



Flood Risk Assessment

Chownes Mead Hotel & Spa, Chownes Mead Lane
Cuckfield RH16 4BS

Client

RCM Partnership LLP

Ref: 10403

Date: January 2026

Consulting Engineers

GTA Civils & Transport Limited

Maple House

192-198 London Road

Burgess Hill

West Sussex, RH15 9RD

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Issue	Issue date	Compiled	Checked
Preliminary/1 st Issue	04 October 2024	JP	FVV / MR
Second Issue	22 June 2026	JP	FVV / MR

1 Introduction

- 1.1 This report has been prepared for RCM Partnership LLP in relation to the proposed Hotel and Spa development at Chownes Mead, Chownes Mead Lane, Cuckfield RH16 4BS. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.2 This report will take the form of a formal Flood Risk Assessment in accordance with the 2024 National Planning Policy Framework (NPPF) and the 2025 Planning Practice Guidance (PPG).
- 1.3 The Strategic Flood Risk Assessment published by Mid Sussex District Council has been researched for historical records of flooding from all known sources.
- 1.4 This report covers only the flood risk and drainage issues relating to this site.
- 1.5 The second version of this report has been prepared following a comment from the LLFA. The EA's surface water flood maps have been updated since the initial issue of this report in 2024.

2 Existing Site & Flood Risk Profile

- 2.1 The application site lies to the west of Haywards Heath, south of Tylers Green (hamlet), in the area administered by Mid Sussex District Council (MSDC.) Measuring approximately 1.8ha, this site comprises a Grade II listed country house and gardens. It is accessed from Chownes Mead Lane close to its northwest corner. A site location map and aerial view are shown in **Appendix A**.
- 2.2 Hydrology: The nearest Main River is the Eastern Adur, approximately 2km to the south at its closest. It flows broadly westwards before looping anti-clockwise to the south, depositing into the English Channel in Littlehampton. The site is drained by a stream that lies to the southwest; this flows S-SW discharging into the Eastern Adur close to the A2300, NW of Burgess Hill. There are two ponds in the site, which discharge into the watercourse to the southwest.
- 2.3 Topography: a topographic survey is shown in Appendix C. The site has a marked NE – SW gradient, with levels ranging between 89m AOD (along the northeast boundary) and 81m AOD (approximately) on the SW boundary.
- 2.4 Geology: according to the BGS online geological map this area's bedrock geology is Upper Tunbridge Wells Sand (sandstone and siltstone). There are no recorded superficial drift deposits overlying this.
- 2.5 BRE365 soakage testing was undertaken on the adjacent site to the northwest (in July 2018), in accordance with the SuDS hierarchy outlined in the CIRIA SuDS Manual. The report is shown in Appendix C, which also shows the test location. (Note that neither building shown on this plan relate to *this* application). The water level did not drop noticeably over 3 hours and so it was concluded that there is no potential for infiltration on this site.
- 2.6 Public Sewers: It is understood that there are no public sewers in Chownes Mead Lane.
- 2.7 A set of greenfield runoff calculations has been produced for the post-development contributing area of 0.293ha. The following table summarises the four main return periods:

Qbar (l/s)	1.70 l/s
Q1 (l/s)	1.44 l/s
Q30 (l/s)	3.91 l/s
Q100 (l/s)	5.42 l/s

(Refer to the calculation sheet in Appendix E.)

- 2.8 The Environment Agency's Rivers and Seas Flood map (in **Appendix B**) shows that the site lies within Flood Zone 1 – Low Risk. Sites in Flood Zone 1 are liable to flood from watercourses with less than a 1 in 1000 probability each year (0.01% AEP).

- 2.9 Surface water flooding: This *can* occur when excess rainwater does not infiltrate into the ground or is not intercepted by sewers or watercourses. The EA's Surface Water Flood Extents Map Yearly Chance of Flooding Between 2040 and 2060 (in Appendix B) shows the site is not liable to flood from this source. Although there are two localised areas of flooding, both correspond with the ponds. As these shall be maintained post-development, there is no impact as a result of this development. Refer to the topographic survey in Appendix C and the proposed layouts in Appendix D.
- 2.10 Artificial sources: flooding from reservoirs, canals and docks. The EA's Reservoirs Flood Map in Appendix B shows the site is not liable to flood from this source. There are no docks or canals in this area.
- 2.11 Historical: according to the EA's Historic Flood Map (see Appendix B), the site has not been affected by flooding in the past.
- 2.12 Groundwater: according to the EA's Groundwater Vulnerability Zones Map and Groundwater Source Protection Zones Map (both in Appendix B), the site overlies a 'Medium' zone (Aquifer) and is removed from the nearest groundwater source protection zone.
- 2.13 In conclusion, the flood risk profile of this site is 'Low.'

3 Proposed Development & SuDS

3.1 The proposed development and application for Full Planning Permission is to build a hotel complex – comprising the following buildings:

1. Treatment Suites & Pool
2. Gym/Yoga Studio
3. Members' Lounge
4. Swimming pool & Fresh Water Pool area

The proposed site layout is shown in **Appendix D**. Two areas of car parking are proposed, in addition.

3.2 The site's flood risk profile is Low, as concluded in section 2.13 above. No flood mitigation is needed or proposed. This proposal does not need to pass the Sequential / Exception Tests as all such development is 'appropriate' in FZ1.

3.3 A drainage strategy layout is shown in Appendix D. The surface water from the roofs and hardstanding areas will be routed to the pond located near to the NW corner of this site. The car parking areas will be of porous pavings – with two downstream attenuation tanks, needed for additional volume. All precipitation that falls on the road and other external areas shall be routed via the porous pavings. Only the roofs will be routed directly via the attenuation tanks.

3.4 The offsite runoff rate, into the pond, shall be restricted to 1.7l/s, which is the Qbar greenfield runoff rate for the total contributing area of 0.293ha – refer to section 2.7 above. The tanks and porous pavings' sub-bases have been sized to hold the volume in the critical 1% (100yrs) event plus 45% allowance for Climate Change. The Drainage Calculations are shown in Appendix E.

3.5 Treatment: the mitigation indices for porous pavings match or exceed the pollution indices for a commercial car park, according to Tables 26.2 and 26.3 in SuDS Manual C753 (0.7, 0.6 and 0.7 respectively).

3.6 Exceedance flows: if the surface water system were to 'fail,' ie get silted up – or in an extreme storm event, the resulting flow would go predominantly west-northwest. The exceedance flow arrows are shown on the drainage layout drawing in Appendix D.

3.7 Foul drainage: because this area is not served by public sewerage, the development's foul drainage shall be routed into a new sewage treatment plant – refer to the drainage strategy layout in Appendix D. This shall comply with current environmental standards. It will be subject to a specialist design – to cater for the load from swimming pool backwash and the spa facilities. An Environmental Permit to Discharge shall be needed from the EA, in due course.

3.8 Ordinary Watercourse Consent will be required from the LLFA in due course for the outfall headwall.

- 3.9 Maintenance: A draft Drainage Management and Maintenance Plan is shown in Appendix F. This sets out how the various components will be inspected and maintained – in line with Industry Standards as per CIRIA's SuDS Manual C753. The responsibility of maintenance, repair, renewal and replacement of the surface water drainage system will remain with the Applicant and their successors in title.

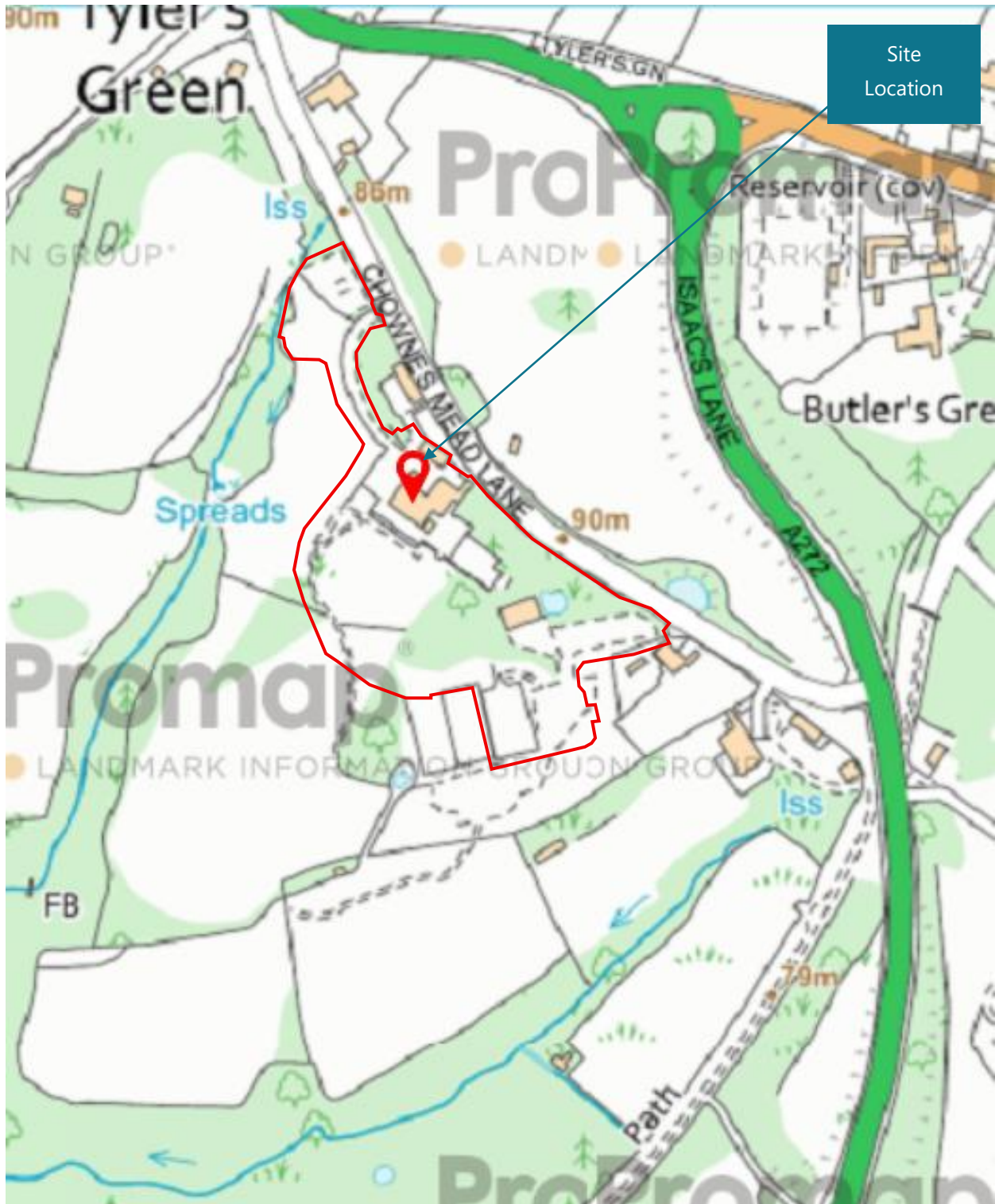
Conclusion

This development will not increase the flood risk, either on this site or to neighbouring properties, and so complies fully with the 2024 NPPF, current (Sept 2025) PPG and local drainage policies.

