South Downs College, Waterlooville

Places for People

Flood Risk Assessment

South Downs College, Waterlooville

Flood Risk Assessment

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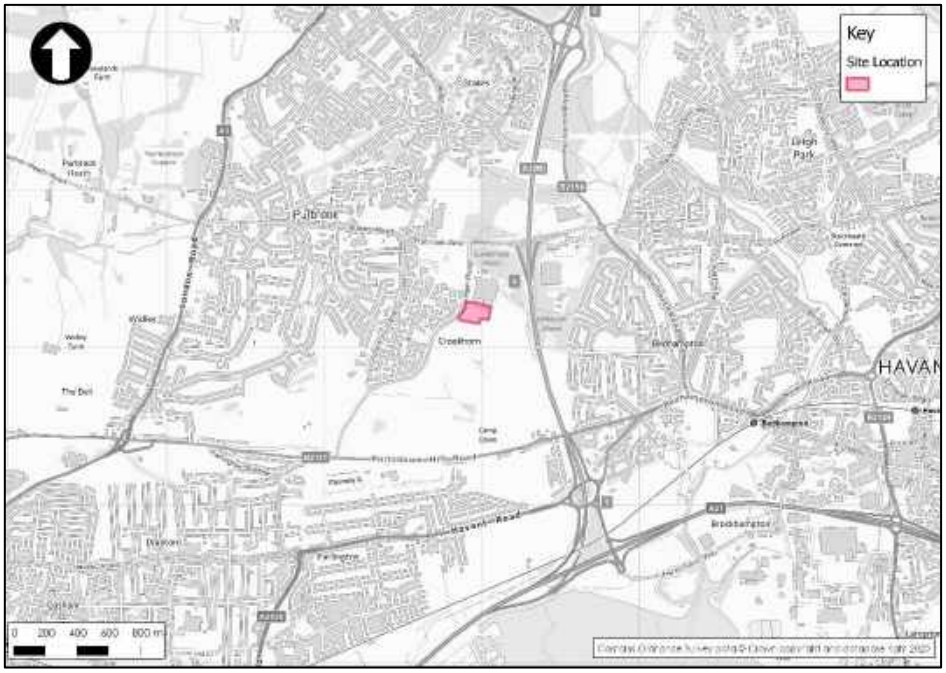
1 Introduction

1.1 Awcock Ward Partnership (AWP) has been commissioned by Places for People to prepare a Flood Risk Assessment in support of a detailed planning application for 102 dwellings and public open space on Land to the south of South Downs College, Waterlooville.

1.2 The location of the proposed development is shown on Figure 1.1 below:

Figure 1:1 - Site Location – Wide Area



National Planning Policy Framework

1.3 The National Planning Policy Framework (NPPF) and the Planning Practice Guidance were published by the Department for Communities and Local Government in March 2012 and March 2014 respectively.

1.4 The NPPF states that "*a site-specific flood risk assessment is required for proposals of 1 hectare or greater in Flood Zone 1; all proposals for new development (including minor development and change of use) in Flood Zones 2 and 3, or in an area within Flood Zone 1 which has critical drainage problems (as notified to the local planning authority by the Environment Agency); and where*

proposed development or a change of use to a more vulnerable class may be subject to other sources of flooding".

1.5 The aim of a site-specific flood risk assessment is to demonstrate that "*the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall*".

1.6 Furthermore, the site-specific flood risk assessment must "*assess the flood risk to and from a development site … The assessment should demonstrate to the decision-maker how flood risk will be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users*", as required by the Planning Practice Guidance.

Structure and limitations of this FRA

1.7 This site-specific FRA has been written in line with the above Framework. It also includes a Surface Water Management Plan (SWMP) that indicates how the surface water runoff can be managed in such a way as not to increase the flood risk to the downstream catchment.

Reference

1.8 This FRA has been prepared by reference to the following documents:

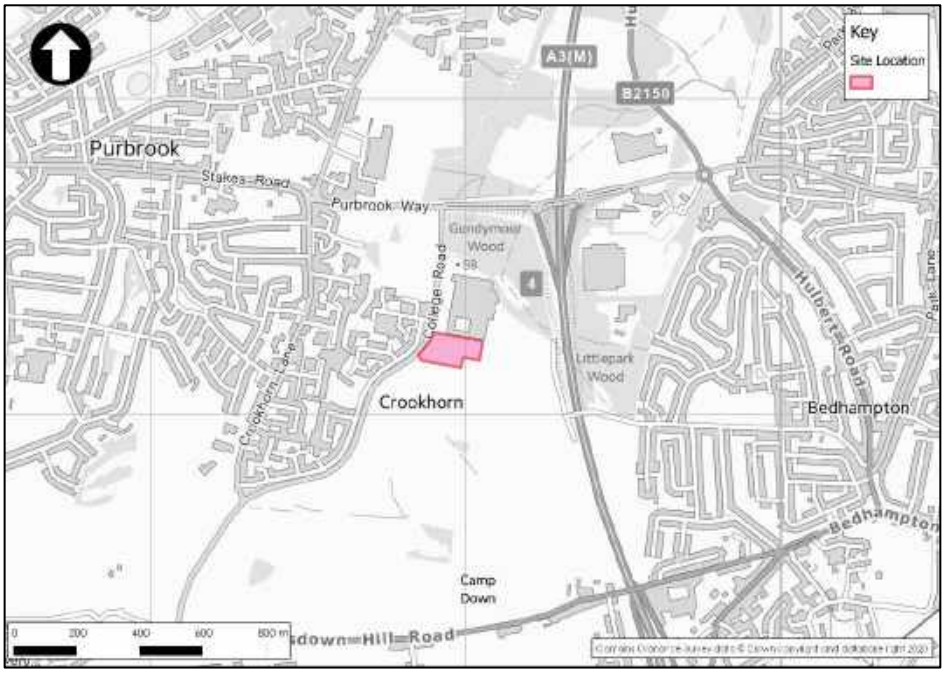
- National Planning Policy Framework (March 2012);
- Planning Practice Guidance (March 2014);
- Environment Agency (EA) Flood Information Service (online);
- Magic.gov.uk Soilscape Dataset (online)
- CIRIA Guide 753 – The SuDS Manual (November 2015); and,
- Southern Water Asset Mapping
- Hampshire County Council Surface Water Check-list
- Hampshire County Council Surface Water and Sustainable Drainage Guidance for Developers, Designers and Planners.
- Havant Borough Council Strategic Flood Risk Assessment (Havant Local Plan Site).

2 Existing Conditions

Context

2.1 The proposed site is located within the Town of Waterlooville, Hampshire. The location of the proposed site in relation to its surroundings is shown on Figure 3.1 below:

Figure 3.1 - Site Location – Local Area



Existing land uses

2.2 The proposed development site comprises of an existing tarmac car park located to the south of Havant and South Downs College (HSDC).

Surrounding land use

2.3 The site is bordered to the north by the 'South Downs' campus of HSDC. To the east and south, the site is bordered by greenfield land (allocation H41 '*Land east of College Road, Campdown'* withdrawn from the draft local plan). To the west, the site is bordered by College Road.

Topographic survey

2.4 A topographic survey has been undertaken. Topographic data indicates that the northern part of the site falls from a high point in the central part of the existing car park of circa 58.5mAOD toward the edges of the car park. The levels in the NE, SE, S, SW, and NW corners are 57.51, 57.61, 57.02, 56.33, 57.83mAOD respectively.

