BARNARD & ASSOCIATES Ltd.
Consulting Civil & Structural Engineers
18 Northfields Prospect
Northfields
London SW18 1PE
☎ 0208 874 9005 Fax 0208 870 7386
☎ Email barnard@intonet.co.uk

INTRODUCTION TO BELOW GROUND DRAINAGE STORMWATER CALCULATIONS TO

STAPLEFORD COTTAGE, DANES HILL WOKING GU22

JOB NUMBER 23170

Prepared By	**TJB**
Checked By	**MD**
Date	**APRIL 24**

Introduction

These calculations been prepared to be submitted in response to planning condition 4.

A stormwater drainage strategy has been previously produced and approved by the planning authority in relation to the proposed development and should be read in conjunction with these calculations.

The condition states the following:

Planning Condition 4

No works pursuant to the development hereby permitted (other than any permitted demolition to ground level) must be undertaken until a surface water drainage scheme for the site based on sustainable drainage principles and an assessment of the hydrological and ydrogeological context of the development has been submitted to and approved in writing by the Local Planning Authority.

The drainage scheme must demonstrate that the surface water run-off generated up to and including the 1 in 100 plus climate change critical storm will not exceed the run-off from the existing site following the corresponding rainfall event.

The drainage scheme details to be submitted for approval must also include:

i. Calculations demonstrating no increase in surface water runoff rates and volumes discharged from the site compared to the existing scenario up to the 1 in 100 plus climate change storm event.

ii. Calculations demonstrating no on site flooding up to the 1 in 30 storm event and that any flooding between the 1 in 30 and 1 in 100 plus climate change storm event will be safely stored on site ensuring no overland flow routes.

iii. Detailed drainage plans showing where surface water will be accommodated on site.

iv. A management and maintenance plan for the lifetime of the development which must include the arrangements for adoption by any public body or statutory undertaker, or any other arrangements to secure the operation of the sustainable drainage scheme throughout its lifetime.

The surface water drainage scheme must be fully implemented in accordance with the approved details prior to the first occupation of the development hereby permitted and thereafter be permanently managed and maintained in accordance with the approved details.

Stormwater drainage proposals

The stormwater drainage system proposes a soakaway so that all run-off is infiltrated into the ground, as is the existing situation.

Item i) is therefore met confirming that no surface water run-off will occur from the site for the 1 in 100 year plus climate change storm event.

The soakaway is sized to cater for the full run-off from the 1 in 100 year plus climate change storm event so that no overland flow will occur. Item ii) is therefore met by the drainage proposals.

Item iii) Layout drawings of the proposed stormwater drainage system are to be read in conjunction with these calculations.

Item iv) A management and maintenance plan has been produced separately and should be read in conjunction with these calculations.

Brief Description of Project	**Construction of new residential building on site with majority of accommodation located below ground floor level, level with the existing ground level at front of site.** **The ground level at the rear of the site is level with the proposed lower ground floor level accommodation.** **New foul drainage networks to discharge to existing gravity foul sewer outfall that currently serves the existing cottage on the site.** **New stormwater drainage to discharge to soakaway at the rear of the site.**
Ground Conditions	**Thin layer of made ground over** **Bagshot Formation, encountered to the limit of investigation of 22.0m depth. The formation was overwhelmingly granular in nature with occasional cohesive horizons.** **Orange brown, brown and grey mottled silty sand with occasional clay layers in the lower reaches to 15.7m depth.** **A grey green very silty sand below 15.7 m depth transgressing to firm to stiff dark grey and brown very sandy clay at 17 m depth. Clay was underlain by a grey silty sand with occasional clay layers to 22 m depth.** **In situ testing of sand indicates medium dense, becoming very dense state of compaction.** **Groundwater encountered at 17.5, rising to 15.8m**
Consideration of SUDS drainage proposals for the development.	**Refer to Whitby Wood Drainage Strategy Report P450434-WW-XX-ZZ-RP-C-0002 dated September 2021, approved at Planning Stage of the project for further information.** **It is intended to adhere to the proposal set out in the drainage strategy approved at planning stage.**
Description of below ground Foul-water drainage system proposed	**Piped foul sewer outfall to front of site to discharge under gravity to ex foul sewer outfall manhole.** **Foul drains at lower ground floor and basement drains to pump station in basement which discharges via rising main to existing foul sewer outfall manhole.**
Description of below ground storm-water drainage system proposed	**Piped stormwater to discharge at rear of site into soakaways via rainwater harvesting tank.**

Infiltration Rate	**BRE365 infiltration testing is to be undertaken on site at the rear, close to the proposed footprint of the Soakaways.** **Access to undertake the infiltration testing is not yet available, until the existing buildings on the site are demolished. For modelling purposes, an infiltration rate of 1 x 10^{-6} has been assumed in the soakaway design.** **Once infiltration testing is complete, the size of the soakaway will be adjusted accordingly.**
Software Used and modelling of stormwater drainage system	**The storm-water drainage system has been designed using XP Solutions MicroDrainage Source Control version 2016.1.1.** **A model has been created to calculate the volume of the soakaway required to cater for a 1 in 100y +40% event using the FSR rainfall method.**
Exceedance Design	**The exceedance flow route will remain as existing.**

Consider Design of below ground stormwater drainage

A below ground drainage strategy has been previously prepared and approved for the development proposal.

Refer to Whitby Wood Drainage Strategy Report dated September 2021 reference P450434-WW-XX-ZZ-RP-C-002 (actually produced by Cube Engineers)

- The strategy proposes the following
- Foul discharge to sewers
- Storm water to soakaway
- Design to accommodate 1 in 100 + 40% storm

Refer to the approved strategy report, which should be read in conjunction with this report

Infiltration Rate

The drainage strategy assumed an infiltration rate of 1 x 10^{-6} m/sec in the initial drainage review

BRE 365 Testing

Access is not yet available for BRE 365 testing

Currently, a working assumption of infiltration rate of 1 x 10^{-6} m/sec is assumed for the new drainage proposals (Fine Silty Sand)

Soakaway Sizing

Final sizing of soakaway will follow the completion of BRE 365 infiltration tests on site.

Consider Catchment Area of Stormwater Design

The built area is 579m^2

The rear patio area is 61m^2

The total area is 640m^2

Allow 10% for future increase = 0.1 x 640 = 64m^2

Design for catchment = 704m^2

Consider soakaway to cater for catchment of 704m^2 and assumed infiltration rate of 1 x 10^{-6} m/sec

Stapleford Cottage:- coordinates 501531 , 158100

(GU22 7HQ)

Catchment = $704m^2$ = 0.07ha

Infiltration rate = 1 x 10^{-6} m/s assumed

Equates to 1 x 10^{-6} x 60x60 = 3.6 x 10^{-3} m/hr (0.036 m/hr)

Cover level 36.700m

Invert level 35.343m -- 1.4m deep

Set soakaway below 1.4m depth

IL = 36.700 – 3.4 = 33.3m

Try cellular storage:- $28m^2$ x 2m deep

8m x 3.5m x 2m deep

From the following Microdrainage print out:-

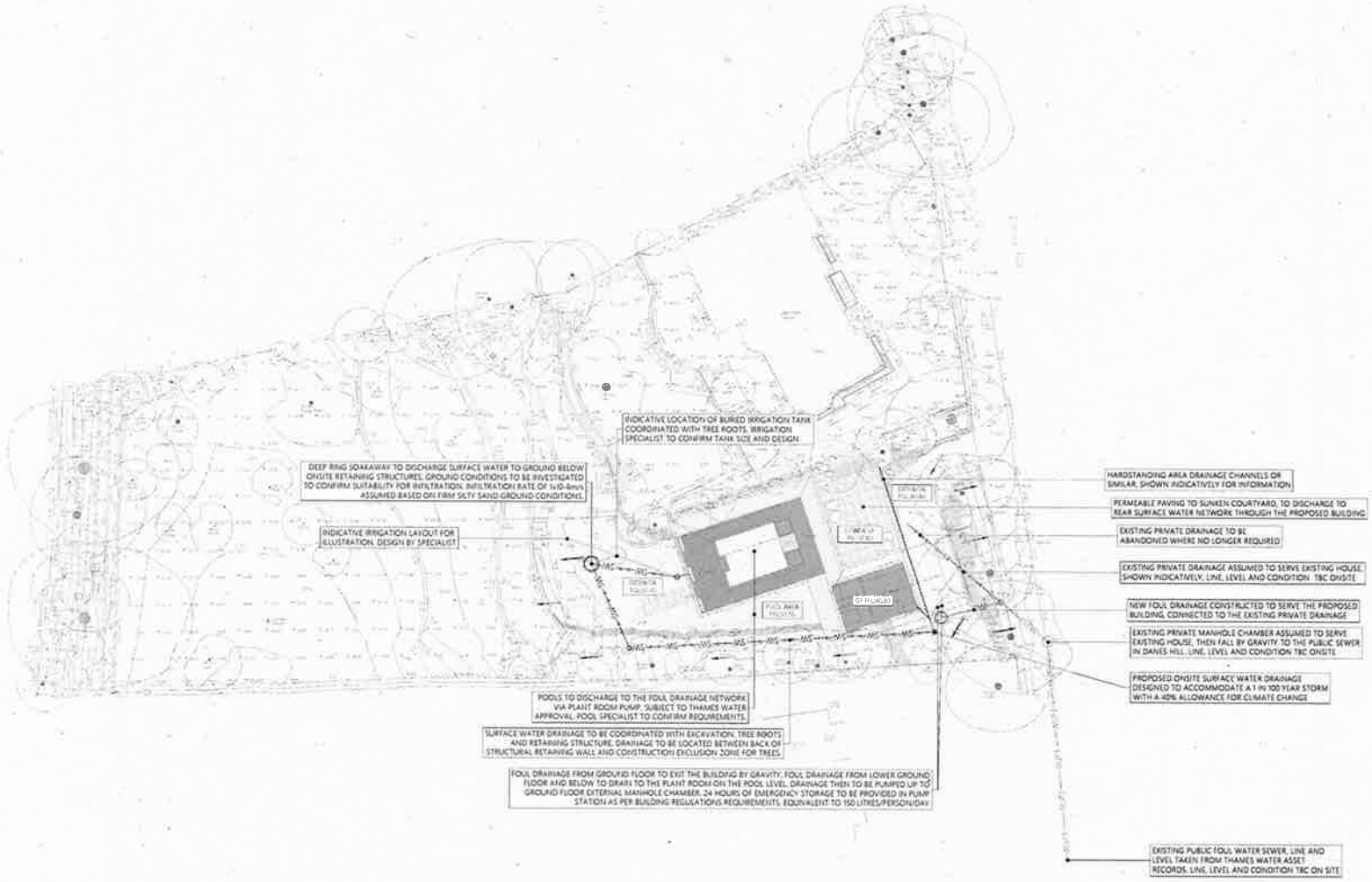
Cellular soakaway 28m^2 (2m deep) → (8x3.5)

