

Project Name : Land at Nightingale Avenue, Eastleigh

Job No : 21-138

Note Title : Drainage Strategy Technical Note

Author : NA

Checked : GG

Approved : GG

Date : April 2023

1.0 INTRODUCTION

1.1.1 Odyssey has been commissioned by Doswell Projects to undertake a surface water and foul drainage strategy to be submitted in association with a planning application for residential development at Nightingale Avenue in Eastleigh.

1.1.2 This report demonstrates the principles of surface and foul water management at the site.

2.0 DEVELOPMENT PROPOSALS

2.1.1 The development proposals comprise the construction of a residential building, containing four dwellings with associated bicycle and bin infrastructure. The proposed site layout is presented in **Appendix A**.

3.0 EXISTING SITE

3.1 Site Location

3.1.1 The site is located approximately 1.75 kilometres (km) south-west of Eastleigh railway station. The site is bounded by residential development to the north-east, east, south and west, and commercial buildings to the north-west. The Ordnance Survey grid reference for the site is 444136E, 118379N, and the nearest postcode is SO50 9JA.



3.1.2 The site is currently brownfield, comprising a storage yard with two garages. The site location plan is presented in **Appendix A**.

3.2 Topography and Existing Drainage

3.2.1 A topographical survey was undertaken by Baypoint Surveys in June 2021. The data obtained for the site shows the site falls predominantly from the west towards the east. The levels range from 14.23 metres Above Ordnance Datum (m AOD) in the west to approximately 13.45m AOD in the east. The topographical data is presented in **Appendix B**.

3.2.2 Southern Water sewer records show there is an existing 150 millimetre (mm) surface water sewer running in an eastern direction along the unnamed access road to the north of the site, and then running in a southern direction along the access road to the east of the site. The Southern Water sewer records are presented in **Appendix C**.

3.2.3 Southern Water sewer records show there is an existing foul sewer running through the residential units located to the west and south of the site. The sewer crosses the unnamed access road approximately 30m south of the site, and runs in an eastern direction towards Magpie Lane.

3.3 Geology and Hydrogeology

3.3.1 British Geological Survey (BGS) online maps (accessed April 2023) indicate the bedrock geology of the site comprises London Clay Formation (clay, silt and sand). There are superficial deposits comprising River Terrace Deposits (sand and gravel) present at the site. BGS hydrogeology mapping indicates the site is located within the Thames Group, described as “*rock with essentially no groundwater*” and summarised as “*predominantly clayey sequence up to 140m thick confining underlying aquifers. Occasional springs at base have very hard water*”. BGS mapping is presented in **Appendix D**.

3.3.2 Environment Agency (EA) online maps indicate the nearest ‘Main River’ is Monk’s Brook, located approximately 110 metres (m) to the east of the site.

3.3.3 Groundwater mapping published by the EA indicates the site is not located within any Source Protection Zones.



3.4 Greenfield Runoff Rates

3.4.1 As the developable area for this site is less than 50 hectares (ha), the Institute of Hydrology (IoH) Report 124 Flood Estimation for Smaller Catchments (1994) method is suitable to estimate greenfield peak flow rates (50 ha is used in the formula and the flow rate is linearly interpolated based on the ratio of the development area). This methodology is approved in the Construction Industry Research and Information Association (CIRIA) C753 The SuDS Manual; the parameters used can be seen in **Table 3.1**.

Table 3.1: Greenfield Runoff Rate Calculation Parameters

Parameter	Value	Unit
SAAR	800	(mm)
Soil Index	0.450	-
Region	7	-
Urban	0.000	-

3.4.2 **Table 3.2** summarises the greenfield discharge rates for the proposed impermeable area (0.042ha). Supporting calculations for the greenfield runoff rates are provided in **Appendix E**.

Table 3.2: Greenfield Runoff Rates

Return Period	Existing Greenfield Discharge Rates from Site (litres per second (l/s))	Existing Greenfield Discharge Rates per Hectare (l/s/ha)
QBAR	0.2	5.1
Q1	0.2	4.4
Q30	0.5	11.6
Q100	0.7	16.4

3.5 Existing Runoff Rates

3.5.6 As the site is currently in a partially developed state, existing runoff rates have also been calculated using Flood Estimation Handbook (FEH) data. The existing run off rates for the existing impermeable area (0.010ha) are shown in **Table 3.3**.

**Table 3.3: Estimated Total Brownfield Surface Water Discharge Rates**

Return Period	Estimated Brownfield Discharge Rates from site (l/s)
Q1	0.6
Q2	0.7
Q30	1.2
Q100	1.5

4.0 PROPOSED DRAINAGE STRATEGY

4.1 *Surface Water Management Strategy Requirements*

4.1.1 The current Planning Practice Guidance (PPG) for flood risk and coastal change sets out the following drainage hierarchy that the discharge of surface water runoff should adhere to:

- into the ground (infiltration);
- to a surface water body;
- to a surface water sewer, highway drain, or another drainage system; and,
- to a combined sewer.

4.1.2 This hierarchy builds upon the drainage hierarchy set out in the PPG and The Building Regulations 2000: Drainage and Waste Disposal Requirement H3 (3).

4.2 *Proposed Surface Water Drainage Strategy*

4.2.1 The options for discharging surface water generated by the site have been assessed in accordance with the drainage hierarchy set out in the PPG.

4.2.2 In accordance with the drainage hierarchy, the first option for surface water discharge is infiltration. The bedrock underlying the site is London Clay and therefore it is unlikely that infiltration would be viable.

4.2.3 The second most favorable option is to discharge to a watercourse, however there are no watercourses on or in close proximity to the site.

4.2.4 It is therefore proposed to implement a lined cellular storage tank to attenuate surface water, prior to discharge at a controlled rate using a vortex control device. Flows would be discharged into a new manhole on the existing 150mm diameter Southern Water surface water sewer, downstream of surface water manhole 1353, in the unnamed access road to the east of the site. The new connection would be subject to approval by Southern Water. The greenfield runoff rates and existing



brownfield rates are too low to be used without causing a significant maintenance burden, therefore a discharge rate of 1l/s is proposed.

4.2.5 The attenuation tank has been designed to accommodate a 1 in 100 year storm plus 45% in line with the latest climate change guidance.

4.2.6 The proposed surface water drainage strategy is presented in **Drawing 21-138-102** in **Appendix E**, along with the associated Micro Drainage calculations.

4.2.7 Exceedance flows have been considered. Owing to the topography of the site, exceedance flows would be directed from the west of the site to the east. It is expected that flows would be managed within the road and car parking area, and the proposed site levels would ensure any exceedance flows would be diverted around the new residential building.

4.3 Water Quality

4.3.1 The “pollution hazard indices for different land use classifications” table has been extracted from CIRIA C753 The SuDS Manual and applied to the development proposals, as shown in **Table 4.1**.

Table 4.1: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. less than 300 traffic movements per day	Low	0.5	0.4	0.4

4.3.2 The SuDS mitigation indices for a proprietary treatment system are set out in **Table 4.2**, in accordance with the guidance contained in The SuDS Manual.