2.5 An 'Existing Site Plan' that sets the context of the pre-development site and can be found within Appendix A of this report.

Existing Flood Risk

2.6 The EA's 'Flood Warning Information Service' provides flood risk information and mapping throughout England.

2.7 An extract of the 'Flood Map for Planning' has been reproduced as Figure 2.2 below and shows the site to be within 'Flood Zone 1', as land assessed as have a probability of flooding from rivers and the sea in excess of a 0.1% Annual Exceedance Probability.

Figure 2.2 – Flood Map for Planning

2.8 An extract of the 'Flood Risk from Surface Water' mapping has been reproduced as Figure 2.3 below. This mapping is based on LIDAR data and indicates the typical conveyance routes of surface water runoff. The mapping shows that the site is not at risk

of surface water flooding from off-site flows or from excessive ponding on site.

Figure 2.3 – Flood Risk from Surface Water

Existing Drainage Infrastructure

2.9 The Southern Water existing asset records indicate that a public surface water sewer exists in College Road to the west and that a public foul sewer is present to the south of the proposed development. The site is not known to be at risk of flooding from existing drainage infrastructure.

Existing site drainage

2.10 The existing drainage regime appears positive and collects discharge from surface gullies to indicated soakaways. The effectiveness of which is unknown, therefore the site may experience flooding during extreme events if the existing soakaway infiltration capacity is overcome.

Flooding from Reservoirs and canals.

2.11 The site is not at risk of flooding from reservoir failure, either alone or in combination with river flooding.

Groundwater Flooding

2.12 The overlying soils are of low permeability over a low permeability clay, and the site is not located at a natural low point in local

topography or close to a watercourse. Therefore, the site is not considered at risk of flooding from groundwater.

Ground conditions

2.13 A Ground Investigation (GI) has been undertaken by Hydrock and reports,

"The ground conditions as proven by the investigation undertaken at the site comprise:

• Surface Cover – bituminous bound pavement hardstanding – from ground level to 0.25m below ground level (bgl), comprising asphalt; over

• Made Ground – between 0.10m and 1.10m below ground level (bgl), comprising granular sub-base material over sandy gravelly silt and/ clay, with man-made fragments of brick and asphalt.

• Wittering Formation – between 0.40m and 9.00m bgl, comprising greyish green/ orange/ grey brown cohesive deposits of sandy clay and granular deposits of gravelly sand; over

• London Clay Formation – between 4.50m and >20.00m bgl, comprising grey to blueish grey slightly sandy silty clay."

2.14 Infiltration assessment using the BRE365 method in the Withering Formation indicates an infiltration rate of $1.08x10^{-6}ms^{-1}$ in this strata. An analysis of plot scale soakaways for a roof area of $50m^2$ indicates the infiltration rate does not support a soakaway with a half drain-down time within 24hours (drain-down time in excess of 7 days).

2.15 The above information suggests the ground has a low permeability and is not suitable for the application of infiltration drainage. Instead, a discharge to a surface water sewer will be utilised.

2.16 Copies of the GI and infiltration testing have been included within Appendix B of this report.

3 Development Proposals

Introduction

3.1 The development proposals comprise of 102 residential dwellings, with associated access roads, garaging and parking and associated landscaping, public open space, drainage and engineering works.

3.2 A copy of the site layout for the scheme can be found within Appendix C of this report.

Vulnerability

3.3 In accordance with the Planning Practice Guidance, residential dwellings are considered to be "More Vulnerable". However, given the site is located within 'Flood Zone 1', Table 3 of the Planning Practice Guidance confirms this as being an appropriate form of development at this site.

3.4 Due to the above, the proposals are classified as an appropriate form of development for the level of flood risk at the site.

Sequential Test

3.5 The site is located within 'Flood Zone 1' and therefore passes the Sequential Test, as there are no competing sites with a lower flood risk classification.

Cross sections and finished levels

3.6 It is anticipated that the existing ground profile will be modified locally to reflect the requirements of the new development.

3.7 Any future levels design should aim to minimise the extent of any re-profiling works and should look to retain existing catchment areas wherever possible.

Safe access and egress

3.8 The full extents of the site and all roads surrounding the site are within 'Flood Zone 1' and hence access and egress for motorised and non-motorised vehicles will not be affected during flood events.

Drainage strategy requirements

3.9 'CIRIA C753 – The SuDS Manual' and Hampshire County Council Surface Water and Sustainable Drainage Guidance for Developers, Designers and Planners advises that surface water disposal should be to be prioritised in the following order:

- Infiltration
- Discharge to surface waters
- Discharge to a surface water sewer, highway drain or other drainage system
- Discharge to a combined sewer

3.10 As required by the NPPF, the drainage strategy must demonstrate that the development will be safe throughout its lifetime, without increasing flood risk elsewhere, whilst also taking account of the impacts of climate change.

3.11 The strategy and attenuation modelling also allow for +10% urban creep to the residential catchment.

Outline drainage strategy

3.12 Infiltration is not a feasible strategy for discharge of surface water from the development. There are not any existing surface water features or public sewers within the application boundary. Therefore, in accordance with the drainage hierarchy, the outline drainage strategy for the site comprises an attenuated discharge, via a requisitioned connection to the local public surface water network. The drainage strategy for the development will comprise the following:

- Adoptable and non-adoptable underground pipework;
- Cellular Storage;
- Hydraulic controls;
- Treatment features; and,
- Overland exceedance measures.

3.13 The drawing included in Appendix D (reference 1017-01-PDL-1001) shows a preliminary drainage layout for the site.

3.14 Details on the attenuation requirements are given within the preliminary drainage layout drawing and have been summarised within the 'Surface Water Management Plan' section of this report.

Climate change impacts

3.15 The NPPF requires that the impact of climate change be considered to minimise vulnerability and provide resilience. The NPPF and Planning Practice Guidance explain that an FRA should demonstrate how flood risk will be managed across the development's lifetime, taking climate change into account.

3.16 The Environment Agency, as the government's expert on flood risk, released the document 'Flood Risk Assessments: Climate Change Allowances Guidance' in February 2016.

3.17 Table 3.1 below provides an extract detailing the predicted increase in peak rainfall intensity due to climate change over the next 100 years.

Table 3.1 – Peak rainfall intensity allowances (applicable across all of England)

Allowance category	Total potential change anticipated for (2015 to 2039)	Total potential change anticipated for (2040 to 2069)	Total potential change anticipated for (2070 to 2115)
Upper end (90th Percentile)	10%	20%	40%
Central (50th Percentile)	5%	10%	20%

3.18 The guidance states for peak rainfall intensity, Flood Risk Assessments should "assess both the central and upper end allowances to understand the range of impact".

3.19 The attenuation for the proposed development has been sized to offer flood protection for the development and its downstream catchment throughout its lifetime, with the upper end allowance of 40% being utilised to present a worst case scenario.

4 Surface Water Management Plan

Existing surface water runoff

4.1 The existing drainage regime in the car-park is positive and collects discharge from surface gullies to indicated soakaways. The size and effectiveness of which is unknown. Buildings scheduled for demolition are local to the positive drainage systems.