Half drain down time = 1376minutes = 22.9hrs

Utilise 8m x 3.5m x 2m deep cellular storage with assumed infiltration rate = 1 x 10^{-6} m/sec

BRE 365 testing required to verify infiltration rate assumed

Soakaway size TBC after infiltration testing



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL LEVELS ARE IN METRES ABOVE ORDINANCE DATUM AND ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. IN LINE WITH NPPF GUIDANCE THE DRAINAGE DESIGN HAS BEEN DESIGNED WITH NO FLOODING FOR A 100YEAR STORM PLUS 40% CLIMATE CHANGE EVENT.
4. BELOW GROUND DRAINAGE PIPEWORK SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND IN COMPLIANCE WITH BS EN 12056, BS EN 752 AND THE NATIONAL BUILDING REGULATIONS APPROVED DOCUMENT H.
5. THE INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY AND INDICATIVE ONLY AND IS SUBJECT TO CHANGE THROUGH SITE INVESTIGATIONS, DETAILED DESIGN AND CO-ORDINATION
6. DISCHARGE RATES AND LOCATIONS ARE SUBJECT TO CONFIRMATION THROUGH SURVEY AND DISCUSSIONS WITH THE LLFA AND THAMES WATER.
7. DRAINAGE CHANNELS AND GULLIES WILL BE REQUIRED TO SERVE HARDSTANDING AREAS. THESE ARE SHOWN INDICATIVELY AT THIS STAGE BUT AN ALLOWANCE FOR THEM SHOULD BE MADE. ADDITIONAL GULLIES WILL BE REQUIRED, TO BE ADDED AS THE DEIGN DEVELOPS
8. INFILTRATION TESTING TO BE UNDERTAKEN TO VERIFY SUITABILITY OF INFILTRATION DEVICES AND INFORMATION THEIR DESIGN
9. SOAKAWAY LOCATION AND TYPE SHOWN INDICATIVELY. SOAKAWAY TO BE SUFFICIENTLY DEEP TO ENSURE WATER INFILTRATES TO GROUND BELOW THE EXISTING ONSITE RETAINING STRUCTURES. SOAKAWAY DESIGN TO BE CONFIRMED BASED ON INFILTRATION RESULTS.

KEY

- SITE BOUNDARY
- EXISTING PUBLIC FOUL WATER SEWER
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING SEWER TO BE ABANDONED
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED SURFACE WATER CHANNEL DRAIN OR SIMILAR
- PROPOSED INFILTRATION DEVICE
- INDICATIVE IRRIGATION NETWORK FOR ILLUSTRATION. DESIGN BY SPECIALIST
- FLOOD FLOW PATHS

P03	28/09/2021	PRELIMINARY ISSUE	AP	AOR
P02	13/09/2021	PRELIMINARY ISSUE	AP	AOR
P01	04/08/2021	PRELIMINARY ISSUE	AP	AOR

PRELIMINARY ISSUE

whitby wood
91-94 LOWER MARSH
LONDON SE1 7AB, UNITED KINGDOM
+44 (0)20 7442 2216 www.whitbywood.com

