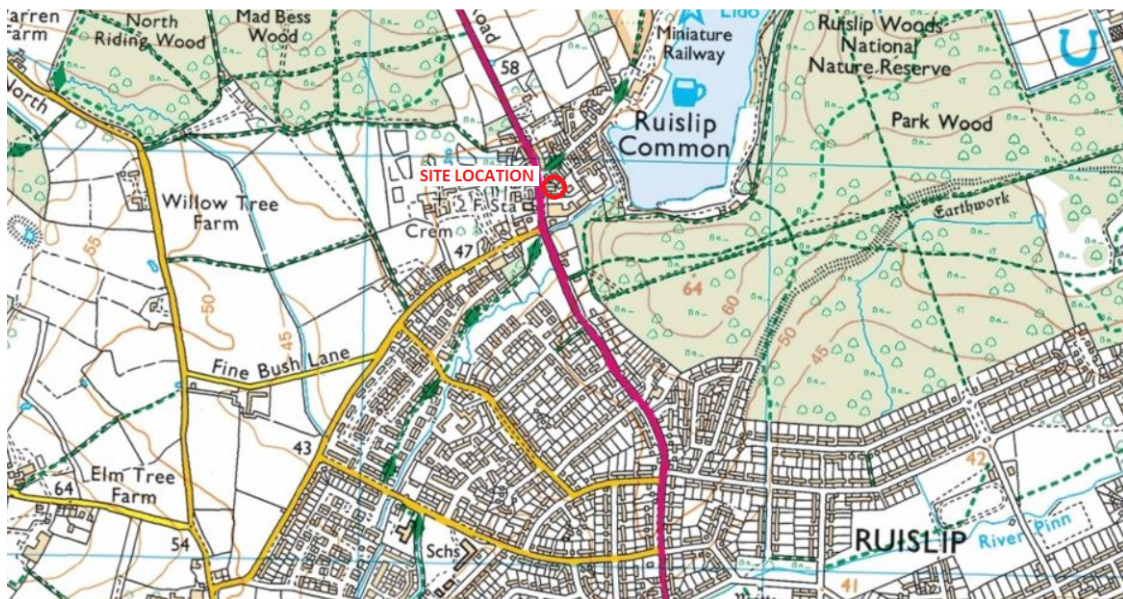


Image courtesy of © 2018 Microsoft – Bing Maps

Figure 1: Site Location Plan

The existing site is approximately 0.0495 hectares in area of which approximately 100% of the site is existing Brownfield land. The site comprises of Auden House which is an un-used building. (See Ariel photo illustrated in **Figure 2**).



Image courtesy of © 2018 Google Maps

Figure 2: Ariel Photo

Existing Topography

No specific topographical survey has been undertaken for the site.

Indicative topographical levels provided on drawing 2723/1 indicate a level of 100.500 to the west of the site and a level of 99.620 to the east of the site. It is noted that the levels stated do not relate to Ordnance Survey datum

Existing Geological Information

The 1:50,000 British Geological Survey (BGS) maps have been analysed to establish the underlying geology of the area. The site is shown to be underlain by the Lambeth Group – Clay, Silt and Sand sedimentary bedrock.

A site investigation was undertaken in April 2012 by Ashmere Soils Laboratories (available through the planning portal). The investigations described the site condition to be –

Surface made ground overlying brown and grey silty clays with variable gravel content. This overlies a brown silty sand with traces of clay that represents the Reading Beds at this site. At depths between 5.9m and 6.8m the Readings Beds were penetrated and a brown claybound gravel marks the base of the formation was encountered. These mixed cohesive and granular soils are only 03m to 10.0m in thickness and overlie Upper Chalk.

The site investigations encountered groundwater at depths of approximately 5.9 to 6.9m and described these as fast inflows. Furthermore the smell of petroleum had been noted in the boring operations.

Traditional infiltration methods are deemed to be not applicable to the site noting the ground make up (clay – low infiltration) and presence of potential contaminants. It is noted that the Environment Agency have not been engaged in respects to remediation works for the ground conditions however infiltration will not be proposed due to the potential risk of resuspension of contaminants.

3.0 POLICY REVIEW

London Plan (2016)

Policy 5.12 Flood Risk Management and 5.13 Sustainable Drainage of the London Plan are deemed to be appropriate to this application site.

Policy 5.12 Flood Risk management requires developments to be progressed in accordance with the NPPF and that developments remain safe and operational under flood conditions. It is noted that the proposed development site is located in Flood Zone 1.