4.2 Exceedance routes follow the existing site topography, and are generally to the north-west and south-west with a small amount to the north-east. The route from the north-west corner follows the topography of the car-park and access along the frontage of the existing college. The route to the south-west discharges around the western end of the existing embankment, and follows the existing topology of the greenfield to the south. The route to the north-east, would follow the existing developed ground levels across the college site to the north.

4.1 The MicroDrainage Source Control module has been used to assess the equivalent greenfield runoff rates for the site using the FEH Statistical method. This method is listed as an appropriate method for assessing greenfield run-off in CIRIA C753 ' The SuDS Manual'.

4.2 A copy of this assessment can be seen within Appendix E of this report, with the results summarised in Table 4.1 below.

Table 4.1 – Equivalent Greenfield Runoff Rates

Return Period	Equivalent Greenfield Rates (l/s)
2 year	8.76
30 year	22.88
100 year	31.74

4.3 To ensure the development will be safe throughout its lifetime and that it does not increase flood risk elsewhere, the drainage strategy will include appropriate mitigation measures, so that the pre-development greenfield runoff rates can be replicated or reduced.

Proposed Surface Water Strategy

4.4 The surface water strategy for this site has been developed to respect the masterplan, accounting for runoff in up to the 100 year (+40% climate change) critical storm event.

4.5 Runoff will be conveyed via a new storm network, towards an attenuation feature in the central pubic open space.

4.6 The attenuation feature will take the form of a below ground cellular attenuation storage tank.

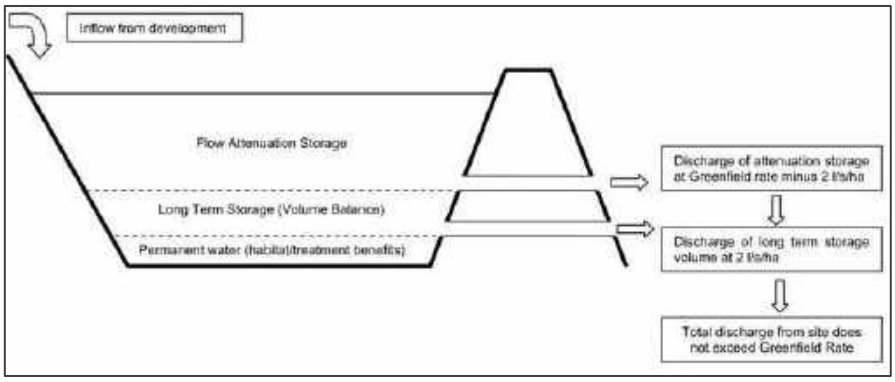
4.7 Proposed parking bays will be surfaced with under-drained (lined) permeable paving to offer treatment of runoff prior to reaching the cellular attenuation storage tank.

4.8 The peak rates of discharge will be managed by a vortex flow control, with the restricted outflow being discharged to the local public surface water network via a requisitioned (or partially requisitioned) connection (shown indicatively on the preliminary drainage layout drawing in Appendix D).

4.9 The outflow from the attenuation tank will drain through an adoptable hydrodynamic separator, which offers treatment of runoff prior to being released off-site.

4.10 The impact of any increased runoff volume will be mitigated through the use of Long Term Storage (LTS). Surface water attenuation and long-term storage will be provided simultaneously as demonstrated by Figure 5.1 below.

Figure 5.1 – Long Term Storage Provision



4.11 The required long-term storage volume has been calculated utilising Equation 24.10 within CIRIA C753 'The SuDS Manual'.

4.12 A copy of the calculation sheet has been included in Appendix E of this report, with the result summarised by Table 4.2 below;

Table 4.2 – Long-term Storage Volume

Long-term Storage Volume (m^3)	22.88

4.13 The required Long Term Storage volume is small due to the sites high SPR value (0.47). The maximum discharge rate for this volume is 3.86l/s. The indicated volume of LTS, would achieve a depth of 65mm in the proposed storage feature. The hydraulic characteristics of the proposed Hydrobrake indicate that at this depth discharge through the hydrobrake would be 2.28l/s. Therefore, in practice the above combined arrangement provide betterment over minimum design requirements for LTS.

Off-site Highways

4.14 The scheme proposes off-site highway improvement works to provide a roundabout junction at the access to the site.

4.15 It is anticipated that drainage associated with the proposed off-site highway works will be designed as a separate system in which additional flows from any increase in highway catchment are off-set within the system locally, by incorporation of storage and flow controls so that impacts to the local highway drainage system are mitigated.

4.16 The exact highway arrangements are subject to detailed design and adoption application. This approach may require the interception of highway drainage outside the areas directly affected by the new junction.

Attenuation storage volumes

4.17 The MicroDrainage Source Control module has been used to determine the attenuation requirements for the proposed development, with +10% allowance for urban creep.

4.18 The output of these models can be seen within Appendix E of this report, with the results summarised in Table 4.3 below.

Table 4.3 – Attenuation Storage Requirements

Proposed attenuation feature	Proposed Volume (m^3)
Cellular Tank 352.5m^2x1.6m	531.5
Total	**531.5**

Exceedance events

4.19 During exceedance events beyond the 100 year critical storm, surface water runoff will overflow from the aforementioned systems.

4.20 Overland flow will follow the topography of the site and where possible route towards convenient holding points, such as areas of public open space and the proposed attenuation features.

4.21 Excess surface water runoff will flow into the highway, where it will be directed towards a low-point where is can drain through an installed oversized exceedance pipe through the embankment to the south of the development where it will follow existing downstream exceedance routes.

Water Quality Management, amenity and biodiversity.

4.22 In line with the pollution indices set out in CIRIA SuDS Manual (C753) the scheme is required to provide 'SuDS component features' which have a 'total SuDS mitigation index' greater than or equal to the 'pollution hazard index'.

4.23 Table 4.4 outlines the pollution hazard indices required for the proposed land use at this site, taken from Table 26.2 of C753 as summarised below;

"Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day."

Table 4.4 – Pollution Hazard Indices (Ref. C753 Table 26.2)

Pollution Hazard Level	Total Suspended Solids	Metals	Hydrocarbons
Low	0.5	0.4	0.4

4.24 The SuDS components proposed for the site and their relevant 'mitigation indices' are identified within Table 4.5.

Table 4.5 – SuDS Mitigation Indices

SuDS Component	Total Suspended Solids	Metals	Hydrocarbons
Hydrodynamic Separator	0.5	0.4	0.5
Permeable Paving	0.7	0.6	0.7

4.25 Table 4.5 demonstrates that the 'SuDS mitigation index' for each proposed feature would be greater than or equal to the 'pollution hazard index'. The higher risk areas represented by parking, receive a double barrier treatment scheme in which the treatment provided exceeds the minimum necessary under CIRIA C753 'The SuDS Manual'. Therefore, overall, the scheme provide a robust treatment train.

4.26 The SuDS scheme contributes to the provision of amenity and biodiversity by occupying areas of the site such that development is restricted, these areas have been used as green public open space that can provide areas in which planting and landscaping can contribute to placing making and biodiversity provision.

Proposed foul water strategy

4.27 A pre-development capacity enquiry has been submitted to Southern Water. Whilst their response has not yet been received, in terms of wastewater connections, the developer is entitled to make a connection to the nearest practical point on the network where the existing sewer is at least the same diameter as the new sewer required to provide capacity for the development.