- End of Report -

Appendix A

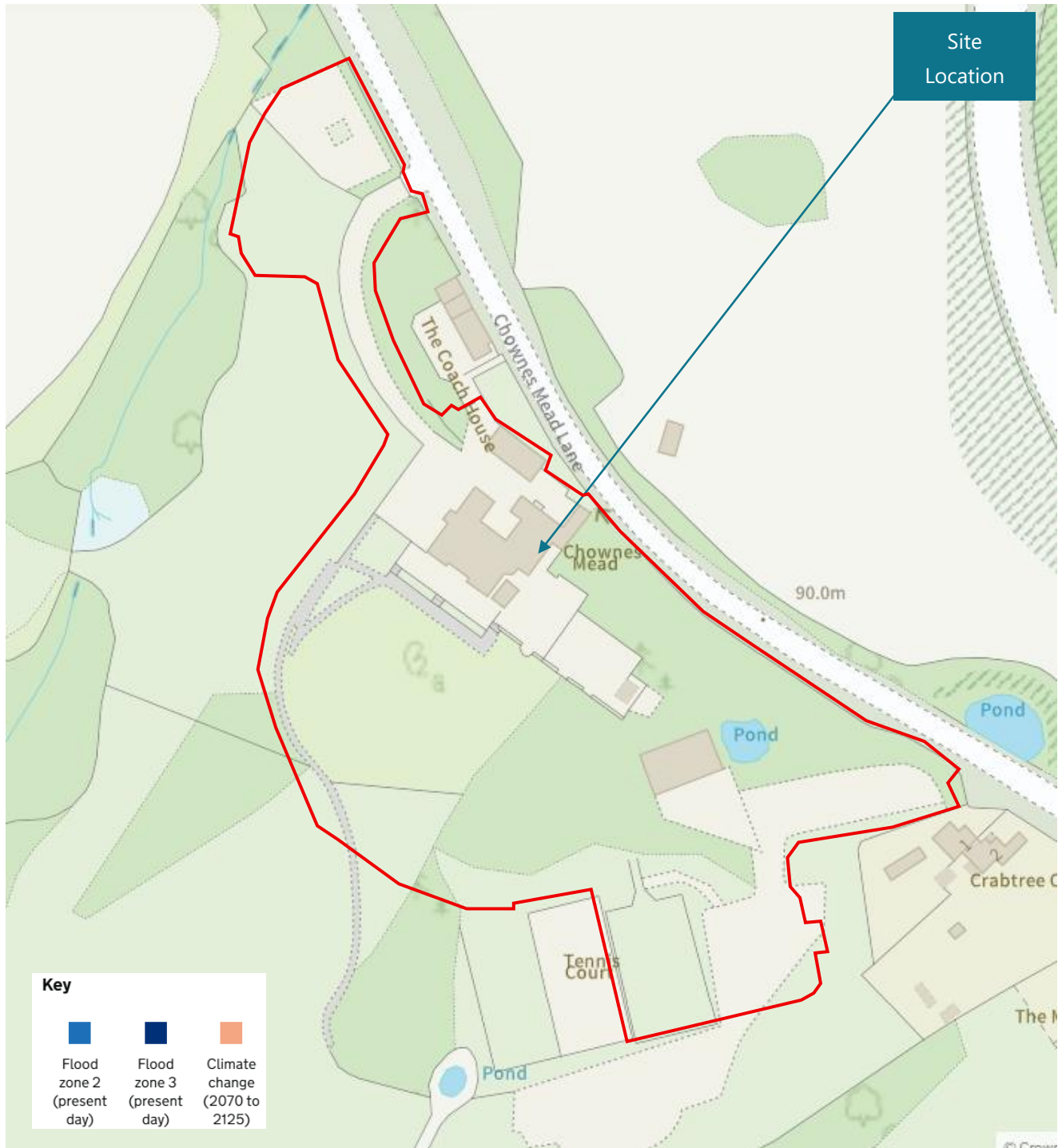
Site Location Map & Aerial Photo





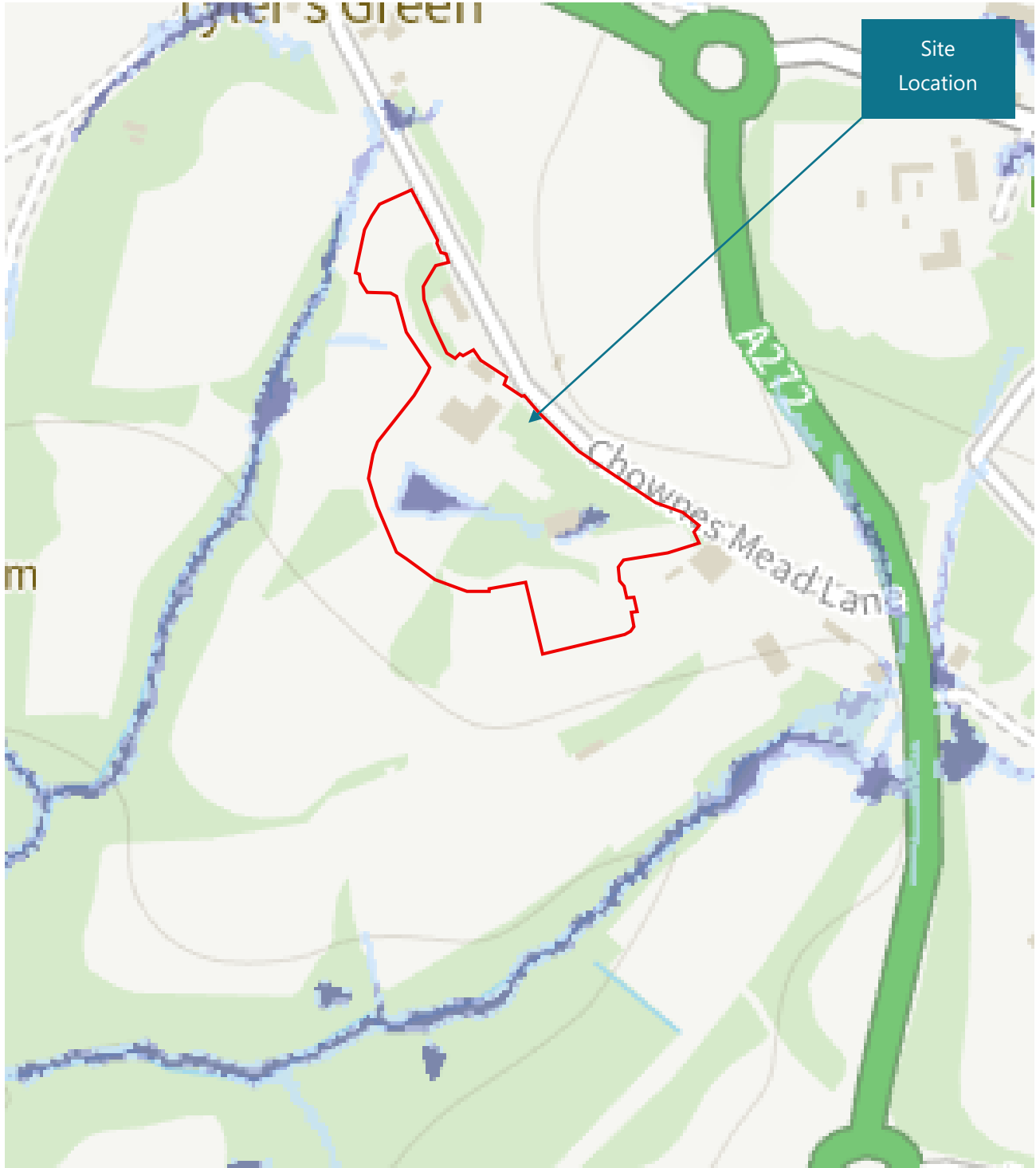
Appendix B

Environment Agency Flood & Groundwater Maps



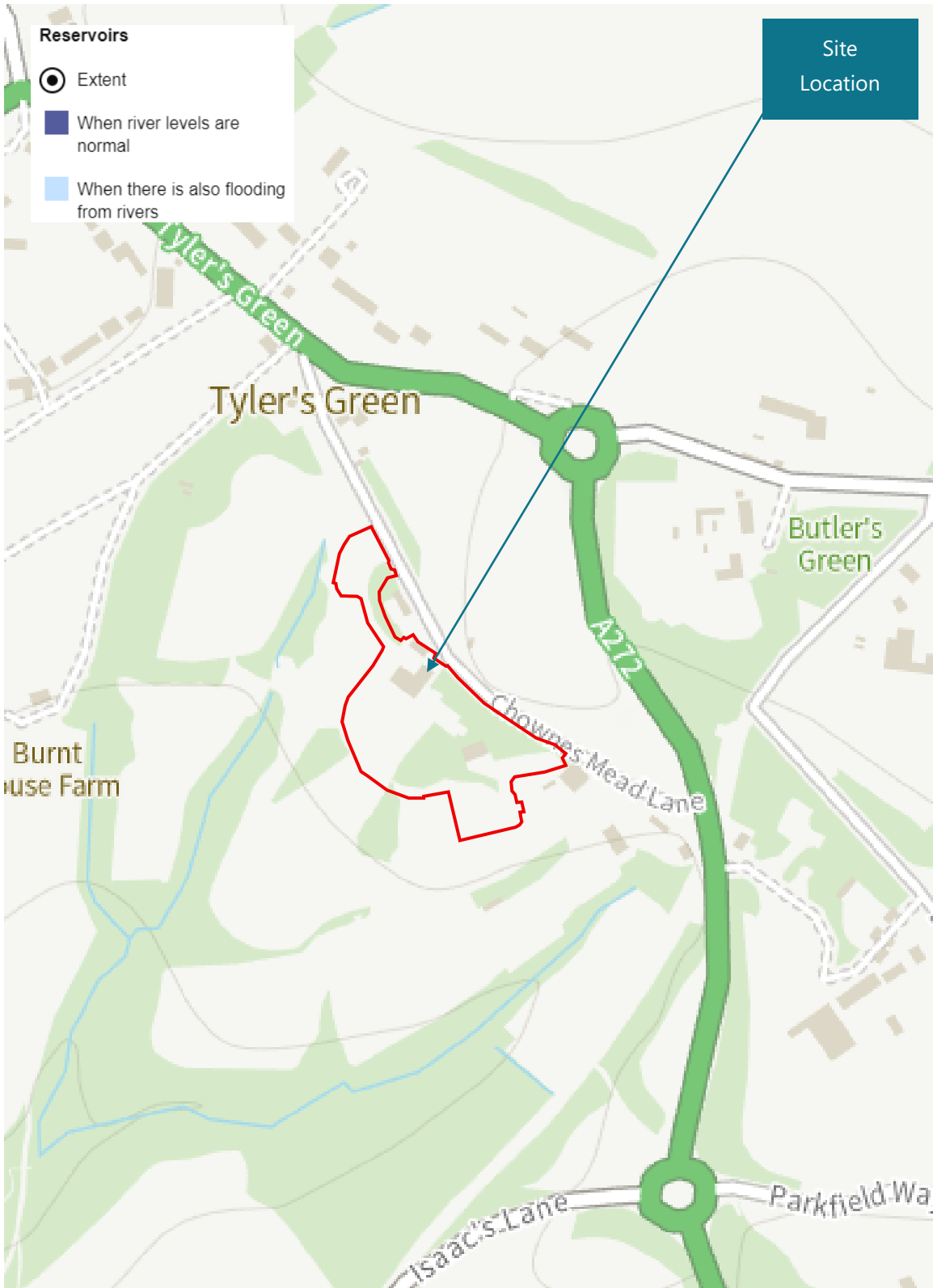
EA's Online Flood Map for Planning (Rivers and Seas)

The site lies in fluvial Flood Zone 1 (FZ1)



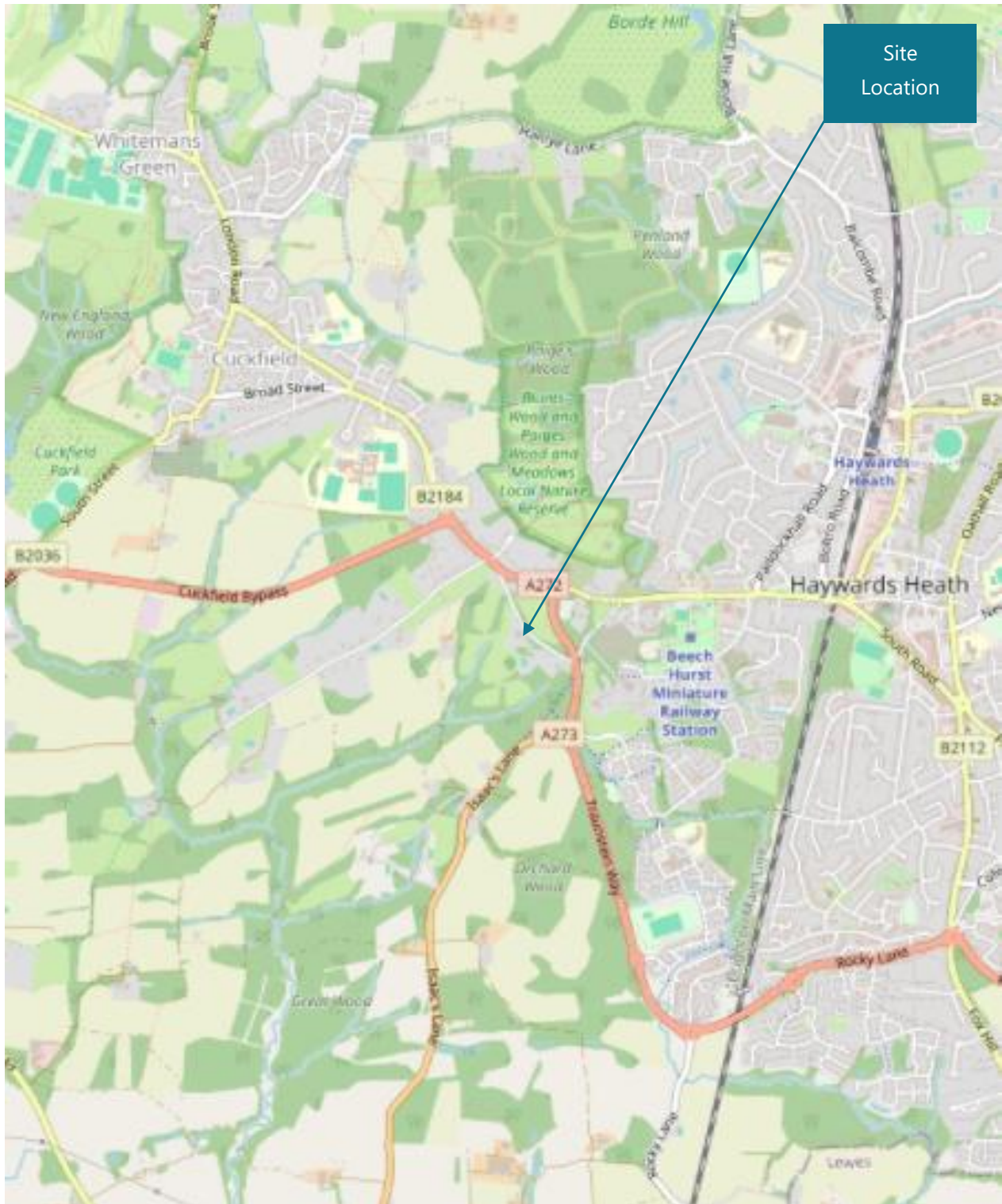