Policy 5.13 Sustainable Drainage states that a Development should utilise sustainable urban drainage systems (SUDS) unless there are practical reasons for not doing so, and should aim to achieve greenfield run-off rates and ensure that surface water run-off is managed 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/drain
- 7 discharge rainwater to the combined sewer.

Drainage should be designed and implemented in ways that deliver other policy objectives of this Plan, including water use efficiency and quality, biodiversity, amenity and recreation.

Hillingdon Local Plan

The Hillingdon Local Plan Part 1 – Strategic Policies sets out the overall level and broad locations of growth up to 2026. Policy EM6: Flood Risk Management requires that developments are directed away from flood zones 2 & 3 and that SuDS are implemented within the site.

The planning permission refers to Policy OE8 of the Hillingdon Local Plan: Part Two Saved UDP Policies (November 2012). No specific reference can be found in relation to this policy. It is therefore assumed that the London Borough of Hillingdon Local Plan Part 2 Revised Proposed Submission Version: Development Management Policies October 2015 Policy SMEI9: Management and Flood Risk is applicable and supersedes stated Policy OE8.

4.0 SURFACE WATER DRAINAGE STRATEGY

A surface water strategy has been devised and hydraulically modelled utilizing SUDS attenuation techniques. The proposed surface water strategy has been designed incorporating SUDs systems in the form of lined permeable pavements (See **Appendix A**)

Existing Drainage

The existing development site measures 495m² and is determined to be 100% impermeable. The surface water discharge location for the existing site is undetermined however it is understood to discharge to the east to a potential ditch network. The location of the outfall pipe and condition is unknown, there are no records of its existence or ownership and it is thought that the pipe discharges under third party lands which have been developed upon over a period of time.

Discharge via the existing connection is not to be retained noting that the extent of investigation required to establish the connection is vast and that it may not be acceptable to the proposed use of the development site.

The Modified Rational Method has been used to determine the runoff from the impermeable areas of the existing site (summarised in Table A) –

$Q=2.78CiA$ Where

- Q = flow (l/s)
- I = rainfall intensity (mm/hr)
- A = Impermeable Area (ha)
- C = runoff coefficient, assumed to be 95%

Table A: Existing site Modified Rational Method impermeable runoff

Return Period	C	I	A	Flow (l/s)
1:1 year	0.95	28.809	0.0495	3.766
1:30 year	0.95	70.680	0.0495	9.240
1:100 year	0.95	91.443	0.0495	11.954

The existing greenfield runoff rate for the site is as presented in Table B, the rates have been calculated utilising ICP SuDS and Micro Drainage Source Control (refer to **Appendix A**).

Table B: Greenfield Runoff rates

Return Period	Runoff Rate (l/s)
1:1 year	0.2
QBAR	0.2
1:30 year	0.5
1:100 year	0.7

It is noted that the existing sites theoretical greenfield runoff rate is extremely low and as such can not be achieved via the inclusion of flow control devices. In accordance with the London Plan Policy 5.13, a development should aim to achieve greenfield runoff rates, this is unreasonable and difficult to achieve noting the scale of the development and the minimal discharge rate.

It is therefore proposed that the surface water drainage should be limited as far as reasonably practical to provide betterment on existing site conditions. It is proposed that the surface water is to be limited to a maximum rate of 3l/s for all storm events.

Discharge Location

The London Plan Policy 5.13 requires surface water drainage to discharge in accordance with its drainage hierarchy. This hierarchy has been reviewed as such:

- 1 store rainwater for later use
The proposed development site is an office block and the inclusion of water butts or rainwater harvesting may not be beneficial to the function of the building noting the space constraints on the site. The client is informed of the benefits of rainwater harvesting however it is not proposed to be effective in the proposed drainage strategy for the site.
- 2 use infiltration techniques, such as porous surfaces in non-clay areas
Infiltration is not proposed within the site noting the clayey nature of the site and potential risk of resuspension of contaminants
- 3 attenuate rainwater in ponds or open water features for gradual release
There is insufficient space for the attenuation of surface water flows in open at surface SuDS
- 4 attenuate rainwater by storing in tanks or sealed water features for gradual release
Attenuation is proposed via the use of lined permeable paving
- 5 discharge rainwater direct to a watercourse
There are no watercourses in the immediate vicinity of the site
- 6 discharge rainwater to a surface water sewer/drain
Proposed
- 7 discharge rainwater to the combined sewer.
N/A

Surface Water Drainage Strategy

Roof water runoff will be collected via a sealed pipe system which in turn discharges to the lined permeable paving, due to the flow control device, before discharge from site. Runoff from courtyard and impermeable parking areas will be collected by gullies and conveyed to the lined permeable paving, due to the flow control device, before discharge from the site.