4.28 Under the provisions of the Water Industry Act 1992 (as amended), the developer will need to pay the sewerage undertaker the published sewer connection charges and infrastructure charge per dwelling, and the sewerage undertaker is responsible for any network reinforcement.

4.29 Foul flows generated by the development will route through a new adoptable foul water network towards the south of the site before being requisitioned to an agreed point of connection.

4.30 We have shown an indicative alignment for the new adoptable foul sewerage system on the preliminary drainage layout included within Appendix D of this report, but the final requisition route will be designed and confirmed by Southern Water.

4.31 Copies of the Southern Water asset mapping has been included within Appendix F of this report.

Maintenance

4.32 Any adoptable sewerage networks will be designed in accordance with the Design and Construction Guidance and will be offered to Southern Water for adoption.

4.33 Any storm drainage which solely serves the adopted highway will be offered to Hampshire County Council for adoption.

4.34 Any private drainage will be designed in accordance with Building Regulations Part H and will become the responsibility of an appointed management company.

4.35 The operation and maintenance of any SuDS features will be undertaken in accordance with 'CIRIA C753 – The SUDS Manual, Chapter 32 – Operation and Maintenance'.

5 Miscellaneous Issues

Construction issues

5.1 It is good practice to offer a Construction Environmental Management Plan (CEMP) to allow the construction and phasing of drainage works to be closely monitored. Prior to the commencement of construction, it is recommended the contractor produce a CEMP and agree it with the LLFA.

Residual flood risks

5.2 The proposed development site is located wholly within 'Flood Zone 1' and is not impacted by flooding from surface water.

5.3 The residual risk of blockage or failure of any key component within the proposed drainage strategy will be reduced through appropriate operation and maintenance procedures.

5.4 At the detailed design stage the residual risks from exceedance storms will be reduced through appropriate design of the external works and highway alignments. The design will aim to steer exceedance flows towards convenient holding points, beyond which an oversized drain will direct flows toward existing exceedance routes in the greenfield to the south of the development site.

5.5 Safe access and egress has been identified.

Health and safety

5.6 The site Ground Investigation has identified asbestos fibres are present in samples analysed from the site.

5.7 Under the CDM Regulations, adequate information about the site must be provided by the client in order to allow the potential hazards to be reviewed by the designer, and avoidance / mitigation measures taken where reasonably practicable.

6 Mitigation, Conclusions and Recommendations

Mitigation

6.1 The proposed development has been assessed in line with the NPPF, to allow the planning application to be progressed and to show that the development can be undertaken in an acceptable manner from a flood risk perspective.

6.2 The extents of built development are limited to 'Flood Zone 1' only and are not susceptible to surface flooding from pluvial, groundwater, infrastructure or artificial sources.

6.3 To ensure the development is safe throughout its lifetime, the surface water strategy accounts for runoff in up to the 100 year return period.

6.4 The strategy also safeguards against the upper end allowances for climate change (40%), providing betterment over undeveloped conditions, where the rate and volume of runoff would continue to increase due to climate change.

6.5 The Ground Investigation indicates the site has a low infiltration rate that precludes the use of soakaways by virtue of excessive half drain-down time (in excess 7 days).

6.6 The outline strategy also provides a 10% allowance for future urban creep and discharge at existing greenfield runoff rates. The cumulative impact of the various design allowances will ensure that flood risk within the downstream catchment is reduced as a result of the proposed development.

6.7 The drainage arrangements include a treatment scheme to mitigate against degradation of water quality as a result of the development. The proposals contribute to the provision of amenity space, and provide potential for planting to improve biodiversity of the development.

6.8 It is anticipated that flood risk from alteration to the highway can be mitigated by local inclusion of storage and flow controls subject to adoption detailed design.

6.9 During exceedance events runoff will be directed away from buildings and toward low points where exceedance drainage provision is provided,

6.10 Foul flows generated by the development are proposed to be discharges via a requisitioned connection to the pubic foul sewer to the south of the site.

Conclusions

This Flood Risk Assessment has been assessed in line with the NPPF. It is concluded that the development can be undertaken in a sustainable manner, whilst also reducing the flood risk to existing properties in the downstream catchment.

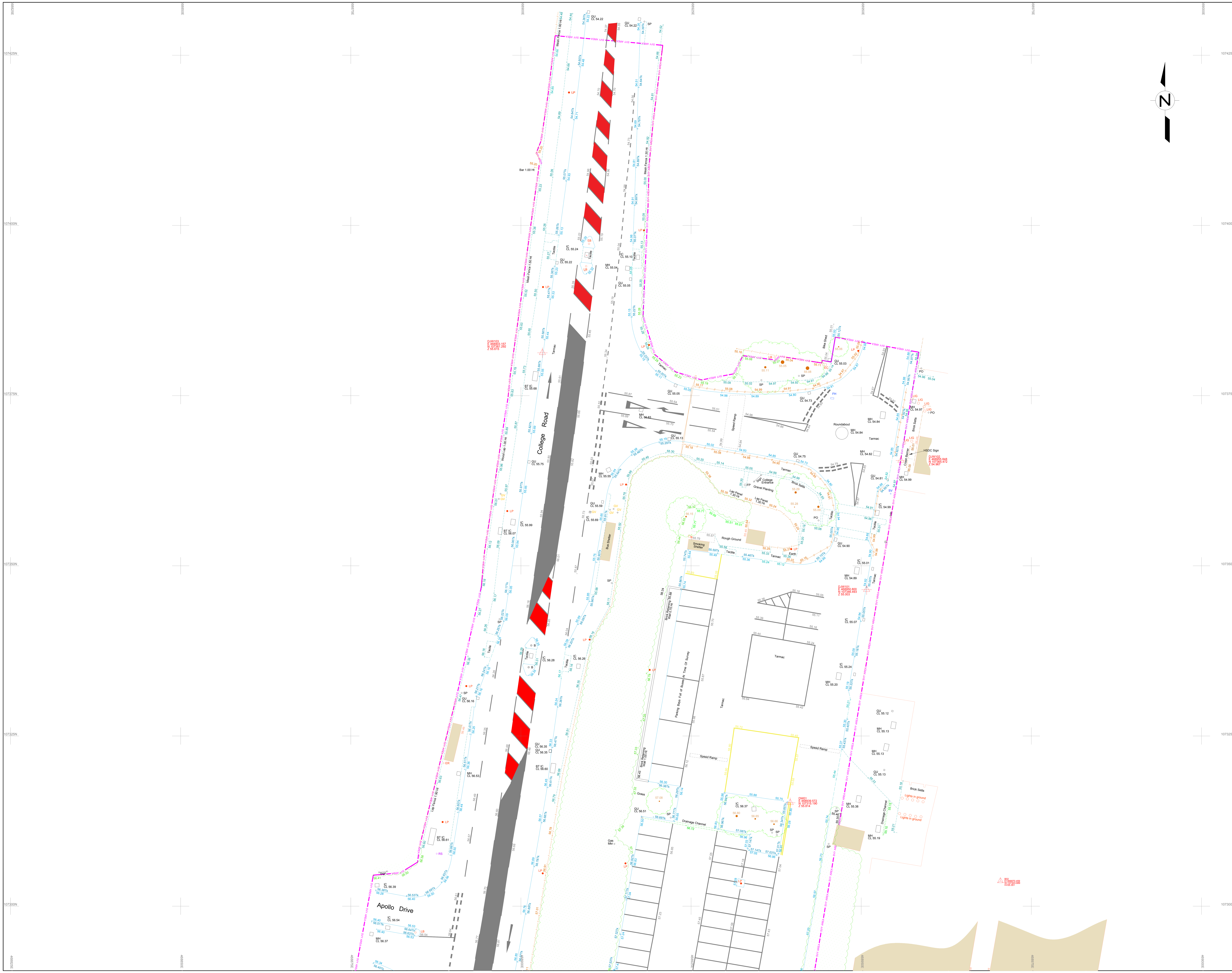
Recommendations

6.11 As demonstrated, the development will be safe from flooding throughout its lifetime and will actively reduce flood risk to properties within the downstream path of the southern catchment.

