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Land Adjacent to Sturt Avenue, Haslemere

Flood Risk Assessment and Drainage Strategy

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Structural Engineering
Civil Engineering
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05	Updated following EA Comments and further consultation	RH	IL	RH	31.01.2022
06	Updated following Further Comments	RH	IL	RH	28.03.2022
07	Updated for Final Issue	RH	IL	RH	01.12.2023

Contents

Appendices

1.0 Introduction

1.1 Scott White and Hookins LLP has been instructed by Jonathan Walton of Pegasus Group, on behalf of Casa Coevo to undertake a flood risk assessment for a development on land adjacent to Sturt Avenue, Haslemere. The land is currently an open field surrounded by trees. This flood risk assessment has been produced as a supporting document for a detailed planning application for a residential development comprising of 9 dwelling houses together with associated access, infrastructure, parking and landscaping', and takes the form of a desk study.

1.2 The existing site is located in Haslemere, Hampshire. The site is currently a field and has a gated entrance. Vehicular access to the site is via the existing accessway to the Thames Water Treatment Works, located to the north of the site. The total site area is approximately 0.65Ha.

On the basis of the proposed development the scheme (Refer to proposed plan in **Appendix F**) is classed as 'More Vulnerable' under table 2 of the NPPF. On this basis development is considered appropriate for flood zone 1 and 2 only. This site meets the sequential test criteria, and an exception test is not required.

	Essential Infrastructure	Highly Vulnerable	More Vulnerable	Less Vulnerable	Water Compatible
FZ1					
FZ2		ETR			
FZ3a	ETR		ETR		
FZ3b	ETR				

Green – Development appropriate.
Red- Development not permitted.
ETR – Exception test required to allow development.

A location plan is provided in **Appendix A**.

1.3 This report considers the flood risk to the proposed development and the impact that the development will have in relation to flooding of adjacent areas and watercourses. It also considers any limits relating to flooding that are likely to be imposed to allow the development to be undertaken and recommends Sustainable Urban Drainage systems (SuDS) to control surface water runoff.

1.4 This report takes into account the requirements of NPPF and is based on information obtained from the Environment Agency.

1.5 Reference has been made to the following documents:

- Chichester District Council "Strategic Flood Risk Assessment", (SFRA) Final Report dated 2018 produced by JBA Consulting.

- Phase 1 Geo-Environmental Risk Assessment, produced by Aviron Associates Limtied, Dated May 2021

- Hydrogeological Report by Ground and Water Ltd - Dated November 2023

1.6 This report is for the private and confidential use of the client and its agents and may not be copied in whole or in part without the written permission of Scott White and Hookins LLP.

1.7 **Environment Agency Consultation**

Following comments from the Environment Agency (EA) as part of the Planning Consultation process, Scott White and Hookins have consulted directly with the Environment Agency to answer the queries raised, and provide additional information where required.

This has been primarily through Sophie Brown – Planning Advisor within the Sustainable Places Team of the EA. This also involved a meeting with a number of representatives from the EA including Neil Landricombe who lead the meeting on behalf of the EA

Following this meeting an addendum to Version 04 of this report was issued to address further queries which was considered and commented on by the EA. This report now includes for all items discussed and submitted to the EA.

The key correspondence relating to discussions with the EA can be found in Appendix K.

2.0 Government Policy on Flood Risk and Drainage of Development

2.1 The frequency and severity of river flooding is perceived to have increased in recent years and in an attempt to mitigate the flood risk the Government published Planning Policy Statement Note 25: Development and Flood Risk (PPS25) in December 2006. PPS25 details the importance of the effective management and reduction of flood risk in the land use planning process and attempts to address the issue of climate change. This has since been updated and is set out in The National Planning Policy Framework (NPPF) and the supporting Technical Guidance to the NPPF.

2.2 Traditionally surface water runoff from developments has been conveyed by pipe systems to the nearest watercourse or sewer. This tends to increase the rate and volume of the run off often leading to flooding downstream of the new development. Latest policy promotes the use of sustainable urban drainage systems (SuDS) whereby the control of run off is to be as close to source as possible. This can be achieved by utilising techniques which mimic the natural drainage processes, the use of direct infiltration for example. The Environment Agency will, in general, seek to restrict the allowable discharge from a new development to that previously expected from the undeveloped land.

2.3 The requirements of the revised Building Regulations which came into force on 1st April 2002 are that adequate provision should be made for dealing with rainwater from the roofs of buildings and certain paved areas providing access to the buildings. Run off from such drainage systems are to be discharged to one of the following systems listed in order of priority: -

- A soakaway or other infiltration system
- A watercourse
- A sewer or drain

The revised Building Regulations were drafted to reinforce the requirements for SuDS wherever possible.

2.4 The Requirements of a Flood Risk Assessment:

2.4.1 A Flood Risk Assessment is required in order to ascertain whether a development will exacerbate the risk of flooding elsewhere in the catchment or is at risk of flooding itself.

2.4.2 A site-specific FRA is required for developments:

- in flood zone 2 or 3 including minor development and change of use

- more than 1 hectare (ha) in flood zone 1
- less than 1 ha in flood zone 1, including a change of use in development type to a more vulnerable class (for example from commercial to residential), where they could be affected by sources of flooding other than rivers and the sea (for example surface water drains, reservoirs)
- in an area within flood zone 1 which has critical drainage problems as notified by the Environment Agency

2.5 The Department for Environment, Food and Rural Affairs (DEFRA) Non-Statutory Technical Standards for Sustainable Drainage Practice Guidance also provides guidance for the sustainable design of drainage. The non-statutory technical standard for Peak Flow Control (S2 and S3) and Volume Control (S4 S5 and S6) are as follows:

2.5.1 Peak Flow Control

S2 - For greenfield developments, the peak runoff rate from the development to any highway drain, sewer or surface water body for the 1 in 1-year rainfall event and the 1 in 100-year rainfall event should never exceed the peak greenfield runoff rate for the same event.

S3 - For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1-year rainfall event and the 1 in 100-year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event but should never exceed the rate of discharge from the development prior to redevelopment for that event.

2.5.2 Volume Control

S4 - Where reasonably practicable, for greenfield development, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event should never exceed the greenfield runoff volume for the same event.

S5 - Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100-year, 6-hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event but should never exceed the runoff volume from the development site prior to redevelopment for that event.

S6 - Where it is not reasonably practicable to constrain the volume of runoff to any rain, sewer or surface water body in accordance with S4 or S5 above, the runoff volume must be discharged at a rate that does not adversely affect flood risk

3.0 Existing Site

3.1 The site is located in Haslemere, Surrey, 1.0 mile south west of the town centre. The site is approximately centred on grid reference 488883E 132324N (SU888323). A location plan is provided in **Appendix A**.

3.2 The site is currently a green field with localised trees located across the area. The site is bounded on the south and west by residential properties. To the north east, the site is bounded by the River Wey. The site has a slope in the west to east direction of approximately 3.0m, with levels ranging from 126.2m along the west to 123.2m adjacent to the bank of the River Wey.

It is approximately 0.65Ha in area. Refer to existing site plan in **Appendix C**.

3.3 The nearest significant watercourse to the site is the River Wey located on the north east boundary of the site.

3.4 As part of the site-specific FRA, sewer maps were provided from Thames Water. The sewer map indicates a 225mm diameter foul sewer running northwest along the north east bank of the River Wey, adjacent to the site. It is unlikely to be any existing foul water connection from the proposed site into the Thames Water network.

Surface water drainage is noted in Sturt Avenue and adjacent roads, which appears to drain into the River Wey via headwalls.

Sewer record mapping can be found in **Appendix B**.

3.5 An intrusive Phase 2 soil investigation has not been carried out at the site however a Phase 1 Geo-Environmental Risk Assessment has been produced and has assessed the relevant information available.

The report suggests that the anticipated geology is as follows:

- ***Head Deposits*** *(Superficial)*- Polymict deposit: comprises gravel, sand and clay depending on upslope source and distance from source. Locally with lenses of silt, clay or peat and organic material. No Available thickness
- ***Atherfield Clay Formation*** *(Solid)*- Sandy mudstone with an impersistent phosphatic pebble bed with vertebrate bones, gritty sandstone or very shelly sandy mudstone with glauconite, at the base. Possible Thickness 10m-18m
- ***Hythe Formation*** *(Solid)* - Fine to medium grained sands, siltstones and silts with some clay interbeds. Possible Thickness 18m-100m

The BGS Geology Maps are attached in **Appendix E.**

3.6 A hydrogeology report has also been undertaken to identify the likely groundwater levels on the site. This was an intrusive investigation which was undertaken in November 2023 and showed that groundwater levels generally were between 0.8m and 1.3m below ground

level. This also showed that the substrata was Head Deposits which was shown to be primarily Clay based.

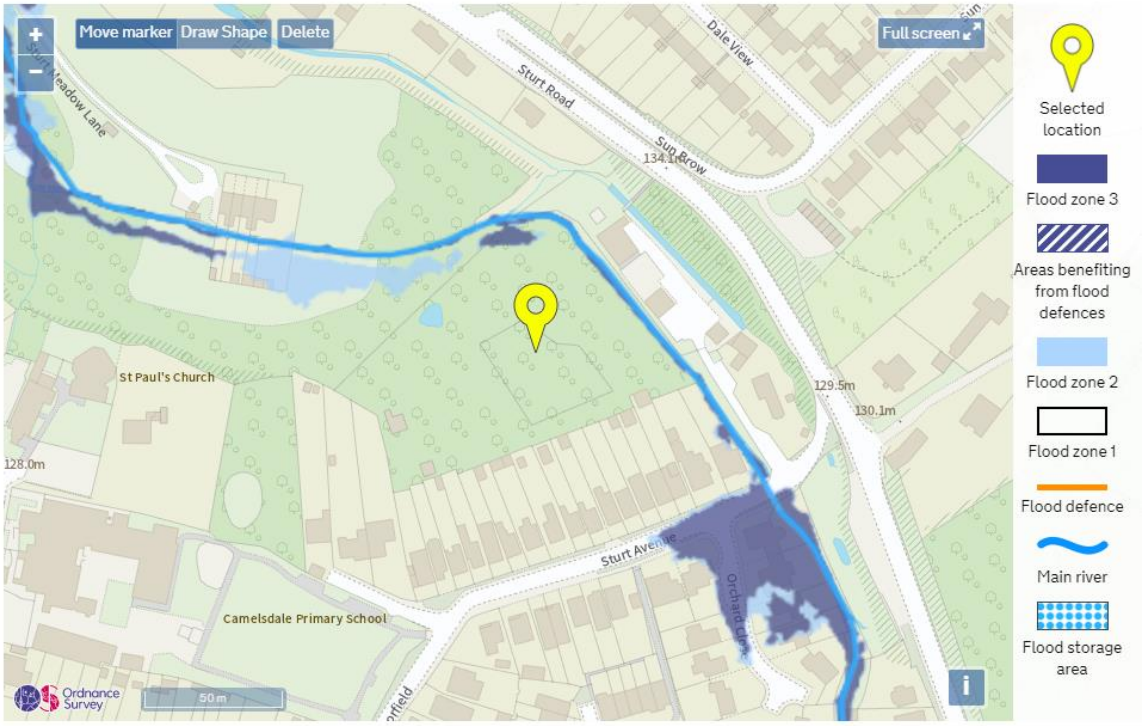
3.7 Based on the assessment in the Phase 1 Geo-Environmental Risk Assessment and the Hydrogeology report, the site is not suitable for soakaways, due the high groundwater levels and the clay based substrata.

4.0 Potential Flood Risks

4.1 Fluvial

Flood plain mapping provided by the EA indicate that the development site lies in Flood Zone. There is a small area of Flood Zone 3 close to the north corner boundary of the site.

Flood zone 1 comprises of land having a less than 1 in 1,000 (<0.1%) annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3). See copy of EA/Gov Maps.



Environment Agency Flood Zone` Map

The River Wey also benefits from the Flood Alert process from the Environment Agency.

We have received Product 5, 6 and 7 information from the Environment Agency. This provides data on the Upper River Wey and is based on the Haslemere to Passfield 2018 model.

This provides information on proposed flooding levels along the river. We have extracted the relevant data relevant for our site. We have also calculated the likely flood level at the location of the existing/proposed bridge.

Point on River	Return Period 1 in ...	Water Level (m)	Easting	Northing
A	2	122.57	488902.5	132352.1
	5	122.62	488902.5	132352.1
	20	122.71	488902.5	132352.1
	30	122.73	488902.5	132352.1
	50	122.76	488902.5	132352.1
	75	122.78	488902.5	132352.1
	100	122.8	488902.5	132352.1
	200	122.83	488902.5	132352.1
	1000	122.9	488902.5	132352.1
	100 + 10% CCA	122.82	488902.5	132352.1
	100 + 15% CCA	122.83	488902.5	132352.1
	100 + 25% CCA	122.85	488902.5	132352.1
	100 + 35% CCA	122.87	488902.5	132352.1
	100 + 70% CCA	122.95	488902.5	132352.1
B	2	123.9	488962	132273.8
	5	124	488962	132273.8
	20	124.09	488962	132273.8
	30	124.11	488962	132273.8
	50	124.13	488962	132273.8
	75	124.15	488962	132273.8
	100	124.17	488962	132273.8
	200	124.21	488962	132273.8
	1000	124.31	488962	132273.8
	100 + 10% CCA	124.2	488962	132273.8
	100 + 15% CCA	124.21	488962	132273.8
	100 + 25% CCA	124.24	488962	132273.8
	100 + 35% CCA	124.27	488962	132273.8
	100 + 70% CCA	124.37	488962	132273.8

The proposed bridge location at Point F has been measured as being:

- 488,938mE -132,309mN

This provides a length from Point B down to Point F of approximately 43m, and from point F to Point A of 55.5m.

As there is no formal data at the exact location of the bridge regarding the calculated flood level, it was agreed with the in the meeting with the EA, Neil Landricombe (EA Flood Management Team) stated we would need to demonstrate the longsection profile of the river to show that the interpolated assumptions made in the determination of the flood level corresponds to the actual shape of the river.

Following the meeting SWH went to site and undertook further physical surveying, primarily up stream of the bridge. This provided information on the river levels at Point B allowing a full profile to be determined throughout the length of the river between point A and Point B. Please refer to Appendix J for drawing 303383-SWH-XX-XX-DR-C-505-P01 showing the longsection along the river between points A and B.

This demonstrates that the river generally falls consistently along this length.

The proposed flood levels from the EA for 1:100 + 70% flood event at points A and B are as follows:

- Point A - 122.95m AOD
- Point B - 124.37m AOD

The difference between these levels is 1.42m.

From the survey information, the surveyed levels at points A and B are as follows:

- Point A - 122.57m AOD
- Point B - 123.95m AOD

The difference between these levels is 1.38m

This demonstrates that the fall on the river corresponds to the calculated flood levels from the EA and therefore it is reasonable to assume that the flood throughout this section also follows a similar profile.

Therefore, based on the above figures the interpolated flood level at point F for both 35% and 70% Climate Change Allowance (CCA) are as follows:

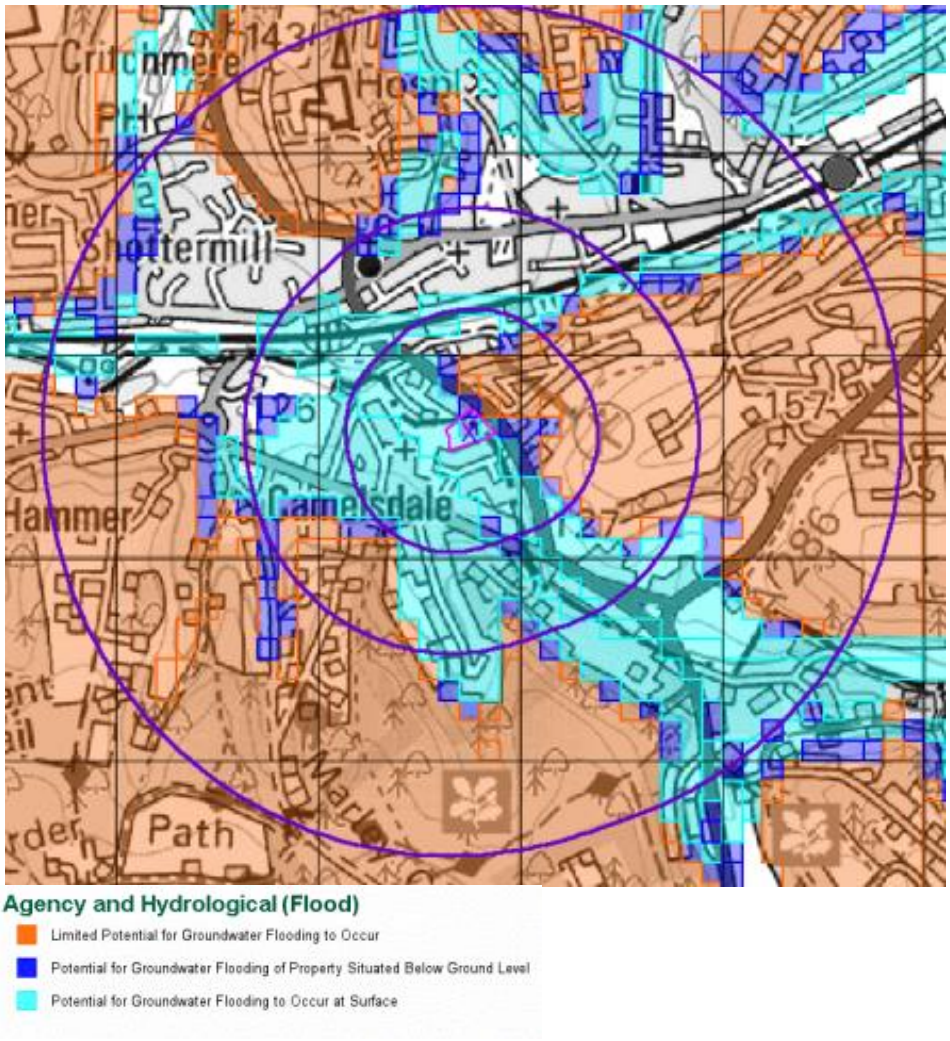
- 1:100 + 35% CCA – 123.640m AOD
- 1:100 + 70% CCA – 123.730m AOD

The Flood Level for the 1:100 + 70% CCA will be adopted for the site.