All surface water arising from the site is to be conveyed to the west of the site and discharged to the Thames Water Public Surface Water Sewer. Surface water flows are to be restricted to a maximum of 3l/s for all storm events via the inclusion of a Hydro Brake unit. Attenuation is to be provided in the form of lined permeable paving located beneath the parking bays.

Refer to **Appendix B** for drawing 18-017-001 entitled Drainage Strategy for a representation of the proposed strategy. The proposed surface water network has been hydraulically modelled up to and including the scenario of a 1 in 100 year storm event with additional 40% allowance for climate change. The model demonstrates that the drainage network can manage and maintain the critical storm events without flooding thus reducing the risk of flooding elsewhere. A copy of the hydraulic model can be found in **Appendix C**.

Table C Below identifies the pre and post runoff site conditions and the betterment that is provided:

Table C: Existing and proposed site impermeable runoff rate

Return Period	Existing Site runoff (l/s)	Proposed site runoff (l/s)	Betterment on existing conditions (%)
1:1 year	4	2.9	27.5
1:30 year	6.32	3	52.5
1:100 year	8.696	3	65.5

Water Quality

It is important to address issues with regards to quality when considering surface water management. As surface water is proposed to discharge via porous pavements and a cellular soakaway, the required level of treatment proposed as part of a SuDS Management Train in accordance with the recommendations of the SuDS Manual (Ciria 753) has been satisfied (i.e. a minimum of two treatment stages).

Long Term Maintenance & Adoption

It is proposed that all drainage as depicted in the drainage strategy will remain private and as such be the responsibility of the properties occupier.

Maintenance refers to the inspections required to identify performance issues and plan maintenance as required, operation and maintenance of the drainage system, landscape management and waste management associated with contaminated silt and other waste materials resulting from maintenance.

CIRIA C753 The SuDS Manual provides information in Chapter 32 for the Operation and maintenance of SuDS. The maintenance activities are broadly defined as regular, occasional and remedial maintenance. It is noted that some scenarios may require one-off maintenance activities. The SuDS Manual defines maintenance as –

- Regular Maintenance: consists of basic tasks carried out to a frequent and predictable schedule, including inspections/monitoring, silt or oil removal if required more frequently than once a year, vegetation management, sweeping or surfaces and litter / debris removal.
- Occasional maintenance: comprises tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the regular tasks.
- Remedial maintenance: describes the intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised with good design, constructions and regular maintenance activities.

Maintenance regimes are to be reviewed on an annual basis to ensure that the approach adopted is meeting its objectives. All those responsible for the maintenance operations should adhere to the relevant health and safety legislation for the activities listed within this report (including lone working, if relevant). Method statements and risk assessments should always be completed prior to the undertaking of any works.

INDICATIVE MAINTENANCE MANAGEMENT PLAN

Permeable Surfaces

Permeable surfaces including permeable block paving, porous asphalt, gravel or free draining soils that allow rain to percolate through the surface into underlying drainage layers. They must be protected from silt, sand, compost, mulch, etc. Permeable block paving and porous asphalt can be cleaned by suction brushing.

Regular inspection and maintenance is important for the effective operation of permeable pavements, they should be inspected regularly, preferably during and after heavy rainfall to check effective operation and to identify any areas of ponding.

Care should be taken in adjusting vacuuming equipment to avoid removal of jointing material. In instances where jointing material is lost, this material should be replaced immediately.

Depending on the amount of usage and the environment that the permeable pavement has been exposed to, the laying course material may require either replacement or cleaning after a 25 to 30 year period. This would be evident if the infiltration rate of the paving became prolonged, allowing ponding to develop. If this situation should occur, the uplifting and cleaning (or replacing, depending on the costings of the activity) of the laying course may be considered. The laying course material, jointing and blocks may be reused (once cleaned), to aid in minimising costs.

Inspection and maintenance of the permeable surfaces will be dependent upon the manufacturers recommendations and installation as per manufacturers details.