EA's Surface Water Flood Extents Map (Yearly Chance of Flooding Between 2040 and 2060)

The site is not liable to flood from this source: although there are two isolated patterns showing a high chance of flooding, these correspond with existing ponds



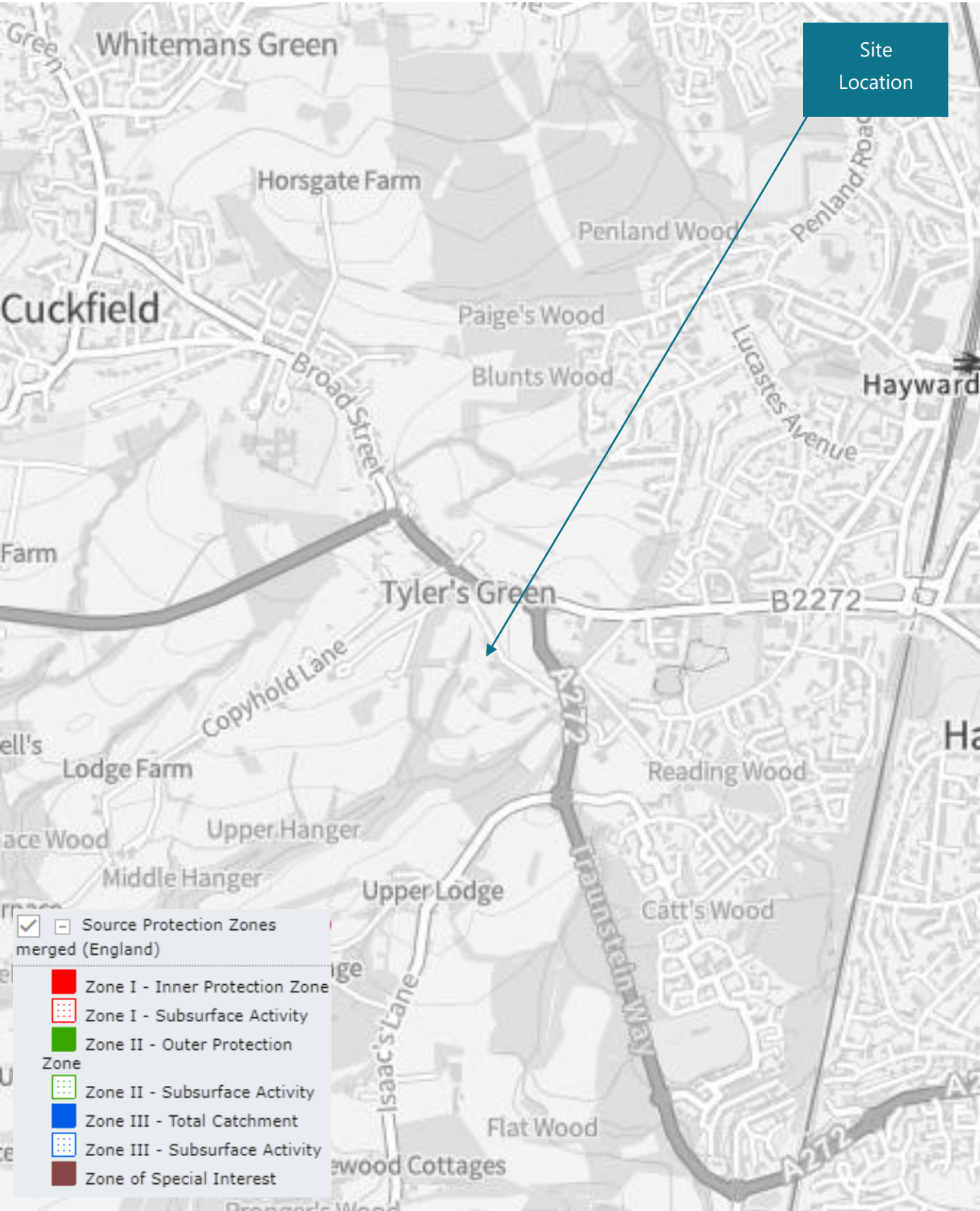
EA's Online Flood Risk from Reservoirs – Flood Depth – Map