**Table 4.2: SuDS Mitigation Indices**

Type of SuDS Component	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Proprietary Treatment System	0.8	0.69	0.4

4.3.3 **Table 4.2** demonstrates an Up-Flo™ Filter proprietary treatment system would provide a sufficient level of surface water runoff treatment prior to discharging to the Southern Water network.

4.4 SuDS Maintenance Requirements

4.4.1 Maintenance of the drainage system and SuDS features would be carried out in accordance with the manufacturer guidance and through an approved maintenance management plan to minimise the residual flood risk of drainage system blockage.

4.4.2 Maintenance would be the responsibility of the developer to assign, however the “*operation and maintenance requirements for attenuation tank*” and “*operation and maintenance requirements for proprietary treatment systems*” tables have been extracted from The SuDS Manual and are presented in **Appendix F**.

5.0 PROPOSED FOUL DRAINAGE STRATEGY

5.1.1 It is proposed that foul flows would be conveyed by gravity to existing Southern Water foul sewer manhole 1302 located in the unnamed access road, approximately 30m south-east of the site, subject to confirmation of the manhole invert level. The site levels are slightly higher than the cover level of manhole 1302, therefore a gravity connection is expected to be feasible. The connection would be subject to approval by Southern Water. The foul drainage strategy is presented in **Drawing 21-138-102** in **Appendix E**.

5.1.1 Southern Water has a duty to improve its network to cater for proposed developments. This is funded via increased infrastructure charges to developers. Should there be a requirement for offsite improvement works, Southern Water would programme these works with due regard to the build programme of the proposed development.



6.0 SUMMARY AND CONCLUSIONS

6.1.1 Odyssey has been commissioned by Doswell Projects to undertake a surface water and foul drainage strategy to be submitted in association with a planning application for a residential building, containing four dwellings with associated bicycle and bin infrastructure.

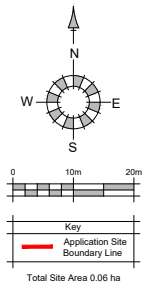
6.1.2 It is proposed to implement a lined cellular storage tank to attenuate surface water, prior to discharge at a controlled rate using a vortex control device. Flows would be discharged into a new manhole on the existing 150mm diameter Southern Water surface water sewer, downstream of surface water manhole 1353, in the unnamed access road to the north of the site. The tanks has been designed to accommodate the 1 in 100 year design event plus 45% climate change.

6.1.3 It is proposed that foul flows would be conveyed by gravity to existing foul sewer manhole 1302 in the unnamed access road, approximately 30m south-east of the site, subject to confirmation of the connection manhole invert level. The connection would be subject to approval by Southern Water.

6.1.4 The drainage strategy demonstrates that the proposed development can be drained in a sustainable manner, commensurate with national and local policy.