The table below gives a summary of the operation and maintenance requirements for permeable paving –

PERMEABLE AND POROUS SURFACES	
Regular Maintenance	Frequency
Brush regularly and remove sweepings from all hard surfaces	Three times a year at end of winter, mid-summer and after autumnal leaf fall, or as required based upon site specific observations or as per manufacturers recommendations
Occasional Tasks	Frequency
Removal of weeds	As required
Stabilise and mow contributing and adjacent areas	As required
Remedial Works	Frequency
Remediate any landscaping which, through vegetation maintenance or soil slip has encroached upon the permeable surface	As required
Remedial work to any depressions, rutting, cracked or broken blocks considered to be detrimental to the structure or that pose a hazard to users	As required
Rehabilitation of surface and upper substructure by sweeping	As required if infiltration performance is reduced
Monitoring	Frequency

Initial Inspection	Monthly for 3 months after installation / regular usage
Inspection for evidence of poor operation and / or weed growth	3 monthly & 48 hours after large storms
Inspection of silt accumulation	Annually
Monitoring of inspection chambers	Annually
Inspection for depressions, ponding or rutting	Annually

Flow Control Chambers

The flow control chamber proposed for this site is a Hydro Brake which has no moving parts and are self-activating requiring minimal maintenance. The bypass disc is the only manually operated element and is applicable for use in the event of a blockage or issue with the drainage network. It is recommended that the chamber is inspected monthly for three months after installation and bi-annually thereafter to verify the condition and operation of the unit and check for blockages within the chamber or flow control device.

Any silt or debris found during inspections should be removed and cleaned out with the use of a sump vacuum cleaner.

The table below gives a summary of the operation and maintenance requirements for flow control devices –

CONTROL CHAMBERS	
Regular Maintenance	Frequency
Check there is no physical damage and that control is functioning. Ensure bypass arrangements are functional. Remove Debris and silt. Undertake inspection after autumnal leaf fall to ensure functionality of control and that there are no blockages	Monthly
Remedial Works	Frequency
Repair physical damage if required / replace unit is damaged	As required
Monitoring	Frequency
Inspect chamber and flow control units to ensure that they are in good condition and operating as designed.	Annually and after large storms

Exceedance

Whilst the drainage system has been designed to a very high standard (1 in 100 Year storm event including climate change), it is possible that a more extreme event will occur and that the design standard for the system will be exceeded. It is best practice to design the drainage system to shed water, primarily into landscaped and other areas, therefore reducing the risk of flooding areas of built development during extreme events.

The proposed site levels to the rear of the office block are to be raised and as such all exceedance flows will fall to the west of the site.

As the development comprises predominately of hardstanding it is envisaged that any excess flood over and above the critical 1 in 100 year event including climate change would discharge onto the A4180.

5.0 FOUL WATER STRATEGY

The proposed foul water from the site will utilise the existing connection to the Thames Water Public Foul Water Sewer located in the A4180/

A Pre-planning enquiry has been sent to Thames Water to assess the capacity of the existing foul and surface water sewers to accommodate the flows generated from the proposed site. Thames Water have accepted the foul and surface water site proposals as per there response reproduced in **Appendix D**.

6.0 CONCLUSION

An inspection of the Environment Agency's website, confirms the development site as being entirely within a Flood Risk Zone 1 area.

A preliminary design surface water drainage strategy has been prepared and hydraulically modelled which demonstrates that the redevelopment proposals can be successfully implemented and designed to withstand the impact of a 1:100 year rainfall event (including climate change), in accordance with the London Plan, Local Policies, NPPF and LLFA requirements

In view of this assessment, the technical note concludes that:

- i. The Development is situated wholly within the Flood Risk Zone 1 area;
- ii. The Development and its occupants are not at an increased risk of flooding;
- iii. The Development does not increase the risk of flooding elsewhere;
- iv. The Development can be drained in a sustainable manner utilizing SUDs techniques;
- v. The Development will satisfactorily manage and maintain a 1 in 100 Year storm event with allowance for climate change

The findings of this note identify the opportunity to implement an appropriate SUDS strategy.

It is determined that sufficient information is provided within this technical note such that planning condition 4 can be discharged.