4.2 Localised flooding caused by ground water

In appendix G of the SFRA from Chichester Borough Council, maps indicating the groundwater levels can be found. This indicates that for our site there is no risk from groundwater.

From the BGS dataset for Below Ground Flooding obtained from the Envirocheck report located in the Phase 1 Geo-Environmental Risk Assessment, this indicates that the there is a risk due to the ground water flooding at surface. An extract is provided below.



Following receipt of the Hydrogeology report, the groundwater has been shown to be at 0.8m to 1.3m across the site. This was recorded in November 2023 following a very wet period of weather over a number of months. The report states that it is anticipated that the levels shown would be close the maximum levels expected.

Also, due to the low permeability clay based material it is believed that the amount of groundwater would be limited, with limited horizontal and vertical movement through the cohesive soil.

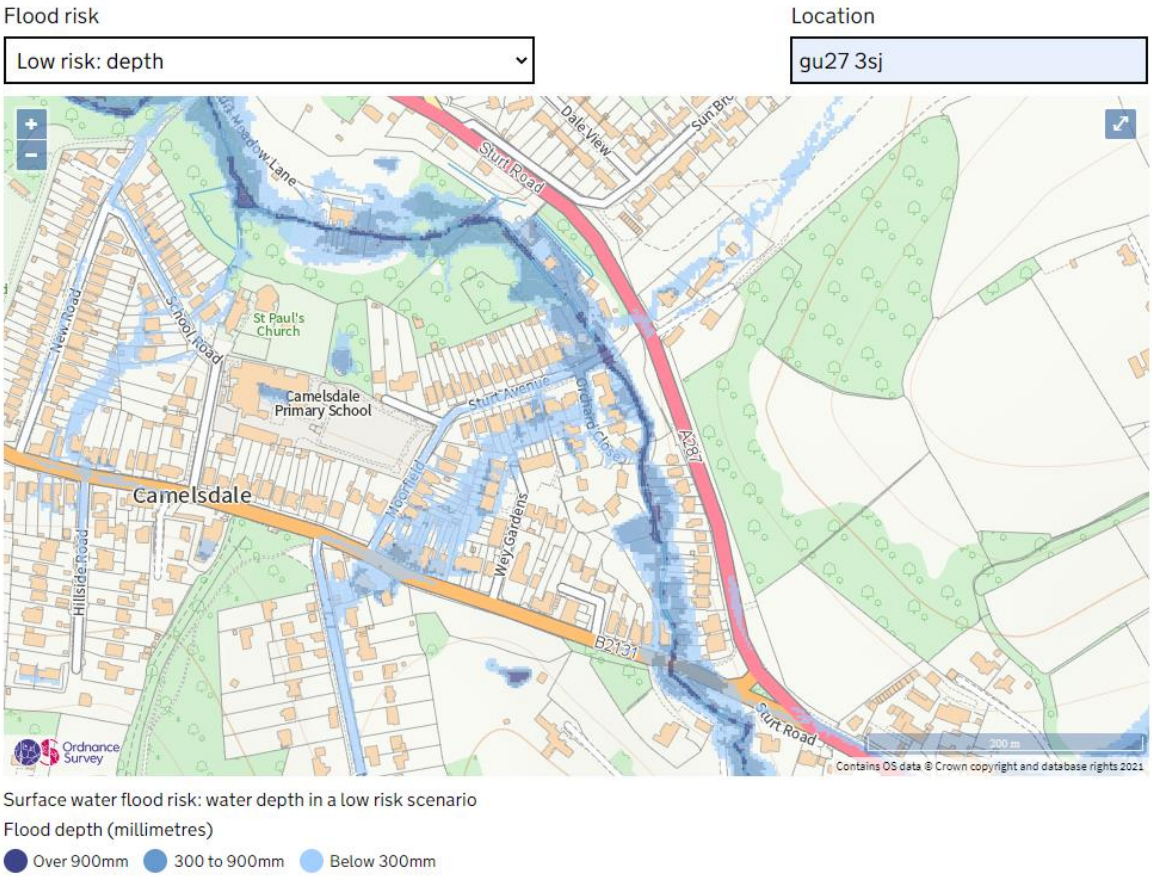
Perched water can be seen in the undulations on the site after prolonged periods of rain. But this would be mitigated by an effective SUDS system.

4.3 Localised flooding caused by overland surface water runoff

In appendix F of the Strategic Flood Risk Assessment from Chichester Borough Council, maps indicating the surface water flooding levels can be found.

The SFRA indicates that for the site there is a low risk to the north eastern boundary of the site adjacent to the River Wey where flooding from Surface Water could occur. Due to the small scale of this drawing we have not included this drawing.

In reviewing the more detailed Surface Water risk maps provided by the environment agency, this indicates that the site is at low risk of flooding in isolated areas adjacent to the River Wey. Low risk flooding indicates that flooding will occur in a 1:100 to 1:1000 year storm event.



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm | 300 to 900mm | Below 300mm

The EA flooding groundwater flooding map indicates that flooding could occur to a depth of 300-900mm on the northeast edge of the site. This coincides with the lowest point within the site.

Therefore following the receipt of the EA information and as detailed in section 4.1, the likely flood level within the main site is 123.66 or lower for up to a 1:1000 storm event.

The SFRA does not provide any information for any specific flooding events within the Haslemere district.

4.4 Drainage and Sewerage Infrastructure Flooding

Flooding from foul and combined sewers occurs when rainfall exceeds the capacity of networks or when there is an infrastructure failure. Within the Haslemere area, the Thames Water network is primary a split system with surface and foul water networks.

The Sewer maps received indicate that, generally the area is served by a foul water network. There is also surface water drainage locally in the Sturt Avenue area, but the area is not widely served by a surface water network.

The surface water systems appear to drain to the River Wey.

We have not received any detail of any flooding events local to the site due to the failure or surcharging of the sewerage network.

4.5 Source Protection Zones

The site is partially located over a source protection zone 1.

The foul water will discharge directly to the mains drainage adjacent to the site.

Surface water will discharge to the River Wey via the drainage network and is protected by a Downstream Defender.

As the site is residential, the pollution indices are indicated below.

TABLE 26.2 Pollution hazard indices for different land use classifications

Land use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very low	0.2	0.2	0.05
Other roofs (typically commercial/ industrial roofs)	Low	0.3	0.2 (up to 0.8 where there is potential for metals to leach from the roof)	0.05
Individual property driveways, residential car parks, low traffic roads (eg cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4
Commercial yard and delivery areas, non-residential car parking with frequent change (eg hospitals, retail), all roads except low traffic roads and trunk roads/motorways[1]	Medium	0.7	0.6	0.7
Sites with heavy pollution (eg haulage yards, lorry parks, highly frequented lorry approaches to industrial estates, waste sites), sites where chemicals and fuels (other than domestic fuel oil) are to be delivered, handled, stored, used or manufactured; industrial sites; trunk roads and motorways[1]	High	0.8[2]	0.8[2]	0.9[2]

By providing a Downstream Defender, these indices are mitigated.

Hydro Products' Mitigation Indices

Hydro International

Proprietary treatment systems *	These must demonstrate that they can address each of the contaminant types to acceptable levels for frequent events up to approximately the 1 in 1 year return period event, for inflow concentrations relevant to the contributing drainage area. *

* Table 26.3, CIRIA C753 The SuDS Manual (2015)

Hydro Mitigation Indices

Product	TSS Index	Metals Index	Hydrocarbon Index
Up-Flo™ Filter	0.8	0.6 / 0.77	0.4
Hydro Biofilter™	0.9	0.92	0.8
First Defense®	0.5	0.37	0.4
Downstream Defender®	0.5	0.4	0.8

4.6 In summary the site is at low risk from flooding from all sources.

Whilst some isolated areas indicate a slightly elevated risk adjacent to the River Wey, this can be managed with a sequential approach to the design process.

5.0 Proposed Drainage Strategy

5.1 Foul Water Network

5.1.1 It is proposed for the Foul Water network to discharge to a new private foul water manhole on site, before discharging to the existing foul water sewer located in main accessway to the north of the River Wey.

It is proposed that the drainage will cross the river as part of the new bridge structure to be constructed.

It should be noted that the River Wey is classified as Main River any services crossing the river will require a Flood Activity Permit to be submitted prior to any works commencing on site.

5.1.2 In accordance with Sewers for Adoption, the proposed daily peak foul water discharge rate is based on 4000l/dwelling/day. For Dry weather flows this is reduced to 1/6 of this rate.

Based on the development proposals of 9 units, the average foul water dry weather discharge rate is 0.07 l/s.

5.2 Surface Water Network

5.2.1 The geology of the area is shown on British Geological Survey mapping which indicates the site is underlain by Head Deposits and Atherfield Clay formation. Both these materials are clay based strata.

The use of soakaways or other infiltration devices is unlikely to be suitable within the cohesive nature of these materials. The presence of public surface water sewers suggest surface water in this area typically discharges to public surface water sewers or watercourses.

5.2.2 Therefore, considering the hierarchy of discharge:

1. Infiltration into ground
2. Discharge to a watercourse
3. Discharge to a sewer

It is therefore proposed to discharge to the watercourse on the northern boundary of the site and mimic existing situation. Surface water runoff will be restricted via a HydroBrake flow control to mimic existing runoff rates, with additional runoff being attenuated in below ground cellular storage.

5.2.4 The sustainable drainage solutions have been designed using MicroDrainage software.

The drainage will accommodate surface water runoff for all storm events up to and including the 1 in 100yr + 40% allowance for climate change.

It is proposed to restrict the surface water runoff to QBAR via a HydroBrake flow control for all storm events. From the calculations for a 1:100 year event, Q100 based on QBAR is 18.2l/s discharge. This is the maximum discharge that the site will be limited to in all storm durations up to 1:100 plus 40% CCA.

5.2.5 The proposed impermeable area is 2475m2, including 10% for urban creep.

The proposed system will utilise an attenuation tank with a flow control device located to the northern side of the site. A traditional drainage system will connect to the attenuation tank.

A Hydrobrake will be fitted to the outflow of the attenuation tank. This will be limited to a maximum flow of 18.2l/s.

Therefore based on the Microdrainage calculation we would propose a tank of 120m2 by 600mm deep, providing approximately 68 cum of storage.

5.2.6 The headwall is proposed to be located 50m downstream of the bridge. The flood level at this point would be similar to that indicated for Point A outlined in section 4.1 above. This equates to a worst case level for the 1:100 plus 70% CCA of 122.950m

The invert of the outfall is indicated at 123.300m providing a 300mm freeboard on the discharge invert, therefore providing free flow from the drainage system with no backing up in all storm events.

An exemption for a Flood Risk Activity Permit will need to be obtained to allow works for the new headwall to be undertaken.

5.2.7 As part of the works, a new bridge will be provided across the River Wey. This will replace an existing timber structure supported on existing abutments.

It is proposed to replace this with a formal bridge structure designed to highway loadings and standards.

The proposed bridge structure has been designed and the outline detail is included within Appendix I

It is proposed as part of the works not to touch the bed of the stream so as not to affect the natural flow of the river. Also, bank protection will be provided where deemed necessary to prevent scour, and this will be assessed at detailed design stage.

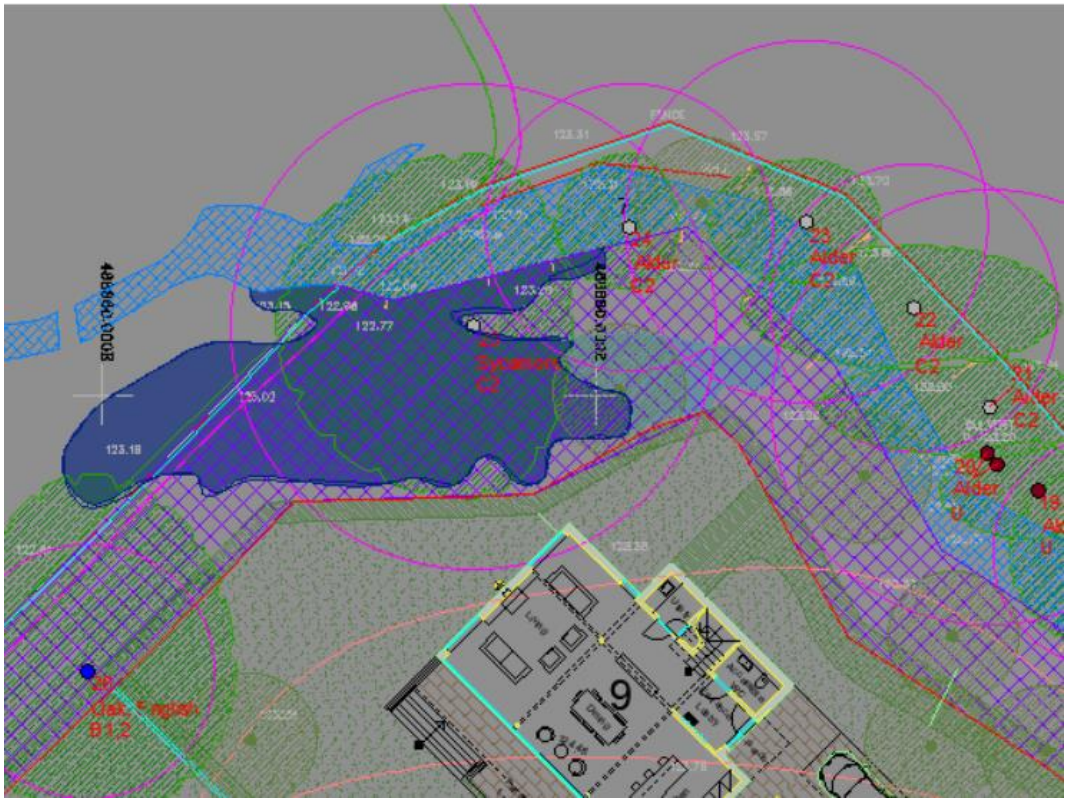
The abutment to the north will be similar in position, but the abutment to the south will move to create a wider free channel at the proposed bridge location.

The soffit is proposed to be at a level of approximately 124.330. This gives a minimum of 600m freeboard above the highest modelled flood level of 123.730m, which achieves the requirement of the EA.

The bridge will be private and maintenance will be managed via a maintenance contract as part of the overall site upkeep.

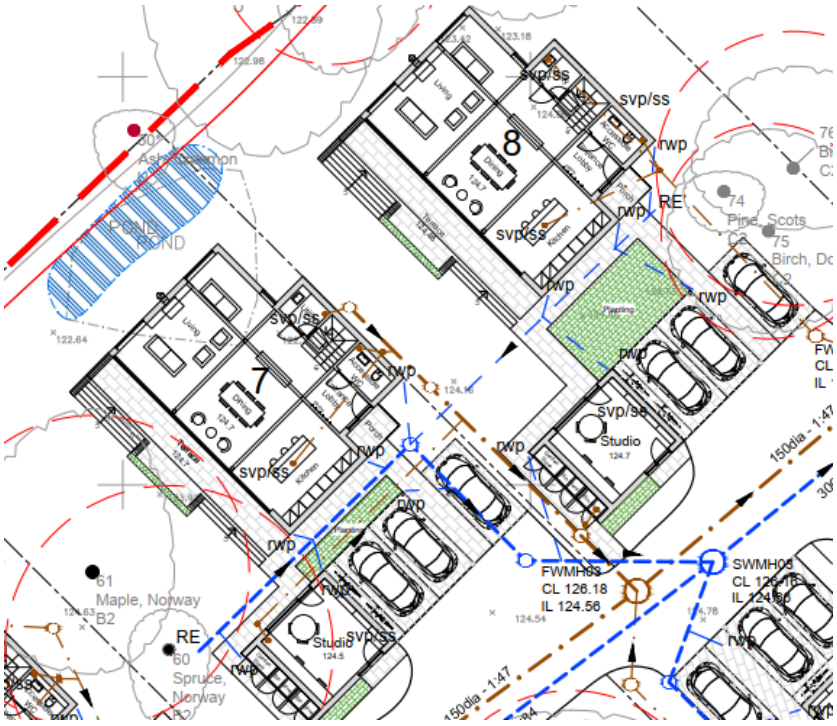
5.2.8 A proposed drainage scheme incorporating the above SuDS techniques is shown on SWH drawing 303383-SWH-ZZ-XX-DR-D-0500 and is attached in **Appendix H**.

5.2.9 Plot 9 sits fully within Flood Zone 1. The development red line sits outside of this area and the boundary to unit 9 will reflect this.



5.2.10 The EA commented that due to potential wet and waterlogged areas noted on site that the proposed finished floor levels of the properties should be raised to avoid any potential flooding of properties.

We would confirm that this has been incorporated where required into the design as already submitted.



The extract above shows properties on the north western side of the proposed development with steps up to the ground floor level from the higher side of the plot, indicating that the ground floor is protected from any potential water. Along the north western boundary This level difference is approximately a minimum of 450mm above existing ground levels. Along the south eastern boundary, the properties are a minimum of 150mm above proposed external levels. FFL's can be seen on the Drainage Strategy drawing in Appendix H.

This situation is also benefitted significantly by formally providing a drainage network to the site, allowing any surface water to drain away via the installed SUDS network.

5.2.11 It is proposed that the site will be landscaped. We would confirm that any landscaping features would be positioned away from the River Wey course and banks, and would not obstruct the water course in any flood situation.

5.2.12 To ensure drainage elements are maintained, maintenance of drainage should be covered by a suitable management company and subject to a regular maintenance regime. Maintenance of SuDS to be in accordance with CIRIA SuDS manual C753 where specific intervals are advised within the document as per element type.

6.0 Maintenance

6.1 This section sets out the inspection and maintenance requirements for long term management of the developments surface water drainage strategy. This work should be undertaken by a private maintenance company.

6.2 All those responsible for maintenance should take appropriate health, safety and welfare precautions for all activities including lone working, if relevant, and risk assessments should always be undertaken. The sites infrastructure Health and Safety File should be consulted before carrying out any works either inside or outside of the development's boundary and information regarding the location of existing utilities passed on to operatives.

6.3 The requirements of the Health and Safety at Work Act 1974 and The Construction (Design and Management) Regulations 2015 should be adhered to and any residual risks identified in the Health and Safety File should be managed and information passed on the maintenance operatives through task specific risk assessments.

There are three types of maintenance activities associated with surface water drainage systems. The SuDS Manual, CIRIA C753, defines these as:

- Regular Maintenance – 'basic tasks undertaken on a frequent and predictable schedule' including vegetation management, litter and debris removal, and inspections.'