CU BE CONSULTING ENGINEERS
WWW.CONSULTINGCUBE.CO.UK

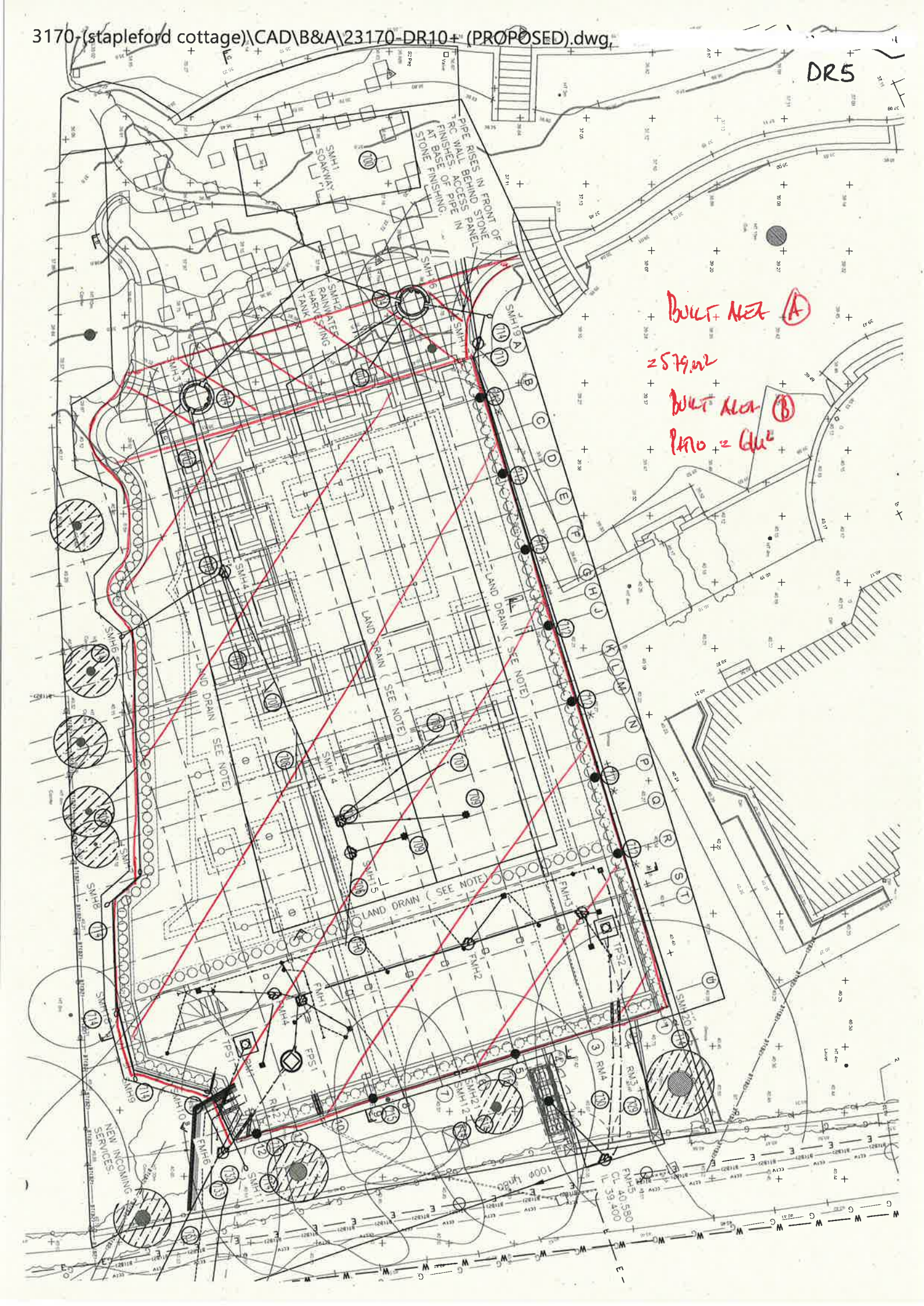
STAPLEFORD COTTAGE

BELOW GROUND DRAINAGE LAYOUT

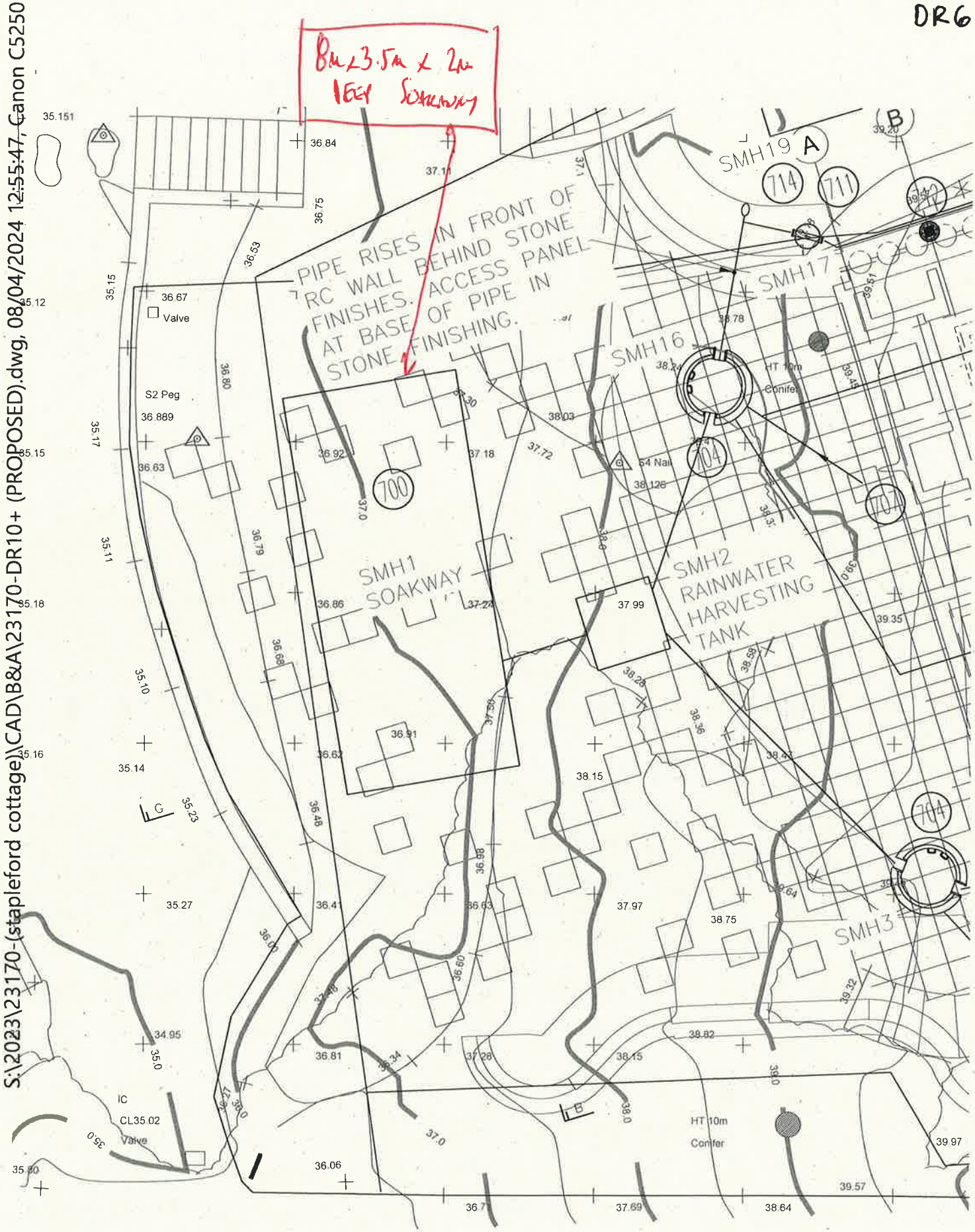
1056	04/08/2021	1:250	
AP	AP	AOR	AOR

1056-C-DR-0100 P03

DR4


3170-(stapleford cottage)\CAD\B&A\23170-DR10+ (PROPOSED).dwg,
DR5
PIPE RISES IN FRONT OF RC WALL BEHIND STONE FINISHES. ACCESS PANEL AT BASE OF PIPE IN STONE FINISHING.
SMH1 SOAKWAY
SMH2 RAINWATER HARVESTING TANK
SMH3
SMH4
SMH5
SMH6
SMH7
SMH8
SMH9
SMH10
SMH11
SMH12
SMH13
SMH14
SMH15
SMH16
SMH17
SMH18
SMH19
SMH20
LAND DRAIN (SEE NOTE)
FMH1
FMH2
FMH3
FMH4
FMH5
FMH6
TPS1
TPS2
FPS1
RM1
RM2
RM3
RM4
NEW INCOMING SERVICES
FMH6 CL 40.580 IL 39.400
BUILT AREA (A)
=579.m2
BUILT AREA (B)
PATIO = 64m2

DR6



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18 Northfields Prospect Northfields London SW18 1PE	STAPLEFORD COTTAGE 501531, 158100 Soakaway 1 x 10-6	
Date 15/03/2024 File SA FSR Cellular.SRCX	Designed by TJB Checked by	
XP Solutions	Source Control 2019.1	

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

Half Drain Time : 1376 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	33.975	0.675	0.2	0.0	0.2	18.0	O K
30 min Summer	34.182	0.882	0.2	0.0	0.2	23.5	O K
60 min Summer	34.392	1.092	0.3	0.0	0.3	29.0	O K
120 min Summer	34.594	1.294	0.3	0.0	0.3	34.4	O K
180 min Summer	34.701	1.401	0.3	0.0	0.3	37.3	O K
240 min Summer	34.766	1.466	0.3	0.0	0.3	39.0	O K
360 min Summer	34.844	1.544	0.3	0.0	0.3	41.1	O K
480 min Summer	34.888	1.588	0.3	0.0	0.3	42.2	O K
600 min Summer	34.910	1.610	0.3	0.0	0.3	42.8	O K
720 min Summer	34.919	1.619	0.3	0.0	0.3	43.1	O K
960 min Summer	34.911	1.611	0.3	0.0	0.3	42.9	O K
1440 min Summer	34.876	1.576	0.3	0.0	0.3	41.9	O K
2160 min Summer	34.811	1.511	0.3	0.0	0.3	40.2	O K
2880 min Summer	34.742	1.442	0.3	0.0	0.3	38.4	O K
4320 min Summer	34.613	1.313	0.3	0.0	0.3	34.9	O K
5760 min Summer	34.503	1.203	0.3	0.0	0.3	32.0	O K
7200 min Summer	34.405	1.105	0.3	0.0	0.3	29.4	O K
8640 min Summer	34.317	1.017	0.3	0.0	0.3	27.0	O K
10080 min Summer	34.236	0.936	0.2	0.0	0.2	24.9	O K
15 min Winter	34.057	0.757	0.2	0.0	0.2	20.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	138.153	0.0	0.0	19
30 min Summer	90.705	0.0	0.0	34
60 min Summer	56.713	0.0	0.0	64
120 min Summer	34.246	0.0	0.0	124
180 min Summer	25.149	0.0	0.0	182
240 min Summer	20.078	0.0	0.0	242
360 min Summer	14.585	0.0	0.0	362
480 min Summer	11.622	0.0	0.0	482
600 min Summer	9.738	0.0	0.0	602
720 min Summer	8.424	0.0	0.0	720
960 min Summer	6.697	0.0	0.0	934
1440 min Summer	4.839	0.0	0.0	1154
2160 min Summer	3.490	0.0	0.0	1536
2880 min Summer	2.766	0.0	0.0	1960
4320 min Summer	1.989	0.0	0.0	2768
5760 min Summer	1.573	0.0	0.0	3624
7200 min Summer	1.311	0.0	0.0	4400
8640 min Summer	1.129	0.0	0.0	5192
10080 min Summer	0.994	0.0	0.0	5960
15 min Winter	138.153	0.0	0.0	19

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	34.289	0.989	0.3	0.0	0.3	26.3	O K
60 min Winter	34.525	1.225	0.3	0.0	0.3	32.6	O K
120 min Winter	34.755	1.455	0.3	0.0	0.3	38.7	O K
180 min Winter	34.877	1.577	0.3	0.0	0.3	42.0	O K
240 min Winter	34.953	1.653	0.3	0.0	0.3	44.0	O K
360 min Winter	35.046	1.746	0.3	0.0	0.3	46.5	O K
480 min Winter	35.101	1.801	0.3	0.0	0.3	47.9	O K
600 min Winter	35.132	1.832	0.4	0.0	0.4	48.7	O K
720 min Winter	35.149	1.849	0.4	0.0	0.4	49.2	O K
960 min Winter	35.154	1.854	0.4	0.0	0.4	49.3	O K
1440 min Winter	35.109	1.809	0.3	0.0	0.3	48.1	O K
2160 min Winter	35.036	1.736	0.3	0.0	0.3	46.2	O K
2880 min Winter	34.947	1.647	0.3	0.0	0.3	43.8	O K
4320 min Winter	34.765	1.465	0.3	0.0	0.3	39.0	O K
5760 min Winter	34.608	1.308	0.3	0.0	0.3	34.8	O K
7200 min Winter	34.470	1.170	0.3	0.0	0.3	31.1	O K
8640 min Winter	34.345	1.045	0.3	0.0	0.3	27.8	O K
10080 min Winter	34.234	0.934	0.2	0.0	0.2	24.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	90.705	0.0	0.0	34
60 min Winter	56.713	0.0	0.0	64
120 min Winter	34.246	0.0	0.0	122
180 min Winter	25.149	0.0	0.0	180
240 min Winter	20.078	0.0	0.0	240
360 min Winter	14.585	0.0	0.0	356
480 min Winter	11.622	0.0	0.0	472
600 min Winter	9.738	0.0	0.0	586
720 min Winter	8.424	0.0	0.0	700
960 min Winter	6.697	0.0	0.0	916
1440 min Winter	4.839	0.0	0.0	1298
2160 min Winter	3.490	0.0	0.0	1640
2880 min Winter	2.766	0.0	0.0	2104
4320 min Winter	1.989	0.0	0.0	3024
5760 min Winter	1.573	0.0	0.0	3872
7200 min Winter	1.311	0.0	0.0	4752
8640 min Winter	1.129	0.0	0.0	5536
10080 min Winter	0.994	0.0	0.0	6352

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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)	20.000	Shortest Storm (mins)	15
Ratio R	0.400	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.070

Time (mins) From:	To:	Area (ha)
0	4	0.070

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Model Details

Storage is Online Cover Level (m) 36.700

Cellular Storage Structure

Invert Level (m) 33.300 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03600 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03600