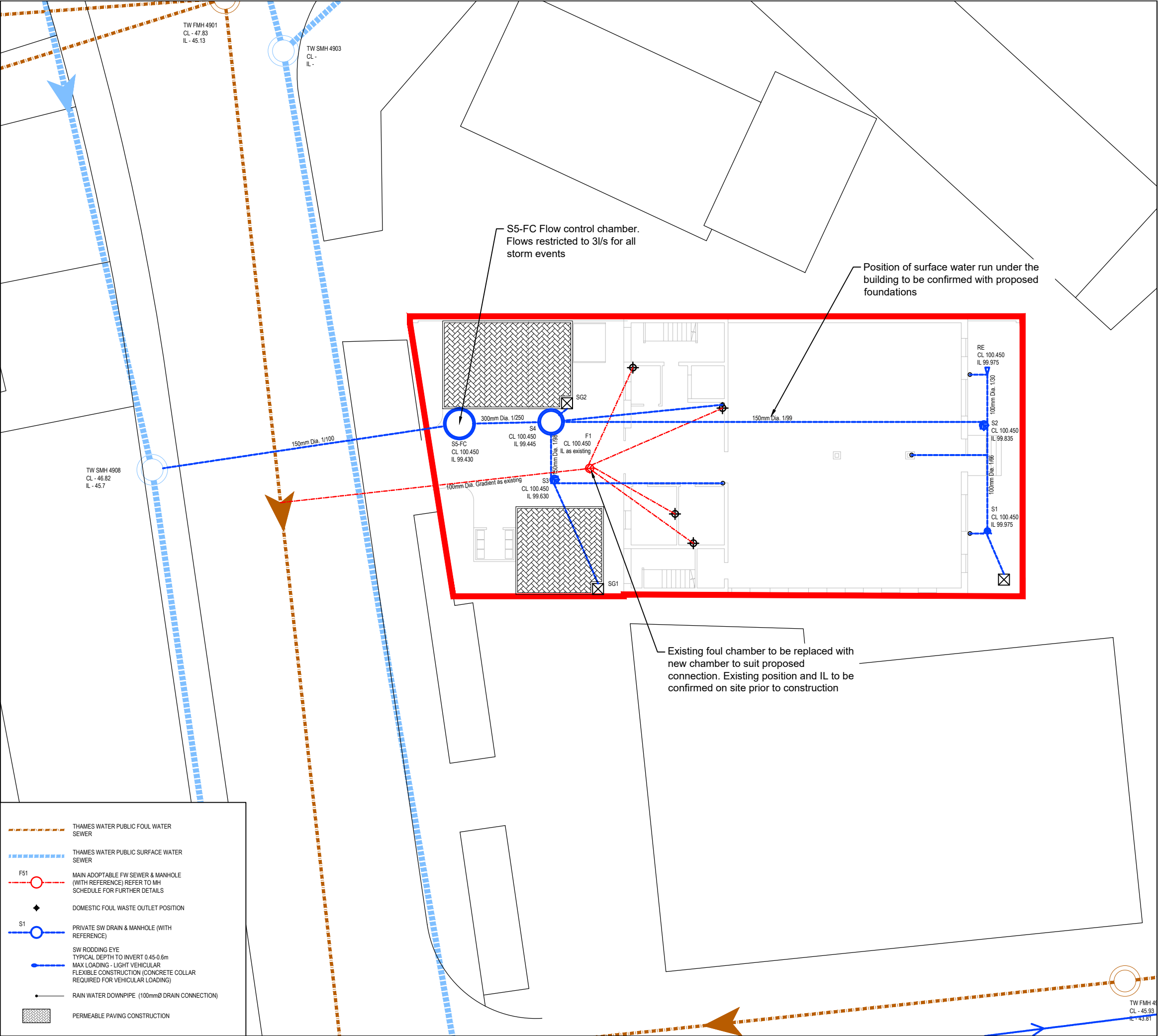
Appendix (A)

18-017 ICP SuDS Greenfield Runoff

Adama Consulting Ltd		Page 1																								
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Auden House Bury Street, Ruislip Greenfield Run-off																									
Date 01/07/2018 File	Designed by MD Checked by TL																									
Micro Drainage	Source Control 2018.1																									
ICP SUDS Mean Annual Flood Input <table><tr><td>Return Period (years)</td><td>100</td><td>Soil</td><td>0.470</td></tr><tr><td>Area (ha)</td><td>0.050</td><td>Urban</td><td>0.000</td></tr><tr><td>SAAR (mm)</td><td>655</td><td>Region Number</td><td>Region 6</td></tr></table> Results 1/s <table><tr><td>QBAR Rural</td><td>0.2</td></tr><tr><td>QBAR Urban</td><td>0.2</td></tr><tr><td>Q100 years</td><td>0.7</td></tr><tr><td>Q1 year</td><td>0.2</td></tr><tr><td>Q30 years</td><td>0.5</td></tr><tr><td>Q100 years</td><td>0.7</td></tr></table>			Return Period (years)	100	Soil	0.470	Area (ha)	0.050	Urban	0.000	SAAR (mm)	655	Region Number	Region 6	QBAR Rural	0.2	QBAR Urban	0.2	Q100 years	0.7	Q1 year	0.2	Q30 years	0.5	Q100 years	0.7
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Q30 years	0.5																									
Q100 years	0.7																									
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Appendix (B)