The site is not liable to flood from this source



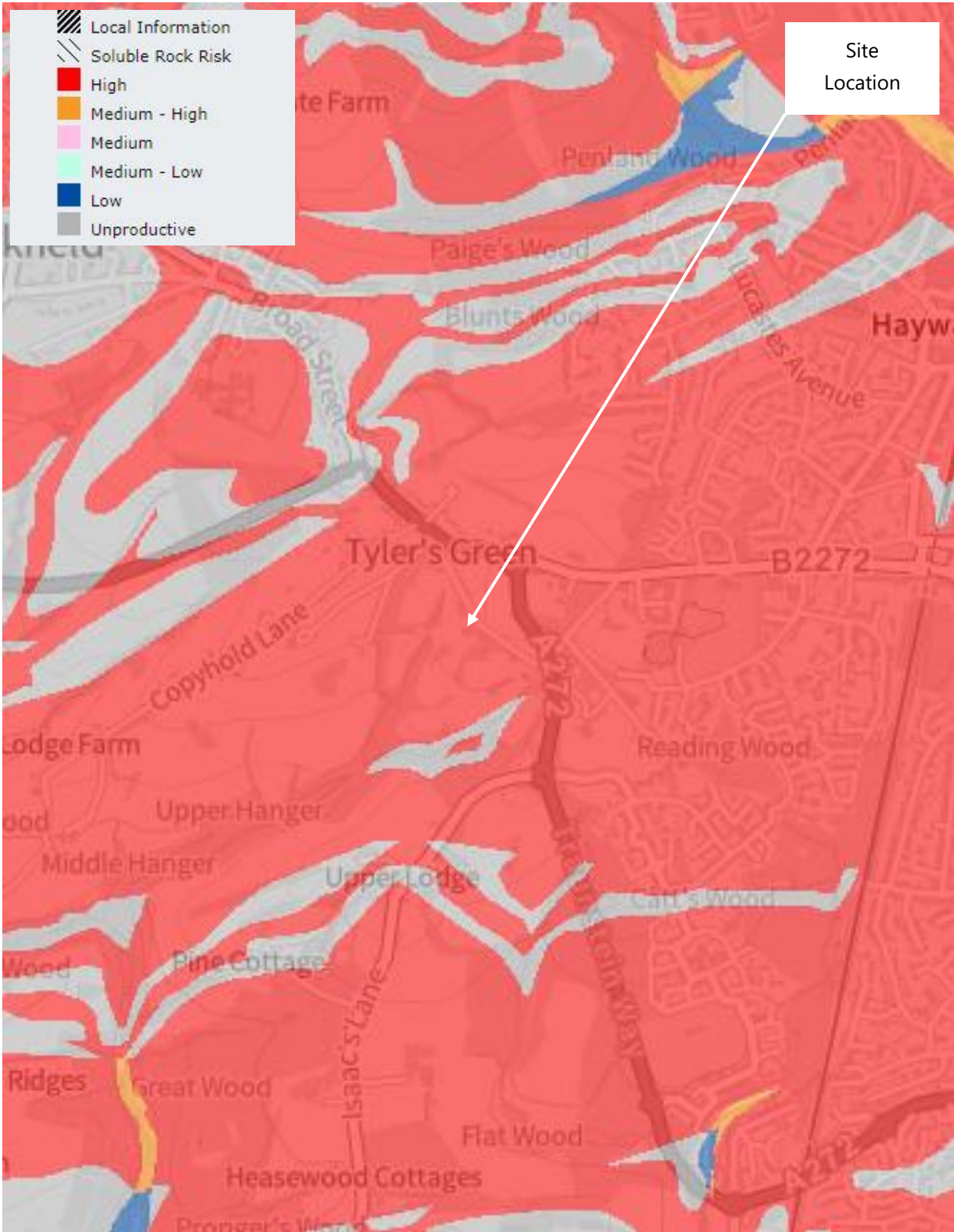
Environment Agency's Online Historical Flood Map

The site has not been affected by flooding in the past



Environment Agency's Online Groundwater Source Protection Zones Map

The site is removed from the nearest Groundwater Source Protection Zone



Environment Agency's Online Groundwater Vulnerability Zones Map

The site overlies a 'High' Zone

Appendix C

Topographic Survey & BRE365 Soil Soakage Test

Ref: CS/C1087

Lindsay Shookhye
c/o Adelaide House
13 Oathall Road
Haywards Heath
RH16 3EG

9th July 2018

Re: Chownes Mead, Cuckfield – Soakaway Testing – Infiltration Test Result Summary

Dear Lindsay

The following investigation was carried out at the above location in accordance with our quotation dated 15th June 2018.

1. Site Works

The purpose of the investigation was to supply soakaway test data in general accordance with BRE document 365 (Soakaway Design) at one location which would be the intended location for the soakaway to serve a new residential dwelling.

The appended drawing illustrates the position of the test pit which was machine excavated to a depth of 1.2m.

The testing commenced at 09:30 and was terminated at 12.30am due to no discernible difference in water height over 3 hours.

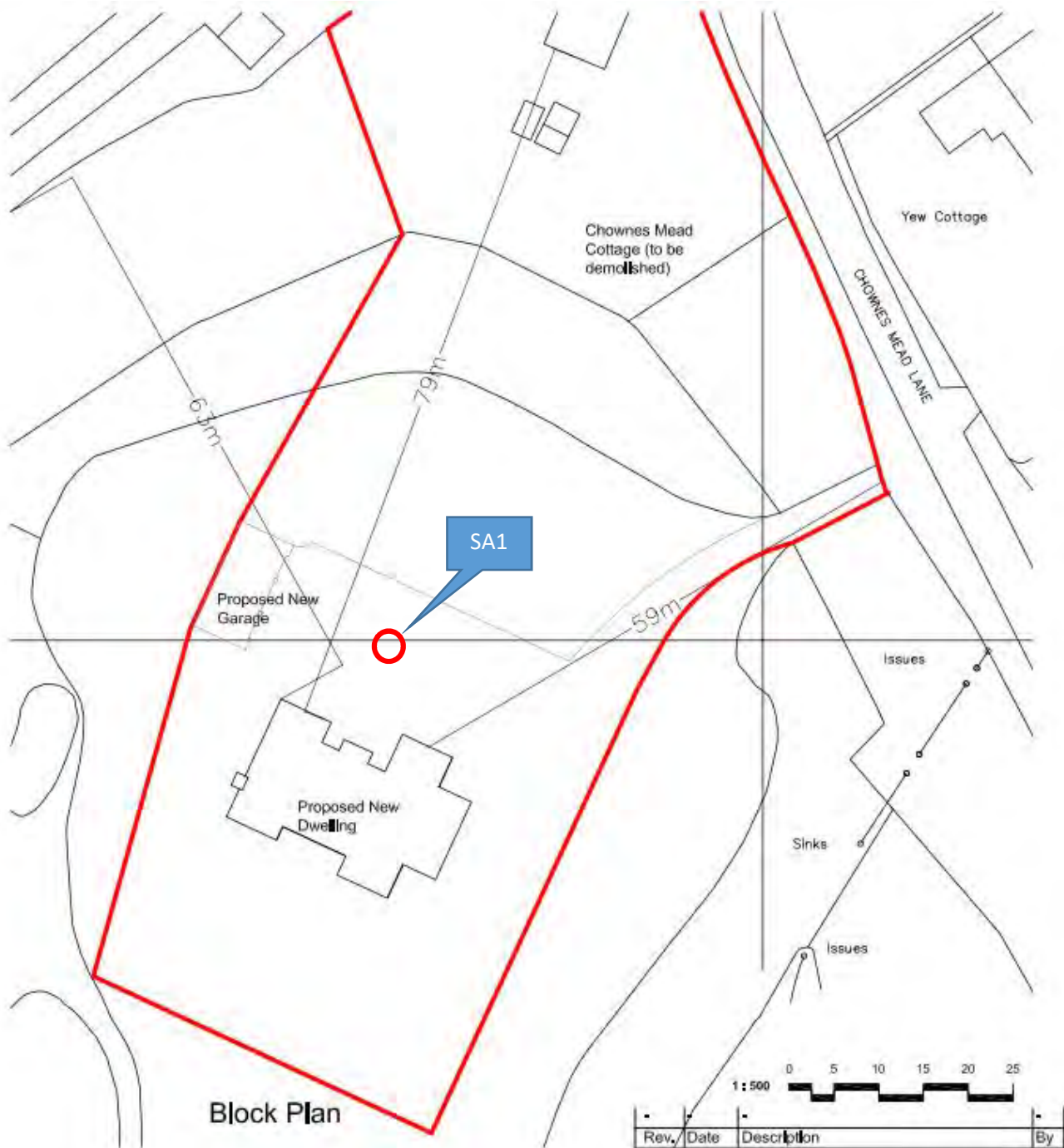
2. Findings

It was noted that the subsoils consisted of dense clay throughout and little or no infiltration was anticipated.

The testing confirmed this and therefore an alternative method of disposal for the surface water should be sought. A walkover of the site noted a watercourse along the southern boundary which discharged into a large pond.