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	28.0	28.0	2.001	0.0	74.0
2.000	28.0	74.0			

Pipe Overflow Control

Diameter (m) 0.150 Entry Loss Coefficient 0.500
Slope (1:X) 60.0 Coefficient of Contraction 0.600
Length (m) 10.000 Upstream Invert Level (m) 35.340
Roughness k (mm) 0.600

whitby wood

Project: Stapleford Cottage, Danes Hill, Woking, GU22 7HQ

Client: Dr Roland Tegeder

P450434-WW-XX-ZZ-RP-C-0002

Drainage Strategy Report

Prepared for Full Planning Submission to Woking Borough Council

September 2021

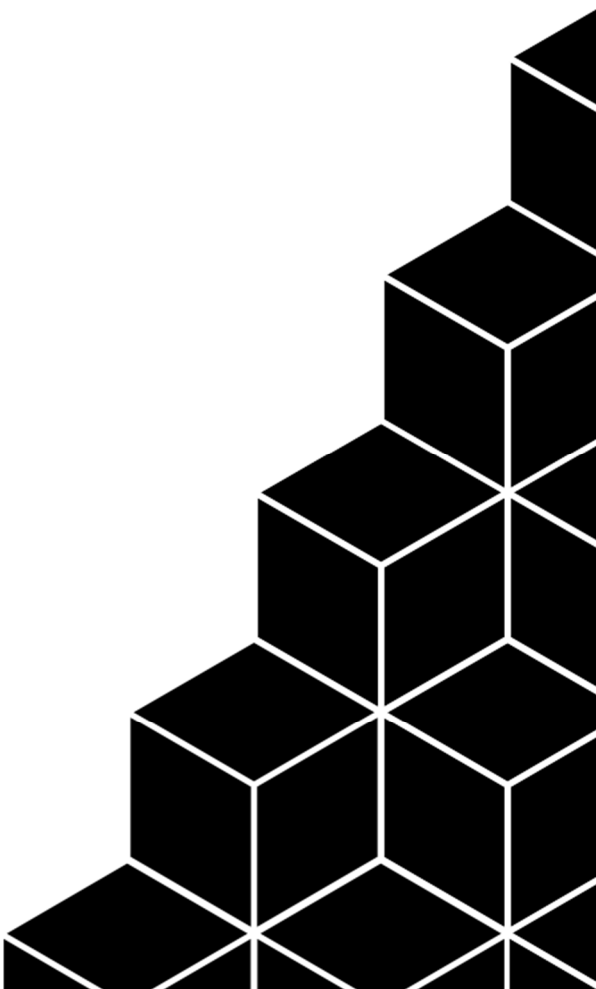
CUBE
CONSULTING ENGINEERS

Stapleford Cottage
Drainage Strategy

Project No.: 1056
Document Ref: 1056-C-RP-0100
Issue: P3
Date: 28/09/2021

Prepared in partnership with

whitby wood



Stapleford Cottage
Drainage Strategy

QUALITY CONTROL

ISSUE:	DATE:	PREPARED:	CHECKED:	APPROVED:	COMMENTS:
P1	04/08/2021	AP	AOR	AOR	PRELIMINARY ISSUE
P2	13/09/2021	AP	AOR	AOR	PRELIMINARY ISSUE
P3	28/09/2021	AP	AOR	AOR	PRELIMINARY ISSUE

CONTENTS

EXECUTIVE SUMMARY

The existing site is understood to be served by a below ground foul water drainage network that discharges unrestricted to the offsite public sewers. It is understood the surface water from the existing site infiltrates into the ground via soakaway to the rear of the property.

A gravity below ground foul water drainage network is proposed to serve the new building, which will discharge unrestricted to the existing foul water public sewer in Danes Hill via the existing connection. Drainage from the lower levels of the proposed building will be pumped to ground floor where it will converge with discharge from the rest of the building and fall to the public sewer.

A separate gravity below ground surface water drainage network is also proposed, to collect surface water from the hardstanding areas and building roofs and discharge to soakaway in the rear garden, at a significantly lower level than the proposed building. Rainwater harvesting is also proposed to collect rainwater from the building roofs and reuse if for irrigation.

The proposed surface water drainage network will be deigned to accommodate a 1 in 100 year storm with a 40% allowance for climate change without flooding.

INTRODUCTION

Cube Consulting Engineers on behalf of Whitby Wood have been appointed to undertake this Drainage Strategy for Stapleford Cottage. The purpose of this document is to support the planning application for the project.

This Drainage Strategy has been produced in line with the requirements of the National Planning Policy Framework (NPPF) and the London Plan. In addition to these the following documents, polices and resources have been used to inform this document:

- Surrey Council Design Guidance

This Drainage Strategy makes partial use of third party information and may contain Google maps, Environment Agency, BGS and Defra copyright information.

EXISTING SITE

SITE LOCATION

The proposed site is located in Woking, Surrey. The site area is 0.1 Ha. The site is occupied by an existing residential building and hardstanding area, that is to be demolished and replaced with a new residential building and hardstanding area. The extent of the site boundary in red can be seen in the figure below.

The site is centred at:

- National Grid Reference: TQ015581
- Easting, Northing: 501536 , 158149
- Nearest Postcode: GU22 7HQ

Figure 1 - Proposed Site

EXISTING DRAINAGE

Existing Foul Water Sewers

There are dedicated foul water public sewers in Danes Hill, east of the site. It is assumed that the existing house connects to the public sewer in Danes Hill, south east of the site (chamber ref: 5101). It is assumed that a short length of private drainage links the house to the offsite public sewer.

Refer to Figure 2 below and Appendix A for further information. The site is shown bounded in green.

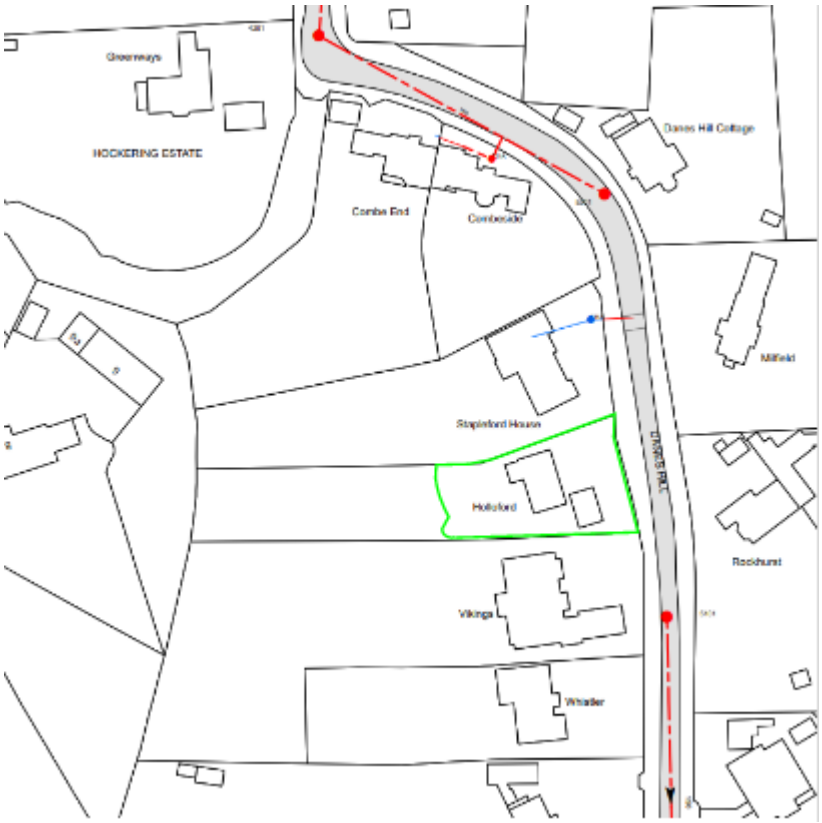


Figure 2 – Extract of Public Sewer Record

Existing Surface Water Sewers

No surface water public sewers are shown on the public sewer records. It is assumed that the individual houses in this area have private drainage networks that discharge to onsite soakaways. Therefore, it is assumed that currently there is no surface water discharge leaving the site.

PROPOSED DRAINAGE STRATEGY

FOUL WATER DRAINAGE

Drainage Design Parameters

The below ground foul water drainage system will be designed in accordance with Design and Construction Guidance for foul and surface water sewers or "the Code", BS EN 752 Parts 3 & 4, and Building Regulations Approved Document H where appropriate.

Proposed Foul Water Drainage Strategy

A below ground, gravity foul water drainage network is proposed to serve the proposed building at ground floor level. The discharge from the ground floor level will be collected and conveyed by gravity via a new piped network to the existing private foul water sewers located to the east of the building. From here the foul water will drain via the existing private foul sewers to the public foul water sewer in Danes Hill. Foul water will be discharged at an unrestricted rate.

Drainage from the lower ground levels will drain to the plant room on the lowest level, from where it will be pumped up to the proposed gravity drainage to the east of the building. From here it will converge with the foul discharge from the rest of the building and fall to the existing public sewer.

Discharge from the pools at lower ground floor levels will connect to the foul drainage subject to Thames Water approval. Pool design and discharge is to be advised by specialist.

Refer to the below ground drainage layout drawing 1056-C-DR-0100 in Appendix B for further details.