18-017-001 Drainage Strategy



The Contractor is to check and verify in conjunction with the Architects details all setting out points, building and site dimensions, levels and sewer invert levels at connection points and ensure that they are fully conversant with the contents and of requirements the site investigation report before work starts.

This drawing is not intended to show details of ground conditions or ground contaminants. Each area of ground relied upon to support any structure depicted (including drainage) must be investigated by the Contractor any areas of formation for said structures which do not accord with the anticipated conditions as described in the site investigation report are to be immediately notified to the Engineer, where applicable. Any suspect fluid ground or ground contaminants on or within the ground should be further investigated by a suitable expert. Any earthworks shown indicate typical slopes for guidance only and should be investigated further by a suitable geotechnical expert.

Where existing trees are shown to be retained they should be subject to a full Arboricultural inspection for safety. All trees are to be planted so as to ensure they are a minimum of 5 metres from buildings and 3 metres from drainage and services, where applicable. A foundation is to be provided to accommodate the proposed tree planting, where applicable.

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- NOTES:
- Drawing for information only
 - Existing drainage positions are indicative only
 - Site layout and information reproduced from Simpson McHugh drawings 2723/1, 2805/2, 2805/3 & 2805/4 and are to be viewed as informative only.
 - Refer to architects details for the site layout and setting out
 - Refer to architects drawings for proposed levels
 - Drainage strategy subject to approval from the LPA and Thames Water

Rev.	Description	Date	By

Client

SIMPSON McHUGH

Project

**AUDEN HOUSE,
BURY STREET, RUISLIP**

Title

DRAINAGE STRATEGY



Civil & Infrastructure Engineering Design
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Scale	1:200	Drawn	MTD
Date	JUNE 2018	Checked	TL
File	18-017	Drawing No	18-017-001
		Rev	-

Appendix (C)