- Occasional Maintenance – 'tasks that are likely to be required periodically, but on a much less frequent and predictable basis than the routine tasks (sediment removal is an example).'

- Remedial Maintenance – 'intermittent tasks that may be required to rectify faults associated with the system, although the likelihood of faults can be minimised by google design. Where remedial work is found to be necessary, it is likely to be due to site-specific characteristics or unforeseen events, and as such timings are difficult to predict.'

Typical operation and maintenance activities of the key SuDS components are shown in Table 32.1 of Ciria C753 – SuDS Manual 2015. The table, showing typical operation and maintenance activities of the SuDS components used on site, has been reproduced below followed by a summary of the maintenance requirements for each of the SuDS components.

Operation and Maintenance Activity	SuDs Component	
	Piped Network / Inspection Chambers	**Cellular / Modular Storage**
Regular Maintenance		
Inspection	■	■
Litter and debris removal	■	□
Grass cutting		
Weed and invasive plant control		
Shrub management (including pruning)		
Occasional Maintenance		
Sediment management	■	■
Vacuum sweeping and brushing		
Remedial Maintenance		
Structure rehabilitation/ repair	□	□
Infiltration Surface Reconditioning		
■ **Will be required** □ **May be required**		

Extract from The SuDs Manual Table 32.1: Typical key SuDs components operation and maintenance activities

The operation and maintenance requirements for the piped network/chambers on site is summarised in the table below:

Piped Network/Chambers Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspect and identify any features that are not operating correctly. If required take remedial action	Monthly for three months, then six monthly.
	Debris removal from catchment surface / gratings (where may cause risks to performance)	Monthly (and after large storms)
	Remove sediment from trapped sumps, manholes and catchpits.	Annually or as required
Remedial Maintenance	Repair / rehabilitation of gratings, inlets and outlets	As required
Monitoring	Inspect / check all gratings, trapped sumps, manholes and catchpits to ensure that they are in good condition and operating as designed	Annually and after large storm events
Structure Rehabilitation / Repair	Regular Maintenance and Monitoring to identify if repair and / or replacement of features or pipework is required.	As required

The operation and maintenance requirements for the cellular soakaways on site is summarised in the table below:

Cellular Storage Maintenance Schedule	Required Action	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
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

Source: The SuDS Manual 2016

6.5 During the construction stage, the below ground drainage system and the SuDS components will not be installed and/or fully operational. The contractor will therefore have to provide suitable measures to discharge the surface water from the site during the construction period in order to mitigate the off-site impact of surface water run-off from the construction site.

6.6 The landowner will be responsible for ensuring that the infiltration SuDS units within the development are maintained over the lifetime of the development, unless the SuDS component(s) have been adopted.

7.0 Summary and Conclusions

7.1 The development is located in Flood Zone 1 on the EA Flood Maps. Therefore, the site is not considered to be at risk of fluvial or tidal flooding and will not require mitigation against these sources of flooding.

7.2 The proposed development will result in an increase in the impermeable area of the post-developed site. The surface water runoff from the proposed development will discharge into the existing River Wey, located on the northern boundary of the site at a maximum rate of 18.2 l/sec. This flow will be controlled by an attenuation tank and hydrobrake.

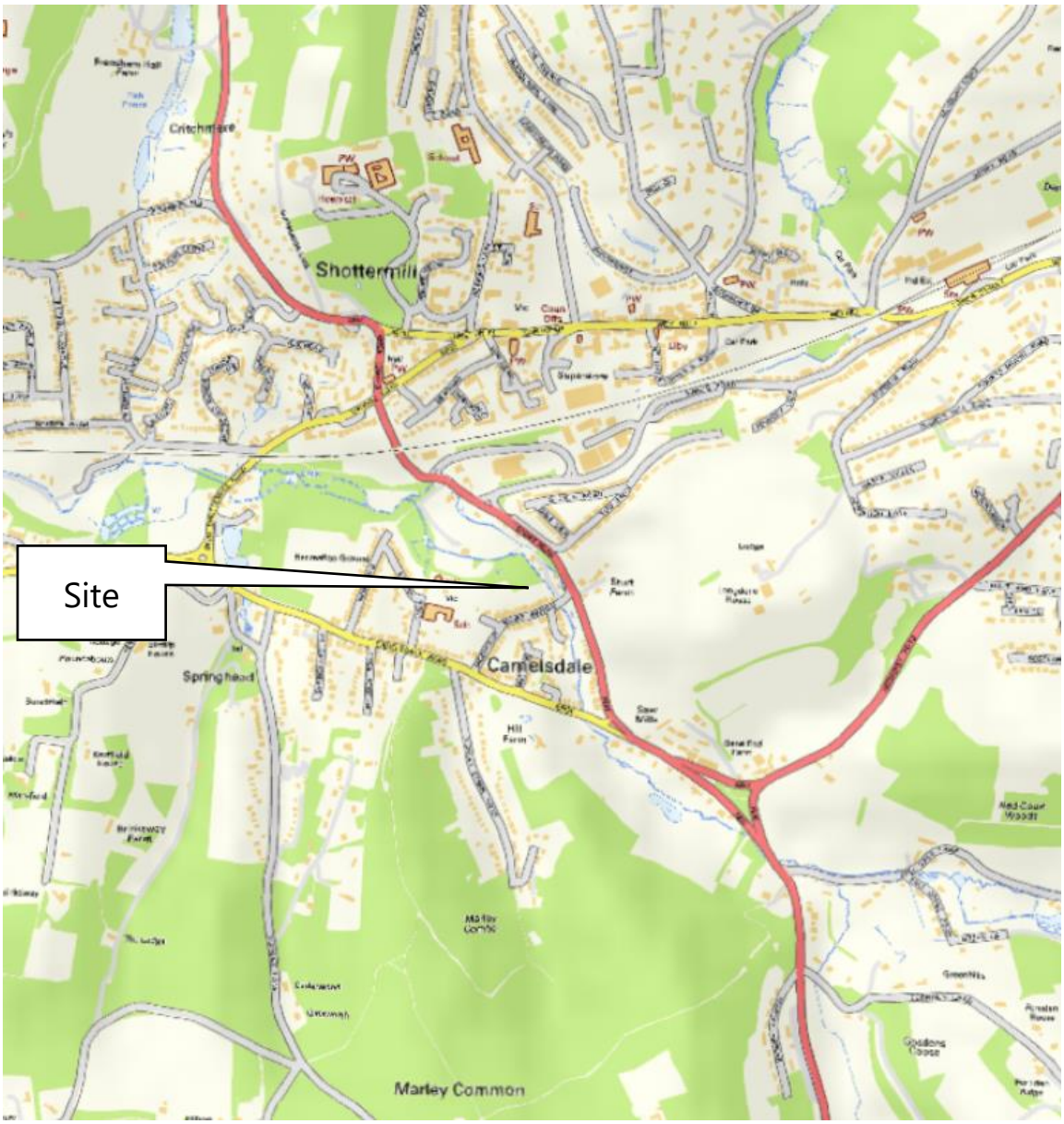
7.3 The attenuation tank will be 120m2 x 0.6m deep to achieve the storage for the flow control.

7.4 Based on flood level modelling data from the Environment Agency, the highest likely level of flooding at the site access bridge location is 123.660m. Further down stream adjacent to the main site, this level will be lower as the site falls away.

7.5 Groundwater levels have been found to be typically 0.8m to 1.3m below ground level. This is believed to be close to the annual peak level. Due to the low permeability of the material natural flows both horizontal and vertical flows from ground water will be very limited if at all. This will be managed by the SUDS system that will be installed.

7.6 The site will significantly benefit from the attenuation measures put in place to control the discharge and flows of waters in a storm event. This will not only provide benefit to the site, but also to the wider surface water catchment.

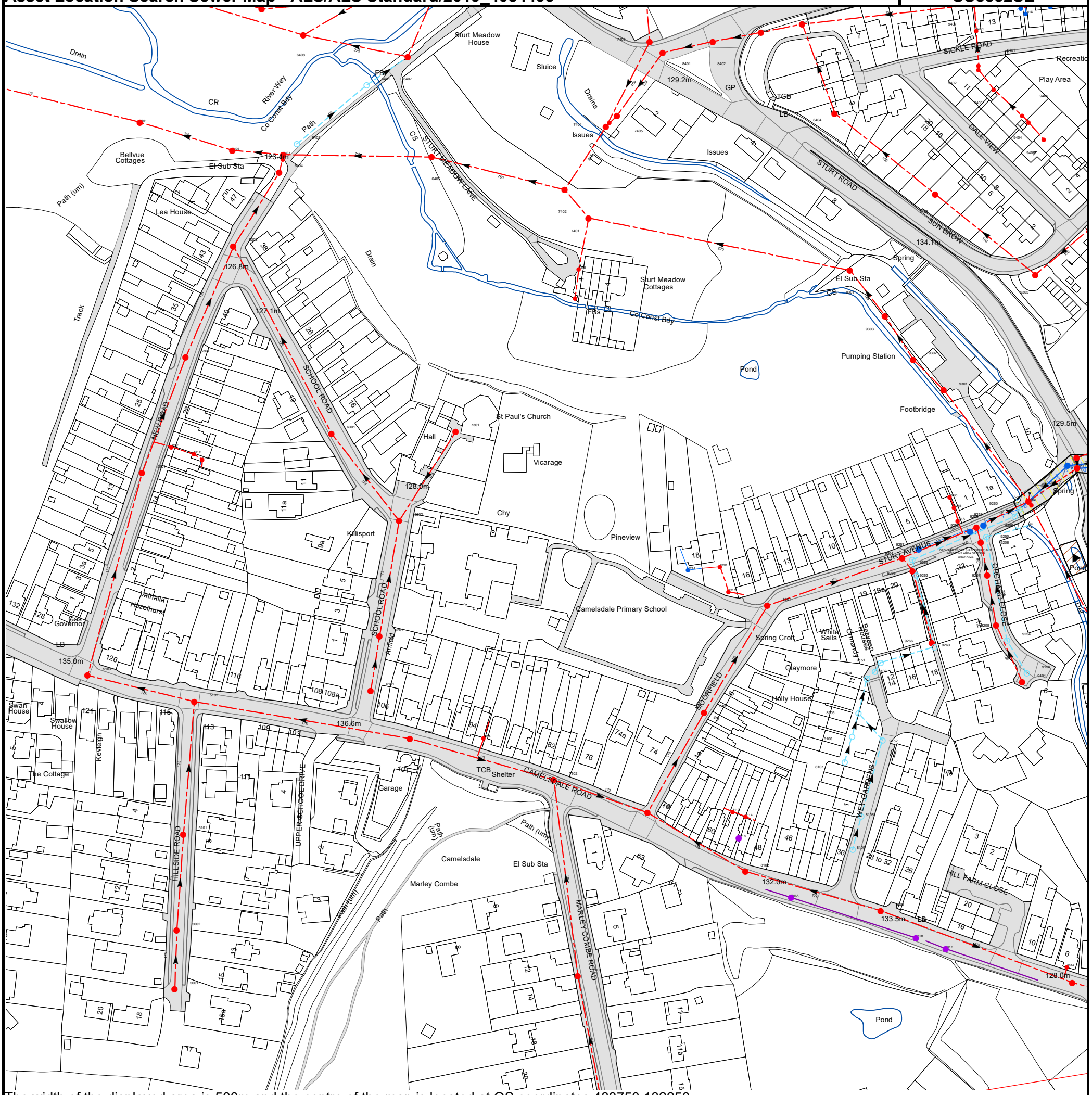
Appendix A
Site Location Plan



Appendix B
Sewer Record Mapping

Asset Location Search Sewer Map - ALS/ALS Standard/2019_4084493

SU8832SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 488750,132250

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. Stationery Office, License no. 100019345 Crown Copyright Reserved.

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

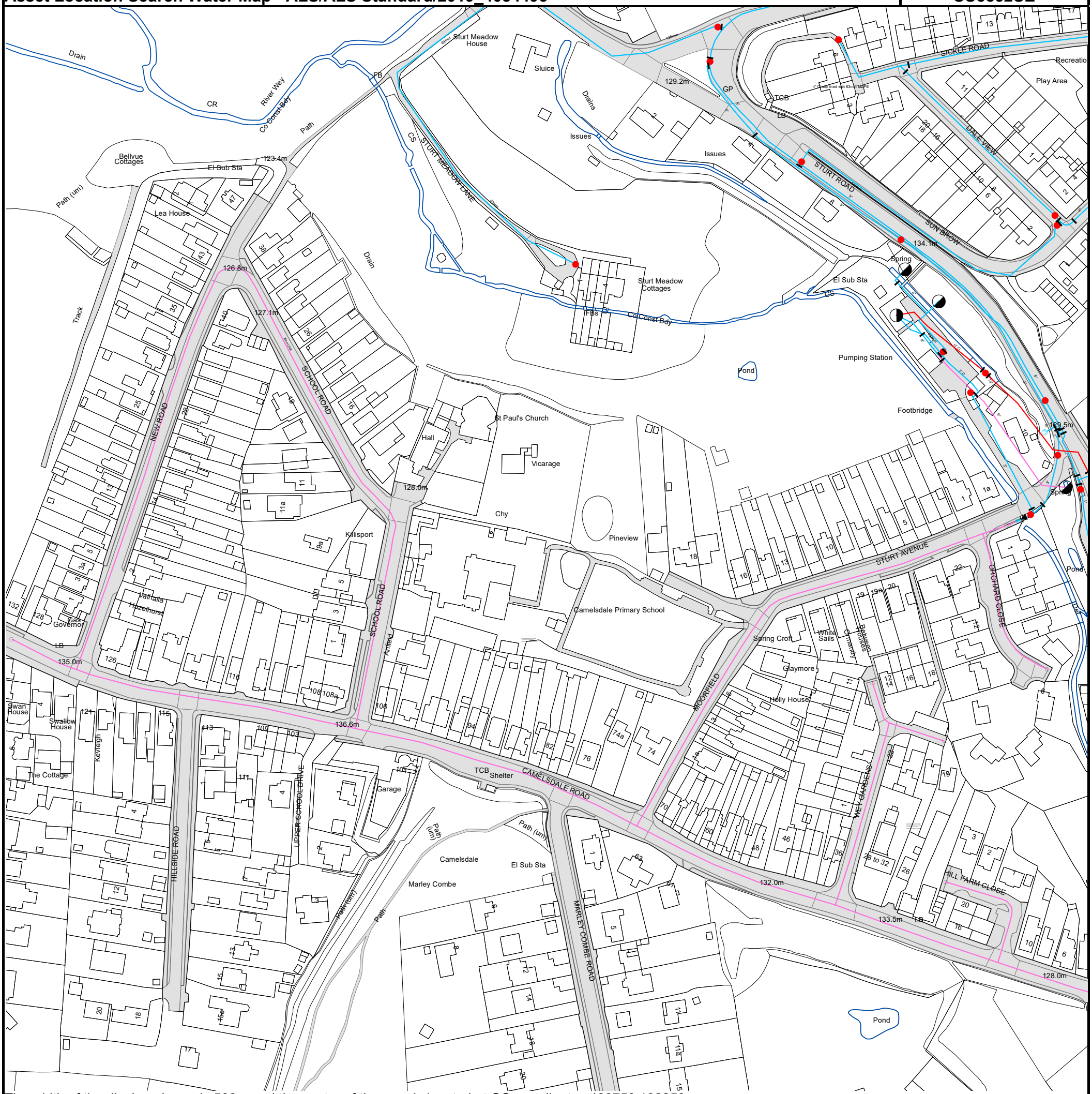
Abandoned Sewer

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 Insight on 0845 070 9148.

Asset Location Search Water Map - ALS/ALS Standard/2019_4084493

SU8832SE



The width of the displayed area is 500m and the centre of the map is located at OS coordinates 488750,132250

ALS Water Map Key

Water Pipes (Operated & Maintained by Thames Water)

4"

Distribution Main: The most common pipe shown on water maps. With few exceptions, domestic connections are only made to distribution mains.

16"

Trunk Main: A main carrying water from a source of supply to a treatment plant or reservoir, or from one treatment plant or reservoir to another. Also a main transferring water in bulk to smaller water mains used for supplying individual customers.

3" SUPPLY

Supply Main: A supply main indicates that the water main is used as a supply for a single property or group of properties.

3" FIRE

Fire Main: Where a pipe is used as a fire supply, the word FIRE will be displayed along the pipe.

3" METERED

Metered Pipe: A metered main indicates that the pipe in question supplies water for a single property or group of properties and that quantity of water passing through the pipe is metered even though there may be no meter symbol shown.

Transmission Tunnel: A very large diameter water pipe. Most tunnels are buried very deep underground. These pipes are not expected to affect the structural integrity of buildings shown on the map provided.

Proposed Main: A main that is still in the planning stages or in the process of being laid. More details of the proposed main and its reference number are generally included near the main.

Valves

- General Purpose Valve
- Air Valve
- Pressure Control Valve
- Customer Valve

Hydrants

- Single Hydrant

Meters

- Meter

End Items

Symbol indicating what happens at the end of a water main.