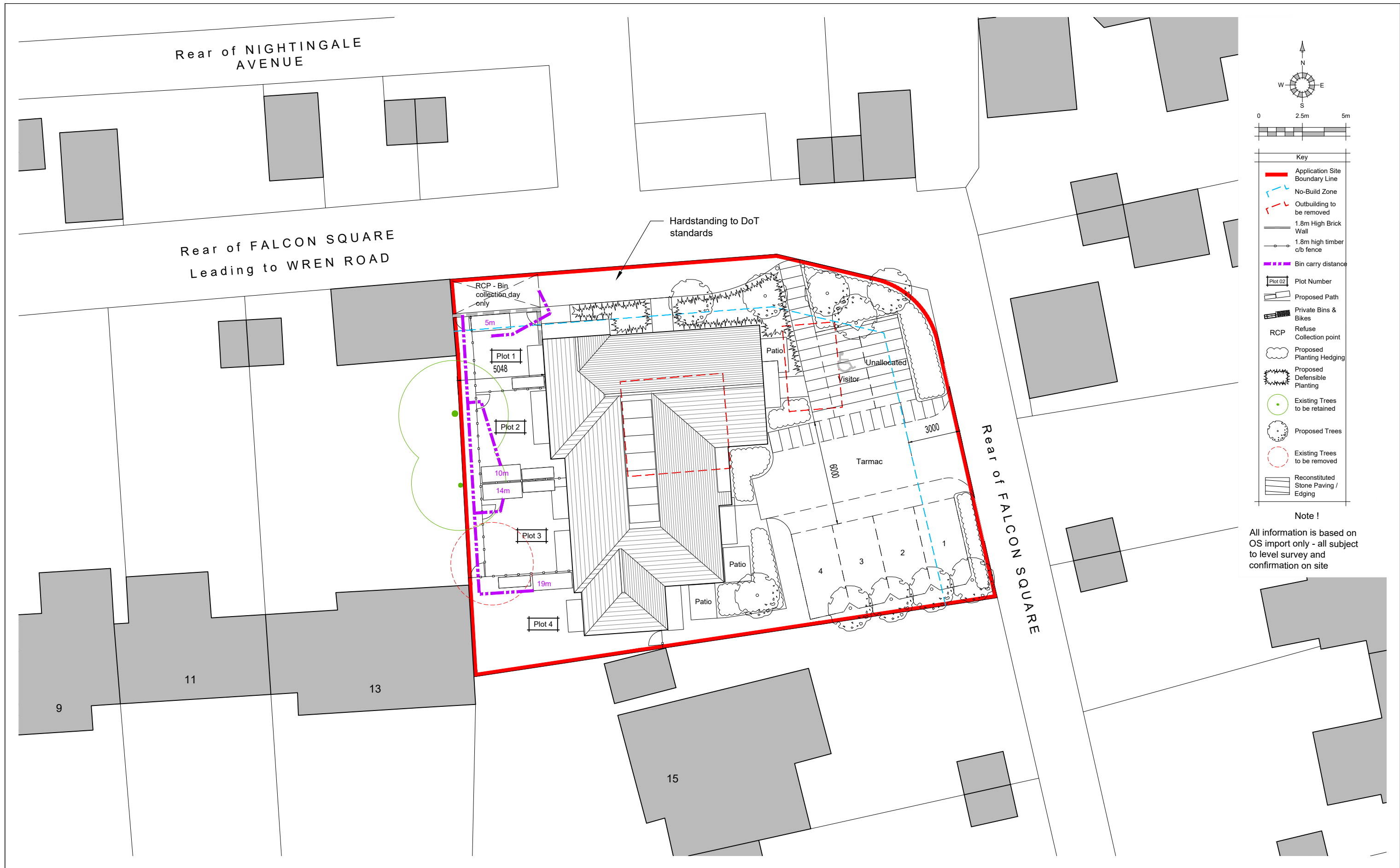
APPENDIX A

Site Location Plan and Site Layout Plan



Preliminary

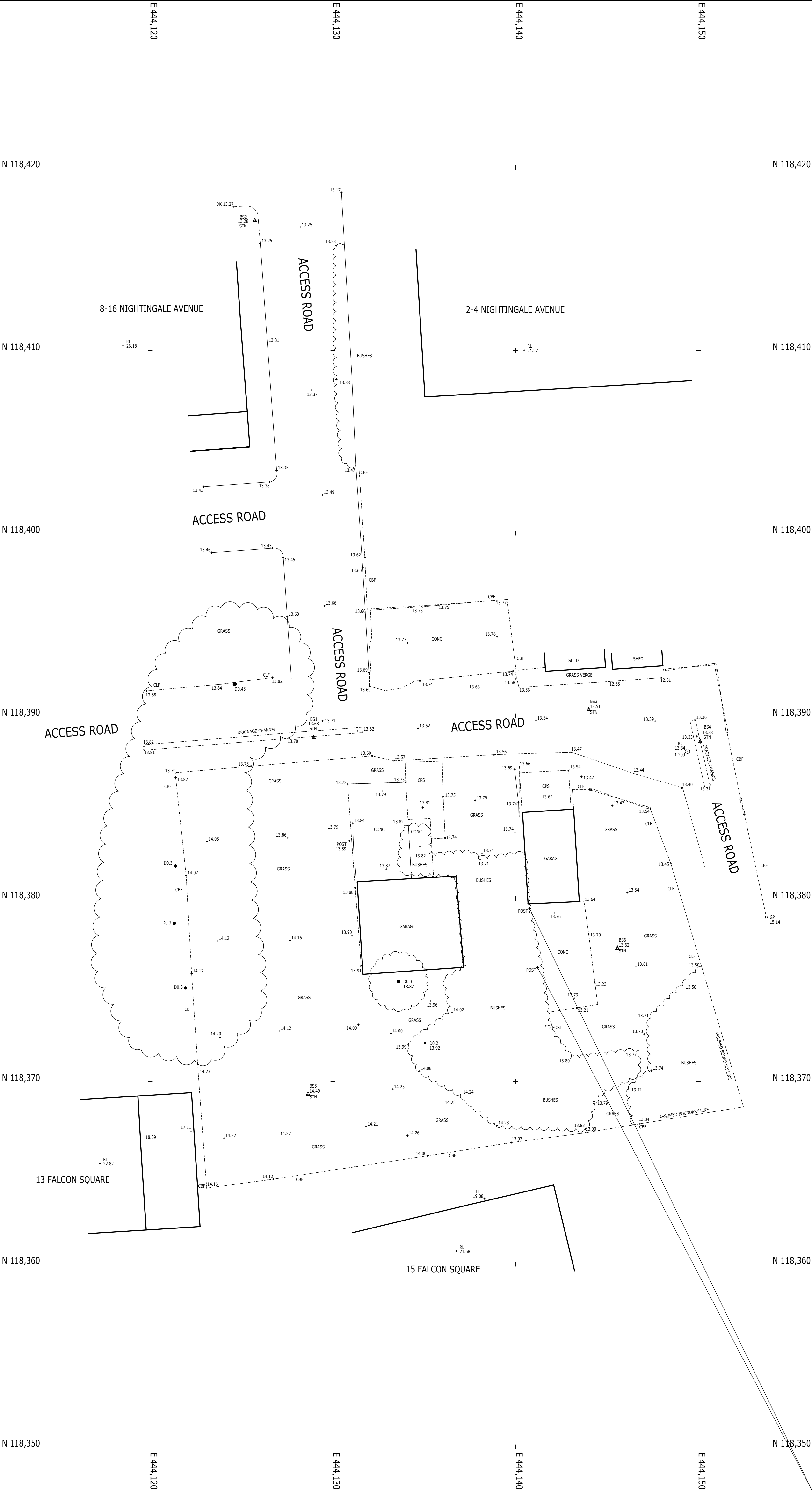
REV.	DATE	REVISIONS	BY	STATUS	CLIENT:	PROJECT:	 architecture · planning · masterplanning Broadmeade House, Farnham Business Park, Weydon Lane, Farnham, Surrey GU9 8QT. info@osparchitecture.com www.osparchitecture.com Tel: 01252 267878	
					Doswell Projects	Nightingale Avenue Eastleigh SO50 9JA		
					SCALE: 1:1250 (A4 ORIGINAL)	DRAWING: Site Location Plan		
					DRAWN: a/jg DATE: 23/03/23	22206	S01	—



REV. A	DATE 11/04/22	REVISIONS: Updates following fire tender swept path analysis.	BY XX	STATUS:	Preliminary		CLIENT: Doswell Projects	PROJECT: Nightingale Avenue Eastleigh SO50 9JA	architecture planning masterplanning Broadmeade House, Farnham Business Park, Weydon Lane, Farnham, Surrey GU9 8QT. info@osparchitecture.com · www.osparchitecture.com Tel: 01252 267878	
							SCALE: 1:200 (A3 ORIGINAL)	DRAWING: Proposed Site Plan Roof Layout		
					This drawing may be scaled or cross referenced to the scale bar for planning application purposes only. Do not scale for any other purpose, use figured dimensions only. Subject to site survey and all necessary consents. All dimensions to be checked by user and any discrepancies, errors or omissions to be reported to the Architect before work commences. This drawing is to be read in conjunction with all other relevant materials. OS Licence No. 100007327		DRAWN: ajg	22206	P02	A
							DATE: 23/03/23			

APPENDIX B

Topographical Survey



LEGEND	
SERVICES/STREET FURNITURE	FOLIAGE
ADD ABOVE ORDNANCE DATUM B BOLLARD B-ILL ILLUMINATED BOLLARD BB BELLISH BEACON BT BRITISH TELECOM COVER BTB BRITISH TELECOM JUNC. BOX BS BUS STOP CATV CABLE TELEVISION COVER CONC CONCRETE CPS CONCRETE PAVING SLABS DK DRAIN KESB DP DOWNPIPE ECB ELECTRICITY CONTROL BOX ELCP ELECTRICITY CABLE PIT EP ELECTRICITY POLE ERC EARTH ROD COVER FH FIRE HYDRANT F/B FLOWER BED FL FLOOR LEVEL FP FLAG POLE GP GATE POST GV GAS VALVE GU GULLY IC INSPECTION COVER LB LETTER BOX LH LAMP HOLE LP LAMP POST MH MANHOLE MP MARKER POST NP ROAD NAME PLATE OSBM O.S. BENCHMARK PCE PRE-CAST CONCRETE EDGING PCK PRE-CAST CONCRETE KERBS PM PARKING METER PE PEDESTAL RS ROAD SIGN KNIP RAINWATER DOWNPIPE SP SIGN POST STN SURVEY STATION STP STACK PIPE SV STOP VALVE/COCK TAP WATER TAP/STANDPIPE TBM TEMPORARY BENCHMARK TCB TELEPHONE CALL BOX TH TRIAL HOLE TL TRAFFIC LIGHT TP TELEGRAPH POLE VENT VENT PIPE WL WATER LEVEL WM WATER METER WMSV WATER METER/STOP VALVE WO WASH OUT WT WATER TROUGH TELEPHONE CABLE ELECTRICITY CABLE	TREE CANOPY SMALL TREES/BUSHES HEDGES HEIGHTS ABOVE FL CL CEILING HEIGHT DH DOOR HEAD HEIGHT F-C CILL HEIGHT C-H HEAD HEIGHT LEVELS RELATIVE TO DATUM FL FLOOR LEVEL RL RAISED LEVEL RL RIDGE LEVEL RLL FLAT ROOF LEVEL RL PARAPET LEVEL WINDOW DOOR ARCHWAY
ELECTRICAL	
13AMP SOCKET BLANKING PLATE CCTV LIGHT SWITCH PIR SPOT LIGHT WALL LIGHT	
FENCES	
BWF BARBED WIRE FENCE CBF CLOSE BOARDED FENCE CLF CHAIN LINK FENCE CPF CHESTNUT PALING FENCE CWF CHICKEN WIRE FENCE BWF BRICK RAILING FENCE PMF POST & MESH FENCE PMF POST & RAIL FENCE PMF POST & WIRE FENCE SF STOCK FENCE	BREAK GLASS CALL POINT SMOKE ALARM DRY RISER OUTLET
FURNITURE	
GATE STILE ACCESS POINT	