6.12 There are therefore no grounds for objections, and we trust that the Lead Local Flood Authority will confirm to the local planning authority accordingly.

6.13 The proposed development has been assessed in line with the NPPF, to allow the planning application to be progressed and to show that the development can be undertaken in an acceptable manner from a flood risk perspective.

Appendix A Topographic Survey



LEGEND

UTILITY LINETYPES

British Telecom	BT	Gas	G
Cable Television	CATV	Heating Pipes	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
Drainage - Storm Water	SW	Traffic Signal Loop	TSL
Empty Duct	ED	Unknown found by GPR	GPR — U
Electric	E	Unknown	U
Fire Hydrant Main	FH	Unknown Cable	UC
Fibre Optic	FO	Unknown Pipeline	UPL
Fuel	FUEL	Water	W

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above) — ASR — XXX — ASR — XXX —

UTILITY SURVEY INFORMATION

Area of Concern	AOC	Unable to Survey	UTS
Contracted Survey Area	SVY AREA	Unable to Lift (cover)	UTL
Previous Survey Area	PREVIOUS	Unable to Trace	
Extent of (Post processed) GPR	GPR Survey	Unable to Trace (due to blockage)	
Depth to Top of Service (metres)	(0.60d)	Unable to Trace Further	
		End of Trace	

ABREVIATIONS used on a PAS 128 Survey

(O.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)		Pipe into Ground (symbol)	
Belisha Beacon (symbol)	BB	Post (symbol)	PO
Bollard (symbol)	B	Rain Water Pipe (symbol)	RWP
Borehole (symbol)		Road Sign (symbol)	RS
British Telecoms IC (sized)	BTIC	Rodding Eye (symbol)	RE
Building (incomplete detail)		Sapling (symbol)	S
Cable into Ground (symbol)		Sign Post (symbol)	SP
Cable TV Box (symbol)	CTV	Spot Light (symbol)	SL
CCTV Camera (symbol)		Spot Height	50.00 +
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Distribution Board (symbol)	DB	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet (sized)	EC	Traffic Bollard (symbol)	B
Electric Pole (symbol)	EP	Tree (dimensions in metres - e.g.)	
Electric Sign (symbol)	ES	Diameter at 1mh: (bole) Height: Spread: Species:	Dia: 0.3 Sp: 7.5 Ht: 10.2 Maple
Embankment	Bottom / Top		
Feeder Pillar (sized)	FP	Traffic Light (symbol)	TL
Fire Hydrant (sized)	FH	Unknown Valve (symbol)	UV
Flag Pole (symbol)	FP	Vent Pipe (symbol)	VP
Flat Roof Level in metres	FRL 50.00	Wall	
Flood Light (symbol)	FL	Waste Pipe (symbol)	WP
Gas Valve (symbol)	GV	Water Meter (symbol)	WM
Gate	Single / Double	Water Valve (symbol)	WV
Ground Level in metres	GL 50.00		
Gulley (sized)	GU	Building Canopy	
Inspection Cover (sized)	IC	Crash Barrier	
Invert Level in metres	IL 50.00	Drainage Channel	Drainage Channel
Junction Box - BT (sized)	JB BT	Drop Kerb (level in metres)	50.00
Junction Box - Comms (sized)	JB COM	Edge Detail (level in metres)	50.00
Junction Box - Elec (sized)	JB	Footpath (level in metres)	50.00
Lamp Post (symbol)	LP	Fence	
Light Bollard (symbol)	LB	Heras Fence	HERAS
Light in ground (symbol)	LIG	Kerb channel (level in metres)	50.00
Manhole (sized)	MH	Kerb top (level in metres)	50.00Tk
Manhole Capped Port		Overhead Service Line	OHS
Parapet Level in metres	PL 50.00	Pedestrian Railing	
Pipe Diameter in millimetres	Ø100		

GENERAL NOTES

Irrespective of the information provided by a utility survey and statutory plans, excavation work should be undertaken with extreme caution and in accordance with HSE Guidelines - HSG47 Avoiding Danger from Underground Services

Only sub-surface utility information is provided. Above ground utility information may be shown where it assists with positional referencing.

Utilities may continue outside of the survey area. Any paint marks outside of the area are for investigative purposes only and may not represent the full extent of the sub-surface utilities.

Where logic indicates a utility exists but which cannot be positively confirmed with the technology, an assumed route (ASR) is recorded. All assumed service routes (ASR) have been highlighted with a background yellow colour for visual enhancement.

Sewer and manhole details shown on this drawing have been obtained by observation and measurement from the surface and as such cannot be guaranteed

Vertical & Horizontal Position - Vertical position (depth) is indicative to the top of the utility/feature and is recorded as (x.xxd) i.e. (1.25d) - (depth to top of service) and should not be taken as exact, as this could be the surround to the service rather than the service itself. Where depth information from the technology is unclear, depth is not shown. Drains and pipes/ducts may have been detected using threading and the depth indicated could be between the top (soffit) and the bottom (invert). Horizontal position is indicative to the centre of the utility/feature and should not be taken as exact.

Warranty - Biodegradable paints are used to mark-out the position of the utilities. Markings may become illegible quickly depending on ground, weather and traffic conditions. No warranty is given in respect of the durability of the paint markings and that they are a complete representation of the sub-surface utilities, therefore, this drawing should be used as the primary reference for the survey results.