- Blank Flange
- Capped End
- Emptying Pit
- Undefined End
- Manifold
- Customer Supply
- Fire Supply

Operational Sites

- Booster Station
- Other
- Other (Proposed)
- Pumping Station
- Service Reservoir
- Shaft Inspection
- Treatment Works
- Unknown
- Water Tower

Other Symbols

- Data Logger

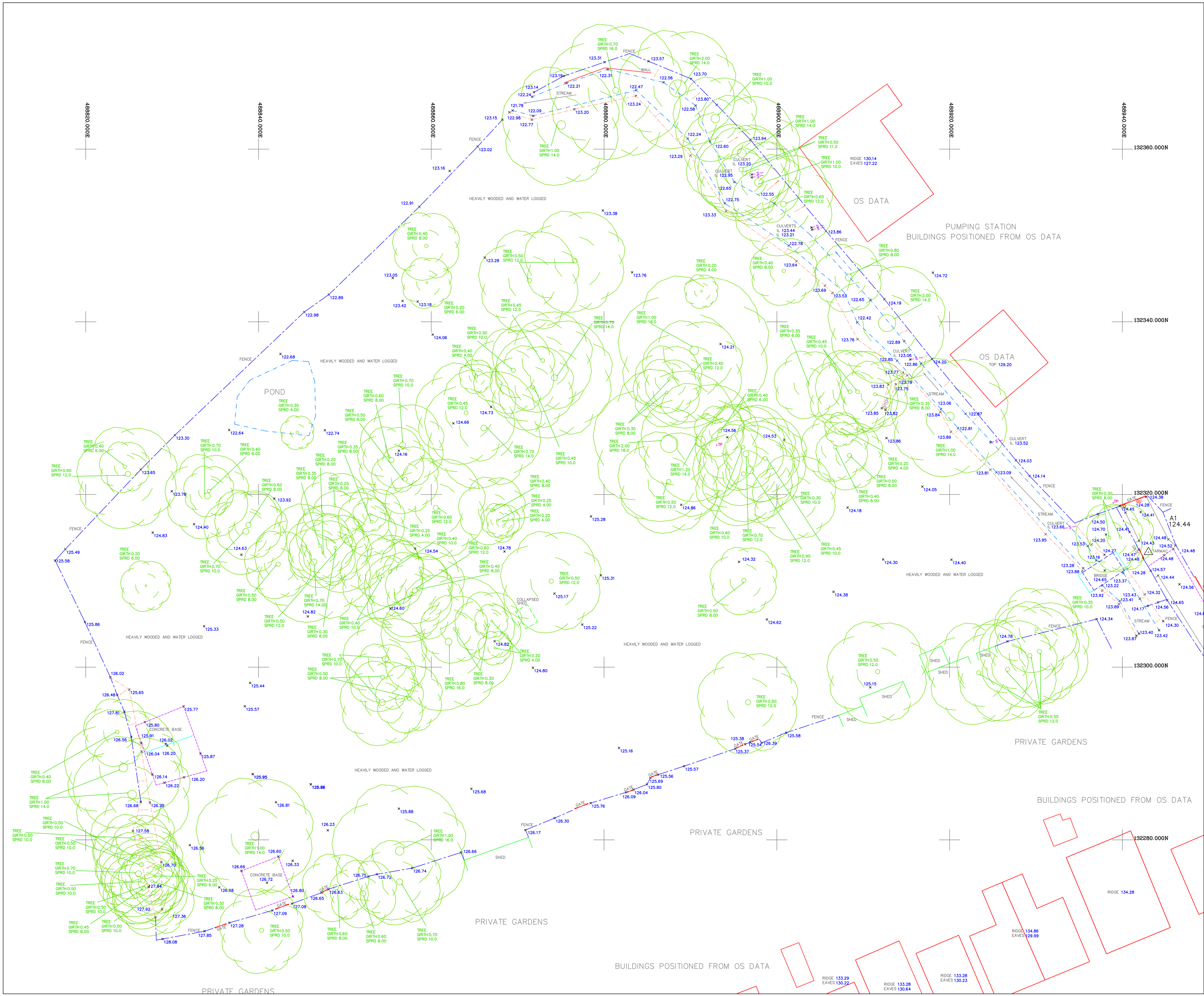
PIPE DIAMETER	DEPTH BELOW GROUND
Up to 300mm (12")	900mm (3')
300mm - 600mm (12" - 24")	1100mm (3' 8")
600mm and bigger (24" plus)	1200mm (4')

Other Water Pipes (Not Operated or Maintained by Thames Water)

Other Water Company Main: Occasionally other water company water pipes may overlap the border of our clean water coverage area. These mains are denoted in purple and in most cases have the owner of the pipe displayed along them.

Private Main: Indiates that the water main in question is not owned by Thames Water. These mains normally have text associated with them indicating the diameter and owner of the pipe.

Appendix C
Existing Site Layout



Topographical Abbreviations

A/R	Assumed Route	MKR	Marker
BH	Borehole	MT	Mercury Telecom Cover
BOL	Bollard	OHC	Overhead Cable
BT	British Telecom Cover	OHP	Overhead Pipe
BW	Barbed Wire Fence	OSBM	Ordnance Survey Bench Mark
BWK	Brickwork	PB	Post Box
CATV	Cable TV Cover	PGM	Permanent Ground Marker
CB	Close Boarded Fence	PR	Post & Rail Fence
CCTV	Closed Circuit TV	PW	Post & Wire Fence
CHLK	Chainlink Fence	PWM	Post & Wire Mesh Fence
CHPL	Chestnut Paling Fence	RE	Rodding Eye
CL	Cover Level	RG	Road Gully
CM	Cable Marker	RN	Road Name
CP	Catch Pit	RS	Road Sign
CPL	Catch Pit Base Level	RW	Retaining Wall
DIA	Diameter	RWP	Rain Water Pipe
DK	Drop Kerb	SAP	Sapling
DP	Down Pipe	SC	Stop Cock
EJB	Electricity Junction Box	SPR	Spread
EC	Electricity Cover	STA	Traverse Station
EP	Electricity Pole	SV	Stop Valve
ER	Earthing Rod	SVP	Soil Vent Pipe
FH	Fire Hydrant	SW	Storm Water
FIG	Feed Into Ground	TB	Telephone Box
FW	Foul Water	TBM	Temporary Bench Mark
GU	Gully	TFR	Taken From Records
GV	Gas Valve	TJB	Telephone Junction Box
H	Height	TPT	Trial Pit
IC	Inspection Cover	TL	Traffic Light
IL	Invert Level	TP	Telephone Pole
IR	Iron Railing Fence	UTL	Unable To Lift
KO	Kerb Outlet	UTT	Unable To Trace
LB	Litter Bin	VP	Vent Pipe
LC	Lamp Column	WKH	Water Key Hole
LP	Lamp Post	WM	Water Meter
MH	Manhole	WV	Water Valve
		- - -	Approximate

Survey Station Information

STA No.	Easting	Northing	Level	Type
STN A1	488943.016	132313.326	124.44	Nail
STN A2	488963.281	132286.127	125.03	Nail

Notes

SITE BEING CLEARED AT TIME OF SURVEY

Grid: Survey is based on a modified Ordnance Survey National Grid (OSGB36), site centered with a scale factor of 1 applied.

Values have been derived via GPS using the OS active network using the OSTN02 transformation and OSGM02 geoid model.

Level datum: Ordnance Datum Newlyn (ODN).

Rev	QA Check	Description	Date
5	-	-	-
4	-	-	-
3	-	-	-
2	-	-	-
1	-	-	-
0	GR	First Complete Issue	11-01-2016
Prelim	-	Preliminary - Not Complete	-

SURVEYED BY
STH SURVEYS
16 St NICHOLAS DRIVE
SHEPPERTON
MIDDX
TW17 9LD

TEL 01932 221358
CELL 07939 100008
E-MAIL info@sthsurveys.com
www.sthsurveys.com

STH Surveys is the trading name for Reed Geomatics Limited

SURVEYED	SR	CLIENT:
DRAWN	SR	Casacoevo
SCALE	1:200	

TOPOGRAPHICAL SURVEY

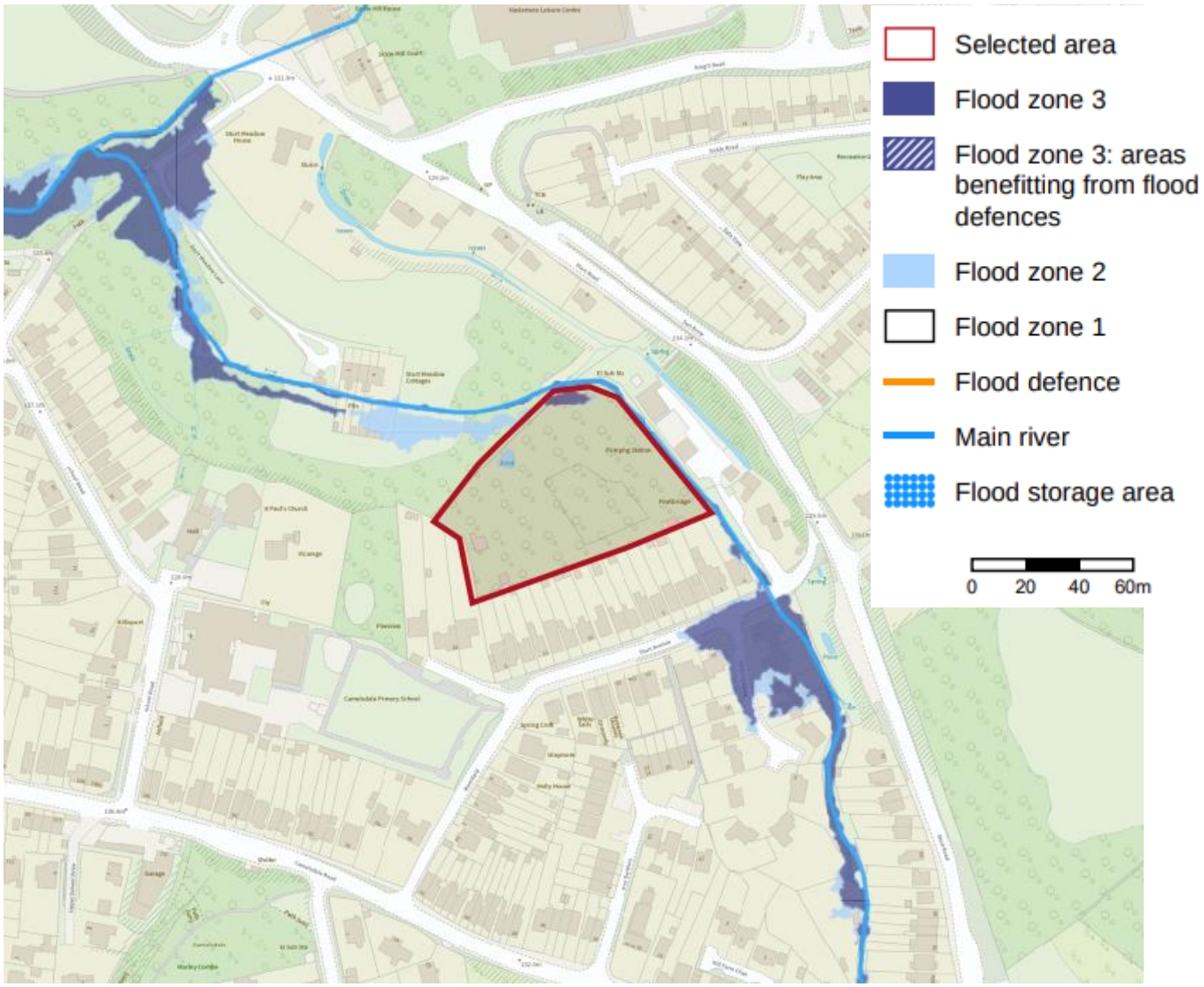
ADDRESS:

LAND AT STURT AVE HAZELMERE, GU27 3SJ

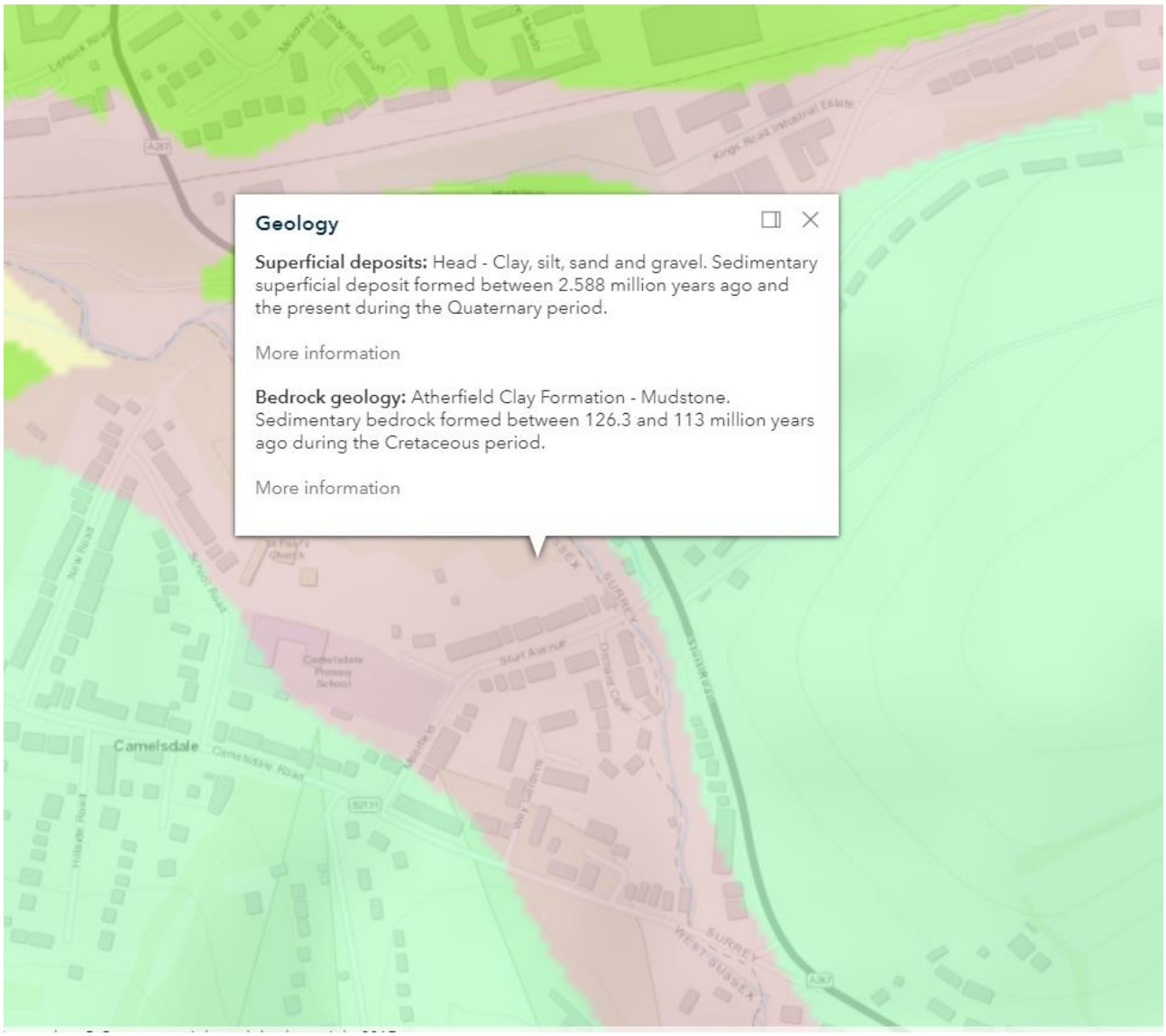
JOB No	DRAWING NUMBER
T15/677	T15/677-01

A1 Sheet - 841mm X 594mm

Appendix D
Environment Agency Flood Mapping



Appendix E
Geology Maps



Appendix F
Proposed Site Layout

0 10m 20m 50m

- INDICATIVE HARD LANDSCAPING
- INDICATIVE SOFT LANDSCAPING
- ADAPTED POND
- PROPOSED NEW ROAD
- EXISTING TREES RETAINED
- ROOT PROTECTION ZONE
- EXISTING STREAM
- NEW BOUNDARIES
- ECOLOGICAL BUFFER ZONE
- EA Flood Zone 2
- EA Flood Zone 3
- INDICATIVE CONTOURS EACH LINE DENOTES A CHANGE IN LEVEL BY APPROXIMATELY 0.5M

N

New Bridge

Sturt Avenue

OS DATA

PUMPING STATION
BUILDINGS POSITIONED FROM OS DATA

BUILDINGS POSITIONED FROM OS DATA

PRIVATE GARDENS

PLANNING	15 11 23	DL	SC	P2
PLANNING	22 07 21	VS	SC	P1
FEASIBILITY	20 09 16	DL	SC	F2
FEASIBILITY	04 02 16	VD	SC	F1
Amendment	Date	Dn	Ck	Rev

The Douglas Stephen Partnership
134 Old Street London EC1V 9BL
020 7336 7884
info@dsparchitecture.co.uk
www.dsparchitecture.co.uk

dsp architecture

Project
STURT AVENUE

Title
Site Layout

Status
Planning

Scale
1:500@A3

Drawing No.
STU 001

Rev.
P2

Appendix G
MicroDrainage Calculations

IH 124 Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	0.693	Urban	0.000
SAAR (mm)	800	Region Number	Region 6

Results l/s

QBAR Rural	5.7
QBAR Urban	5.7
Q100 years	18.2
Q1 year	4.8
Q2 years	5.0
Q5 years	7.3
Q10 years	9.2
Q20 years	11.4
Q25 years	12.2
Q30 years	12.9
Q50 years	14.9
Q100 years	18.2
Q200 years	21.4
Q250 years	22.4
Q1000 years	29.4

Warning: It is unusual to use the IH124 method with an area < 50ha. The Interim Code of Practice recommends that the IH124 method is applied with 50ha and the resulting discharge is linearly interpolated for the required area. The ICP SUDS tab will do this automatically.