SURFACE WATER DRAINAGE

Drainage Design Parameters

The below ground surface water drainage system will be designed in accordance with local policy, local Sustainable Drainage System (SuDS) guidance, national standards and best practice. Industry standards along with the Environment Agency and Design and Construction Guidance for foul and surface water sewers or "the Code" dictate that for below ground surface water systems:

- The system should not surcharge for a 1 in 2 year storm event;
- The system should not flood any part of the site in a 1 in 30 year storm event; and
- Controlled flooding of the site is permitted in a 1 in 100 year storm event including a climate change allowance provided the flood water is contained within the site and does not affect the safe ingress and egress from the site.

The Environment Agency have completed an assessment of the impacts of Climate Change on peak rainfall intensity for small catchments (less than 5km^2). These are summarised in Table 1 extracted from EA guidance 'Flood Risk Assessments: Climate Change allowances' issued on 19th February 2016 with subsequent revisions.

APPLIES ACROSS ALL OF ENGLAND	TOTAL POTENTIAL CHANGE FOR '2020S' (2015 TO 2039)	TOTAL POTENTIAL CHANGE FOR '2050S' (2040 TO 2069)	TOTAL POTENTIAL CHANGE FOR '2080S' (2070 TO 2115)
Upper End	10%	20%	40%
Central	5%	10%	20%

Table 1: Peak rainfall intensity climate change allowances

A typical lifespan for a new development is 100 years, under national and local policy this development will be assessed against a 1 in 100 year storm event including a 40% climate change allowance using FEH rainfall.

Surface Water Disposal Hierarchy

In accordance with Building Regulations Approved Document H, all drainage strategies should manage surface water discharge based on the following hierarchy:

1. Infiltration or a soakaway on site;
2. Discharge to a watercourse; or
3. Discharge to a sewer.

Infiltration is proposed, by utilising soakaways to soak surface water into the ground. Ground conditions are understood to be suitable for infiltration and there is a garden to the rear of the building to accommodate a soakaway. The garden area where infiltration devices are proposed is lower than the building, so there is no risk of flood water from an exceedance event flooding the building. An assumed infiltration rate of $1x10^{-6}$m/s has been used in the design, based on the known ground conditions.

Infiltration testing is to be undertaken in due course to enable detailed design of the infiltration devices to be undertaken.

Rainwater harvesting is also proposed to intercept rainwater from the building roof and reuse it for irrigation.

The proposed surface water drainage strategy will result in all surface water being either captured for reuse on the site, or infiltrated into the ground on the site.

Refer to the below ground drainage layout drawing 1056-C-DR-0100 in Appendix B for further details. Refer to Appendix C for hydraulic modelling information.

OFFSITE IMPACT

The proposed surface water drainage strategy outlined in this document demonstrates that the proposed drainage network included in the development will manage all surface water run off during events up to and including the 100 year return period storm including the upper end allowance for climate change. The development will result in no increase in flood risk downstream.

OVERLAND FLOW AND EXCEEDANCE

The proposed building is located at the high point of the site, with the land to the rear falling away. The infiltration device serving the site is located in the rear garden from where the ground falls away from the proposed building. The risk of the building flooding from exceedance event or blockage of the drainage network is therefore very low.

Refer to the exceedance flow routes on drawing 1056-C-DR-0100 in Appendix B for further details.

DRAINAGE MAINTENANCE STRATEGY

The following drainage maintenance and management strategy has been produced in accordance with the SuDS Manual, best practice and manufactures guidance. This is not intended to be an exhaustive list but outline guidance for the recommended requirements which are to be reviewed and updated based on the specific site requirements. It is expected that the maintenance for the drainage of the proposed development will be undertaken by the management company and will be suitably qualified to undertake the required maintenance.

This schedule should be read in accordance with the manufacturer's guidance and the SuDS Manual.

MANHOLES AND INSPECTION CHAMBERS

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular Maintenance	Inspect chambers (from ground level) to ensure no build-up of water, debris or sediments are occurring in the chamber. If required clean or take remedial action. Do not attempt to enter chambers, refer to remedial actions.	6 monthly
	Any public manholes are the responsibility of the sewerage undertaker and may require permissions to access or lift covers. Maintenance/monitoring of these chamber is not required, should any issues be identified these should be highlighted to the sewerage undertaker.	As deemed necessary by asset owner
Remedial actions	Call out to drainage maintenance company for bespoke advice. Entering manhole chambers is a dangerous task as they are a confined space with potential toxic gas and/or low oxygen environments. Any such, cleaning and repairs should always be handled by a qualified engineer with experience working in confined spaces. Do not attempt to enter inspection chambers.	As required
Monitoring	Visually inspect chambers (from ground level) to monitor any build-up of water, debris or sediments occurring in the chamber.	6 monthly of after large storms

Table 2: Operation and maintenance requirements for manhole and inspection chambers

SOAKAWAYS

MAINTENANCE SCHEDULE	REQUIRED ACTION	TYPICAL FREQUENCY
Regular maintenance	Inspect for sediment and debris in pre-treatment components and floor of inspection tube or chamber and inside concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any roots that may be causing blockages	Annually (or as required)
Occasional maintenance	Remove sediments and debris from pre-treatment components and floor of inspection tube or chamber and inside of concrete manhole rings.	As required, based on inspections
Remedial actions	Reconstruct soakaways and/or replace or clean void fill, if performance deteriorates or failure occurs	As required
	Replacement of clogged geotextile (will require reconstruction of soakaway	As required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually.
	Check soakaway to ensure emptying is occurring	Annually

Table 3: Operation and maintenance requirements for soakaways (from the SuDS Manual)

Appendix A
Thames Water Asset Plans

Asset location search

Property Searches

WW
EXETER
EX3 0LH

Search address supplied Stapleford House
Danes Hill
Woking
GU22 7HQ

Your reference Stapleford Cottage

Our reference ALS/ALS Standard/2021_4460032

Search date 2 July 2021

Knowledge of features below the surface is essential for every development

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

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

Contact us to find out more.

Thames Water Utilities Ltd
Property Searches, PO Box 3189, Slough SL1 4WW
DX 151280 Slough 13

searches@thameswater.co.uk
www.thameswater-propertysearches.co.uk

0800 009 4540

Asset location search

Property Searches

Search address supplied: Stapleford House, Danes Hill, Woking, GU22 7HQ

Dear Sir / Madam

An Asset Location Search is recommended when undertaking a site development. It is essential to obtain information on the size and location of clean water and sewerage assets to safeguard against expensive damage and allow cost-effective service design.

The following records were searched in compiling this report: - the map of public sewers & the map of waterworks. Thames Water Utilities Ltd (TWUL) holds all of these.

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

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

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

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

Contact Us

If you have any further queries regarding this enquiry please feel free to contact a member of the team on 0800 009 4540, or use the address below:

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

Email: searches@thameswater.co.uk
Web: www.thameswater-propertysearches.co.uk

Asset location search

Thames Water Property Searches

Waste Water Services

Please provide a copy extract from the public sewer map.

Enclosed is a map showing the approximate lines of our sewers. Our plans do not show sewer connections from individual properties or any sewers not owned by Thames Water unless specifically annotated otherwise. Records such as "private" pipework are in some cases available from the Building Control Department of the relevant Local Authority.

Where the Local Authority does not hold such plans it might be advisable to consult the property deeds for the site or contact neighbouring landowners.

This report relates only to sewerage apparatus of Thames Water Utilities Ltd, it does not disclose details of cables and or communications equipment that may be running through or around such apparatus.

The sewer level information contained in this response represents all of the level data available in our existing records. Should you require any further Information, please refer to the relevant section within the 'Further Contacts' page found later in this document.

For your guidance:

- The Company is not generally responsible for rivers, watercourses, ponds, culverts or highway drains. If any of these are shown on the copy extract they are shown for information only.
- Any private sewers or lateral drains which are indicated on the extract of the public sewer map as being subject to an agreement under Section 104 of the Water Industry Act 1991 are not an ‘as constructed’ record. It is recommended these details be checked with the developer.

Clean Water Services

Please provide a copy extract from the public water main map.

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

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

For your guidance:

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

Payment for this Search

A charge will be added to your suppliers account.

Further contacts:

Waste Water queries

Should you require verification of the invert levels of public sewers, by site measurement, you will need to approach the relevant Thames Water Area Network Office for permission to lift the appropriate covers. This permission will usually involve you completing a TWOSA form. For further information please contact our Customer Centre on Tel: 0845 920 0800. Alternatively, a survey can be arranged, for a fee, through our Customer Centre on the above number.