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SHEET LAYOUT

Sheet 01

Sheet 02 | Sheet 03

Rev	Notes	Drawn	Date
A	CCTV reference numbers added. Additional drainage information from CCTV added.	MWS	6/4/20

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Title:
Utility Mapping & Topographical & CCTV Survey

Client:
Places For People

Project:
Havant & South Downs College, College Road, Widley,Waterlooville

Date Completed:	20/03/2020	Post Code:	PO7 8AA
Surveyed:	SW, DW	Scale:	1/250 (A1 Sheet)
Drawn:	DM		
Checked:	SW, DW		
Job No:	SOR017240	Dwg No: 01	Rev: A

LEGEND

UTILITY LINETYPES

British Telecom	BT	Gas	G
Cable Television	CATV	Heating Pipes	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
Drainage - Storm Water	SW	Traffic Signal Loop	TSL
Empty Duct	ED	Unknown found by GPR	U
Electric	E	Unknown	U
Fire Hydrant Main	FH	Unknown Cable	UC
Fibre Optic	FO	Unknown Pipeline	UPL
Fuel	FUEL	Water	W

Assumed Service Route - See GENERAL NOTES (Using abbreviation of service and colour as above) — ASR — XXX — ASR — XXX

UTILITY SURVEY INFORMATION

Area of Concern	AOC	Unable to Survey	UTS
Contracted Survey Area	SVY AREA	Unable to Lift (cover)	UTL
Previous Survey Area	PREVIOUS	Unable to Trace	
Extent of (Post processed) GPR	GPR Survey	Unable to Trace (due to blockage)	
Depth to Top of Service (metres)	(0.60d)	Unable to Trace Further	
		End of Trace	

ABREVIATIONS used on a PAS 128 Survey

(0.65d B2P) 0.65d = Depth in metres, B2 = Quality Level, P = Post processed GPR

TOPOGRAPHIC & UTILITY DETAILS

Barrier (symbol - sized)	BB	Pipe into Ground (symbol)	
Belisha Beacon (symbol)		Post (symbol)	PO
Bollard (symbol)	B	Rain Water Pipe (symbol)	RWP
Borehole (symbol)		Road Sign (symbol)	RS
British Telecoms IC (sized)	BTIC	Rodding Eye (symbol)	RE
Building (incomplete detail)		Sapling (symbol)	
Cable into Ground (symbol)		Sign Post (symbol)	SP
Cable TV Box (symbol)	CTV	Spot Light (symbol)	SL
CCTV Camera (symbol)		Spot Height	50.00
Cover Level in metres	CL 50.00	Stop Cock (symbol)	SC
Direction of Flow (Drainage)		Stop Valve (symbol)	SV
Distribution Board (symbol)	DB	Survey Station (symbol)	
Earth Rod (symbol)	ER	Telephone Pole (symbol)	TP
Electric Cabinet (sized)	EC	Traffic Bollard (symbol)	B
Electric Pole (symbol)	EP	Tree (dimensions in metres - e.g.)	
Electric Sign (symbol)	ES	Diameter at 1mt (bole)	Dia 0.3
Embankment		Height	Ht 7.5
Feeder Pillar (sized)	FP	Spread	Sp 7.5
Fire Hydrant (sized)	FH	Species	Maple
Flag Pole (symbol)	FP	Traffic Light (symbol)	TL
Flat Roof Level in metres	FRL 50.00	Unknown Valve (symbol)	UV
Flood Light (symbol)	FL	Vent Pipe (symbol)	VP
Gas Valve (symbol)	GV	Wall	
Gate		Waste Pipe (symbol)	WP
Ground Level in metres	GL 50.00	Water Meter (symbol)	WM
Gulley (sized)	GU	Water Valve (symbol)	WV
Inspection Cover (sized)	IC	Building Canopy	
Invert Level in metres	IL 50.00	Crash Barrier	
Junction Box - BT (sized)	JB BT	Drainage Channel	Drainage Channel 50.00
Junction Box - Comms (sized)	JB COM	Drop Kerb (level in metres)	50.00
Junction Box - Elec (sized)	JB	Edge Detail (level in metres)	50.00
Lamp Post (symbol)	LP	Footpath (level in metres)	50.00
Light Bollard (symbol)	LB	Fence	
Light in ground (symbol)	LIG	Heras Fence	HERAS
Manhole (sized)	MH	Kerb channel (level in metres)	50.00
Manhole Capped Port		Kerb top (level in metres)	50.00
Parapet Level in metres	PL 50.00	Overhead Service Line	OHS
Pipe Diameter in millimetres	100	Pedestrian Railing	

GENERAL NOTES

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Checked:	SW, DW	

Job No:	Dwg No:	Rev:
SOR017240	02	A

LEGEND

UTILITY LINETYPES

British Telecom	BT	Gas	G
Cable Television	CATV	Heating Pipes	HP
Closed Circuit Television	CCTV	HV Cables	HV
Communications	C	Multiple Services Route	MSR
Drainage	DR	Oil	OIL
Drainage - Combined Water	CW	Oxygen	OXY
Drainage - Foul Water	FW	Street Lighting	SL
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Electric Sign (symbol)	ES	Diameter at 1m: (tube)	Dia 0.3
Embankment		Height	Ht 7.5
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Fire Hydrant (sized)	FH	Spread	Spr 6.0
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Inspection Cover (sized)	IC	Water Valve (symbol)	WV
Invert Level in metres	IL 50.00	Building Canopy	
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Junction Box - Comms (sized)	JB COM	Drainage Channel	Drainage Channel
Junction Box - Elec (sized)	JB	Drop Kerb (level in metres)	DK 50.00
Lamp Post (symbol)	LP	Edge Detail (level in metres)	ED 50.00
Light Bollard (symbol)	LB	Footpath (level in metres)	FP 50.00
Light in ground (symbol)	LIG	Fence	
Manhole (sized)	MH	Heras Fence	HERAS
Manhole Capped Port		Kerb channel (level in metres)	KC 50.00
Parapet Level in metres	PL 50.00	Kerb top (level in metres)	KT 50.00
Pipe Diameter in millimetres	100	Overhead Service Line	OHS
		Pedestrian Railing	

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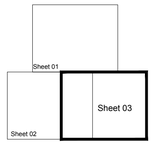

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Client: Places For People

Project: Havant & South Downs College, College Road, Widley,Waterlooville

Date Completed:	20/03/2020	Post Code:	PO7 8AA
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Drawn:	DM		
Checked:	SW, DW		
Job No:	SOR017240	Dwg No:	03
		Rev:	A

Appendix B Ground Investigation

EXECUTIVE SUMMARY

SITE INFORMATION AND SETTING	
Objectives	Phase 1 Desk Study and phase 2 Ground Investigation.
Client	Places for people
Site name and location	Havant & South Downs College, College Road, Widley, Waterlooville, PO7 8AA.
Proposed development	The site development proposals are understood to comprise of six apartment blocks and 57 low-rise residential units with associated infrastructure and gardens.
GROUND MODEL	
Desk study summary	The site currently comprises southern car park of Havant & South Downs College which consists of asphalt covered ground and some grass verges. The north of the site is occupied by the south and south east buildings of the college and appear to have used potentially asbestos containing building materials in their construction. There is a high-pressure gas main present in the west and an electricity sub-station in the east of site. The site is approximately 2.2 ha in area and is relatively level at 50m above Ordnance Datum (OD). Review of historical Ordnance Survey mapping indicates: • Early maps dated 1868 show the site to have been covered by woodland which is then replaced by open grassland in 1897. • There is a roman road noted in the south of site traversing west to east, connecting to a roman villa complex situated to the east of site. • In the 1980s, the South Downs College premises is constructed to the north of site, with a car park covering the site. The College buildings have undergone reconfiguration over the years but the car park remains similar to this present day. A non-specialist UXO assessment indicates a High bomb risk. The geology at the site consists of Wittering Formation overlying London Clay Formation. Beneath the London Clay Formation are strata of the Lambeth Group and subsequently the Portsdown Chalk Formation. The site is underlain at depth by strata associated with soluble deposits (Portsdown Chalk Formation). However, the underlying Chalk deposits are considered to be too deep to have any significant effect on the site. Localised Made Ground is likely to be present as a result of historical construction. The Wittering formation comprises a Secondary A aquifer. The site is within a Zone 1c Source Protection Zone and there are no groundwater abstractions within 1km of the site. The nearest surface water feature is an unnamed inland river (partially culverted) 185m east of site.
Ground and groundwater conditions encountered by investigation	The ground conditions as proven by the investigation undertaken at the site comprise: • Surface Cover – bituminous bound pavement hardstanding – from ground level to 0.25m below ground level (bgl), comprising asphalt; over • Made Ground – between 0.10m and 1.10m below ground level (bgl), comprising granular sub-base material over sandy gravelly silt and/ clay, with man-made fragments of brick and asphalt. • Wittering Formation – between 0.40m and 9.00m bgl, comprising greyish green/ orange/ grey brown cohesive deposits of sandy clay and granular deposits of gravelly sand; over • London Clay Formation – between 4.50m and >20.00m bgl, comprising grey to blueish grey slightly sandy silty clay.