18-017 Micro Drainage Calculations

Adama Consulting Ltd		Page 1								
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Auden House Bury Street 18-017 SW Strategy									
Date 01/07/2018 File 18-017 SW REV 1.0.MDX	Designed by MD Checked by TL									
Micro Drainage	Network 2018.1									
<u>Time Area Diagram for Storm</u> <table><thead><tr><th>Time (mins)</th><th>Area (ha)</th><th>Time (mins)</th><th>Area (ha)</th></tr></thead><tbody><tr><td>0-4</td><td>0.036</td><td>4-8</td><td>0.010</td></tr></tbody></table> Total Area Contributing (ha) = 0.047 Total Pipe Volume (m³) = 1.338			Time (mins)	Area (ha)	Time (mins)	Area (ha)	0-4	0.036	4-8	0.010
Time (mins)	Area (ha)	Time (mins)	Area (ha)							
0-4	0.036	4-8	0.010							
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<u>Online Controls for Storm</u> <u>Hydro-Brake® Optimum Manhole: S5-FC, DS/PN: 1.003, Volume (m³): 3.8</u> <table><tr><td>Unit Reference</td><td>MD-SHE-0082-3000-1000-3000</td></tr><tr><td>Design Head (m)</td><td>1.000</td></tr><tr><td>Design Flow (l/s)</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>82</td></tr><tr><td>Invert Level (m)</td><td>99.430</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>100</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><td>Control Points</td><td>Head (m)</td><td>Flow (l/s)</td></tr><tr><td>Design Point (Calculated)</td><td>1.000</td><td>3.0</td></tr><tr><td>Flush-Flo™</td><td>0.297</td><td>3.0</td></tr><tr><td>Kick-Flo®</td><td>0.623</td><td>2.4</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>2.6</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>2.4</td><td>1.200</td><td>3.3</td><td>3.000</td><td>5.0</td><td>7.000</td><td>7.4</td></tr><tr><td>0.200</td><td>2.9</td><td>1.400</td><td>3.5</td><td>3.500</td><td>5.4</td><td>7.500</td><td>7.7</td></tr><tr><td>0.300</td><td>3.0</td><td>1.600</td><td>3.7</td><td>4.000</td><td>5.7</td><td>8.000</td><td>7.9</td></tr><tr><td>0.400</td><td>2.9</td><td>1.800</td><td>3.9</td><td>4.500</td><td>6.0</td><td>8.500</td><td>8.2</td></tr><tr><td>0.500</td><td>2.8</td><td>2.000</td><td>4.1</td><td>5.000</td><td>6.3</td><td>9.000</td><td>8.4</td></tr><tr><td>0.600</td><td>2.5</td><td>2.200</td><td>4.3</td><td>5.500</td><td>6.6</td><td>9.500</td><td>8.6</td></tr><tr><td>0.800</td><td>2.7</td><td>2.400</td><td>4.5</td><td>6.000</td><td>6.9</td><td></td><td></td></tr><tr><td>1.000</td><td>3.0</td><td>2.600</td><td>4.7</td><td>6.500</td><td>7.2</td><td></td><td></td></tr></table>			Unit Reference	MD-SHE-0082-3000-1000-3000	Design Head (m)	1.000	Design Flow (l/s)	3.0	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	82	Invert Level (m)	99.430	Minimum Outlet Pipe Diameter (mm)	100	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.000	3.0	Flush-Flo™	0.297	3.0	Kick-Flo®	0.623	2.4	Mean Flow over Head Range	-	2.6	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	3.3	3.000	5.0	7.000	7.4	0.200	2.9	1.400	3.5	3.500	5.4	7.500	7.7	0.300	3.0	1.600	3.7	4.000	5.7	8.000	7.9	0.400	2.9	1.800	3.9	4.500	6.0	8.500	8.2	0.500	2.8	2.000	4.1	5.000	6.3	9.000	8.4	0.600	2.5	2.200	4.3	5.500	6.6	9.500	8.6	0.800	2.7	2.400	4.5	6.000	6.9			1.000	3.0	2.600	4.7	6.500	7.2		
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Adama Consulting Ltd		Page 4
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Auden House Bury Street 18-017 SW Strategy	
Date 01/07/2018 File 18-017 SW REV 1.0.MDX	Designed by MD Checked by TL	
Micro Drainage	Network 2018.1	
<u>Storage Structures for Storm</u> <u>Porous Car Park Manhole: SG2, DS/PN: 3.000</u> Infiltration Coefficient Base (m/hr) 0.00000 Membrane Percolation (mm/hr) 1000 Max Percolation (l/s) 9.5 Safety Factor 2.0 Porosity 0.30 Invert Level (m) 99.900 Width (m) 7.1 Length (m) 4.8 Slope (1:X) 0.0 Depression Storage (mm) 5 Evaporation (mm/day) 3 Cap Volume Depth (m) 0.400 <u>Porous Car Park Manhole: SG1, DS/PN: 4.000</u> Infiltration Coefficient Base (m/hr) 0.00000 Membrane Percolation (mm/hr) 1000 Max Percolation (l/s) 6.4 Safety Factor 2.0 Porosity 0.30 Invert Level (m) 99.900 Width (m) 4.8 Length (m) 4.8 Slope (1:X) 0.0 Depression Storage (mm) 5 Evaporation (mm/day) 3 Cap Volume Depth (m) 0.400		
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Simulation Criteria

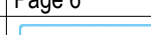
Number of Input Hydrographs	0	Number of Storage Structures	2
Number of Online Controls	1	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Rainfall Model	FSR	Ratio R	0.400
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

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, 10, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	15 Winter	1	+0%	100/15	Summer			100.006
2.000	RE	15 Winter	1	+0%					99.988
1.001	S2	15 Winter	1	+0%	30/15	Summer			99.876
3.000	SG2	30 Winter	1	+0%	100/15	Summer			99.907
4.000	SG1	15 Winter	1	+0%	100/15	Summer			99.919
4.001	S3	15 Winter	1	+0%	30/15	Summer			99.677
1.002	S4	15 Winter	1	+0%	30/15	Summer			99.623
1.003	S5-FC	15 Winter	1	+0%	1/15	Summer			99.622