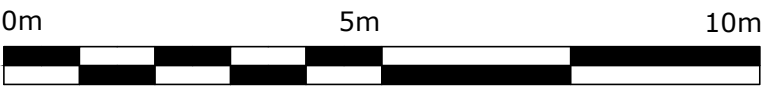
Orientation to north



Baypoint Station Coordinate Schedule

Point	Easting	Northing	Elevation
BS1	444128.951	118388.844	13.683
BS2	444125.731	118417.140	13.280
BS3	444144.001	118390.370	13.508
BS4	444150.108	118388.622	13.376
BS5	444128.643	118369.321	14.489
BS6	444145.572	118377.309	13.620

Scale



Notes

This survey has been computed and drawn about a plane local grid and was surveyed for a scale of 1:100, any subsequent enlargements should be verified on site.

Whilst every care has been taken, no responsibility can be accepted for errors or omissions caused by detail obscured or not accessible at the time of this survey.

Visible features in the vicinity of the boundaries, as shown on this survey, may not represent the extent of legally conveyed ownership.

Revisions



Baypoint Surveys Ltd, 82 Castle Lane West, Bournemouth, BH9 3JU
T 01202 511503 M 07770 386996
E info@baypoint.co.uk W www.baypoint.co.uk



project

Nightingale Avenue
Eastleigh

client

Vivid homes

drawing title

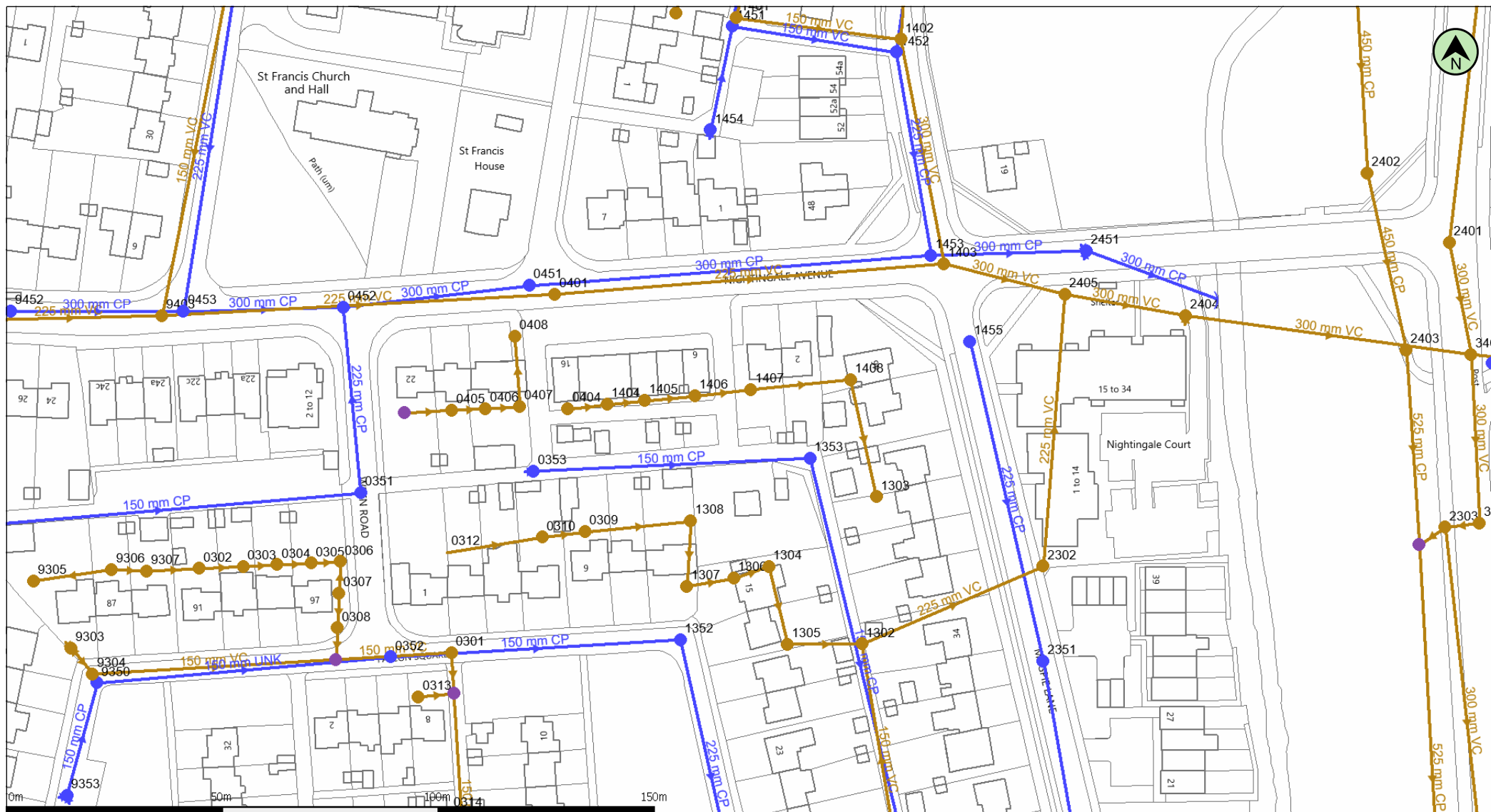
Topographical Survey

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scale 1:100	paper size A1
drawn by ALM	checked by SPB
date	30.06.21
grid	OS National Grid
datum	OS Datum
drawing number	3227-SV-1
revision	

APPENDIX C

Southern Water Sewer Records



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Date: 29/03/23

Scale: 1:1250

Map Centre: 444136,118400

Data updated: 27/02/23

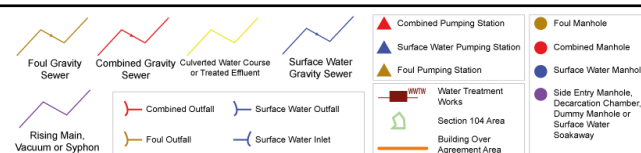
Our Ref: 1123441 - 1

Wastewater Plan A4

The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2023 Ordnance Survey 100031673. This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.