	Water levels recorded post-fieldwork ranged from between 3.05m bgl and 7.39m bgl (50.73m OD to 54.21m OD).
GEOTECHNICAL CONCLUSIONS	
Conclusions of geotechnical assessment	Obstructions associated with current development, including services such as the high-pressure gas main, should be anticipated. Excavation to proposed founding depth generally should be readily achievable with standard excavation plant. Heavy duty excavation plant/breaking equipment may be required to excavate the existing construction. Water seepages into excavations are likely to be adequately controlled by sump pumping. Wittering Formation and London Clay Formation should be considered of high volume change potential. Foundations are recommended to comprise: • Zone A: Strip/trench fill foundations from 1.2m bgl; • Zone B: Strip/trench fill foundations from 2.0m bgl; Both zones will be subject to deepening of foundations/heave protection is likely to be required to allow for the effects of trees. Allowable net bearing pressure of 140kN/m² should be available for Zone A strip/trench fill foundations. Subject to deepening due to trees. Allowable net bearing pressure of 117kN/m² should be available for Zone B strip/trench fill foundations. Subject to deepening due to trees. Suspended floors recommended due to presence of high shrinkage potential clay soils. A design CBR of 2.5% is recommended. Design Sulfate Class - DS-1 and ACEC Class AC-1 for Wittering Formation. Equivalent to Design Chemical Class DC-2 for a 50-year design life.
GEO-ENVIRONMENTAL CONCLUSIONS	
Conclusions of contamination Generic risk assessment	Human health: • Asbestos fibres in sub-base of car park. • Asbestos fibres from insulation or asbestos-containing materials in the college buildings. Plant growth: • The conditions at the site are not considered to pose an unacceptable risk to plant life. Controlled Waters: • The conditions at the site are not considered to pose an unacceptable risk to Controlled Waters. Ground gases or vapours: • Low risk from ground gases (subject to completion of two further monitoring visits) and CS1 conditions apply. Radon: • The site is not in a Radon Affected Area. Radon protection not required in new buildings. Water supply pipes: • Brownfield site with organic contamination and barrier pipe is considered suitable for this site. However, confirmation should be sought from the water supply company at the earliest opportunity.
Proposed mitigation measures	The mitigation measures proposed to remove unacceptable risks include: • If sub-base of car park is to remain, further testing and assessment of risk from asbestos (PL1). Depending on results of further investigation, a 600mm engineered cover system in gardens and 450mm in public open space, comprising a crushed stone break layer, subsoil and topsoil may be required.

	• Completion of demolition asbestos survey and safe removal of ACM in existing buildings (PL2). • Installation of barrier pipe for new plastic water supply pipes (PL3). • Watching brief during groundworks is advised.
Waste management	Excavated soils to be disposed of as waste, are likely to be classed as non-hazardous.
FUTURE CONSIDERATIONS	
Further work	Following the ground investigation works undertaken to date, the following further works will be required: • demolition asbestos survey; • specialist UXO/UXB risk assessment in accordance with CIRIA Report C681 with regard to construction risk; • completion and reporting of two additional gas monitoring visits to meet the minimum monitoring requirements, hence the conclusions in this report are provisional, subject to the completion of monitoring; • watching brief during groundworks in the vicinity of the electrical substation and former oil tank; • discussion and agreement with utility providers regarding the materials suitable for pipework; • discussions with regulatory bodies and the warranty provider regarding the conclusions of this report; • assessment of tree influence on foundations and design of foundations; • production of a Remediation Strategy and Verification Plan (and agreement with the regulatory bodies and the warranty provider); • if required, production of a Materials Management Plan relating to reuse of soils at the site; • remediation and mitigation works; and • verification of the remediation and mitigation works.

This Executive Summary forms part of Hydrock Consultants Limited report number 16422-HYD-XX-XX-RP-GE-0001 and should not be used as a separate document.

5. GROUND INVESTIGATION RECORDS AND DATA

5.1 Physical ground conditions

5.1.1 Summary of strata encountered

The following presents a summary of the properties of the ground and groundwater conditions encountered, based on field observations, interpretation of the field data and laboratory test results, taking into account drilling, excavation and sampling methods, transport, handling and specimen preparation.

All relevant data from the Hydrock investigation discussed in Section 4 are used from this point forward.

Details of the Hydrock ground investigation works are provided in the logs in Appendix E, a summary of the ground model is presented in Table 5.1 and the individual strata are described in the sections below.

Table 5.1: Strata encountered

Stratum	Depth to top (m bgl)	Depth to base (m bgl)	Thickness (m) (range)	Thickness (m) (average)
Surface Cover – bituminous bound pavement hardstanding	0.00	0.10 – 0.25	0.10 – 0.25	0.20
Made Ground	0.10 – 0.25	0.40 - 1.10	0.40 – 1.10	0.65
Wittering Formation	0.40 – 1.10	4.60 - 9.00	>4.0 – 8.5	4.90
London Clay Formation	4.50 – 9.00	> 5.45 - >20.00	>0.35 - >11.00	>2.80

5.1.2 Surface covering

The following surface cover was identified during the field reconnaissance and the fieldworks:

- Bituminous bound pavement hardstanding, covering approximately 85% of the site.
- Structures (college buildings and electricity substation) covering approximately 10% of the site.
- Vegetation (grass verges, hedges and trees), covering approximately 5% of the site.

5.1.3 Bituminous bound pavement

Bituminous bound pavement of asphalt material was encountered at all locations, with the exception of WS103 which was located on a grass verge. The thickness of the cores recovered ranged from 0.10m and 0.25m with an average thickness of 0.20mm being recorded. The bituminous bound pavement was found to rest directly on a granular sub-base.

5.1.4 Made Ground

Below the surface covering, Made Ground was recorded across the entire site and comprised the following:

- Granular sub-base material, immediately beneath asphalt to depths of between 0.10m and 0.60m, with an average thickness of 0.40m. Comprises sand and gravel or sandy gravel with minor proportions of clay and silt.

- General made ground encountered beneath granular sub-base material between 0.20m and 1.10m, with an average thickness of 0.65m. Comprises sandy gravelly silt and/ clay, with man-made fragments of brick and asphalt.

5.1.5 Wittering Formation

Wittering Formation was encountered underlying the Made Ground across site, up to 8.50m thickness, and comprised largely cohesive deposits with some granular layers as detailed below:

- 'Cohesive' Wittering Formation consisted of greyish green/ orange/ grey and brown sandy clay.
- 'Granular' Wittering Formation consisted of gravelly sand.