If you have any questions regarding sewer connections, budget estimates, diversions, building over issues or any other questions regarding operational issues please direct them to our service desk. Which can be contacted by writing to:

Developer Services (Waste Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

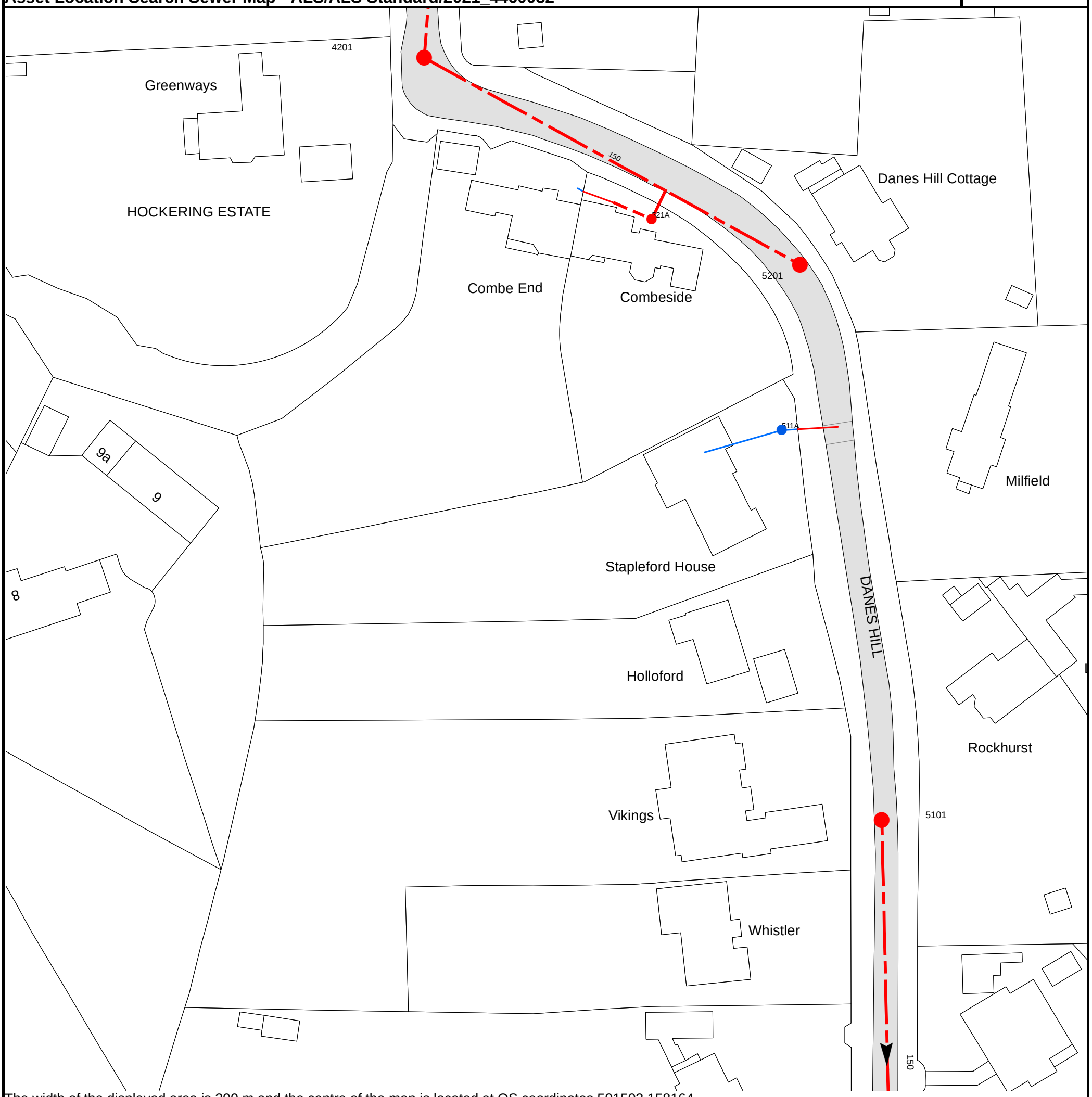
Clean Water queries

Should you require any advice concerning clean water operational issues or clean water connections, please contact:

Developer Services (Clean Water)
Thames Water
Clearwater Court
Vastern Road
Reading
RG1 8DB

Tel: 0800 009 3921
Email: developer.services@thameswater.co.uk

Asset Location Search Sewer Map - ALS/ALS Standard/2021_4460032



The width of the displayed area is 200 m and the centre of the map is located at OS coordinates 501503,158164

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.

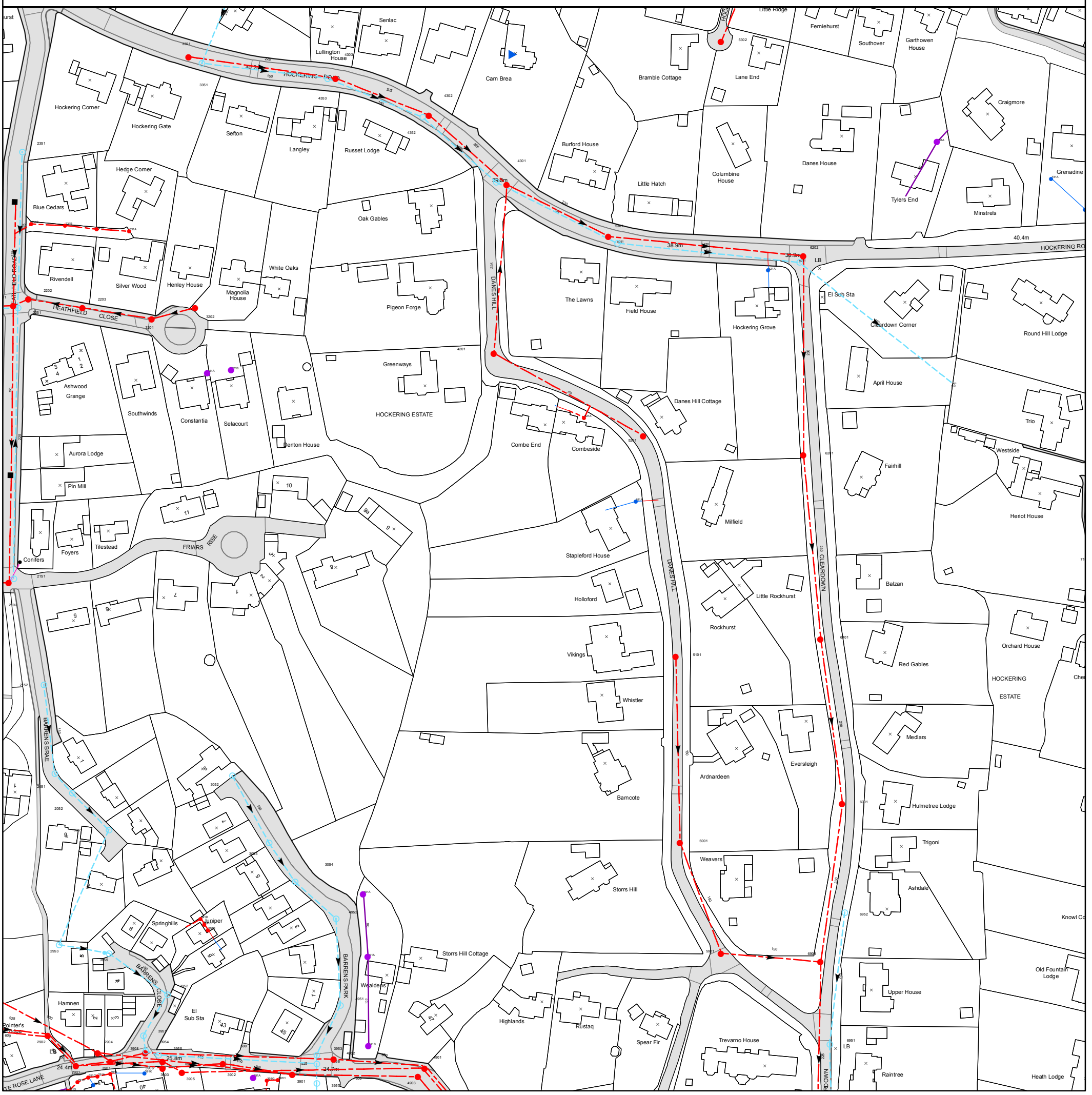
NB. Levels quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates that no survey information is available

Manhole Reference	Manhole Cover Level	Manhole Invert Level
5101	40.42	38.81
511A	n/a	n/a
5201	40.08	38.93
521A	n/a	n/a
4201	39.45	38.29

The position of the apparatus shown on this plan is given without obligation and warranty, and the accuracy cannot be guaranteed. Service pipes are not shown but their presence should be anticipated. No liability of any kind whatsoever is accepted by Thames Water for any error or omission. The actual position of mains and services must be verified and established on site before any works are undertaken.

Based on the Ordnance Survey Map with the sanction of the Controller of H.M Stationary Office License Number 10019345

ALS/ALS Standard/2021_4460032



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 before any works are undertaken. Crown copyright Reserved

Scale:	1:1790
Width:	500m
Printed By:	Rveldhur
Print Date:	02/07/2021
Map Centre:	501503,158164
Grid Reference:	TQ0158SE

Comments:

ALS/ALS Standard/2021_4460032

NB: Level quoted in metres Ordnance Newlyn Datum. The value -9999.00 indicates no Survey information is available.

REFERENCE	COVER LEVEL	INVERT LEVEL
5101	40.42	38.81
3902	25.24	23.8
6001	34.92	33.1
2102	42.51	40.48
2052	39.83	39.18
3952	28.41	26.94
5901	35.72	33.91
2202	42.68	39.42
4952	25.34	
4951	25.15	23.77
6951	31.08	30.38
3959	32.35	29.56
3903	25.77	23.83
3907	25.63	23.9
4901	25.82	23.64
3202	41.52	40.57
3957	24.44	22.78
4353	39.91	38.9
2902	28.01	23.86
4201	39.45	38.29
3901	24.7	23.76
5201	40.08	38.93
2151	42.49	41.42
2251	42.62	40.44
3951	26.48	25.29
3954	25.89	25.08
6202	38.83	36.32
4302	39.25	37.79
2351	41.98	40.63
3053	26.81	25.56
231A		
231B		
321A		
2201	42.64	38.96
491B		
491A		
391H		
4351	39.26	38.12
391B		
391D		
731A		
291A		
291C		
511A		
291G		

REFERENCE	COVER LEVEL	INVERT LEVEL
5001	40.29	38.12
3052		
6952	33.45	32.73
2953		
5301	38.99	37.13
4903	25.76	23.65
5302	37.64	36.45
4902	24.66	23.7
4303	39.8	38.37
3955	25.82	24.53
3201		
3051	38.41	37.39
2051	40.13	39.28
4352	39.28	38.38
3301	40.99	39.46
3351	40.85	39.88
3953	24.69	22.91
2152	40.37	39.49
3905	25.73	23.75
2904	26.12	24
3054	25.84	24.54
4301	39.2	37.56
2203		
6901	32.98	30.56
3908	25.88	23.82
6201	38.59	36.15
391G		
6101	37.84	35.06
3956	24.65	22.87
3906	25.81	23.81
331A		
231C		
321B		
391A		
401A		
621A		
5351	38.94	37.93
6251	38.86	37.36
391C		
2901	24.97	23.85
391J		
291E		
521A		
391K		
631A		

ALS Sewer Map Key

Public Sewer Types (Operated & Maintained by Thames Water)

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

Surface Water: A sewer designed to convey surface water (e.g. rain water from roofs, yards and car parks) to rivers or watercourses.