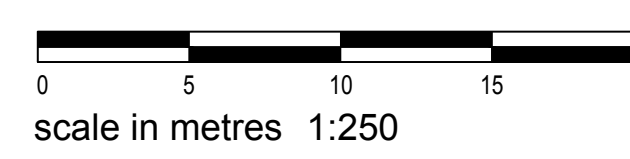
For design purposes it is recommended that a connection is made onto this at a rate agreed with the planning authority.

Appendix A – Soakaway Test Location Plan



Appendix D

Proposed Site Layout & Drainage Strategy Layout



KEY

- | | | | | | |
|----|-----------------------------|-----|--|----|----------------------------------|
| 1 | The Coach House | 9 | Grass Tennis Court | 18 | Hardstanding (removed) |
| 2 | Garage | 10 | Chicken Coop (removed) | 19 | Pond (relocated) |
| 3 | Chowens Mead | 11 | Main Entrance to Site | 20 | New Extension to Listed Building |
| 4 | Shed (removed) | 12 | Chowens Mead Lane | 21 | New Pool and Spa |
| 4A | Greenhouse (removed) | 13 | Secondary Entrance to Site (relocated to 25) | 22 | New Gym and Members Lounge |
| 4B | Bin Store (replaced) | 14 | Crabtree Cottage (neighbouring) | 23 | New Link |
| 4C | Shed | 15 | Existing Car Park | 24 | New Pond |
| 5 | Swimming Pool (removed) | 16 | Pavilion | 25 | Relocated Secondary Entrance |
| 6 | Poolhouse (removed) | 16A | Pavilion Store | 26 | New Car Parking Area |
| 7 | Agricultural Barn (removed) | 17 | Garden Room | 27 | New Accessible Parking |
| 8 | Hard Tennis Court | | | 28 | New Terrace |

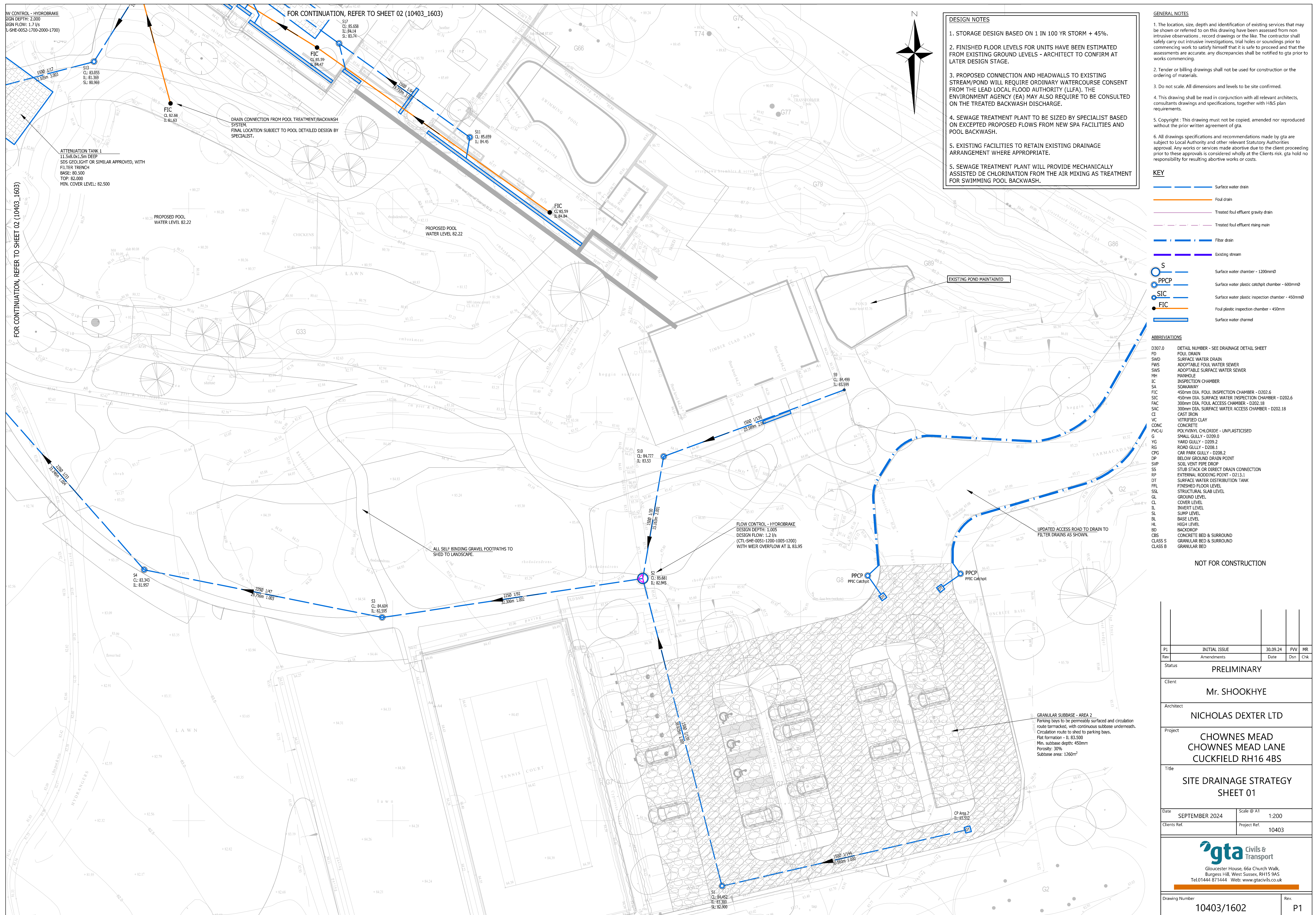
CHOWNES MEAD LANE

Note: All to be read in conjunction with drawings by Nicholas Dexter Landscape Design

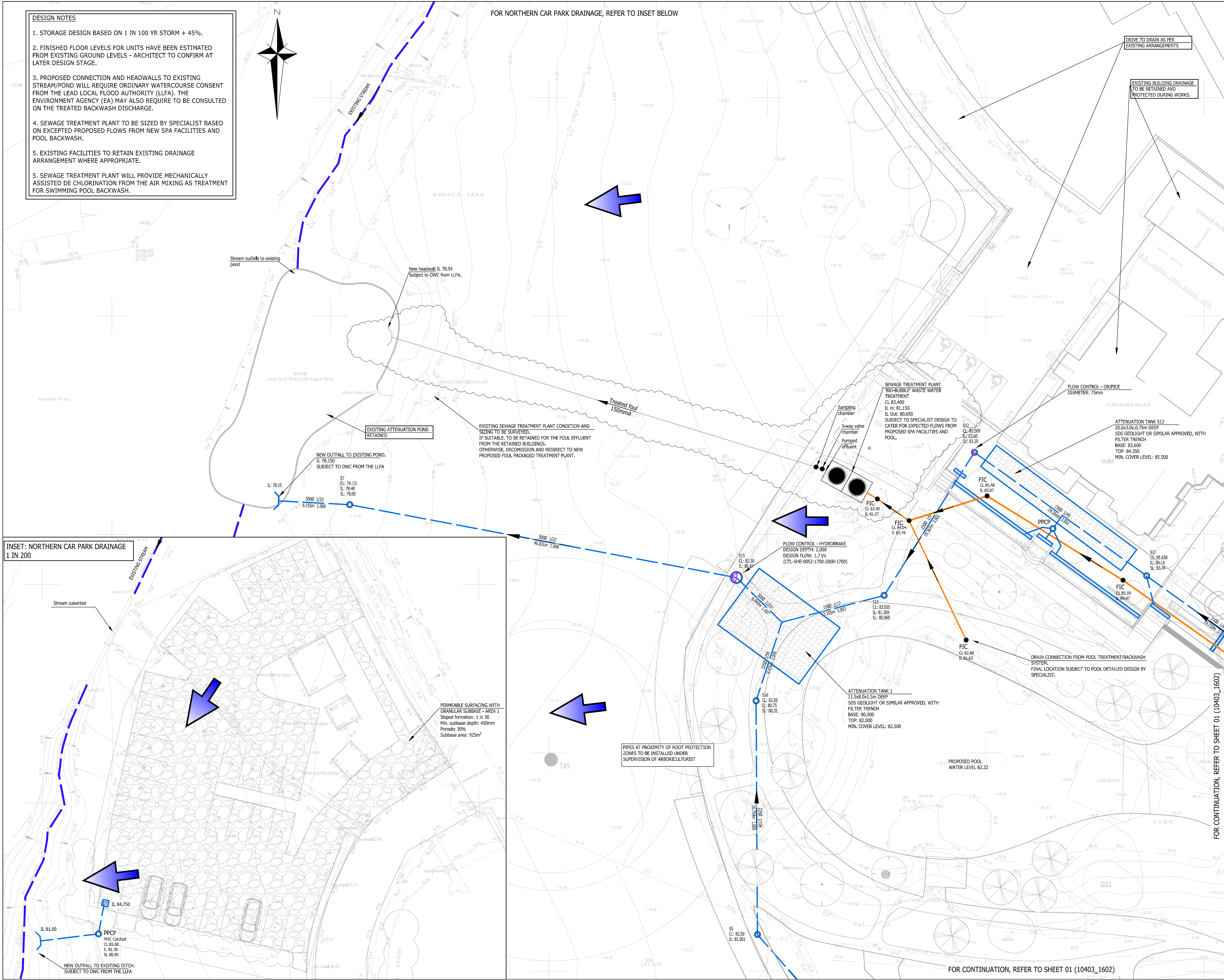
client	RCM Partnership LLP		drawing number	0603.PL.1502	revision	A
project	Chownes Mead Hotel, Chownes Mead Lane, Haywards Heath, RH16 4BS		drawing title	Proposed Site Plan / Key Plan		
PLANNING						
drawn by	checked by	ria work stage	date	scale/original sheet size		
Others/ES	MR	3	Feb '26	1:250 @ A0		
www.azb.co.uk azb@azbarchitects.co.uk Unit 1, Bess House, St John's Road, Rye, BN22 2FX, United Kingdom Phone +44 (0)1323 726 356 Company Building 0877117 VAT no 951 4542 17			© ASB Architects Ltd. Check all dimensions on site before work is undertaken. Goods, materials and workmanship to conform with current building regulations, BS5 and COP9.			