jwalters@odysseyconsult.co.uk

Nightingale Avenue 2



Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0301	F	14.91	12.86	-
0302	F	0.00	0.00	-
0303	F	0.00	0.00	-
0304	F	0.00	0.00	-
0305	F	0.00	0.00	-
0306	F	0.00	0.00	-
0307	F	0.00	0.00	-
0308	F	0.00	0.00	-
0309	F	0.00	0.00	-
0310	F	0.00	0.00	-
0312	F	0.00	0.00	-
0313	F	0.00	0.00	-
0314	F	0.00	0.00	-
0401	F	13.91	11.99	-
0404	F	0.00	0.00	-
0405	F	0.00	0.00	-
0406	F	0.00	0.00	-
0407	F	0.00	0.00	-
0408	F	0.00	0.00	-
1302	F	13.44	0.00	-
1303	F	0.00	0.00	-
1304	F	0.00	0.00	-
1305	F	0.00	0.00	-
1306	F	0.00	0.00	-
1307	F	0.00	0.00	-
1308	F	0.00	0.00	-
1401	F	13.26	11.43	-
1402	F	12.37	9.51	-
1403	F	12.22	9.17	-
1404	F	0.00	0.00	-
1405	F	0.00	0.00	-
1406	F	0.00	0.00	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
1407	F	0.00	0.00	-
1408	F	0.00	0.00	-
1409	F	0.00	0.00	-
2302	F	11.87	9.61	-
2303	F	11.49	8.58	-
2401	F	11.70	8.82	-
2402	F	11.82	9.90	-
2403	F	11.75	9.77	-
2404	F	11.99	9.04	-
2405	F	12.12	9.09	-
3301	F	11.36	8.63	-
3401	F	11.57	8.73	-
9303	F	15.91	14.22	-
9304	F	15.93	13.82	-
9305	F	0.00	0.00	-
9306	F	0.00	0.00	-
9307	F	0.00	0.00	-
9403	F	15.65	12.85	-
0351	S	14.92	13.35	-
0352	S	15.05	13.66	-
0353	S	14.35	12.81	-
0451	S	14.04	12.06	-
0452	S	14.80	12.88	-
0453	S	15.62	13.30	-
1352	S	14.35	12.76	-
1353	S	13.40	11.96	-
1451	S	13.27	11.87	-
1452	S	12.33	10.89	-
1453	S	12.24	10.41	-
1454	S	13.42	12.30	-
1455	S	0.00	0.00	-
2351	S	0.00	0.00	-

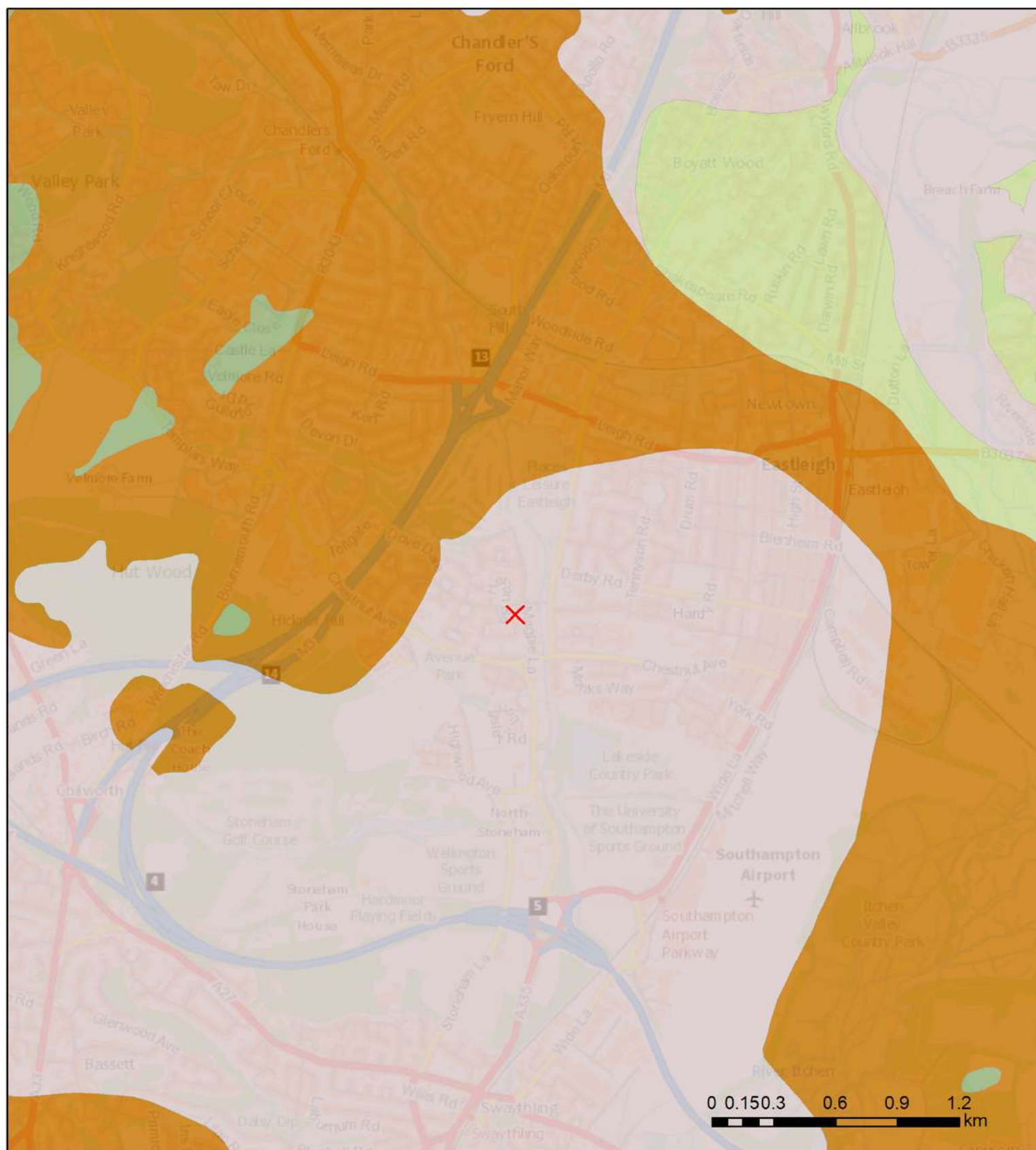
APPENDIX D

British Geological Survey Data

Bedrock



British
Geological
Survey



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GeolIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Bedrock geology 1:50,000 scale

-  [LONDON CLAY FORMATION - CLAY, SILT AND SAND](#)
-  [WHITECLIFF SAND MEMBER - SAND](#)
-  [EARNLEY SAND FORMATION - SAND, SILT AND CLAY](#)
-  [WITTERING FORMATION - SAND, SILT AND CLAY](#)