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

Trunk Surface Water

Trunk Foul

Storm Relief

Trunk Combined

Vent Pipe

Bio-solids (Sludge)

Proposed Thames Surface Water Sewer

Proposed Thames Water Foul Sewer

Gallery

Foul Rising Main

Surface Water Rising Main

Combined Rising Main

Sludge Rising Main

Proposed Thames Water Rising Main

Vacuum

Sewer Fittings

A feature in a sewer that does not affect the flow in the pipe. Example: a vent is a fitting as the function of a vent is to release excess gas.

Air Valve

Dam Chase

Fitting

Meter

Vent Column

Operational Controls

A feature in a sewer that changes or diverts the flow in the sewer. Example: A hydrobrake limits the flow passing downstream.

Control Valve

Drop Pipe

Ancillary

Weir

End Items

End symbols appear at the start or end of a sewer pipe. Examples: an Undefined End at the start of a sewer indicates that Thames Water has no knowledge of the position of the sewer upstream of that symbol, Outfall on a surface water sewer indicates that the pipe discharges into a stream or river.

Outfall

Undefined End

Inlet

Other Symbols

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

Public/Private Pumping Station

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

Invert Level

Summit

Areas

Lines denoting areas of underground surveys, etc.

Agreement

Operational Site

Chamber

Tunnel

Conduit Bridge

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

Foul Sewer

Surface Water Sewer

Combined Sewer

Gulley

Culverted Watercourse

Proposed

Abandoned Sewer

Notes:

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

2) All measurements on the plans are metric.

3) Arrows (on gravity fed sewers) or flecks (on rising mains) indicate direction of flow.

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

5) 'na' or '0' on a manhole level indicates that data is unavailable.

6) The text appearing alongside a sewer line indicates the internal diameter of 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 Searches on 0800 009 4540.

Terms and Conditions

All sales are made in accordance with Thames Water Utilities Limited (TWUL) standard terms and conditions unless previously agreed in writing.

1. All goods remain in the property of Thames Water Utilities Ltd until full payment is received.
2. Provision of service will be in accordance with all legal requirements and published TWUL policies.
3. All invoices are strictly due for payment 14 days from due date of the invoice. Any other terms must be accepted/agreed in writing prior to provision of goods or service, or will be held to be invalid.
4. Thames Water does not accept post-dated cheques-any cheques received will be processed for payment on date of receipt.
5. In case of dispute TWUL`s terms and conditions shall apply.
6. Penalty interest may be invoked by TWUL in the event of unjustifiable payment delay. Interest charges will be in line with UK Statute Law 'The Late Payment of Commercial Debts (Interest) Act 1998'.
7. Interest will be charged in line with current Court Interest Charges, if legal action is taken.
8. A charge may be made at the discretion of the company for increased administration costs.

A copy of Thames Water's standard terms and conditions are available from the Commercial Billing Team (cashoperations@thameswater.co.uk).

We publish several Codes of Practice including a guaranteed standards scheme. You can obtain copies of these leaflets by calling us on 0800 316 9800

If you are unhappy with our service you can speak to your original goods or customer service provider. If you are not satisfied with the response, your complaint will be reviewed by the Customer Services Director. You can write to her at: Thames Water Utilities Ltd. PO Box 492, Swindon, SN38 8TU.

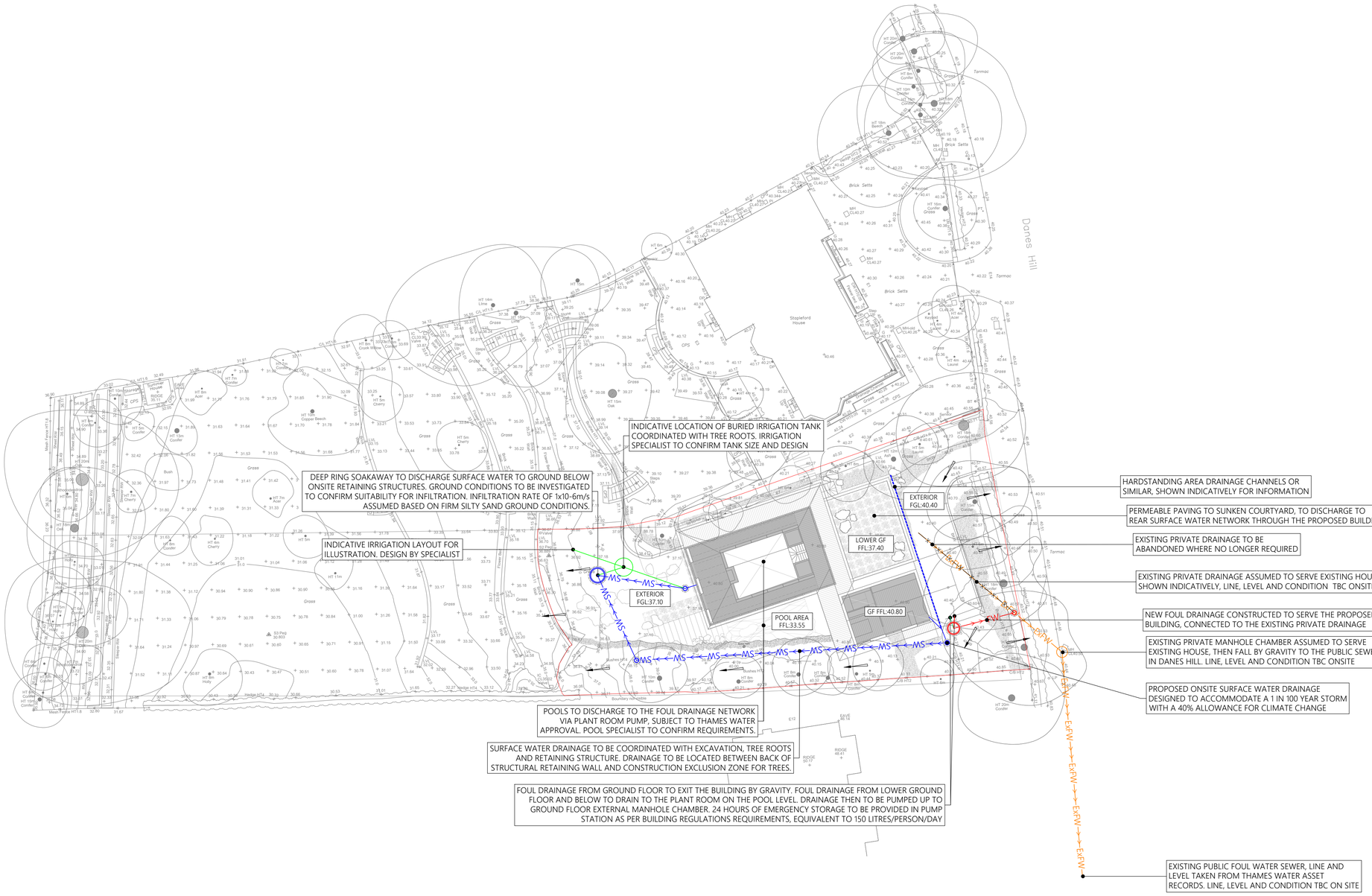
If the Goods or Services covered by this invoice falls under the regulation of the 1991 Water Industry Act, and you remain dissatisfied you can refer your complaint to Consumer Council for Water on 0121 345 1000 or write to them at Consumer Council for Water, 1st Floor, Victoria Square House, Victoria Square, Birmingham, B2 4AJ.