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

Half Drain Time : 36 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	124.013	0.413	0.0	18.2	18.2	47.1	O K
30 min Summer	124.093	0.493	0.0	18.2	18.2	56.2	O K
60 min Summer	124.116	0.516	0.0	18.2	18.2	58.8	O K
120 min Summer	124.077	0.477	0.0	18.2	18.2	54.4	O K
180 min Summer	124.010	0.410	0.0	18.2	18.2	46.7	O K
240 min Summer	123.940	0.340	0.0	18.2	18.2	38.7	O K
360 min Summer	123.828	0.228	0.0	18.2	18.2	26.0	O K
480 min Summer	123.753	0.153	0.0	18.1	18.1	17.4	O K
600 min Summer	123.706	0.106	0.0	17.7	17.7	12.1	O K
720 min Summer	123.684	0.084	0.0	16.5	16.5	9.5	O K
960 min Summer	123.658	0.058	0.0	13.8	13.8	6.6	O K
1440 min Summer	123.630	0.030	0.0	10.4	10.4	3.4	O K
2160 min Summer	123.608	0.008	0.0	7.7	7.7	0.9	O K
2880 min Summer	123.600	0.000	0.0	6.2	6.2	0.0	O K
4320 min Summer	123.600	0.000	0.0	4.5	4.5	0.0	O K
5760 min Summer	123.600	0.000	0.0	3.6	3.6	0.0	O K
7200 min Summer	123.600	0.000	0.0	3.0	3.0	0.0	O K
8640 min Summer	123.600	0.000	0.0	2.6	2.6	0.0	O K
10080 min Summer	123.600	0.000	0.0	2.3	2.3	0.0	O K
15 min Winter	124.077	0.477	0.0	18.2	18.2	54.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	132.376	0.0	61.7	16
30 min Summer	88.746	0.0	82.4	29
60 min Summer	56.713	0.0	105.6	46
120 min Summer	34.939	0.0	130.1	80
180 min Summer	25.903	0.0	144.5	114
240 min Summer	20.805	0.0	154.7	146
360 min Summer	15.298	0.0	170.8	206
480 min Summer	12.279	0.0	182.8	262
600 min Summer	10.345	0.0	192.3	316
720 min Summer	8.988	0.0	200.5	374
960 min Summer	7.193	0.0	214.0	492
1440 min Summer	5.245	0.0	234.1	736
2160 min Summer	3.816	0.0	255.5	1100
2880 min Summer	3.042	0.0	271.6	0
4320 min Summer	2.205	0.0	295.3	0
5760 min Summer	1.753	0.0	313.0	0
7200 min Summer	1.468	0.0	327.6	0
8640 min Summer	1.270	0.0	340.2	0
10080 min Summer	1.124	0.0	351.2	0
15 min Winter	132.376	0.0	68.9	17

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	124.173	0.573	0.0	18.2	18.2	65.3	O K
60 min Winter	124.196	0.596	0.0	18.2	18.2	67.9	O K
120 min Winter	124.132	0.532	0.0	18.2	18.2	60.6	O K
180 min Winter	124.028	0.428	0.0	18.2	18.2	48.8	O K
240 min Winter	123.915	0.315	0.0	18.2	18.2	36.0	O K
360 min Winter	123.760	0.160	0.0	18.1	18.1	18.2	O K
480 min Winter	123.690	0.090	0.0	17.1	17.1	10.2	O K
600 min Winter	123.666	0.066	0.0	14.7	14.7	7.5	O K
720 min Winter	123.650	0.050	0.0	12.9	12.9	5.7	O K
960 min Winter	123.630	0.030	0.0	10.4	10.4	3.4	O K
1440 min Winter	123.608	0.008	0.0	7.7	7.7	0.9	O K
2160 min Winter	123.600	0.000	0.0	5.6	5.6	0.0	O K
2880 min Winter	123.600	0.000	0.0	4.5	4.5	0.0	O K
4320 min Winter	123.600	0.000	0.0	3.2	3.2	0.0	O K
5760 min Winter	123.600	0.000	0.0	2.6	2.6	0.0	O K
7200 min Winter	123.600	0.000	0.0	2.1	2.1	0.0	O K
8640 min Winter	123.600	0.000	0.0	1.9	1.9	0.0	O K
10080 min Winter	123.600	0.000	0.0	1.6	1.6	0.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	88.746	0.0	92.2	30
60 min Winter	56.713	0.0	118.4	48
120 min Winter	34.939	0.0	145.4	88
180 min Winter	25.903	0.0	162.0	124
240 min Winter	20.805	0.0	173.3	154
360 min Winter	15.298	0.0	191.1	210
480 min Winter	12.279	0.0	204.6	258
600 min Winter	10.345	0.0	215.4	316
720 min Winter	8.988	0.0	224.6	376
960 min Winter	7.193	0.0	239.7	492
1440 min Winter	5.245	0.0	262.2	736
2160 min Winter	3.816	0.0	286.2	0
2880 min Winter	3.042	0.0	304.1	0
4320 min Winter	2.205	0.0	330.7	0
5760 min Winter	1.753	0.0	350.6	0
7200 min Winter	1.468	0.0	366.9	0
8640 min Winter	1.270	0.0	381.0	0
10080 min Winter	1.124	0.0	393.4	0

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	0.354	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.248

Time (mins) From:	To:	Area (ha)
0	4	0.248

Model Details

Storage is Online Cover Level (m) 125.500

Cellular Storage Structure

Invert Level (m) 123.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	120.0	0.0	0.601	0.0	0.0
0.600	120.0	0.0			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0194-1820-0700-1820
Design Head (m)	0.700
Design Flow (l/s)	18.2
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	194
Invert Level (m)	123.500
Minimum Outlet Pipe Diameter (mm)	225
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.700	18.2
Flush-Flo™	0.296	18.2
Kick-Flo®	0.542	16.1
Mean Flow over Head Range	-	14.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	6.7	1.200	23.5	3.000	36.5	7.000	55.1
0.200	17.7	1.400	25.3	3.500	39.4	7.500	56.6
0.300	18.2	1.600	27.0	4.000	42.0	8.000	58.5
0.400	17.9	1.800	28.6	4.500	44.4	8.500	60.3
0.500	16.9	2.000	30.1	5.000	46.8	9.000	62.1
0.600	16.9	2.200	31.5	5.500	49.0	9.500	63.8
0.800	19.4	2.400	32.8	6.000	51.1		
1.000	21.6	2.600	34.1	6.500	53.1		

Appendix H
Drainage Scheme

KEY:

- Site Boundary
- Proposed Surface Water
- Proposed Foul Water Sewer
- Proposed Surface Water Chamber
- Proposed Foul Water Chamber
- Proposed Attenuation Tank
- RE — Indicative Rodding eye
- rwp — Indicative Rainwater pipe
- svp/ss — Indicative Internal soil vent pipe
- Tree root protection

NORTH

SWMH05 CL 125.74 IL 124.24
FWMH04 CL 125.80 IL 123.82
SWMH04 CL 125.98 IL 124.48
FWMH03 CL 126.00 IL 124.20
SWMH03 CL 126.18 IL 124.56
FWMH02 CL 126.46 IL 125.08
SWMH02 CL 126.46 IL 124.96
FWMH01 CL 126.55 IL 125.20
SWMH01 CL 126.55 IL 125.05
SWMH09 - Downstream Defender incorporated CL 125.25 IL 123.39
SWMH06 CL 125.56 IL 124.08
FWMH05 CL 125.58 IL 123.49
SWMH07 Catchpit CL 125.38 IL 123.91
SWMH08 Hydrobreak Head - 0.8m Flow rate - 18.2l/s CL 125.56 IL 123.53
FWMH06 CL 125.33 IL 123.46
FWMH05 CL 125.33 IL 122.88
FW Outfall CL 124.50 IL 122.79 tbc
SW Outfall Minimum of 50m from Bridge Construction IL 123.30
Attenuation Tank Size = 120m² Max volume = 68.4m³ Max water level = 124.196 CL - 125.13 (min) CL - 124.20 IL - 123.60
225dia
300dia - 1:84
150dia - 1:47
150dia - 1:65
NEW BRIDGE
OS DATA
PUMPING STATION BUILDINGS POSITIONED FROM OS DATA
BUILDINGS POSITIONED FROM OS DATA
PRIVATE GARDENS
PRIVATE GAR
SM Goat Willow
Indicative connection levels subject to utility survey
Proposed road and bridge levels to be raised above existing ground levels due to potential risk flooding from existing stream and provide suitable cover to proposed attenuation tank.
Shape and position of proposed attenuation tank to fall in road and miss the existing root protection areas.
Proposed attenuation tank to be surrounded with concrete for floatation protection against existing ground water levels. Depth of concrete to be confirmed subject to detailed design by tank supplier.

DO NOT SCALE FROM THIS DRAWING

PRELIMINARY - NOT FOR CONSTRUCTION

Notes

GENERAL

- This drawing is to be read in conjunction with all relevant Engineers and Architects drawings and with the Specification.
- For setting out refer to Architects drawings.
- All dimensions are in millimetres and levels are in metres unless noted otherwise.
- Contractor to take all relevant dimensions on site. Any discrepancies to be advised to the Engineer.
- Contractor to check/scan for services prior to construction to avoid any damage during works.

DRAINAGE

- Any information given on this drawing regarding existing services is believed to be correct. The contractor must check this information and determine the nature and location of other existing services from the various statutory authorities before commencing excavation works.
- Drainage works to be constructed in accordance with BS EN 752 and Approved Document H
- All soft spots and unacceptable material encountered in drainage excavations is to be removed and replaced with granular material to the requirements of the building control officer.
- Pipes to be installed to manufacturers recommendations.
- Pipes under buildings to be laid to a fall of 1:40 minimum unless noted otherwise.
- Plastic plain wall pipes to be PVC-U to BS EN 1401-1, class SN4, with flexible joints, Kitemark certified. Structured wall plastic pipes to be to WIS 04-35-01, Kitemark certified
- Clay pipes to be vitrified clay to BS EN 295-1, with flexible joints, Kitemark certified. Clayware pipes must be extra strength classification protected in accordance with the specified details.
- Concrete pipes to be precast concrete to BS 5911-1 and BS EN 1916, with flexible joints.
- Bedding of pipes to be in accordance with approved document H1.
- Rocker pipes with flexible joints are to be provided at a distance of 150mm and 750mm from the face of construction to manholes, where pipes pass above, below or through ground beams or foundations; at gully connections and soil stack ends.
- Manhole access covers are to be located at the outgoing side of manholes.
- Cover levels are to be fixed on site to suit finished levels. Covers and frames to BS EN124, Grade D to be used in areas subject to heavy vehicular loading, Grade C in areas subject to light vehicular loading and Grade B to be used elsewhere.
- All pipes to be 100Ø unless noted otherwise.
- Manhole positions and level information is indicative only to be confirmed by Architect.
- Access points to be located at base of all rwps and svps.
- All gullies to be trapped
- Positions of SVP's and RWP's is indicative only and should be read in conjuction with Architects drawings.
- Hydrobreak information based on 1 in 100yr + 40% climate control.

HAZARDS LEADING TO UNUSUAL OR SIGNIFICANT RISKS DURING THE CONSTRUCTION PROCESS ARE IDENTIFIED ON THIS DRAWING AS:

NOTE: THE LIST BELOW IDENTIFIES CERTAIN RISKS WHICH ARE DEEMED TO BE UNUSUAL, ABNORMAL OR UNEXPECTED TO A COMPETENT CONTRACTOR CARRYING OUT WORK OF THIS NATURE BUT DOES NOT COVER ALL POSSIBLE SITUATIONS WHICH MAY BE ENCOUNTERED DURING THE CONSTRUCTION PROCESS. IT IS THEREFORE THE MAIN CONTRACTOR'S RESPONSIBILITY TO IDENTIFY ANY FURTHER RISKS/HAZARDS AND TAKE APPROPRIATE ACTION.

RISKS/HAZARDS SPECIFIC TO THIS DRAWING:

Rev.	Amendment	Drn.	Chkd.	Appd.	Date
P07	General Update	TK	RH	RH	01.12.23
P06	Downstream Defender Added	TK	RH	RH	28.03.22
P05	Outfall position updated	TK	RH	RH	22.10.21
P04	Site Layout and drainage details updated.	TK	RH	RH	21.07.21
P03	Site Layout and drainage details updated.	TK	RH	RH	02.07.21
P02	Site Layout updated and drainage details added.	TK	RH	RH	01.07.21
P01	Preliminary Issue	TK	RH	RH	28.06.21

Project

Sturt Avenue, Haslemere

Drawing

Drainage Strategy

Client

Pegasus Group

Scott White and Hookins
Structural Engineering | Civil Engineering | Sustainability and BREEAM | CDM Consultancy

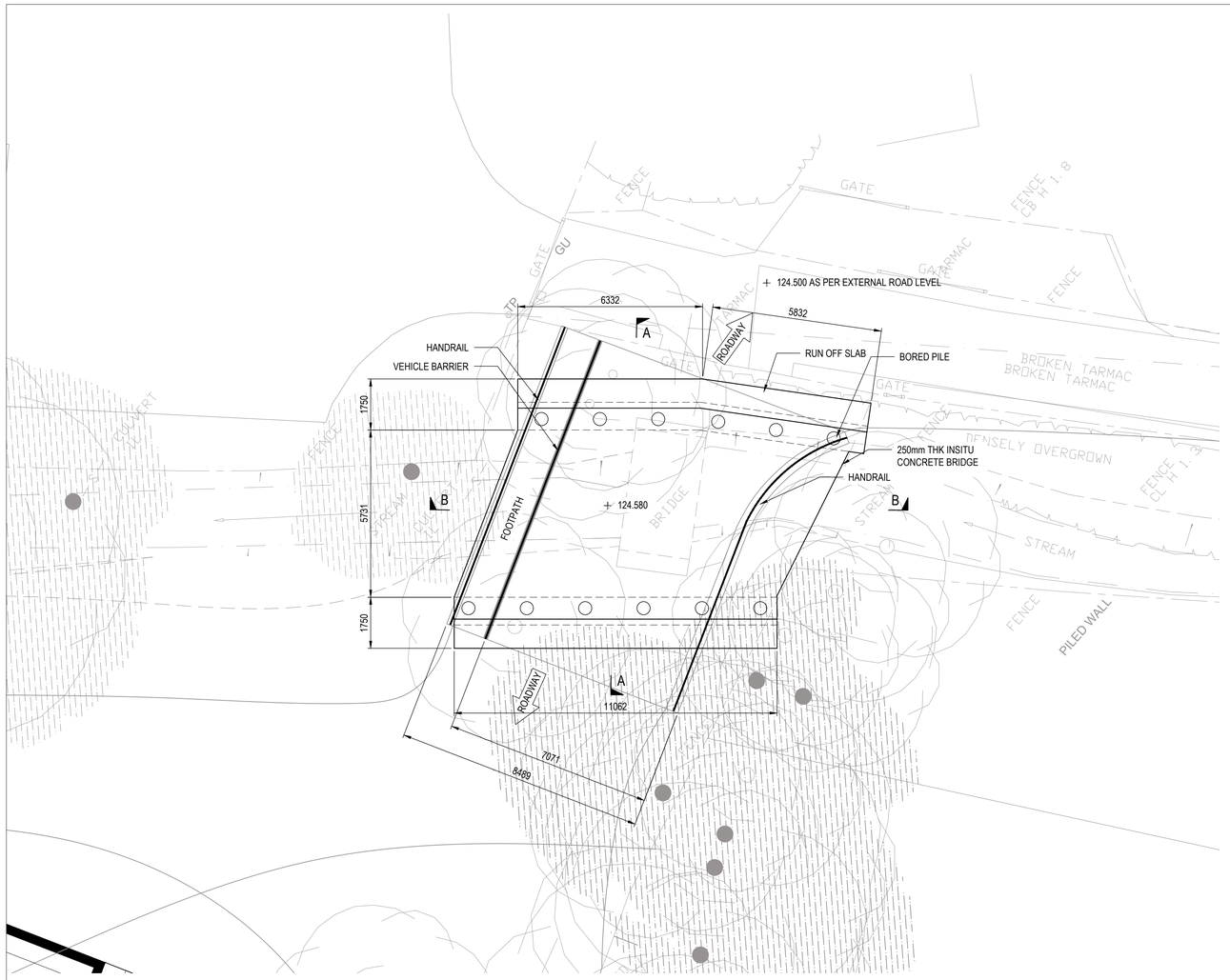
Harman House, Andover Road, Winchester, Hampshire SO23 7BS
T: +44 (0)1962 844855 W: www.swh.co.uk E: info@swh.co.uk

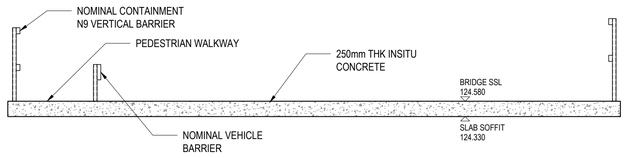
Scale at A1 - 1:200

303383-SWH-XX-XX-DR-C-501 P07

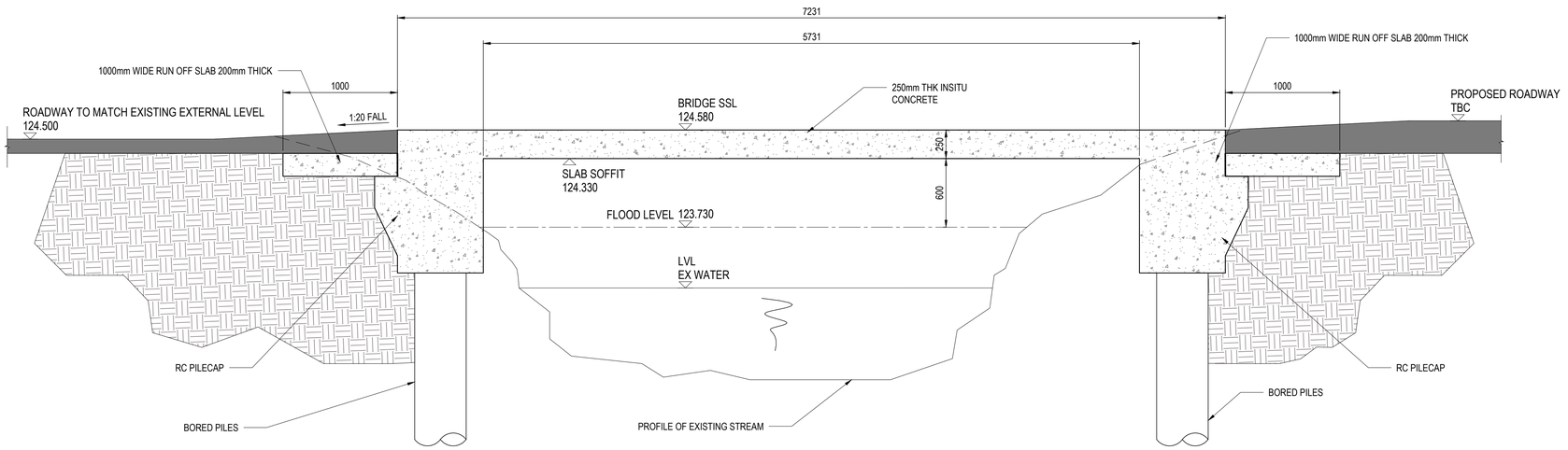
Project | Originator | Zone | Level | Type | Role | Number | Rev.

Appendix I
Proposed Bridge Detail





SECTION B-B
SCALE 1:50



SECTION A-A
SCALE 1:25

DESIGN INTENTION SUPPORTING PLANNING APPLICATION

1. THE LEVEL OF THE BRIDGE SOFFIT IS 124.330 WICH IS ABOVE THE FLOOD LEVEL OF 123.730
2. THE PLAN LOCATION OF THE ABUTMENT IS DETERMINED USING THE LINE OF EXISTING PILECAP
3. BRIDGE STRUCTURAL FORM SELECTED FOR THESE PLANNING DRAWINGS ADOPTS INSITU CONCRETE BRIDGE FORMING THE ROAD SURFACE. THIS IS CONSIDERED LOW MAINTENANCE, EASY TO CONSTRUCT AND FUTURE PROOF.
4. STANDARD NORMAL CONTAINMENT N1 IS PROPOSED FOR THE VEHICLE BARRIERS DUE TO THE LIGHT USE OF THE BRIDGE.
5. MOVEMENT JOINTS WILL BE STANDARD RUBBER STRIP MJ WITH A MINIMUM DESIGN LIFE OF 20 YEARS.