Superficial Deposits



British
Geological
Survey



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GeolIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

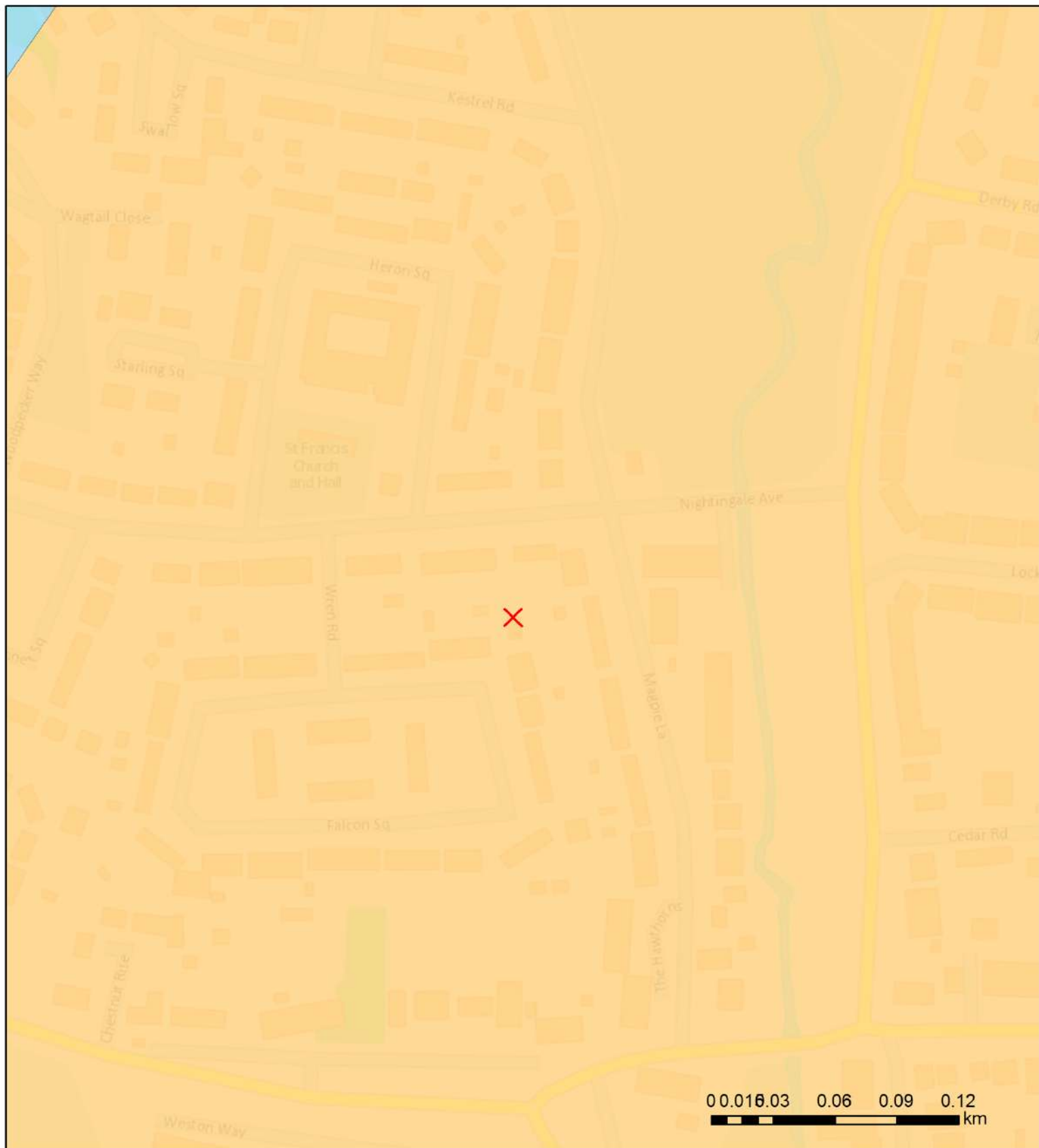
Superficial deposits 1:50,000 scale

-  [ALLUVIUM - CLAY, SILT, SAND AND GRAVEL](#)
-  [HEAD - GRAVEL, SAND, SILT AND CLAY](#)
-  [RIVER TERRACE DEPOSITS, 11 - SAND AND GRAVEL](#)

Hydrogeology



British
Geological
Survey



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GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Hydrogeology 1:625,000 scale

Aquifers with significant intergranular flow

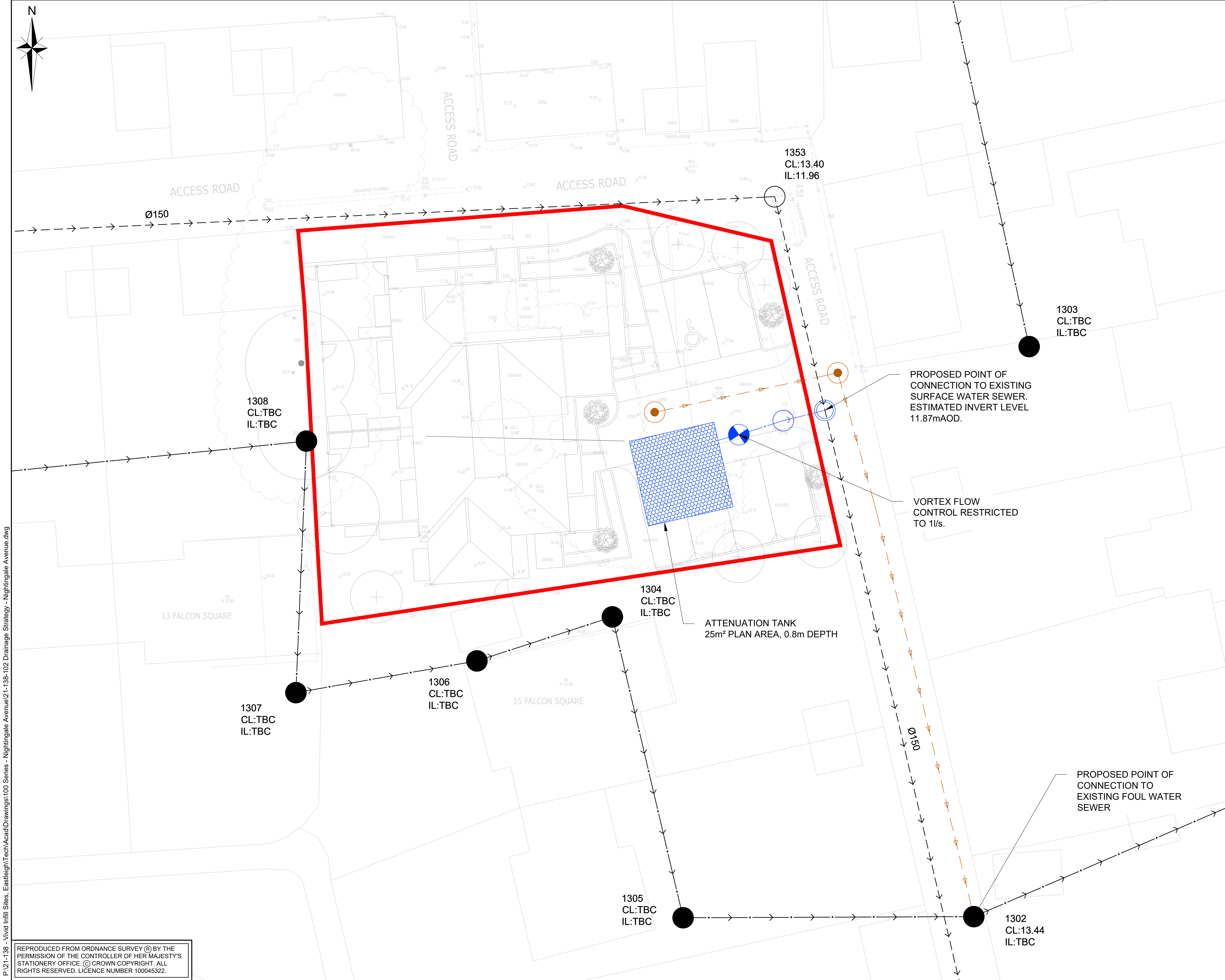
-  Highly productive aquifer
-  Moderately productive aquifer
-  Low productivity aquifer