Ways to pay your bill

Credit Card	**BACS Payment**	**Telephone Banking**	**Cheque**
Call **0800 009 4540** quoting your invoice number starting CBA or ADS / OSS	Account number **90478703** Sort code **60-00-01** A remittance advice must be sent to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW.** or email **ps.billing@thameswater.co.uk**	By calling your bank and quoting: Account number **90478703** Sort code **60-00-01** and your invoice number	Made payable to '**Thames Water Utilities Ltd**' Write your Thames Water account number on the back. Send to: **Thames Water Utilities Ltd., PO Box 3189, Slough SL1 4WW** or by DX to **151280 Slough 13**

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

Appendix B
Proposed Drainage Layout Drawing



NOTES:

1. DO NOT SCALE FROM THIS DRAWING.
2. ALL LEVELS ARE IN METRES ABOVE ORDINANCE DATUM AND ALL DIMENSIONS ARE IN METRES UNLESS NOTED OTHERWISE.
3. IN LINE WITH NPPF GUIDANCE THE DRAINAGE DESIGN HAS BEEN DESIGNED WITH NO FLOODING FOR A 100YEAR STORM PLUS 40% CLIMATE CHANGE EVENT.
4. BELOW GROUND DRAINAGE PIPEWORK SHALL BE INSTALLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS AND IN COMPLIANCE WITH BS EN 12056, BS EN 752 AND THE NATIONAL BUILDING REGULATIONS APPROVED DOCUMENT H.
5. THE INFORMATION SHOWN ON THIS DRAWING IS PRELIMINARY AND INDICATIVE ONLY AND IS SUBJECT TO CHANGE THROUGH SITE INVESTIGATIONS, DETAILED DESIGN AND CO-ORDINATION.
6. DISCHARGE RATES AND LOCATIONS ARE SUBJECT TO CONFIRMATION THROUGH SURVEY AND DISCUSSIONS WITH THE LLFA AND THAMES WATER.
7. DRAINAGE CHANNELS AND GULLIES WILL BE REQUIRED TO SERVE HARDSTANDING AREAS. THESE ARE SHOWN INDICATIVELY AT THIS STAGE BUT AN ALLOWANCE FOR THEM SHOULD BE MADE. ADDITIONAL GULLIES WILL BE REQUIRED, TO BE ADDED AS THE DEIGN DEVELOPS
8. INFILTRATION TESTING TO BE UNDERTAKEN TO VERIFY SUITABILITY OF INFILTRATION DEVICES AND INFORMATION THEIR DESIGN
9. SOAKAWAY LOCATION AND TYPE SHOWN INDICATIVELY. SOAKAWAY TO BE SUFFICIENTLY DEEP TO ENSURE WATER INFILTRATES TO GROUND BELOW THE EXISTING ONSITE RETAINING STRUCTURES. SOAKAWAY DESIGN TO BE CONFIRMED BASED ON INFILTRATION RESULTS.

KEY

- SITE BOUNDARY
- EXISTING PUBLIC FOUL WATER SEWER
- EXISTING PRIVATE FOUL WATER SEWER
- EXISTING SEWER TO BE ABANDONED
- PROPOSED FOUL WATER DRAINAGE
- PROPOSED SURFACE WATER DRAINAGE
- PROPOSED FOUL WATER RISING MAIN
- PROPOSED SURFACE WATER CHANNEL DRAIN OR SIMILAR
- PROPOSED INFILTRATION DEVICE
- INDICATIVE IRRIGATION NETWORK FOR ILLUSTRATION. DESIGN BY SPECIALIST
- FLOOD FLOW PATHS

REV	DATE	DESCRIPTION	DRN	APP
P03	28/09/2021	PRELIMINARY ISSUE	AP	AOR
P02	13/09/2021	PRELIMINARY ISSUE	AP	AOR
P01	04/08/2021	PRELIMINARY ISSUE	AP	AOR

STATUS

PRELIMINARY ISSUE

PREPARED IN PARTNERSHIP WITH
whitby wood
91-94 LOWER MARSH
LONDON SE1 7AB, UNITED KINGDOM
+44 (0)20 7442 2216 www.whitbywood.com

PREPARED BY
CUBE CONSULTING ENGINEERS
WWW.CONSULTTHECUBE.CO.UK

CLIENT

-

PROJECT

STAPLEFORD COTTAGE

DRAWING TITLE

BELOW GROUND DRAINAGE LAYOUT

JOB NO.	DATE	SCALE
1056	04/08/2021	1:250

DRN	DES	CHK	APP
AP	AP	AOR	AOR

DRAWING NUMBER: 1056-C-DR-0100

REV: P03

Appendix C
Proposed Hydraulic Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	20.700	Add Flow / Climate Change (%)	0
Ratio R	0.439	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.007		30.510	29.548	0.000	0	0

Storage Structures for Storm

Cellular Storage Manhole: 5, DS/PN: 1.007

Invert Level (m) 27.832 Safety Factor 1.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.03600

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	25.0	40.0	2.001	0.0	90.6
2.000	25.0	90.6			

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	1	+0%	100/15 Winter				39.771
1.001	2	15 Winter	1	+0%	30/15 Summer				39.391
1.002	3	15 Winter	1	+0%	100/15 Summer				38.041
2.000	4	15 Winter	1	+0%	100/15 Summer				36.388
1.003	4	15 Winter	1	+0%	100/15 Summer				32.790
1.004	6	15 Winter	1	+0%	100/15 Summer				32.061
1.005	6	15 Winter	1	+0%	100/15 Summer				31.329
1.006	8	15 Winter	1	+0%					30.595
1.007	5	1440 Winter	1	+0%					28.222

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.079	0.000	0.10			0.9	OK	
1.001	2	-0.043	0.000	0.60			3.2	OK	
1.002	3	-0.059	0.000	0.35			3.3	OK	
2.000	4	-0.062	0.000	0.31			2.2	OK	
1.003	4	-0.060	0.000	0.34			5.5	OK	
1.004	6	-0.060	0.000	0.34			5.5	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	6	-0.062	0.000	0.30			5.4	OK	
1.006	8	-0.067	0.000	0.24			5.4	OK	
1.007	5	-1.711	0.000	0.00		1368	0.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%	100/15 Winter				39.783
1.001	2	15 Winter	30	+0%	30/15 Summer				39.508
1.002	3	15 Winter	30	+0%	100/15 Summer				38.085
2.000	4	15 Winter	30	+0%	100/15 Summer				36.416
1.003	4	15 Winter	30	+0%	100/15 Summer				32.825
1.004	6	15 Winter	30	+0%	100/15 Summer				32.097
1.005	6	15 Winter	30	+0%	100/15 Summer				31.361
1.006	8	15 Winter	30	+0%					30.620
1.007	5	1440 Winter	30	+0%					28.613

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	-0.067	0.000	0.24			2.2	OK	
1.001	2	0.074	0.000	1.74			9.3	SURCHARGED	
1.002	3	-0.015	0.000	0.99			9.3	OK	
2.000	4	-0.034	0.000	0.76			5.5	OK	
1.003	4	-0.025	0.000	0.91			14.7	OK	
1.004	6	-0.024	0.000	0.93			14.8	OK	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m^3)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	6	-0.030	0.000	0.83			14.8	OK	
1.006	8	-0.041	0.000	0.65			14.7	OK	
1.007	5	-1.319	0.000	0.00		1368	0.0	OK	

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

Simulation Criteria

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

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

Synthetic Rainfall Details

Rainfall Model		FSR	Ratio R 0.350
Region	England and Wales	Cv (Summer)	0.750
M5-60 (mm)	20.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+40%	100/15 Winter				39.861
1.001	2	15 Winter	100	+40%	30/15 Summer				39.803
1.002	3	15 Summer	100	+40%	100/15 Summer				39.495
2.000	4	15 Winter	100	+40%	100/15 Summer				36.578
1.003	4	15 Winter	100	+40%	100/15 Summer				33.747
1.004	6	15 Winter	100	+40%	100/15 Summer				32.591
1.005	6	15 Winter	100	+40%	100/15 Summer				31.502
1.006	8	15 Winter	100	+40%					30.632
1.007	5	1440 Winter	100	+40%					29.208

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.011	0.000	0.41			3.8	FLOOD RISK	
1.001	2	0.368	0.000	2.94			15.8	SURCHARGED	
1.002	3	1.395	0.000	1.62			15.2	SURCHARGED	
2.000	4	0.128	0.000	1.36			9.7	SURCHARGED	
1.003	4	0.897	0.000	1.30			21.2	SURCHARGED	
1.004	6	0.471	0.000	1.23			19.6	SURCHARGED	

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

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.005	6	0.111	0.000	1.07			19.1	SURCHARGED	
1.006	8	-0.029	0.000	0.84			19.1	OK	
1.007	5	-0.725	0.000	0.00		1344	0.0	OK	

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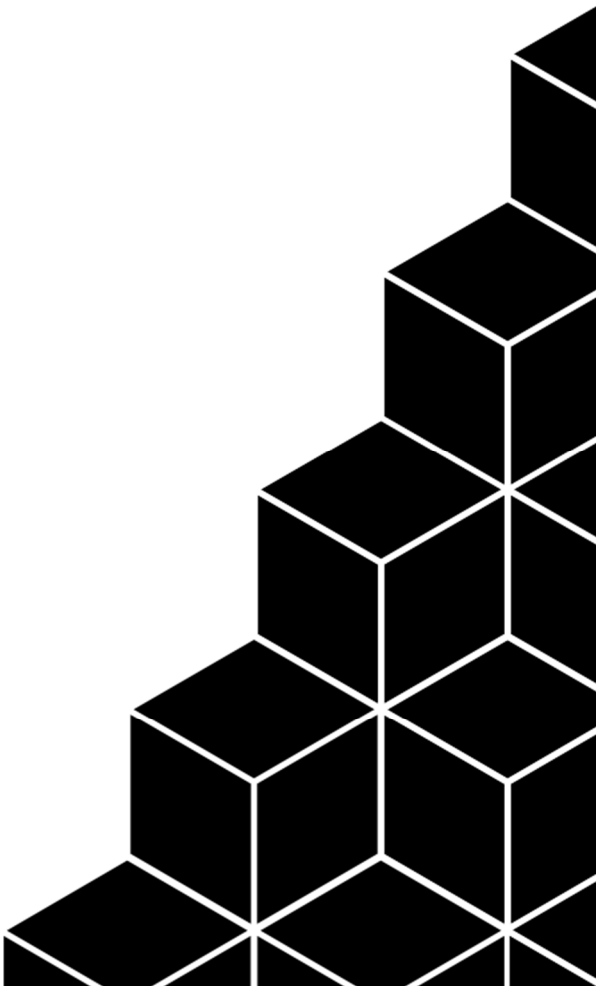

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