ABIR Architects

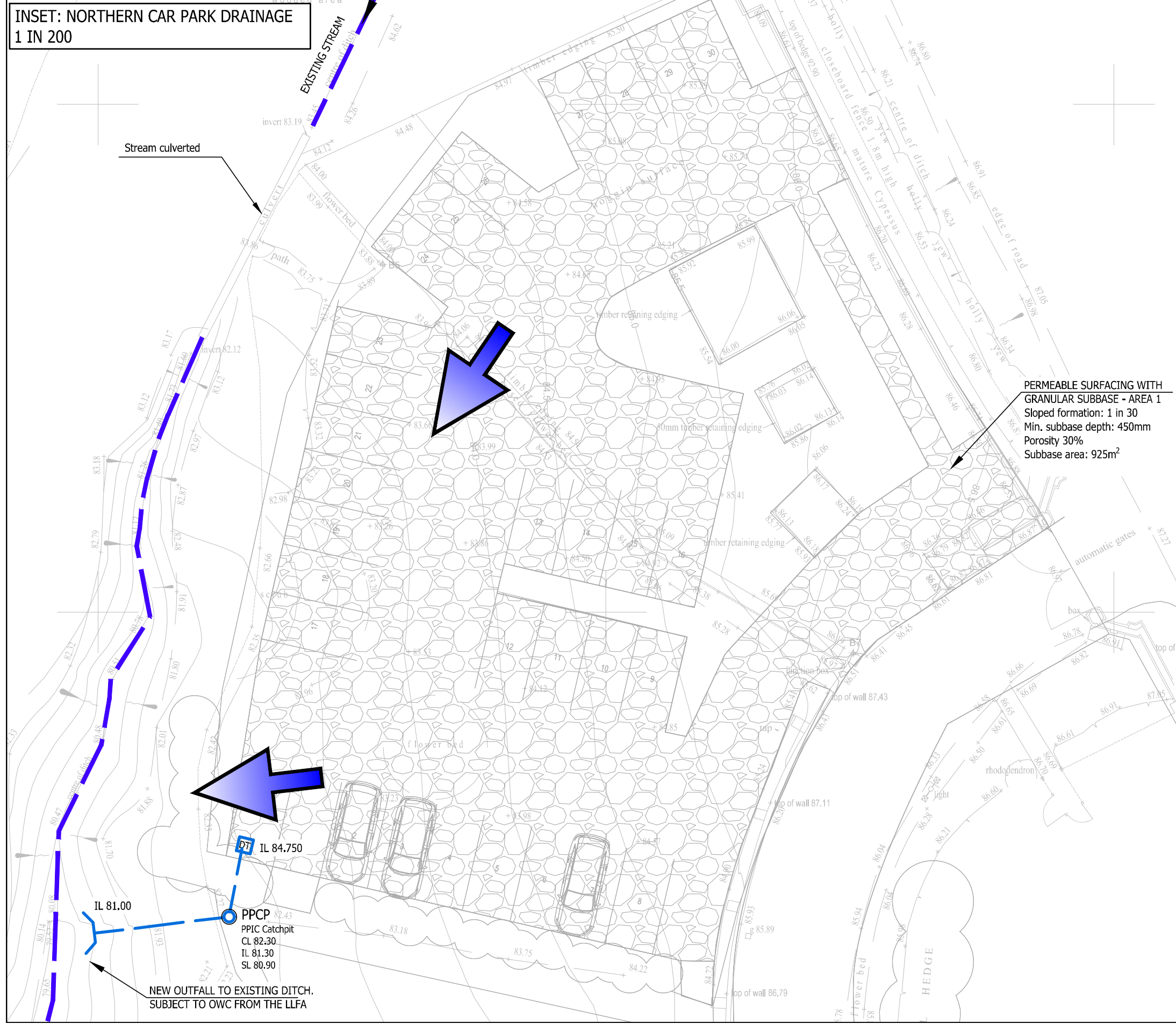
RIBA
Chartered Practitioner



P1	INITIAL ISSUE	30.09.24	FVV	MR					
Rev.	Amendments	Date	Dsn	Cdn					
Status PRELIMINARY									
Client Mr. SHOOKHYE									
Architect NICHOLAS DEXTER LTD									
Project CHOWNES MEAD CROOKS ROAD LANE CRICKFIELD RH16 4BS									
Title SITE DRAINAGE STRATEGY SHEET 01									
Date SEPTEMBER 2024		Scale @ A1 1:200							
Clients Ref.		Project Ref. 10403							
 Glooucester House, 66a Church Walk, Burgess Hill, West Sussex, RH15 9AS Tel.01444 871444 Web: www.gtacivils.co.uk									
Drawing Number 10403/1602								Rev. P1	



- DESIGN NOTES**
1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 45%.
 2. FINISHED FLOOR LEVELS FOR UNITS HAVE BEEN ESTIMATED FROM EXISTING GROUND LEVELS - ARCHITECT TO CONFIRM AT LATER DESIGN STAGE.
 3. PROPOSED CONNECTION AND HEADWALLS TO EXISTING STREAM/POND WILL REQUIRE ORDINARY WATERCOURSE CONSENT FROM THE LEAD LOCAL FLOOD AUTHORITY (LLFA). THE ENVIRONMENT AGENCY (EA) MAY ALSO REQUIRE TO BE CONSULTED ON THE TREATED BACKWASH DISCHARGE.
 4. SEWAGE TREATMENT PLANT TO BE SIZED BY SPECIALIST BASED ON EXCEPTED PROPOSED FLOWS FROM NEW SPA FACILITIES AND POOL BACKWASH.
 5. EXISTING FACILITIES TO RETAIN EXISTING DRAINAGE ARRANGEMENT WHERE APPROPRIATE.
 5. SEWAGE TREATMENT PLANT WILL PROVIDE MECHANICALLY ASSISTED DE CHLORINATION FROM THE AIR MIXING AS TREATMENT FOR SWIMMING POOL BACKWASH.



- GENERAL NOTES**
1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations, record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.
 2. Tender or billing drawings shall not be used for construction or the ordering of materials.
 3. Do not scale. All dimensions and levels to be site confirmed.
 4. This drawing shall be read in conjunction with all relevant architects, consultants drawings and specifications, together with H&S plan requirements.
 5. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.
 6. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

- KEY**
- Surface water drain
 - Foul drain
 - Treated foul effluent gravity drain
 - Treated foul effluent rising main
 - Filter drain
 - Existing stream
 - Surface water chamber - 1200mmØ
 - Surface water plastic catchpit chamber - 600mmØ
 - Surface water plastic inspection chamber - 450mmØ
 - Foul plastic inspection chamber - 450mm
 - Surface water channel

- ABBREVIATIONS**
- | | |
|---------|--|
| D307.0 | DETAIL NUMBER - SEE DRAINAGE DETAIL SHEET |
| FD | FOUL DRAIN |
| SWD | SURFACE WATER DRAIN |
| FWS | ADOPTABLE FOUL WATER SEWER |
| SWS | ADOPTABLE SURFACE WATER SEWER |
| MH | MANHOLE |
| IC | INSPECTION CHAMBER |
| SA | SOAKAWAY |
| FIC | 450mm DIA. FOUL INSPECTION CHAMBER - D202.6 |
| SIC | 450mm DIA. SURFACE WATER INSPECTION CHAMBER - D202.6 |
| FAC | 300mm DIA. FOUL ACCESS CHAMBER - D202.18 |
| SAC | 300mm DIA. SURFACE WATER ACCESS CHAMBER - D202.18 |
| CI | CAST IRON |
| VC | VITRIFIED CLAY |
| CONC | CONCRETE |
| PVC-U | POLYVINYL CHLORIDE - UNPLASTICISED |
| G | SMALL GULLY - D209.0 |
| YG | YARD GULLY - D209.2 |
| RG | ROAD GULLY - D208.1 |
| CPG | CAR PARK GULLY - D208.2 |
| DP | BELOW GROUND DRAIN POINT |
| SVP | SOIL VENT PIPE DROP |
| SS | STUB STACK OR DIRECT DRAIN CONNECTION |
| RP | EXTERNAL RODDING POINT - D213.1 |
| DT | SURFACE WATER DISTRIBUTION TANK |
| FFL | FINISHED FLOOR LEVEL |
| SLL | STRUCTURAL SLAB LEVEL |
| GL | GROUND LEVEL |
| CL | COVER LEVEL |
| IL | INVERT LEVEL |
| SL | SUMP LEVEL |
| BL | BASE LEVEL |
| HL | HIGH LEVEL |
| BD | BACKDROP |
| CBS | CONCRETE BED & SURROUND |
| CLASS S | GRANULAR BED & SURROUND |
| CLASS B | GRANULAR BED |

NOT FOR CONSTRUCTION

P3	STP LOCATION UPDATED	02.06.26	NG	FVW	
P2	FLOW ARROWS ADDED	04.10.24	FVW	MR	
P1	INITIAL ISSUE	30.09.24	FVW	MR	
Rev	Amendments	Date	Disn	Chk	
Status PRELIMINARY					
Client Mr. SHOOKHYE					
Architect NICHOLAS DEXTER LTD					
Project CHOWNES MEAD CHOWNES MEAD LANE CUCKFIELD RH16 4BS					
Title SITE DRAINAGE STRATEGY SHEET 02					
Date SEPTEMBER 2024		Scale @ A1 1:200			
Clients Ref.		Project Ref. 10403			
 Civils & Transport Gloucester House, 66a Church Walk, Burgess Hill, West Sussex, RH15 9AS Tel:01444 871444 Web: www.gtacivils.co.uk					
Drawing Number 10403/1603					Rev. P3

Appendix E

Drainage Calculation Sheets

Calculated by:

Florence Van Vaerenbergh

Site name:

Chownes Mead

Site location:

Cuckfield

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

Site Details

Latitude:

50.99794° N

Longitude:

0.12461° W

Reference:

4049065515

Date:

Oct 01 2024 13:51

Runoff estimation approach

IH124

Site characteristics

Total site area (ha):

0.293

Methodology

Q_{BAR} estimation method:

Calculate from SPR and SAAR

SPR estimation method:

Calculate from SOIL type

Notes

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

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

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

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

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

Hydrological characteristics

	Default	Edited
SAAR (mm):	819	819
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates

	Default	Edited
Q _{BAR} (l/s):	1.7	1.7
1 in 1 year (l/s):	1.44	1.44
1 in 30 years (l/s):	3.91	3.91
1 in 100 year (l/s):	5.42	5.42
1 in 200 years (l/s):	6.36	6.36

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Depth (m)
CP Area 2	0.170	5.00	84.162	Junction	0.649
S1			84.452	Manhole	1.152
S9	0.030	5.00	84.650	Manhole	0.951
S10			84.777	Manhole	1.247
S2			85.681	Manhole	2.736
S3			84.604	Manhole	2.009
S4			83.343	Manhole	1.386
S5			82.550	Manhole	1.549
S16			82.550	Manhole	1.800
S11	0.044	5.00	85.659	Manhole	1.209
S17			85.658	Manhole	1.518
S12	0.049	5.00	85.509	Junction	1.909
S13			83.055	Manhole	1.686
Attenuation Tank 1			82.570	Junction	2.070
S15			82.550	Manhole	2.080
S7			79.131	Manhole	0.731
S8			78.602	Junction	0.452

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.000	CP Area 2	S1	30.560	0.600	83.513	83.300	0.213	143.5	150
1.001	S1	S2	38.925	0.600	83.300	83.020	0.280	139.0	150
2.000	S9	S10	23.589	0.600	83.699	83.530	0.169	139.6	150
2.001	S10	S2	15.163	0.600	83.530	83.020	0.510	29.7	150
1.002	S2	S3	32.306	0.600	82.945	82.595	0.350	92.3	225
1.003	S3	S4	29.756	0.600	82.595	81.957	0.638	46.6	225
1.004	S4	S5	31.246	0.600	81.957	81.001	0.956	32.7	225
1.005	S5	S16	26.754	0.600	81.001	80.750	0.251	106.6	225
1.006	S16	Attenuation Tank 1	9.476	0.600	80.750	80.575	0.175	54.1	225
3.000	S11	S17	19.733	0.600	84.450	84.140	0.310	63.7	150
3.001	S17	S12	24.266	0.600	84.140	83.600	0.540	44.9	150
3.002	S12	S13	19.367	0.600	83.600	81.369	2.231	8.7	150
3.003	S13	Attenuation Tank 1	12.105	0.600	81.369	80.650	0.719	16.8	150
1.007	Attenuation Tank 1	S15	6.060	0.600	80.500	80.470	0.030	202.0	300
1.008	S15	S7	46.031	0.600	80.470	78.400	2.070	22.2	300

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Σ Area (ha)
1.000	0.837	14.8	44.5	0.170
1.001	0.850	15.0	44.5	0.170
2.000	0.848	15.0	7.9	0.030
2.001	1.853	32.7	7.9	0.030
1.002	1.361	54.1	52.4	0.200
1.003	1.920	76.3	52.4	0.200
1.004	2.296	91.3	52.4	0.200
1.005	1.266	50.3	52.4	0.200
1.006	1.781	70.8	52.4	0.200
3.000	1.262	22.3	11.5	0.044
3.001	1.505	26.6	11.5	0.044
3.002	3.440	60.8	24.4	0.093
3.003	2.467	43.6	24.4	0.093
1.007	1.102	77.9	76.8	0.293
1.008	3.348	236.7	76.8	0.293

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)
1.009	S7	S8	8.155	0.600	78.400	78.150	0.250	32.6	300

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	Σ Area (ha)
1.009	2.762	195.2	76.8	0.293

Simulation Settings

Rainfall Methodology	FEH-22	Winter CV	1.000	Drain Down Time (mins)	1440	Check Discharge Rate(s)	x
Rainfall Events	Singular	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0	Check Discharge Volume	x
Summer CV	1.000	Skip Steady State	✓	Starting Level (m)			

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440	2160	2880	4320	5760	7200
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Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)	Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0	100	45	0	0
30	40	0	0				

Node S2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.002	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0051-1200-1005-1200
Invert Level (m)	82.945	Min Outlet Diameter (m)	0.075
Design Depth (m)	1.005	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.2		

Node S2 Online Weir Control

Flap Valve	x	Replaces Downstream Link	✓	Width (m)	1.200
Downstream Link	1.002	Invert Level (m)	83.950	Discharge Coefficient	0.590

Node S12 Online Orifice Control

Flap Valve	x	Replaces Downstream Link	✓	Diameter (m)	0.075
Downstream Link	3.002	Invert Level (m)	83.600	Discharge Coefficient	0.600

Node S15 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Downstream Link	1.008	Sump Available	✓
Replaces Downstream Link	✓	Product Number	CTL-SHE-0052-1700-2000-1700
Invert Level (m)	80.470	Min Outlet Diameter (m)	0.075
Design Depth (m)	2.000	Min Node Diameter (mm)	1200
Design Flow (l/s)	1.7		

Node CP Area 2 Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Width (m)	15.000	Depth (m)	0.450
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	83.513	Length (m)	84.000	Inf Depth (m)	
Safety Factor	2.0	Time to half empty (mins)		Slope (1:X)	1000.0		

Node S12 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	83.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	50

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	60.0	0.0	0.750	60.0	0.0	0.760	0.0	0.0

Node Attenuation Tank 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	80.500
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	92.0	0.0	1.500	92.0	0.0	1.550	0.0	0.0

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
360 minute winter	CP Area 2	344	83.641	0.128	5.5	33.0551	0.0000	OK
360 minute winter	S1	336	83.640	0.340	1.9	0.0962	0.0000	SURCHARGED
15 minute summer	S9	10	83.765	0.066	5.5	0.1375	0.0000	OK
360 minute winter	S10	336	83.639	0.109	1.0	0.0174	0.0000	OK
360 minute winter	S2	336	83.639	0.694	1.8	0.7851	0.0000	SURCHARGED
30 minute winter	S3	15	82.614	0.019	1.0	0.0030	0.0000	OK
15 minute winter	S4	9	81.974	0.017	1.0	0.0027	0.0000	OK
4320 minute winter	S5	2100	81.024	0.023	1.0	0.0519	0.0000	OK
2160 minute summer	S16	2040	80.857	0.107	1.7	0.2404	0.0000	OK
15 minute summer	S11	10	84.515	0.065	8.0	0.0573	0.0000	OK
15 minute summer	S17	10	84.198	0.058	7.9	0.0163	0.0000	OK
120 minute summer	S12	76	83.736	0.136	8.6	7.8369	0.0000	OK
120 minute summer	S13	76	81.399	0.030	3.7	0.0085	0.0000	OK
2160 minute summer	Attenuation Tank 1	2040	80.856	0.356	2.8	31.1212	0.0000	SURCHARGED

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
CP Area 2	1.000	S1	1.9	0.551	0.125	0.5131
S1	1.001	S2	1.4	0.452	0.091	0.6853
S9	2.000	S10	5.4	0.951	0.358	0.1454
S10	2.001	S2	0.9	0.508	0.028	0.2376
S2	Hydro-Brake®	S3	1.0			
S2	Weir	S3	0.0			
S3	1.003	S4	1.0	0.711	0.014	0.0432
S4	1.004	S5	1.0	0.882	0.011	0.0542
S5	1.005	S16	1.0	0.555	0.020	0.0790
S16	1.006	Attenuation Tank 1	2.6	0.641	0.036	0.2764
S11	3.000	S17	7.9	1.185	0.355	0.1331
S17	3.001	S12	8.0	1.478	0.302	0.1900
S12	Orifice	S13	3.7			
S13	3.003	Attenuation Tank 1	3.7	1.494	0.085	0.0299
Attenuation Tank 1	1.007	S15	3.0	0.157	0.038	0.4267

Results for 2 year Critical Storm Duration. Lowest mass balance: 99.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2160 minute summer	S15	2040	80.856	0.386	3.0	0.8686	0.0000	SURCHARGED
180 minute summer	S7	172	78.416	0.016	1.1	0.0026	0.0000	OK
180 minute summer	S8	172	78.166	0.016	1.1	0.0000	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
S15	Hydro-Brake®	S7	1.1			
S7	1.009	S8	1.1	0.743	0.006	0.0119

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
720 minute winter	CP Area 2	705	83.901	0.388	9.4	132.9578	0.0000	FLOOD RISK
720 minute winter	S1	705	83.900	0.600	1.5	0.1699	0.0000	SURCHARGED
30 minute summer	S9	20	84.264	0.565	18.0	1.1706	0.0000	SURCHARGED
30 minute summer	S10	20	84.085	0.555	14.5	0.0883	0.0000	SURCHARGED
30 minute summer	S2	20	83.961	1.016	14.4	1.1487	0.0000	SURCHARGED
30 minute summer	S3	20	82.630	0.035	3.6	0.0055	0.0000	OK
30 minute summer	S4	21	81.987	0.030	3.5	0.0047	0.0000	OK
2880 minute winter	S5	2820	81.552	0.551	1.1	1.2407	0.0000	SURCHARGED
2880 minute winter	S16	2820	81.552	0.802	1.1	1.8051	0.0000	SURCHARGED
15 minute summer	S11	11	84.891	0.441	28.9	0.3915	0.0000	SURCHARGED
15 minute summer	S17	12	84.418	0.278	27.3	0.0787	0.0000	SURCHARGED
60 minute summer	S12	45	84.104	0.504	41.8	28.9680	0.0000	SURCHARGED
2880 minute winter	S13	2820	81.552	0.183	1.7	0.0519	0.0000	SURCHARGED
2880 minute winter	Attenuation Tank 1	2820	81.552	1.052	3.5	91.9643	0.0000	SURCHARGED