Aquifers in which flow is virtually all through fractures and other discontinuities

-  Highly productive aquifer
-  Moderately productive aquifer
-  Low productivity aquifer
-  Rocks with essentially no groundwater

APPENDIX E

Preliminary Drainage Strategy and MicroDrainage Calculations



- NOTES**
- DO NOT SCALE FROM THIS DRAWING.
 - ALL DIMENSIONS SHOWN IN METERS UNLESS NOTED OTHERWISE.
 - THE TOPOGRAPHY SURVEY WAS SUPPLIED BY NJ GROUP. THE SURVEY WAS UNDERTAKEN BY BAYPOINT SURVEYS. DRAWING REF.3227-SV-1. DATED: 30.06.21. ODYSSEY CANNOT TAKE ANY RESPONSIBILITY FOR THE ACCURACY OF THIS INFORMATION
 - THE SITE LAYOUT HAS BEEN PROVIDED BY DEACON DESIGN. DRAWING REF. DD624XR01. ODYSSEY CANNOT TAKE ANY RESPONSIBILITY FOR THE ACCURACY OF THIS INFORMATION
 - THE DRAINAGE STRATEGY IS SUBJECT TO DETAILED DESIGN DEVELOPMENT

LEGEND

- PROPOSED SITE BOUNDARY
- EXISTING FOUL WATER PIPE AND MANHOLE
- EXISTING SURFACE WATER PIPE AND MANHOLE
- PROPOSED FOUL PIPE AND MANHOLE
- PROPOSED SURFACE WATER PIPE AND MANHOLE
- PROPOSED VORTEX CONTROL DEVICE
- PROPOSED PROPRIETARY TREATMENT SYSTEM
- PROPOSED ATTENUATION TANK

A LAYOUT UPDATED		HM	NA	GS	20/04/23
Rev	Amendments	Dm	Chk	App	Date

**ODYSSEY**
Tuscany House
White Hart Lane
Basingstoke
Hampshire RG21 4AF
Telephone: 01256 331144
Fax: 01256 331134
E: info@odysseyconsult.co.uk
W: www.odysseyconsult.co.uk

Job Title VIVID INFILL SITES, EASTLEIGH		
Drawing Title DRAINAGE STRATEGY NIGHTINGALE AVENUE		
Client DOSWELL PROJECTS		
Scale 1:250 @A1	Date JAN 22	Designed JW
Drawn HM	Checked NA	Approved GG
Job No 21-138	Drawing No 21-138-102	Rev A

P:\21-138 - Vivid Infill Sites, Eastleigh\Tech\Acad\Drawings\100 Series - Nightingale Avenue\21-138-102 Drainage Strategy - Nightingale Avenue.dwg

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Odyssey Markides LLP		Page 1
Tuscany House White Hart Lane Basingstoke RG21 4AF	Nightingale Avenue Eastleigh Greenfield Runoff	
Date 20/04/2023 11:42 File	Designed by NA Checked by GG	
Innovyze Source Control 2020.1		
<u>ICP SUDS Mean Annual Flood</u> Input Return Period (years) 100 Soil 0.450 Area (ha) 0.042 Urban 0.000 SAAR (mm) 800 Region Number Region 7 Results 1/s 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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Odyssey Markides LLP

Tuscany House
White Hart Lane
Basingstoke RG21 4AF

Date 20/04/2023 12:30
File 21-138 Attenuation Tank...

Innovyze

Nightingale Avenue
Eastleigh
Attenuation Tank

Designed by NA
Checked by GG

Source Control 2020.1

Page 1



Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 172 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	12.426	0.426	0.0	0.9	0.9	10.1	O K
30 min Summer	12.556	0.556	0.0	0.9	0.9	13.2	O K
60 min Summer	12.670	0.670	0.0	0.9	0.9	15.9	O K
120 min Summer	12.667	0.667	0.0	0.9	0.9	15.8	O K
180 min Summer	12.639	0.639	0.0	0.9	0.9	15.2	O K
240 min Summer	12.614	0.614	0.0	0.9	0.9	14.6	O K
360 min Summer	12.568	0.568	0.0	0.9	0.9	13.5	O K
480 min Summer	12.527	0.527	0.0	0.9	0.9	12.5	O K
600 min Summer	12.488	0.488	0.0	0.9	0.9	11.6	O K
720 min Summer	12.449	0.449	0.0	0.9	0.9	10.7	O K
960 min Summer	12.366	0.366	0.0	0.9	0.9	8.7	O K
1440 min Summer	12.247	0.247	0.0	0.9	0.9	5.9	O K
2160 min Summer	12.145	0.145	0.0	0.9	0.9	3.4	O K
2880 min Summer	12.097	0.097	0.0	0.8	0.8	2.3	O K
4320 min Summer	12.064	0.064	0.0	0.7	0.7	1.5	O K
5760 min Summer	12.052	0.052	0.0	0.6	0.6	1.2	O K
7200 min Summer	12.046	0.046	0.0	0.5	0.5	1.1	O K
8640 min Summer	12.042	0.042	0.0	0.5	0.5	1.0	O K
10080 min Summer	12.039	0.039	0.0	0.4	0.4	0.9	O K
15 min Winter	12.481	0.481	0.0	0.9	0.9	11.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	137.306	0.0	10.8	18
30 min Summer	92.143	0.0	14.5	33
60 min Summer	59.121	0.0	18.6	62
120 min Summer	33.632	0.0	21.2	120
180 min Summer	24.181	0.0	22.8	152
240 min Summer	19.145	0.0	24.1	182
360 min Summer	13.799	0.0	26.1	250
480 min Summer	10.967	0.0	27.6	320
600 min Summer	9.192	0.0	28.9	388
720 min Summer	7.965	0.0	30.1	458
960 min Summer	6.366	0.0	32.1	580
1440 min Summer	4.648	0.0	35.1	820
2160 min Summer	3.417	0.0	38.7	1152
2880 min Summer	2.763	0.0	41.8	1500
4320 min Summer	2.070	0.0	46.9	2204
5760 min Summer	1.706	0.0	51.6	2936
7200 min Summer	1.485	0.0	56.1	3624
8640 min Summer	1.335	0.0	60.5	4320
10080 min Summer	1.227	0.0	64.9	5120
15 min Winter	137.306	0.0	12.1	18