PN	US/MH Name	Surcharged	Flooded	Flow / Cap.	Overflow (l/s)	Pipe	Status	Level Exceeded
		Depth (m)	Volume (m³)			Flow (l/s)		
1.000	S1	-0.074	0.000	0.15		1.0	OK	
2.000	RE	-0.087	0.000	0.04		0.3	OK*	
1.001	S2	-0.114	0.000	0.13		2.2	OK	
3.000	SG2	-0.143	0.000	0.01		0.3	OK	
4.000	SG1	-0.131	0.000	0.04		1.1	OK	
4.001	S3	-0.108	0.000	0.17		2.0	OK	
1.002	S4	-0.127	0.000	0.10		4.5	OK	
1.003	S5-FC	0.042	0.000	0.18		2.9	SURCHARGED	

Adama Consulting Ltd		Page 6
Unit 34 The Enterprise Centre Cranborne Rd Potters Bar EN6 3DQ	Auden House Bury Street 18-017 SW Strategy	
Date 01/07/2018 File 18-017 SW REV 1.0.MDX	Designed by MD Checked by TL	
Micro Drainage	Network 2018.1	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Synthetic Rainfall Details

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	S1	30 Winter	30	+10%	100/15	Summer			100.061
2.000	RE	30 Winter	30	+10%					100.053
1.001	S2	30 Winter	30	+10%	30/15	Summer			100.052
3.000	SG2	30 Winter	30	+10%	100/15	Summer			100.039
4.000	SG1	30 Winter	30	+10%	100/15	Summer			100.042
4.001	S3	30 Winter	30	+10%	30/15	Summer			100.040
1.002	S4	30 Winter	30	+10%	30/15	Summer			100.039
1.003	S5-FC	30 Winter	30	+10%	1/15	Summer			100.038

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Synthetic Rainfall Details

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surchage	First (Y) Flood	First (Z) Overflow	Overflow Act.
1.000	S1	60 Winter	100	+40%	100/15	Summer		
2.000	RE	240 Winter	100	+40%				
1.001	S2	60 Winter	100	+40%	30/15	Summer		
3.000	SG2	60 Winter	100	+40%	100/15	Summer		
4.000	SG1	60 Winter	100	+40%	100/15	Summer		
4.001	S3	60 Winter	100	+40%	30/15	Summer		
1.002	S4	60 Winter	100	+40%	30/15	Summer		
1.003	S5-FC	60 Winter	100	+40%	1/15	Summer		

Appendix (D)

Thames Water Pre-planning Enquiry Response



Mr M Dier
Adama Consulting
Unit 34 The Enterprise Centre
Cranbourne rd
Potters Bar
Herts EN6 3DQ



Our ref: DS6050181



0800 009 3921

Monday to Friday, 8am to 5pm

29th June 2018

Pre-planning enquiry: Wastewater Capacity check

Dear Mr Dier

Thank you for providing details on your development with the Pre-Planning application dated 20th June 18' for Auden Hse Bury St Ruislip HA4 7TL { Brownfeild site of 2 flats / 225m2 offices area developed to :- 285m2 of offices only}.

Foul

If your proposals progress in line with the details you've provided as above, we're pleased to confirm that there will be sufficient sewerage capacity to serve your foul discharges from your development.

Surface Water

In considering your surface water needs, we support the use of sustainable drainage on development sites.

The surface water drainage strategy should follow policy 5.13 of the London Plan. Typically greenfield run off rates of 5l/s/ha should be aimed for using the drainage hierarchy. The hierarchy lists the preference for surface water disposal as follows; Store Rainwater for later use > Use infiltration techniques, such as porous surfaces in non-clay areas > Attenuate rainwater in ponds or open water features for gradual release > Discharge rainwater direct to a watercourse > Discharge by storing and attenuating rainwater direct to a surface water sewer/drain > Discharge by storing and attenuating rainwater to the combined sewer.

Please refer to the attached document titled "Planning your wastewater" attached to this letter, specifically to notes relating to surface water. Also I would advise you to liaise with the LA and discuss their criteria regarding surface water discharges in that area and adhere to their stipulation. If you agree & adhere to a LA stipulation then TW will be able to accommodate that agreed discharge.

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.

Please note that you must 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 sewerage capacity.

What happens next?

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

If you've any further questions, please contact me.

Yours sincerely

Siva Sivarajan

Developer Services- Wastewater Adoptions Engineer

Office: 0203 577 7752 Mobile: 07747642603

siva.sivarajan@thameswater.co.uk

Thames Water Utilities Ltd, Clearwater Court, Vastern Road, Reading, Berkshire, RG1 8DB

Find us online at developers.thameswater.co.uk



TW internal ref: DTS 58376