20 0 20 40 60 80

100mm ON ORIGINAL DRAWING

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES ABOVE ORDNANCE DATUM UNLESS NOTED OTHERWISE.
3. ALL DIMENSIONS AND LEVELS SHALL BE CHECKED ON SITE PRIOR TO ANY WORKS BEING PUT IN HAND.
4. THE CONTRACTOR IS RESPONSIBLE FOR THE STABILITY OF THE EXISTING STRUCTURE AT ALL TIMES DURING THE WORKS.
5. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONTRACT DRAWINGS AND RELEVANT STRUCTURAL SPECIFICATIONS.
6. ANY DISCREPANCIES BETWEEN THE INFORMATION GIVEN SHALL BE BROUGHT TO THE ATTENTION OF THE ENGINEER AS SOON AS POSSIBLE.
7. ALL MATERIALS USED IN THE WORKS SHALL BE TO BRITISH STANDARDS OR OTHER APPLICABLE SPECIFICATIONS.
8. ALL WORK IS TO BE CARRIED OUT TO B.S. CODES OF PRACTICE AND IN ACCORDANCE WITH GOOD WORKMANSHIP PRACTICE.
9. ALL PROPRIETARY MATERIALS USED IN THE WORKS SHALL BE USED IN COMPLETE ACCORDANCE WITH THE MANUFACTURERS RECOMMENDATIONS.
10. ALL BURIED, SURFACE AND OVERHEAD SERVICE INFORMATION CONTAINED WITHIN THIS DRAWING IS SHOWN INDICATIVELY. THE SERVICES SHOWN MAY NOT REPRESENT THE ENTIRETY OF ALL SERVICES THAT MAY BE ENCOUNTERED. ALL SOURCE INFORMATION SHOULD BE REFERRED TO PRIOR TO UNDERTAKING WORKS ON SITE. CROUCH WATERFALL ACCEPT NO RESPONSIBILITY FOR OMISSIONS OR ERRORS IN THE POSITIONING OF THE SERVICES PRESENT ON SITE. REFER TO ALL RELATED ENGINEERING DRAWINGS, FORMS AND SPECIFICATIONS FOR FURTHER INFORMATION. REFER TO THE RESIDUAL/DESIGNERS RISK ASSESSMENT FOR ACTIONS TO MINIMISE AND MITIGATE RISK ASSOCIATED WITH KNOWN AND UNKNOWN SERVICES ON SITE

PLANNING

REV	AMENDMENT	DRN	CHK	APP	DATE
P01.2	ISSUED FOR PLANNING	AG	MO	MO	15/12/2021
P01.1	ISSUED FOR PLANNING	NH	CB	CB	24/11/2021
P01	ISSUED FOR PLANNING	NH	CB	CB	22/10/2021

Suite 5.01
Network House
Basing View
Basingstoke
RG21 4HG

Tel 01256 479203
Basingstoke@crouchwaterfall.co.uk

CROUCH WATERFALL

CLIENT

CASA COEVO GROUP LIMITED

PROJECT TITLE

HASLEMERE DEVELOPMENT
BRIDGE, STRUT AVE

DRAWING TITLE

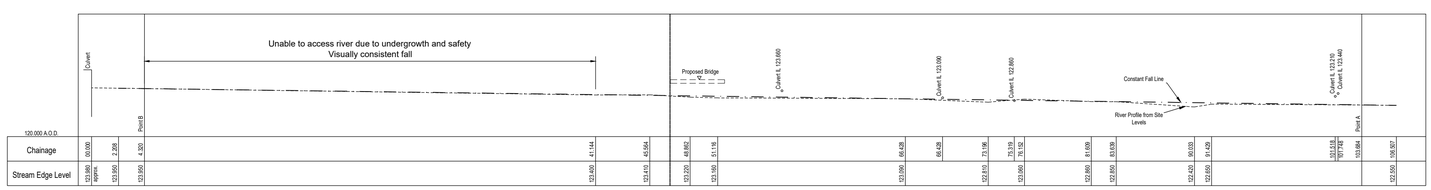
PROPOSED ACCESS BRIDGE GA

DRAWN	CHK	APP	DATE	SCALE
NH	C.B	C.B	22/10/2021	AS SHOWN AT A1

JOB NUMBER	DRAWING NUMBER	REVISION
16-178G	001	P01.2

Appendix J
Long Section Drawing

Plan
(SCALE 1:250)



Section
(SCALE 1:200)

DO NOT SCALE FROM THIS DRAWING

Notes

GENERAL

- This drawing is to be read in conjunction with all relevant Engineers and Architects drawings.
- No dimensions are to be scaled from this drawing.
- All dimensions are in millimetres and levels are in metres unless noted otherwise.
- The Engineer is not responsible for dimensional information except where shown on the drawings. All setting out information, dimensions etc, shall be calculated from the Architects drawings.
- The contractor shall verify all site dimensions and existing details, setting out dimensions and levels with the Architect. Engineer to be informed of any discrepancies before proceeding with work.
- Existing details are assumed and are to be confirmed on site with any discrepancies recorded & reported to the Engineer so that any adjustments required to the scheme can be considered.
- The contractor is responsible and liable for ensuring the stability of the works, adjoining structures and services at all stages of construction. Any temporary works are to be designed and detailed by the contractor.
- All existing services are to be located prior to commencement of the work on site. Unless shown we have no knowledge of any underground obstructions or services.

HAZARDS LEADING TO UNUSUAL OR SIGNIFICANT RISKS DURING THE CONSTRUCTION PROCESS ARE IDENTIFIED ON THIS DRAWING AS:

NOTE: THE LIST BELOW IDENTIFIES CERTAIN RISKS WHICH ARE DEEMED TO BE UNUSUAL, ABNORMAL OR UNEXPECTED TO A COMPETENT CONTRACTOR CARRYING OUT WORK OF THIS NATURE BUT DOES NOT COVER ALL POSSIBLE SITUATIONS WHICH MAY BE ENCOUNTERED DURING THE CONSTRUCTION PROCESS. IT IS THEREFORE THE MAIN CONTRACTOR'S RESPONSIBILITY TO IDENTIFY ANY FURTHER RISKS/HAZARDS AND TAKE APPROPRIATE ACTION.

RISKS/HAZARDS SPECIFIC TO THIS DRAWING:

WORK IN PROGRESS - INFORMATION ONLY

Rev.	Amendment	Drn.	Chkd.	Appd.	Date
P01	PRELIMINARY	IR	RH	RH	08.12.21

Project

Sturt Avenue
Haslemere

Drawing

Long Section Through River

Client
Casa Coevo Group Limited

Scott White and Hookins
Structural Engineering | Civil Engineering | Sustainability and BREEAM | CDM Consultancy

Harman House, Andover Road, Winchester, Hampshire SO23 7BS
T: +44 (0)1962 844855 W: www.swh.co.uk E: info@swh.co.uk

Scale at A1 - 1:Varies

303383-SWH-XX-XX-DR-C-0505 P01

Project | Originator | Zone | Level | Type | Role | Number | Rev.

Appendix K
EA Correspondence

Richard Hemming

From: Brown, Sophie <sophie.brown@environment-agency.gov.uk>
Sent: 07 October 2021 11:35
To: Richard Hemming
Cc: kevin@soobadoo.com; jaz@casacoevo.co.uk; Jonathan.Walton@pegasusgroup.co.uk; Ian Llewellyn; Tim Killingback
Subject: RE: Sturt Avenue, Hazelmere - Planning Ref 21/02428/FUL

Dear Richard,

Thank you for your email. I will try to call you back today, however, here are some comments in response for the time being.

Comments on the FRA
The FRA did make an assessment for climate change but in relation to surface water for their proposed drainage system. The FRA did not assess the impact of climate change from the River. We would ask that the FRA be updated to include this assessment. Please see the **link** on gov.uk for further information.

We note a model report has been supplied in the email dated 5 October but this was not referenced in the FRA online. We apologise if the applicant was told there was no modelling. We can confirm that there is modelling at this location. The model is the Upper Wey (Haslemere to Passfield) 2018. We have provided a **sharefile link** for the model (Product 6 and 7) and report (Product 5) for the applicant's information. We would advise the applicant refer to the latest modelled information for their assessment.

Therefore, the applicant will need to assess for climate change and demonstrate whether Plot 9 does lie in Flood Zone 1 including a plan showing the plot overlain with the modelled extents. The applicant has stated they will produce a drawing, this will need to submitted to the LPA. If the customer requires further assistance then maybe we should offer chargeable planning advice.

Comments on the Bridge
The proposed bridge is mentioned briefly in the planning statement and FRA and the location is shown on the site layout drawing. There was no design drawings or details in general submitted. We note that this is a Full Application. This bridge would be the only point of access to the site. We would require drawings/plans to be submitted for the proposed bridge. The FRA would also need to assess the proposed bridge from a flood risk perspective and in the assessment it needs to consider the latest climate change allowances. In the FRA it must demonstrate that the bridge is not effecting the surrounding area and properties as well as the river and its flow.

Headwall Exemption
If the applicant can meet all the criteria for the headwall exemption (FRA12) then we have no comment other than to state that they would need to apply before any works could commence. However, if the applicant does not meet one or more criteria then they would need to apply for a Bespoke Permit.

Finally, we ask that applicant to submit all evidence and/or supporting document to the LPA for their application. If you require any further feedback on the information you provide prior to submission to the LPA we can provide this but it will be chargeable. If you decide you wish to proceed, we would be happy provide you with detailed advice subject to a charge. Please let me know and I can send you an offer letter for this work. The Environment Agency charges for our detailed planning advice in response to planning enquiries. The current charge is £100 per person per hour, plus VAT. You can of course send the documents directly to the Local Planning Authority who will consult with us in due course.

I do hope this helps.

Many thanks

Sophie

Sophie Brown | Planning Advisor | Sustainable Places | Solent and South Downs Area | Environment Planning and Engagement
Environment Agency | Oving Road |Chichester | West Sussex | PO20 2AG
Tel: 020 3025 7250 Mob: 07468352926 Sophie.brown@environment-agency.gov.uk

Please be aware I work Part Time hours and will be available Monday, Tuesday, and Wednesday, only. If you have any urgent enquiries outside of those hours please email planningSSD@environment-agency.gov.uk

---

From: PlanningSSD
Sent: 05 October 2021 14:17
To: Brown, Sophie <sophie.brown@environment-agency.gov.uk>
Subject: FW: Sturt Avenue, Hazelmere - Planning Ref 21/02428/FUL

From: Richard Hemming [mailto:rhemming@swh.co.uk]
Sent: 05 October 2021 13:35
To: PlanningSSD <PlanningSSD@environment-agency.gov.uk>
Cc: Kevin Soobadoo <kevin@soobadoo.com>; Shahzad Akhtar <jaz@casacoevo.co.uk>; Jonathan Walton <Jonathan.Walton@pegasusgroup.co.uk>; Ian Llewellyn <illewellyn@swh.co.uk>; Tim Killingback <tkillingback@swh.co.uk>
Subject: Sturt Avenue, Hazelmere - Planning Ref 21/02428/FUL

For the Attention of Mrs Sophie Brown

Dear Sophie,
Your ref: HA/2021/123552/01-L01

Many thanks for the comments received on the Chichester DC website for the planning application at Sturt Avenue, Haslemere.

I have tried to call to discuss the comments.

The two key elements highlighted in your comments are:
1 – The FRA does not consider Climate Change.
2 – No details for the bridge have been included.

Comments on FRA
With regard to Climate Change, In paragraph 5.2.4 of the FRA we state that the drainage system is designed for a 1:100 year storm plus 40% Climate Change Allowance.
In reviewing our Microdrainage calculations the attenuation tank size is designed for a 1:100 year storm plus 40%. We believe that we have complied with this, but if there is additional elements required to be considered, we would appreciate discussing these so we can amend and re-issue.

With regard to modelled data for the site, we applied for Product 4 information from the Environment Agency on 2 July 2021. We received an email from the team on the 5 August stating that there was no formal modelling for the section of the River Wey we were looking at.
The Client was aware of this issue previously, and therefore commissioned formal modelling to be undertaken on this section of the River Wey in 2016, due to the flood maps not correctly showing the line and expected flood areas for

the site. This modelling was undertaken by Waterco who are specialists in Hydraulic Modelling. I attach this report for your information. This report derives flood levels for 1:100 and 1:1000 storm events with different CCA. This is the information that we are using for our response to the comments, as we cannot obtain other modelled data.

You also noted about Plot 9 possibly sitting in flood zone 2. I can confirm that plot 9 will sit outside flood zone 2. We will produce a drawing to reflect this.

Comments on Bridge.
The Client has undertaken feasibility works for the bridge. This report is attached to the email. The report cites a previously produced FRA, which is now superseded by the FRA on the Planning Portal for this site. But the levels quoted in the Bridge Feasibility report are based on the Waterco flood modelling data, so are current.

The bridge report has considered space availability and investigated the potential structural solutions. Quite correctly it has stated that a slender deck solution will need to be provided to ensure that the bridge does not affect the river in flood. In the report it states that the soffit should be above 124.55AOD as this is the 1:100 event stated in the Waterco report.
In actual fact we believe this to be an error, as the Waterco report, for the 1% AED (1:100 storm) + 70% CCA states a level at the upper end of the river adjacent to the site of 123.55 AOD.

Therefore, this level will need to cleared by the bridge structure.

At present the bridge design has not commenced past this feasibility works, but the Client would be happy to condition the bridge design elements based on the criteria set out above.

Headwall Exemption
"Outfall pipes less than 300mm diameter through a headwall (FRA12)". In reviewing the exemption requirements, currently the only non-compliance is that where the headwall is currently shown is not 50m from any other man made structure on or over the river. We are proposing to move the headwall down stream to achieve this requirement. We will also provide a detail for the headwall to demonstrate the compliance with the detailing aspects of the exemption.

I would appreciate a conversation with yourself to discuss all the above if possible, as we would like to issue updated information to ensure swift resolution to the objection.

If you are able to contact me on the details below it would be much appreciated.

Many thanks in advance.

Regards

Richard Hemming :: Partner
rhemming@swh.co.uk
Mobile: +44 07879 412096

Scott White and **Hookins**
London :: Bedford :: Sutton :: Winchester

Please note that SWH are now remote working in line with Government advice. We have a robust virtual office with a full communication network set up to maintain our service to our clients and consultants.
To further assist and speed up our response please would you reply to all above when responding or issuing emails. Thank you.

Structural Engineering :: Civil Engineering :: CDM Consultants :: Sustainability and BREEAM
Traffic and Transport :: Flood Risk Assessments :: Highway Engineering :: Event Engineering

Sturt Avenue, Haslemere
Addendum to Flood Risk Assessment

Planning Reference:
Planning Application ref 21/02428/FUL
Land north of 1-16 Sturt Avenue, Haslemere, West Sussex

Introduction

Scott White and Hookins (SWH) have developed a Flood Risk Assessment and Drainage Strategy for the new development. This report is reference 'Flood Risk Assessment and Drainage Strategy' Revision 04 dated 22 October 2021.

This report has been issued to the Environment Agency (EA) and comments have been received on the contents. Following further correspondence between SWH and Sophie Brown at the EA Sustainable Places team, a meeting was organised between the EA representatives and the Clients project team.

This Addendum focuses on the comments made in the email received from the EA on 15 November 2021 and the discussion had in the meeting on the 25 November 2021.

The key points to finalise are:
- Agreeing the flood level at the proposed bridge position
- Agreeing the allowable freeboard from flood level to soffit of proposed bridge.
- FFL levels above general site level due to concerns over wet and waterlogged sections
- Finalised Bridge Details and bridge approaches

Flood Levels at the bridge.

In the FRA, SWH approached the level at the bridge in a simple calculation based on it being approximately half way between the known points. The EA commented that this was too simplistic and should be at least an accurate interpolation.

SWH have re-assessed this and more accurately positioned the bridge in relation to the given points from the EA. This has resulted in the calculated position of Point F being:
- 488,938mE -132,309mN

This provides a length from Point B down to Point F of approximately 43m, and from point F to Point A of 55.5m.

The EA also commented that as there was no formal data at the bridge regarding the calculated flood level, the level should be taken as the next calculated flood level up stream. i.e. calculated flood level at Point B.

In discussion in the meeting with the EA, Neil Landricombe (EA Flood Management Team) stated we would need to demonstrate the long section profile of the river to show that the interpolated

assumptions made in the determination of the flood level corresponds to the actual shape of the river.

Following the meeting further surveying was undertaken, primarily up stream of the bridge. This provided information on the river levels at Point B allowing a generally full profile to be determined throughout the length of the river between point A and Point B.

Points A & B – EA Flood Level *Point F – Proposed Bridge*

As a result, a long section has been developed for the full length of the river from the culvert to below Point A. Please see Appendix A, drawing 303383-SWH-XX-XX-DR-C-505-P01 which shows details of the long section and bridge position.

This demonstrates that the river generally falls consistently along this length.

The proposed flood levels from the EA for 1:100 + 70% flood event at points A and B are as follows:

- Point A - 122.95m AOD
- Point B - 124.37m AOD

The difference between these levels is 1.42m.

From the survey information, the surveyed levels at points A and B are as follows:

- Point A - 122.57m AOD
- Point B - 123.95m AOD

The difference between these levels is 1.38m

This demonstrates that the fall on the river corresponds to the calculated flood levels from the EA and therefore it is reasonable to assume that the flood throughout this section also follows a similar profile.

It was agreed in the meeting, Neil Landricombe was going to advise whether we needed to apply the 35% or 70% Climate Change Allowance to the proposed flood levels, based on the general advice from the EA. At time of writing this, we have not received this confirmation.