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Tuscany House White Hart Lane Basingstoke RG21 4AF			Nightingale Avenue Eastleigh Attenuation Tank				
Date 20/04/2023 12:30 File 21-138 Attenuation Tank...			Designed by NA Checked by GG				
Innovyze			Source Control 2020.1				
<u>Summary of Results for 100 year Return Period (+45%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	12.628	0.628	0.0	0.9	0.9	14.9	O K
60 min Winter	12.761	0.761	0.0	1.0	1.0	18.1	O K
120 min Winter	12.769	0.769	0.0	1.0	1.0	18.3	O K
180 min Winter	12.740	0.740	0.0	1.0	1.0	17.6	O K
240 min Winter	12.707	0.707	0.0	0.9	0.9	16.8	O K
360 min Winter	12.646	0.646	0.0	0.9	0.9	15.4	O K
480 min Winter	12.587	0.587	0.0	0.9	0.9	14.0	O K
600 min Winter	12.530	0.530	0.0	0.9	0.9	12.6	O K
720 min Winter	12.473	0.473	0.0	0.9	0.9	11.2	O K
960 min Winter	12.343	0.343	0.0	0.9	0.9	8.2	O K
1440 min Winter	12.180	0.180	0.0	0.9	0.9	4.3	O K
2160 min Winter	12.084	0.084	0.0	0.8	0.8	2.0	O K
2880 min Winter	12.062	0.062	0.0	0.7	0.7	1.5	O K
4320 min Winter	12.046	0.046	0.0	0.5	0.5	1.1	O K
5760 min Winter	12.039	0.039	0.0	0.4	0.4	0.9	O K
7200 min Winter	12.036	0.036	0.0	0.4	0.4	0.8	O K
8640 min Winter	12.033	0.033	0.0	0.3	0.3	0.8	O K
10080 min Winter	12.032	0.032	0.0	0.3	0.3	0.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	92.143	0.0	16.2	32			
60 min Winter	59.121	0.0	20.8	60			
120 min Winter	33.632	0.0	23.7	116			
180 min Winter	24.181	0.0	25.6	168			
240 min Winter	19.145	0.0	27.0	192			
360 min Winter	13.799	0.0	29.2	268			
480 min Winter	10.967	0.0	30.9	346			
600 min Winter	9.192	0.0	32.4	422			
720 min Winter	7.965	0.0	33.7	498			
960 min Winter	6.366	0.0	35.9	616			
1440 min Winter	4.648	0.0	39.3	838			
2160 min Winter	3.417	0.0	43.4	1148			
2880 min Winter	2.763	0.0	46.8	1472			
4320 min Winter	2.070	0.0	52.6	2192			
5760 min Winter	1.706	0.0	57.8	2856			
7200 min Winter	1.485	0.0	62.8	3640			
8640 min Winter	1.335	0.0	67.8	4312			
10080 min Winter	1.227	0.0	72.7	5040			
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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 444139 118365 SU 44139 18365
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.042

	Time (mins)	Area
From:	To:	(ha)
	0	4 0.042

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Model Details

Storage is Online Cover Level (m) 13.600

Cellular Storage Structure

Invert Level (m) 12.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m ²)	Inf. Area (m ²)	Depth (m)	Area (m ²)	Inf. Area (m ²)
0.000	25.0	25.0	0.801	0.0	41.0
0.800	25.0	41.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference MD-SHE-0049-1000-0800-1000
Design Head (m) 0.800
Design Flow (l/s) 1.0
Flush-Flo™ Calculated
Objective Minimise upstream storage
Application Surface
Sump Available Yes
Diameter (mm) 49
Invert Level (m) 12.000
Minimum Outlet Pipe Diameter (mm) 75
Suggested Manhole Diameter (mm) 1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.800	1.0
Flush-Flo™	0.215	0.9
Kick-Flo®	0.437	0.8
Mean Flow over Head Range	-	0.8

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	0.8	1.200	1.2	3.000	1.8	7.000	2.7
0.200	0.9	1.400	1.3	3.500	1.9	7.500	2.8
0.300	0.9	1.600	1.4	4.000	2.1	8.000	2.9
0.400	0.8	1.800	1.4	4.500	2.2	8.500	2.9
0.500	0.8	2.000	1.5	5.000	2.3	9.000	3.0
0.600	0.9	2.200	1.6	5.500	2.4	9.500	3.1
0.800	1.0	2.400	1.6	6.000	2.5		
1.000	1.1	2.600	1.7	6.500	2.6		

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APPENDIX F

Maintenance Schedule

TABLE 21.3 Operation and maintenance requirements for attenuation storage tanks

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

21.14 REFERENCES

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TABLE 14.2 An example of operation and maintenance requirements for a proprietary treatment system

Maintenance schedule	Required action	Typical frequency
Routine maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation	Six monthly
	Change the filter media	As recommended by manufacturer
	Remove sediment, oil, grease and floatables	As necessary – indicated by system inspections or immediately following significant spill
Remedial actions	Replace malfunctioning parts or structures	As required
Monitoring	Inspect for evidence of poor operation	Six monthly
	Inspect filter media and establish appropriate replacement frequencies	Six monthly
	Inspect sediment accumulation rates and establish appropriate removal frequencies	Monthly during first half year of operation, then every six months

should be undertaken whenever access for maintenance is required. Removal of oil, silt and other pollutants must be in accordance with the appropriate waste management legislation.

Maintenance responsibility for all systems should be placed with an appropriate organisation, and Maintenance Plans and schedules should be developed during the design phase.

- Further detail on the preparation of maintenance specifications and schedules of work is given in **Chapter 32**.

Table 14.2 provides guidance on the type of operation and maintenance schedule that may be appropriate for a proprietary treatment system. The list of actions is not exhaustive and some actions may not always be required.

CDM 2015 requires designers to ensure that all maintenance risks have been identified, eliminated, reduced and/or controlled where appropriate. This information will be required as part of the health and safety file.

- Generic health and safety guidance is presented in **Chapter 36**.

14.12.2 Oil water separators

Specific requirements for oil/water separators are provided in PPG3 (EA/SEPA/EHSNI, 2006). The following items should be undertaken every six months as a minimum:

- check volume of sludge
- check thickness of light liquid
- check function of automatic closure device
- empty the separator, if required
- check the coalescing material and clean or change if necessary (class 1 only)
- check the function of the warning device (if fitted)

General inspection of the integrity of oil/water separators should occur at a maximum frequency of five years, and should cover the following:

- watertightness of system