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
CP Area 2	1.000	S1	1.5	0.530	0.100	0.5380
S1	1.001	S2	1.4	0.404	0.091	0.6853
S9	2.000	S10	14.5	0.993	0.970	0.4153
S10	2.001	S2	14.4	0.966	0.441	0.2669
S2	Hydro-Brake®	S3	1.2			
S2	Weir	S3	2.4			
S3	1.003	S4	3.5	1.084	0.046	0.0974
S4	1.004	S5	3.4	0.965	0.038	0.1190
S5	1.005	S16	1.1	0.554	0.022	1.0640
S16	1.006	Attenuation Tank 1	2.1	0.632	0.030	0.3769
S11	3.000	S17	27.3	1.563	1.222	0.3474
S17	3.001	S12	25.9	1.601	0.973	0.4272
S12	Orifice	S13	8.0			
S13	3.003	Attenuation Tank 1	1.7	0.963	0.039	0.2131
Attenuation Tank 1	1.007	S15	2.6	0.219	0.034	0.4267

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 99.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
2880 minute winter	S15	2820	81.552	1.082	2.6	2.4350	0.0000	SURCHARGED
2880 minute winter	S7	2820	78.418	0.018	1.3	0.0028	0.0000	OK
2880 minute winter	S8	2820	78.168	0.018	1.3	0.0000	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
S15	Hydro-Brake®	S7	1.3			
S7	1.009	S8	1.3	0.782	0.007	0.0135

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
600 minute winter	CP Area 2	420	84.045	0.532	14.3	157.2023	0.0000	FLOOD RISK
600 minute winter	S1	420	84.011	0.711	5.5	0.2013	0.0000	SURCHARGED
30 minute summer	S9	19	84.566	0.867	23.6	1.7964	0.0000	FLOOD RISK
30 minute summer	S10	20	84.210	0.680	20.1	0.1081	0.0000	SURCHARGED
30 minute summer	S2	20	83.974	1.029	19.9	1.1641	0.0000	SURCHARGED
30 minute summer	S3	20	82.651	0.056	9.6	0.0089	0.0000	OK
1440 minute winter	S4	1410	82.458	0.501	4.9	0.0797	0.0000	SURCHARGED
1440 minute winter	S5	1410	82.458	1.457	4.9	3.2785	0.0000	FLOOD RISK
1440 minute winter	S16	1410	82.458	1.708	4.6	3.8429	0.0000	FLOOD RISK
15 minute summer	S11	12	85.569	1.119	37.6	0.9927	0.0000	FLOOD RISK
15 minute summer	S17	12	84.823	0.683	33.2	0.1933	0.0000	SURCHARGED
60 minute summer	S12	47	84.288	0.688	52.3	39.5576	0.0000	SURCHARGED
1440 minute winter	S13	1410	82.458	1.089	3.7	0.3082	0.0000	SURCHARGED
1440 minute winter	Attenuation Tank 1	1410	82.458	1.958	7.1	133.2850	0.0000	FLOOD RISK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
CP Area 2	1.000	S1	5.5	0.548	0.375	0.5380
S1	1.001	S2	5.6	0.340	0.370	0.6853
S9	2.000	S10	20.1	1.142	1.341	0.4153
S10	2.001	S2	19.9	1.130	0.607	0.2669
S2	Hydro-Brake®	S3	1.2			
S2	Weir	S3	8.4			
S3	1.003	S4	9.6	1.379	0.126	0.2080
S4	1.004	S5	4.9	0.627	0.053	1.2427
S5	1.005	S16	4.6	0.552	0.092	1.0640
S16	1.006	Attenuation Tank 1	4.5	0.641	0.063	0.3769
S11	3.000	S17	33.2	1.884	1.487	0.3474
S17	3.001	S12	31.3	1.776	1.176	0.4272
S12	Orifice	S13	9.5			
S13	3.003	Attenuation Tank 1	3.7	1.026	0.084	0.2131
Attenuation Tank 1	1.007	S15	2.7	0.156	0.035	0.4267

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.19%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S15	1410	82.458	1.988	2.7	4.4727	0.0000	FLOOD RISK
1440 minute winter	S7	1410	78.420	0.020	1.7	0.0032	0.0000	OK
1440 minute winter	S8	1410	78.170	0.020	1.7	0.0000	0.0000	OK

US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
S15	Hydro-Brake®	S7	1.7			
S7	1.009	S8	1.7	0.851	0.009	0.0163

Appendix F

Draft Drainage Maintenance Plan

This Plan sets out the framework for the management of the proposed sustainable drainage systems (SuDS) and foul drainage network. The document will be updated with further information through the next stage of detailed design and coordination. At this stage, what is set out herein is intended to be sufficient to demonstrate the viability of the proposed SuDS and foul drainage maintenance regime for planning purposes.

Maintenance Responsibilities

It is the overarching responsibility of the Applicant/Client (and successors in title) to ensure that the Drainage Infrastructure is maintained in accordance with this Maintenance Plan.

Contamination or Dilution of Spillage

The Environment Agency would prefer all spillages on any highway to be contained to prevent any downstream contamination. However, this cannot always be achieved, depending on the nature of the spillage. In all circumstances involving the spillage of substances on the highway it is important that the Environment Agency are notified as soon as possible so that they can provide advice and take appropriate action.

Prompt action following a spillage can prevent or reduce its effects, whilst inappropriate action may cause or worsen the pollution effects. In the design of the drainage on this site, a number of measures have been put in place to prevent any pollution entering the groundwater such as Green roofs and permeable paving. The permeable paving sub-base is lined with a geotextile fabric.

In the event of a spillage on site it is the responsibility of the freeholders to clear up any spillage before it enters the drainage system. The primary method of dealing with any spillage of Hydrocarbons should be to use sand to soak up the leak and prevent any Hydrocarbons entering the drainage system. Once sand has been contaminated it should not be washed into the drainage system but disposed of by a Licensed Contractor.

Environment Agency – Emergency Contact Number

In the event of a spillage the Environment Agency should be contacted to notify the event and seek advice. The Environment Agency's Incident Hotline is **0800 80 70 60** (Freephone 24hrs).

Health and Safety

All those responsible for and involved in the maintenance of the site drainage systems should be safety-conscious and comply with the relevant health and safety legislation. This includes:

- The Health and Safety at Work etc. Act 1974
- The Management of Health and Safety at Work Regulations 1999
- The Workplace (Health, Safety and Welfare) Regulations 1992

The Applicant/Client is responsible for suitable risk assessment and management to ensure safe working conditions and practices. Measures to protect potential visitors also need to be considered.

Specialist contractors used should work to industry guidelines and be able to demonstrate safe working practices.

Employers have a duty to employees to inform them about the risks of their work environment and to decrease the risk as far as reasonably practicable. Appropriate personal protective equipment (PPE) should be provided and policies implemented based on risk assessment.

Operatives should be trained for working near water. Risks of contaminated water should be considered. Checking for open cuts and using nitrile gloves, waterproof plasters etc is advised.

Entry of pipes, chambers, tanks and culverts should be avoided wherever possible. Work should be carried out from the surface using appropriate equipment. In the event that entry cannot be avoided to perform a critical task, the required safety training, protection measures and precautions must be implemented prior to entry. Lone working should never be attempted.

For further information refer to Section 36 of The SuDS Manual (CIRIA C753).

Attenuation Cellular Storage Tanks

Make: Modular tanks – manufacturer to be determined

Inspection Frequency: Annually

Product Function: Rainwater storage.

Maintenance Requirements: Carry out periodic removal of particulate material from connecting catchpit and channel outlet sumps in accordance with manufacturer's Technical Data to ensure the crates do not become blocked and ineffective.

Permeable Pavings

Regular inspection and maintenance are important for the effective operation of porous paved areas.

The surfaces should be kept clear of debris and/or cleaned as necessary.

Damaged surfaces should be repaired as soon as possible. Please contact the contractor who installed the surfacing.

Areas subject to snow, ice and frost can be treated using Rock Salt; however, this may be harmful to plants and can damage surrounding metal or concrete surfaces. Excessive snow should be shovelled away using a plastic snow shovel, taking care not to damage the surfacing. Do not use a wire brush ice remover.

Permeable paving maintenance and monitoring requirements are described in the following table:

Schedule	Action	Frequency
Regular Maintenance	Brushing and vacuuming.	Three times per year at end of winter, mid-summer, after autumn leaf fall, or as required based on specific observations
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
Remedial Actions	Remedial work to any depressions, rutting and cracked or broken blocks or deformations in the permeable paving (if applicable) considered detrimental to the structural performance Rehabilitation of surface and upper structure	As required As required
Monitoring	Initial Inspection Inspect for evidence of poor operation and / or weed growth Inspect silt accumulation rates and establish appropriate brushing techniques	Monthly for 3 months after installation 3 monthly & 48hrs. after large storms Annually

Drains, Channel Drains, Manholes, Gullies, Silt Catchpits

Regular inspection and maintenance are required to ensure the effective long-term operation of private drains and manholes.

Post Completion: a CCTV survey to be carried out on all new and retained existing drainage systems and any downstream receiving systems.

The report will be used to prove the integrity of the as-built drainage system prior to issue of practical completion certificate and will be handed over to the Client & Management Company for future reference.

All drains and manholes are private and to be maintained by the Estate Management Company in shared areas. Operation and maintenance requirements for all sewers, manholes, gullies and channel drains are described in

the following table:

Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	6 Monthly intervals
	Debris removal from gullies & silt pits, channel drains (where may cause risks to performance).	Weekly
	Lift and inspect receiving manholes to check for any blockages. Particular attention should be given to the control manhole containing the flow control device	Six-monthly
Remedial Actions	Repair any damaged gully gratings or manhole covers	As required
	Replace / fix any loose channel drain covers	As required
Monitoring	Carry out full CCTV survey to confirm ongoing integrity of all drains. Inspect all gullies and silt pits & drainage channels during the survey	10-yearly intervals

Check hydrobrake orifice is clear and retention tank door is closed. Check function of retention tank door and oil if necessary.

Where appropriate refer also to specialist drainage manufacturer's information and maintenance requirements.

In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in 'Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services.



Civil Engineering - Transport Planning - Flood Risk

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