Therefore, based on the above figures the interpolated flood level at point F for both 35% and 70% Climate Change Allowance (CCA) are as follows:

- 1:100 + 35% CCA – 123.640m AOD
- 1:100 + 70% CCA – 123.730m AOD

Freeboard to Underside of Bridge

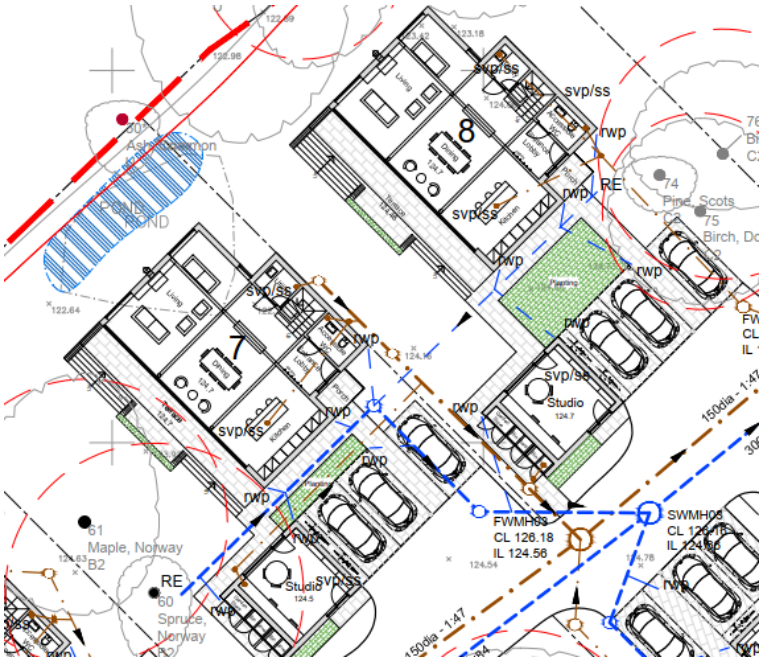
The requirement from the EA was to provide a freeboard of 600mm from the bridge soffit. Initial designs could not achieve this, but since the meeting the project team have reviewed the design requirements and can show that 600mm freeboard can be achieved even with the 1:100 + 70%.

Please refer to Appendix B for revised bridge proposal drawings.

General Finished Floor Levels of Properties in relation to Existing Site.

The EA commented that due to potential wet and waterlogged areas noted on site that the proposed finished floor levels of the properties should be raised to avoid any potential flooding of properties.

We would confirm that this has been incorporated where required into the design as already submitted.



The extract above shows properties on the north western side of the proposed development with steps up to the ground floor level from the higher side of the plot, indicating that the ground floor is protected from any potential water. This level difference is a minimum of approximately 450mm above existing ground levels.

This situation is also benefitted significantly by formally providing a drainage network to the site, allowing any surface water to drain away via the installed SUDS network.

Bridge Construction and Configuration

A number of other comments and queries have been raised and we would address these as follows:

- *The bridge does not fall within the red line boundary, therefore who will be responsible for the maintenance of the structure?*

We would confirm that the bridge will be private, but the client has rights to access the site at this location. The bridge maintenance will be to standard highway details but will be managed via a Maintenance contract as part of the overall site upkeep and maintenance.

No discussions on the actual bridge construction have been undertaken with the Highways department, as the bridge will remain private. A Transport Assessment has been submitted as part of the planning addressing accessibility to the site and parking etc.

- *An ecological assessment is required to be undertaken and compensation for the darkening of the channel and loss of vegetation due to the proposed bridge should be considered. The EA would also want the piled caps to be set back to allow mammal passage by a metre or two.*

Ecology Co-op have reviewed the comments made and have responded as follows:

The channel was walked during the water vole survey, which confirmed that there is very little/no submerged aquatic vegetation within the stream and that the channel bed is composed almost exclusively of shingle and silt. Therefore, any impact resulting from increased shading of the new bridge is considered to impact upon bankside vegetation only.

Given that a footbridge already exists within the site, there is already a degree of shading experienced by bankside vegetation within this area, though it is accepted that this is smaller in width than the new 8m wide bridge proposed and the impact of shading is likely to increase within the developed site as a result. Unmitigated, this small-scale increase of shading is considered to present a significant impact on the watercourse at the site level only.

Much of the bankside vegetation located elsewhere in the site (north of the existing bridge) consists of invasive/non-native species of plant (see photo below) including Himalayan balsam, American skunk cabbage and some cherry laurel. The proposed development will see the removal of these non-native species and the creation of a 5m wide ecological buffer zone between the development and the watercourse. Proposed planting and natural colonisation of native species

within this zone will result in the banks of the watercourse being restored to a more natural state. This proposed enhancement of the ecological buffer zone is considered to compensate for increased levels of shading associated with the bridge. When considered in combination, the existing level of shading created by the footbridge, the increase of shading by the new bridge creation as well as the removal of non-native species and new planting elsewhere along the watercourse is considered to result in a positive impact on the watercourse that is significant at the site level.

Irrespective of the position set out above, the bridge abutment on the southern side of the bridge has also been moved back to aid the passage of mammals.

- *Query about potential land raising proposed either side of the bridge. The amount of land raising will likely change if the soffit height is altered.*

There is no land raising required on the northern or southern sides, as these will typically follow the existing levels of the ground.

Conclusion

We believe that the above information addresses all the concerns and questions raised by the Environment Agency and therefore we look forward to receiving confirmation of the removal of the objection on the development.

Prepared by:

[redacted]

Richard Hemming :: Partner
BEng MEng CEng MICE

16th December 2021

creating a better place

Environment Agency

Kevin Soobadoo
Casa Coevo Group Ltd
Moorgate House 7B (Ground And First Floor)
Station Road West
Oxted
RH8 9EE

Our ref: HA/2021/123625/04-L01
Your ref: ENVPAC/1/SSD/00217

Date: 27 January 2022

Dear Mr Soobadoo

CHARGED ADVICE - FRA REVIEW - 9 NO. NEW DWELLING HOUSES AND 9 NO. CARPORTS/STUDIOS WITH ASSOCIATED ACCESS, INFRASTRUCTURE, PARKING AND LANDSCAPING. LAND NORTH OF 1 TO 16 STURT AVENUE CAMELSDALE LINCHMERE WEST SUSSEX

Thank you for accepting our offer to provide detailed planning advice. We have reviewed the following documents:

Sturt Avenue, Haslemere - Addendum to Flood Risk Assessment

We are providing this advice under Agreement No. ENVPAC/1/SSD/00217 . Please note we have taken 3 hours to review and provide our advice on these documents which is the same as we estimated in our Programme of Works. The revised total will now be £300 plus VAT which is payable on receipt of our invoice.

Environment Agency Advice

We have reviewed the submitted information in relation to the proposed development and have the following detailed comments

The FRA addendum submitted to us following the meeting on 25 November 2021, outlines that the following are key points to finalise.

- Agreeing the flood level at the proposed bridge position

- Agreeing the allowable freeboard from flood level to soffit of proposed bridge.
- FFL levels above general site level due to concerns over wet and waterlogged sections
- Finalised Bridge Details and bridge approaches

As a result of our meeting dated 25 November 2021, the applicant has undertaken some survey work, mainly upstream of the proposed bridge. In the survey in Appendix A of the FRA addendum (Ref SWH Long Section Drawing - 303383-SWH-XX-XX-DR-C-505-P01 dated 08.12.2021) shows there is a relatively consistent fall in levels.

We assume that the proposed bridge will replace the existing footbridge. Can the documentation please confirm this is the case?

The applicant has interpolated the data to derive 123.64m AOD (35%) and 123.73m AOD (70%). The applicant has chosen the flood level of 123.73mAOD to be used to inform bridge soffit. This level is higher than the original proposed flood level of 123.66mAOD.

Appendix B Crouch Waterfall Bridge Drawing – 16-178G 001 P01.2 shows that 600mm freeboard will be applied to 123.73m AOD (70%) flood level in order to allow floating debris to pass freely through the structure. The proposed soffit is 124.33mAOD. We advise that a 600mm freeboard be applied to new bridges and that the soffit should be no lower than 300mm above either of upstream bank tops. As this second part will not be met, we would wish to see that the highest assessed allowance of 70% is applied with the 600mm freeboard for the bridge soffit, which we can see the applicant is proposing.

We requested that the abutments be moved back to avoid encroachment. The applicant has stated that the southern abutment will be moved back. Consideration should be made to potential scour and the design should consider measures to reduce or prevent potential scour to abutments or bank. Where bank protection is required soft engineered approaches should be considered where possible.
A new bridge must produce no difference in water levels between the upstream and downstream sides (afflux) since this would increase flood risk upstream of the bridge. The applicant should demonstrate within the submission that no afflux will occur across the structure.

We can see the proposed cross section shows an open-type parapet design. This will allow overtopping in exceedance events beyond the design flood or in case of the bridge becoming partially blocked in an extreme flood event. We would recommend this design is maintained. If handrails are required, we would recommend these be open to floodwater.

We previously raised a matter concerning the topographical survey (Ref T15/677-01)

identifying several locations across the site as being "heavily wooded and waterlogged". This would seem to indicate that there may be a high-water table and/ or susceptibility to groundwater emergence. We note in earlier submissions there was no proposed flood resilience measures for the dwellings. In the FRA addendum it states “we would confirm that this has been incorporated where required into the design as already submitted”. It is unclear in the FRA addendum if 450mm above existing ground levels is being applied across the site of just the north western side of the development. We would ask that the applicant clarify what finished floor levels will be applied across the development?

Advice to Applicant

Environmental Permit

Please note that this development may require an environmental permit, a variation of an existing permit or an exception from an environmental permit from us.
Further information can be found on the gov.uk website –
https://www.gov.uk/topic/environmental-management/environmental-permits
https://www.gov.uk/guidance/discharges-to-surface-water-and-groundwater-environmental-permits

The Applicant must ensure that the operations at the site are in accordance with the Environmental Permitting (England and Wales) Regulations 2016. The Applicant is advised to contact the National Customer Contact Centre on **03708 506 506** (Monday to Friday 8am to 6pm) or by emailing enquiries@environment-agency.gov.uk.

Please note that the need for an environmental permit is separate to the need for planning permission. The granting of planning permission does not necessarily lead to the granting of a permit.

I hope the above advice is helpful. If there is any further work you anticipate needing our detailed advice on in relation to this project please contact me on the details below.

Yours sincerely

Mrs Sophie Brown
Sustainable Places Planning Advisor

Direct dial 02030 257250
Direct e-mail planningSSD@environment-agency.gov.uk

creating a better place

Environment Agency

Kevin Soobadoo
Casa Coevo Group Ltd
Moorgate House 7B (Ground and First Floor)
Station Road
West Oxted
RH8 9EE

Our ref: HA/2021/123625/05-L01
Your ref: ENVPAC/1/SSD/00217

Date: 10 March 2022

Dear Kevin Soobadoo,

Charged advice review of Flood Risk Assessment (9 no. new dwelling houses and 9 no. carports/studios with associated access, infrastructure, parking and landscaping)

Land North of 1 to 16 Sturt Avenue, Camelsdale, Linchmere, West Sussex

Thank you for accepting our offer to provide detailed planning advice. We have reviewed the following document:

- Flood Risk Assessment and Drainage Strategy (June 2021) Rev 05 by Scott White and Hookins LLP

We are providing this advice under Agreement No. ENVPAC/1/SSD/00217. Please note we have taken 1 hour to review and provide our advice on these documents which is the same as we estimated in our latest Programme of Works. The revised total for all the work undertaken for this site will now be £800 plus VAT which is payable on receipt of our invoice.

Summary

In principle, we do not have an objection from a fluvial flood risk perspective to this proposal. The updated Flood Risk Assessment (FRA) has addressed our concerns that were raised. Please be advised that the applicant must ensure all information including drawings/plans reflect the latest FRA submission and are formally submitted to the Local Planning Authority (LPA). If we are formally consulted by the LPA, then it is likely we would request conditions for this proposal.

The applicant must be made aware that we would need to highlight to the LPA that there are waterlogging issues across the site and that the LPA may wish to consult the Lead Local Flood Authority to ensure that they are satisfied with the drainage strategy and proposed property thresholds as they are the lead flood risk management authority for groundwater.

Environment Agency Advice

The applicant has contacted us to ask whether the information submitted will overcome the Environment Agency's objection to the proposal which was not assessing for climate change and not providing details of the proposed bridge.

We are pleased to see that this FRA has been updated to explain how the flood level was calculated by way of interpolation and by supplying the survey (reference: SWH Long Section Drawing - 303383-SWH-XX-XX-DR-C-505-P01 dated 08.12.2021) to show there is a relatively consistent fall in levels.

In section 4 of the FRA, the 1 in 100 plus 35% climate change allowances (CCA) and the 1 in 100 plus 70% CCA was derived as 123.64 and 123.73m Above Ordnance Datum (AOD) respectively.

The applicant has now included the proposed access bridge general arrangement drawing (drawing no: 001 Rev.P01.3 (Appendix I)) which provides information of the proposed bridge which is also referenced in section 5.2.7 of the FRA. The soffit level of the bridge is 124.33mAOD, with a freeboard of 600mm above the 123.73mAOD (1 in 100 plus 70% CCA) which we welcome. The FRA confirms the existing footbridge will be removed.

We requested that the abutments be moved back to avoid encroachment. The applicant previously stated that the southern abutment could be moved back. The proposed access bridge general arrangement drawing (Drawing number 001 Rev.P01.3 (Appendix I)) confirms this. We mentioned that consideration should be made to potential scour and the design should consider measures to reduce or prevent potential scour to abutments or bank. Where bank protection is required, soft engineered approaches should be considered where possible. There is reference to bank protection being provided on the proposed access bridge general arrangement drawing but no specifics. The FRA (section 5.2.7) states "bank protection will be provided where deemed necessary to prevent scour, and this will be assessed at detailed design stage".

We note there are several elements of this application which will require a flood risk permit such as scour protection, removal and installation of bridges and installation of outfalls. We advise that if planning permission is granted that the applicant contact Westthamesconsents@environment-agency.gov.uk for permit advice before submitting a flood risk permit application.

We previously raised a matter concerning the topographical survey (Reference: T15/677-01 (Appendix C)) identifying several locations across the site as being "heavily wooded and waterlogged". This would seem to indicate that there may be a high-water table and/ or susceptibility to groundwater emergence. We note in earlier submissions that there were no proposed flood resilience measures for the dwellings so requested this information. The finished flood level of buildings has now been mentioned in the Drainage Scheme (Appendix H) and in the FRA. In section 5.2.10 it states "Along the north western boundary this level difference is approximately a minimum of 450mm above existing ground levels. Along the south eastern boundary, the properties are a minimum of 150mm above proposed external levels". Our understanding is that 150mm could be considered a typical standard threshold for properties. If this is the case, then there would be no additional resilience for these dwellings. Therefore, it will lie with the LPA on whether they are satisfied with this.

I hope the above advice is helpful. If there is any further work you anticipate needing our detailed advice on in relation to this project, please contact me on the details below.

Yours sincerely,

Mrs Sophie Brown

Sustainable Places Planning Advisor

Direct dial: 02030 257250
Direct e-mail: planningSSD@environment-agency.gov.uk

Disclaimer
Our opinion is based on the information available to us at the time of the enquiry. When the formal planning application is submitted, our position may change if there have been changes to environmental risk or evidence, and/or planning policy.

Appendix L
Hydrogeology Report

geotechnical and environmental consultants

ground&water

Hydrogeological Report

Land at the Rear of Sturt Avenue, Haslemere, Surrey GU27 3SJ

On behalf of Casa Coevo Group Limited

Report Reference: GWPR5705/HGR/November 2023			Status: Final
Issue	Prepared By	Checked By	Verified By
V1.01	[redacted]		
	Rob Terrell BSc (Hons) MSc FGS Senior Engineer	Miltiadis Mellios MSc(Eng) GMICE FGS MIEnvSc Principal Engineer	Francis Williams MGeol (Hons) FGS CEnv CGeol Director

Site Investigations | Environmental Consultants | Geotechnical Engineers

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0333 600 1221 enquiries@groundandwater.co.uk **groundandwater.co.uk**

Registered Office: Kineton House, 31 Horse Fair, Banbury, Oxfordshire OX16 0AE Registered in England No. 07032001

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Hydrogeological Report	
REPORT REFERENCE	GWPR5705/HGR/November 2023. The techniques adopted for the investigation were chosen considering the requirements of the client, anticipated ground conditions, the nature of the site and logistical limitations. This hydrogeological report is not a Flood Risk Assessment and should be read in conjunction with a Flood Risk Assessment. The conditions and limitations of this report can be viewed within Appendix A. A technical glossary has also been provided within Appendix B.
SITE DETAILS	The site comprised a ~0.69ha plot of land, situated to the rear (north) of the properties along the northern side of Sturt Avenue, along the southern side of a watercourse. A site location plan has been provided within Figure 1. A view of the site development area has been provided within Figure 2, with an aerial view of the site provided in Figure 3.
PROPOSED DEVELOPMENT	At the time of reporting, November 2023, the proposed development was understood to comprise the development of 9No. residential plots, each with car parking, soft landscaped areas and areas of hardstanding, all accessed by a new access route. A proposed development plan is displayed within Figure 4.
ANTICIPATED GEOLOGY AND HYDROGEOLOGY	The British Geological Survey (BGS) maps and DEFRA online maps for the area suggest that the site was located on Head Deposits, classified as a Secondary Undifferentiated Bedrock Aquifer, overlying the Hythe Formation, classified as a Principal Bedrock Aquifer, underlain by the Atherfield Clay Formation, classified as Unproductive Bedrock Strata. Alluvium was noted along the banks of the adjacent watercourse, classified as a Secondary A Superficial Aquifer. Based on this, it was anticipated that groundwater was perched on top of the Atherfield Clay Formation within the Hythe Formation; however, perched water may be encountered within the superficial deposits, especially when they are mainly cohesive and have granular bands (the granular bands will become saturated with perched water, especially after periods of prolonged or intense rainfall).
SITE WORKS	Site works were undertaken on the 27th November 2023 and comprised the hand auguring of 9No. Trial Pits (HA1 – HA9) to 2.00m bgl. A trial hole location plan can be viewed within Figure 5.
GROUND CONDITIONS ENCOUNTERED	A summary of the ground conditions encountered has been summarised in the following table. The trial hole logs can be seen within Appendix C.

Summary of Strata Encountered

Strata	Top Depth (m bgl)	Base Depth (m bgl)	Thickness (m)
TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint. ***(HA1 – HA5 and HA7 – HA9 only)***	GL	0.20 – 0.60	0.20 – 0.60
MADE GROUND: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint (80%) and brick (20%). ***(HA6 only)***	GL	0.40	0.40
HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine. ***(All trial holes)***	0.20 – 0.60	1.80 – >2.00	1.20 – >1.80
HEAD DEPOSITS: Brown silty/clayey SAND. Sand is fine. ***(HA7 only)***	1.80	>2.00	>0.20

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Hydrogeological Report

GROUNDWATER

Groundwater was encountered at depths of between 0.80m – 1.50m bgl within HA1 – HA7. No groundwater strikes were recorded within HA8 or HA9. Groundwater strikes may be obscured by the auguring process. A summary can be seen in the following table.

Summary of Groundwater Strikes	
Trial Hole	**Groundwater Struck (m bgl)**
HA1	1.30
HA2	1.30
HA3	1.50
HA4	0.80
HA5	0.80
HA6	0.80
HA7	0.80
HA8	No groundwater noted.
HA9	No groundwater noted.

Changes in groundwater level occur for a number of reasons including seasonal effects and variations in drainage. The investigation was undertaken in November 2023 when groundwater levels are likely to be approaching their annual maximum (highest elevation). Exact groundwater levels may only be determined through long term measurements from monitoring wells installed on-site.

CONCLUSIONS AND RECOMMENDATIONS

Based on the aquifer classification, the site itself has the potential to flood from groundwater, due to the site being located on a Secondary Undifferentiated Superficial Aquifer, underlain by a Principal Bedrock Aquifer, underlain by Unproductive Strata.

Due to the relatively low permeability rates of the cohesive soils encountered, the amount of groundwater was likely limited, with limited mobility horizontally and vertically through the cohesive soils. Limited sub-surface structures (i.e. foundations, services etc) were noted, which are not likely obstruct groundwater flow and cause ponding issues upstream.

Perched water may be encountered on top of the cohesive Head Deposits, within the shallow surface soils, especially after periods of prolonged or intense rainfall. This may cause localised surface water flooding from pluvial (rainfall) sources. This would be able to be mitigated by SUDS and/or drainage infrastructure.

All points above should be considered in final design with the help of a civil engineer/drainage designer.

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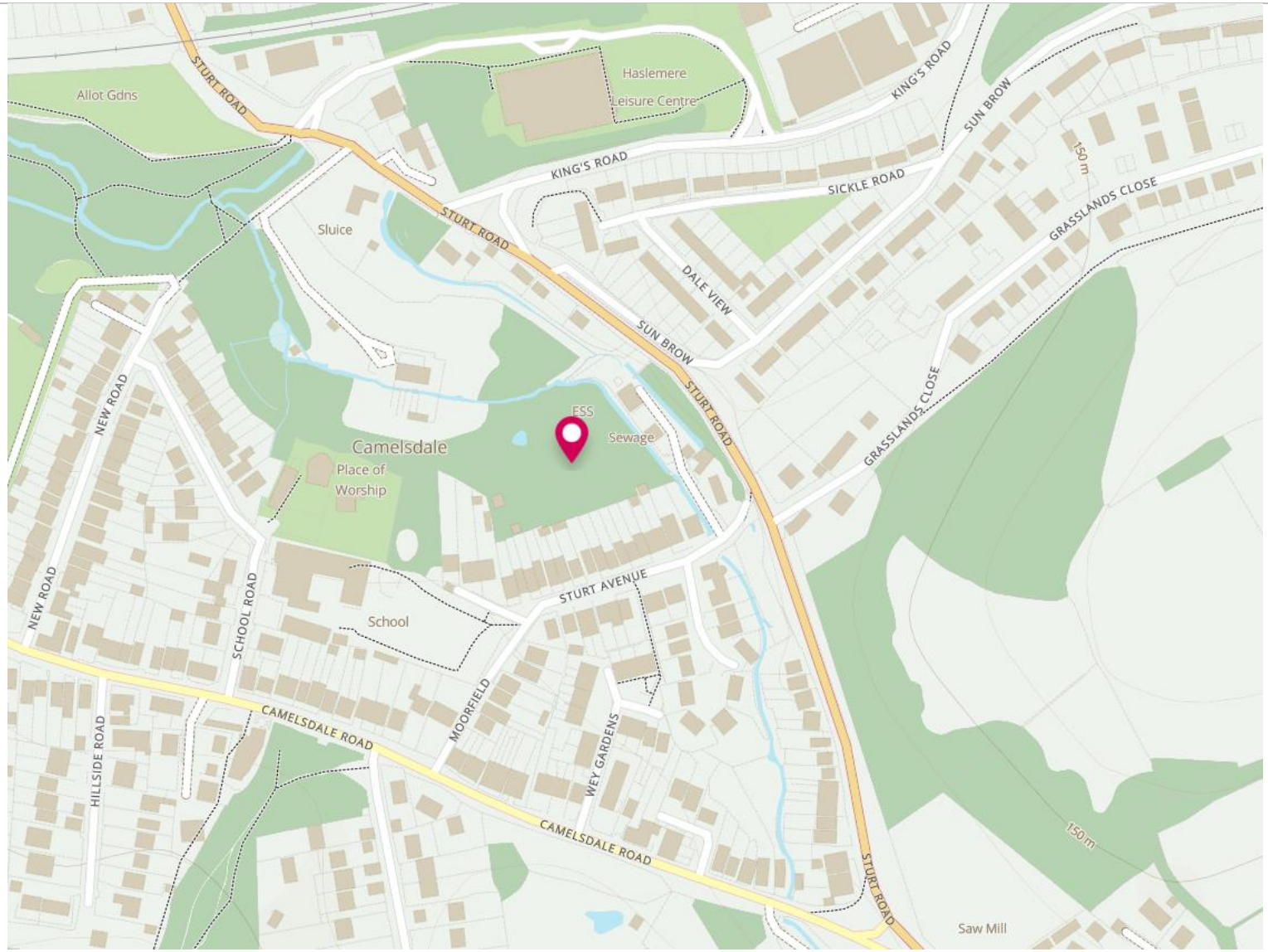
FIGURES



Site Location

Not to Scale

Land at the Rear of Sturt Avenue, Haslemere, Surrey GU27 3SJ	
Casa Coevo Group Limited	**November 2023**
Figure 1: Site Location Plan	**GWPR5705**

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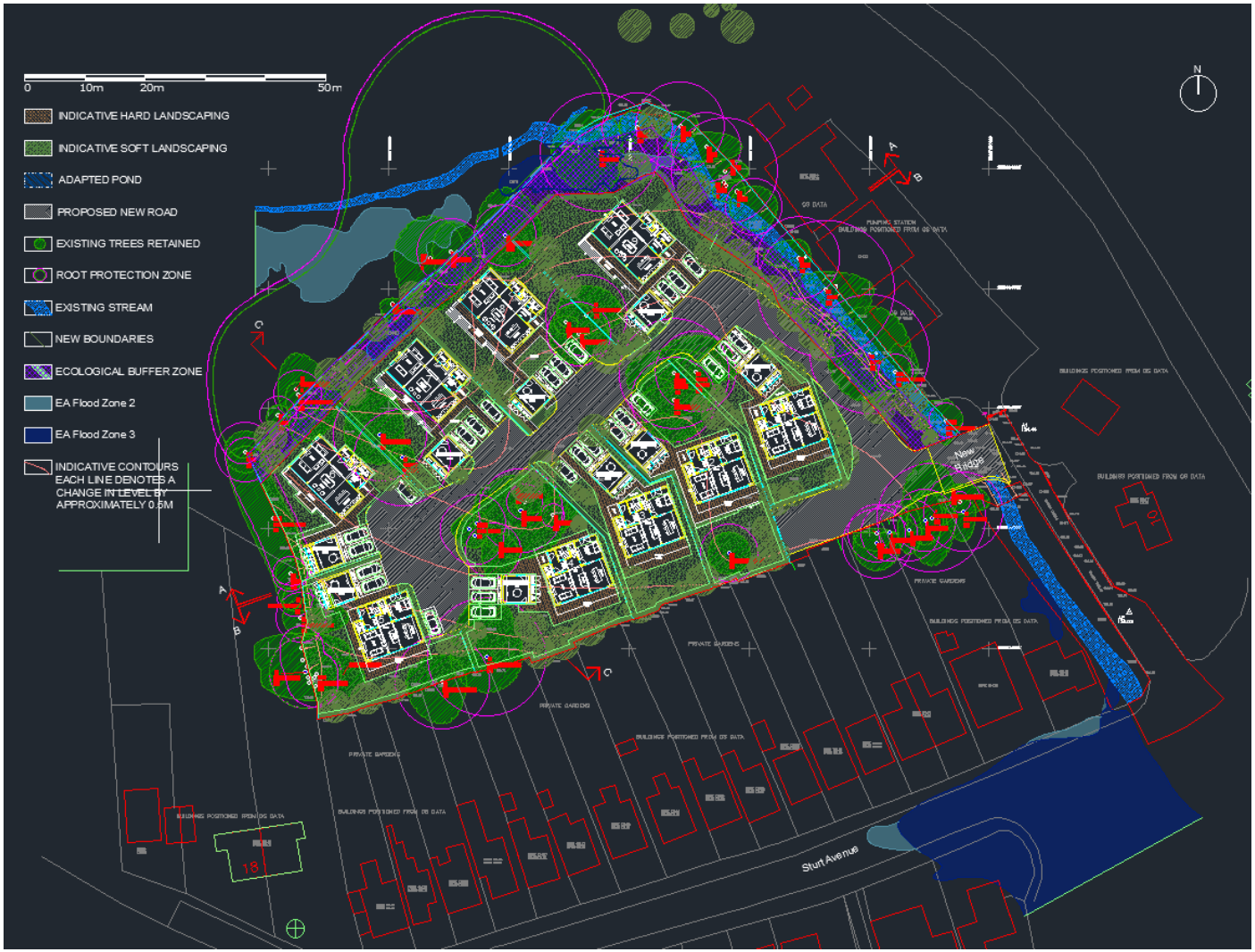

Not to Scale

Land at the Rear of Sturt Avenue, Haslemere, Surrey GU27 3SJ

Casa Coevo Group Limited	**November 2023**
Figure 2: Proposed Development Plan	**GWPR5705**

ground&water

Site boundary

Hand Auger

Not to Scale

Land at the Rear of Sturt Avenue, Haslemere, Surrey GU27 3SJ	
Casa Coevo Group Limited	**November 2023**
Figure 3: Trial Hole Location Plan	**GWPR5705**

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APPENDIX A: Conditions and Limitations

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The ground is a product of continuing natural and artificial processes. As a result, the ground will exhibit a variety of characteristics that vary from place to place across a site, and also with time. Whilst a ground investigation will mitigate to a greater or lesser degree against the resulting risk from variation, the risks cannot be eliminated.

The report has been prepared on the basis of information, data and materials which were available at the time of writing. Accordingly any conclusions, opinions or judgements made in the report should not be regarded as definitive or relied upon to the exclusion of other information, opinions and judgements.

The investigation, interpretations, and recommendations given in this report were prepared for the sole benefit of the client in accordance with their brief; as such these do not necessarily address all aspects of ground behaviour at the site. No liability is accepted for any reliance placed on it by others unless specifically agreed in writing.

Any decisions made by you, or by any organisation, agency or person who has read, received or been provided with information contained in the report ("you" or "the Recipient") are decisions of the Recipient and we will not make, or be deemed to make, any decisions on behalf of any Recipient. We will not be liable for the consequences of any such decisions.

Current regulations and good practice were used in the preparation of this report. An appropriately qualified person must review the recommendations given in this report at the time of preparation of the scheme design to ensure that any recommendations given remain valid in light of changes in regulation and practice, or additional information obtained regarding the site.

Any Recipient must take into account any other factors apart from the Report of which they and their experts and advisers are or should be aware. The information, data, conclusions, opinions and judgements set out in the report may relate to certain contexts and may not be suitable in other contexts. It is your responsibility to ensure that you do not use the information we provide in the wrong context.

This report is based on readily available geological records, the recorded physical investigation, the strata observed in the works, together with the results of completed site and laboratory tests. Whilst skill and care has been taken to interpret these conditions likely between or below investigation points, the possibility of other characteristics not revealed cannot be discounted, for which no liability can be accepted. The impact of our assessment on other aspects of the development required evaluation by other involved parties.

The opinions expressed cannot be absolute due to the limitations of time and resources within the context of the agreed brief and the possibility of unrecorded previous in ground activities. The ground conditions have been sampled or monitored in recorded locations and tests for some of the more common chemicals generally expected. Other concentrations of types of chemicals may exist. It was not part of the scope of this report to comment on environment/contaminated land considerations.

The conclusions and recommendations relate to the Rear of Sturt Avenue, Haslemere, Surrey GU27 3SJ.

Trial hole is a generic term used to describe a method of direct investigation. The term trial pit, borehole or window sampler borehole implies the specific technique used to produce a trial hole.

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The depth to roots and/or of desiccation may vary from that found during the investigation. The client is responsible for establishing the depth to roots and/or of desiccation on a plot-by-plot basis prior to the construction of foundations. Where trees are mentioned in the text this means existing trees, recently removed trees (approximately 15 years to full recovery on cohesive soils) and those planned as part of the site landscaping.

Only our client may rely on this report and should this report or any information contained in it be provided to any third party we accept no responsibility to the third party for the contents of this report save to the extent expressly outlined by us in writing in a reliance letter addressed from us to the third party.

Recipients are not permitted to publish this report outside of their organisation without our express written consent.

The aim of the investigation was understood to be to supply the client and their designers with information regarding the ground conditions underlying the site to assist them in preparing an appropriate scheme for development.

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APPENDIX B: Technical Glossary

TECHNICAL GLOSSARY

The list of possible definitions within the report may be seen below. Please note that some definitions may not be relevant to this report.

HYDROGEOLOGY:

A **Principal Aquifer** is a layer of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.

Secondary (A) Aquifers consist of deposits with permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as Minor Aquifers.

Secondary (B) Aquifers consist of deposits with predominantly lower permeability layers with may stoke and yield limited amounts of groundwater due to localised features such as fissures, think permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.

Secondary Aquifers (Undifferentiated) are assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both a minor aquifer and non-aquifer in different locations due to the variable characteristics of the rock type.

Unproductive Strata are rock layers with low permeability that have negligible significance for water supply or river base flow. These were formerly classified as non-aquifers.

FLOOD ZONES:

Environment Agency Flood Zone 2, defined as; land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.

Environment Agency Flood Zone 3 shows the extent of a river flood with a 1 in 100 (1%0 or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year.

Environment Agency Flood Zone 3 area that benefits from flood defences, defined as; land and property in this flood zone would have a high probability of flooding without the local flood defences. These protect the area against a river flood with a 1% chance of happening each year, or a flood from the sea with a 0.5% chance of happening each year.

GROUNDWATER SOURCE PROTECTION ZONES (SPZS):

Inner Zone (SPZ1): This zone is 50 day travel time of pollutant to source with a 50 metres default minimum radius.

Outer Zone (SPZ2): This zone is 400 day travel time of pollutant to source. This has a 250 or 500 metres minimum radius around the source depending on the amount of water taken.

Total Catchment (SPZ3): This is the area around a supply source within which all the groundwater ends up at the abstraction point. This is the point from where the water is taken. This could extend some distance from the source point.

Zone of Special Interest (SPZ4): This zone is where local conditions require additional protection.

IN-SITU STRENGTH GEOTECHNICAL TESTING:

Windowless Sample and/or Cable Percussion and/or Rotary Boreholes provide samples of the ground for assessment but they do not give any engineering data. The standard penetration test (SPT) is an in-situ dynamic penetration test designed to provide information on the geotechnical engineering properties of soil. The test uses a thick-walled sample tube, with an outside diameter of 50mm and an inside diameter of 35mm, and a length of around 650mm. This is driven into the ground at the bottom of a borehole by blows from a slide hammer with a weight of 63.5kg falling through a distance of 760mm. The sample tube is driven 150mm into the ground and then the number of blows needed for the tube to penetrate each 75mm up to a depth of 450mm is recorded. The sum of the number of blows is termed the "standard penetration resistance" or the "N-value".

Dynamic Probing involves the driving of a metal cone into the ground via a series of steel rods. These rods are driven from the surface by a hammer system that lifts and drops a 63.5kg (SHDP) hammer onto the top of the rods through a set height, thus ensuring a consistent energy input. The number of hammer blows that are required to drive the cone down by each 100mm increment are recorded. These blow counts then provide a comparative assessment from which correlations have been published, based on dynamic energy, which permits engineering parameters to be generated. (The Dynamic Probe 'Super Heavy' (SHDP) Tests were conducted in accordance with BS 1377; 1990; Part 9, Clause 3.2).

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APPENDIX C: Trial Hole Logs

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA1	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
					0.50			HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
					2.00			End of Borehole at 2.000m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 1.30m bgl after the conclusion of hand auguring.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA2	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.20			TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
								HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
					2.00			End of Borehole at 2.000m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 1.30m bgl after the conclusion of hand auguring.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA3	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
					0.40			HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
	▼				2.00			End of Borehole at 2.000m

1
2
3
4
5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 1.50m bgl after the conclusion of hand auguring.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA4	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.50			TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
					2.00			HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
								End of Borehole at 2.000m

1
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Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 0.80m bgl after the conclusion of hand auguring.

AGS

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA5	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.40			TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
								HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
					2.00			End of Borehole at 2.000m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 0.80m bgl after the conclusion of hand auguring.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA6	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.40			MADE GROUND: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint (80%) and brick (20%).
								HEAD DEPOSITS: Brown sandy silty CLAY with grey mottling. Sand is fine.
					2.00			End of Borehole at 2.000m

1
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3
4
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Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 0.80m bgl after the conclusion of hand auguring.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA7	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
	▼				0.60			TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
					1.80			HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
					2.00			HEAD DEPOSITS: Brown silty/clayey SAND. Sand was fine.
								End of Borehole at 2.000m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

Groundwater standing at 0.80m bgl after the conclusion of hand auguring.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA8	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
					0.50			HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
					2.00			End of Borehole at 2.000m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

No groundwater encountered.

Trial Pit Log

Project Name: Land at the Rear of Sturt Avenue	Client: Casa Coevo Group Limited	Date: 27/11/2023
Location: Haslemere, Surrey GU27 3SJ	Contractor:	
Project No. : GWPR5705	Crew Name:	Equipment:

Location Number	Location Type	Level	Logged By	Scale	Page Number
HA9	TP			1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description
		Depth (m)	Type	Results				
								TOPSOIL: Brown gravelly silty/clayey SAND. Sand was fine to coarse. Gravel was fine and medium, sub-angular to sub-rounded flint.
					0.40			HEAD DEPOSITS: Brown sandy silty CLAY. Sand is fine.
					2.00			End of Borehole at 2.000m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks

Remarks

No groundwater encountered.