5.1.6 London Clay Formation

London Clay Formation was encountered underlying the Wittering Formation from depths between 4.50m and 9.00m bgl and comprised firm becoming very stiff with depth grey to blueish grey slightly sandy silty clay to the base of the borehole at 20.00m bgl.

5.2 Obstructions

Obstructions were encountered during the investigation as summarised in Table 5.2.

Table 5.2: Obstructions encountered

Stratum	Location	Depth (m bgl)	Description
Made Ground	WS103	0.8	Heavily compacted made ground

5.3 Groundwater

5.3.1 Groundwater observations and levels

Groundwater was not encountered during the investigation. A summary of the groundwater levels recorded during post-fieldwork monitoring are summarised in Table 5.3.

Table 5.3: Groundwater level data summary

Stratum	Date range	Location	Post-fieldwork monitoring	
			Depth to groundwater (range) (m bgl)	Groundwater elevation (range) (m OD)
Wittering Formation	16/09/20 – 26/10/20	BH101	7.27 – 7.39	50.73 – 50.91
		WS102	3.32 – 4.6	52.93 – 54.21
		WS106	Dry	
		WS107	3.05 – 3.89	53.17 – 54.01

5.3.2 Groundwater summary

In general, groundwater was encountered during monitoring within the Wittering Formation at levels between 3.05m and 7.39m bgl (50.73m and 54.21m AOD).

KEY

BHXXX Cable percussive borehole

WSXXX Windowless sample borehole

NOTES

1. All dimensions are to be checked on site before the commencement of works. Any discrepancies are to be reported to the Architect & Engineer for verification. Figured dimensions only are to be taken from this drawing.

2. This drawing is to be read in conjunction with all relevant Engineers' and Service Engineers' drawings and specifications.

3. This drawing has been based on the following drawings and information:
Sumo Survey Services dwg no. SOR017240

REV.	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE
P1	FIRST ISSUE					
	MR	14/09/20	MR	14/09/20	AJ	14/09/20

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CLIENT
PLACES FOR PEOPLE

PROJECT
HAVANT & SOUTH DOWNS COLLEGE

TITLE
SITE INVESTIGATION PLAN

HYDROCK PROJECT NO.	SCALE @ A3
16422	1:600

PURPOSE OF ISSUE	STATUS
SUITABLE FOR INFORMATION	S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)	REVISION
16422-HYD-XX-XX-DR-GE-1001	P01

Hydrock	Project: Havant and South Downs College	Borehole No BH101 Page No. 1 of 2	
Method: Cable Percussion	Date(s): 10/09/2020	Logged By: MR	Drilled By: SE
Client: Places for People	Co-ords: 468912.95, 107217.63	Checked By: ARJ	Flush: Water
Hydrock Project No: 16422	Ground Level: 58.25m OD		Scale: 1:50

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Depth (m)	Type	Results							
0.20 - 0.50	B			Asphalt. (MADE GROUND)	0.25	(0.25)	58.00		
0.30	ES			Light brown SAND and GRAVEL of brick,concrete and flint. (MADE GROUND)	0.50	(0.25)	57.75		
0.50 - 1.20	B			*... At 0.40m bgl black plastic membrane.*					
0.80	D			Soft, greyish green slightly gravelly sandy CLAY. Gravel is angular to rounded fine to coarse of flint. (WITTERING FORMATION)					
0.80	ES				1	(0.90)			
1.20 - 1.65	U				1.40		56.85		
				Firm grey and orange mottled slightly sandy to sandy CLAY. Very thin undulating laminations and closely spaced (WITTERING FORMATION)					
2.00	SPT	N=10 (1,2,2,3,2,3)			2				
2.00 - 2.45	D			*... From 2.50m bgl undulate thinly laminated to thickly laminated extremely closely spaced grey and orange slightly sandy to sandy CLAY*					
3.00 - 3.45	U				3				
3.50	D					(4.80)			
4.00	SPT	N=17 (2,2,3,4,4,6)		*... From 4.0m bgl becoming stiff. Rare medium rounded gravel of flint.*	4				
4.00	D			*... From 4.0m bglbecoming stiff. Rare medium rounded gravel of flint.*					
5.00	D				5				
5.00 - 5.45	U								
5.50	D								
6.00	SPT	N=18 (2,3,3,4,5,6)			6				
6.00	D			Medium dense yellow and orange mottled SAND. (WITTERING FORMATION)	6.20		52.05		
6.20 - 6.50	B								
7.00	D				7				
7.50	SPT	N=20 (4,3,4,4,6,6)		*... From 7.50m bgl moistured*		(2.80)			
8.00 - 8.50	B				8				
9.00	D				9				
9.00 - 9.45	U			Firm, light grey thinly laminated extremely closely spaced very sandy CLAY with grey fosilised wood to very clayey SAND. (LONDON CLAY FORMATION)	9.00		49.25		
9.50	D			*... From 9.50m bgl becoming sandy clay.*		(1.20)			
10.00	D				10				

Progress and Observations									Chiselling		
Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)	From (m)	To (m)	Duration (HH:MM)
Premier							Water				

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Install to 9.00m bgl.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No BH101 Page No. 2 of 2	
Method: Cable Percussion	Date(s): 10/09/2020	Logged By: MR	Drilled By: SE
Client: Places for People	Co-ords: 468912.95, 107217.63	Checked By: ARJ	Flush: Water
Hydrock Project No: 16422	Ground Level: 58.25m OD		Scale: 1:50

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Depth (m)	Type	Results							
				Firm, light grey thinly laminated extremely closely spaced very sandy CLAY with grey fosilised wood to very clayey SAND. (LONDON CLAY FORMATION)	10.20		48.05		
10.50	SPT	N=21 (3,3,4,5,6,6)		Stiff dark grey slightly sandy CLAY. (LONDON CLAY FORMATION)					
11.00	D				11	(1.80)			
12.00	D				12	12.00	46.25		
12.00 - 12.45	U			Very stiff dark grey silty CLAY. (LONDON CLAY FORMATION)					
12.50	D								
13.00	D				13				
13.50	SPT	N=36 (5,6,9,8,9,10)							
14.00	D			*... From 14.00m bgl becoming slightly sandy.*	14				
15.00	D				15				
15.00 - 15.45	U								
15.50	D								
16.00	D				16	(8.00)			
16.50	SPT	N=33 (5,7,6,8,8,11)							
17.00	D				17				
18.00	D				18				
18.00 - 18.45	U								
19.00	D				19				
19.50	SPT	N=40 (6,8,9,10,11,10)							
20.00	D			End of Borehole at 20.00m	20	20.00	38.25		

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

Chiselling

From (m)	To (m)	Duration (HH:MM)

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Install to 9.00m bgl.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS101 Page No. 1 of 1	
Method: Window Sampler	Date(s): 10/09/2020	Logged By: MR	Drilled By: RGI
Client: Places for People	Co-ords: 468917.63, 107241.40	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 57.75m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt. (MADE GROUND)	0.25	(0.25)	57.50		
							Light brown SAND and GRAVEL of brick,concrete and flint. (MADE GROUND)	0.60	(0.35)	57.15		
			0.60	B			Firm grey and orange mottled slightly sandy to sandy CLAY. Very thin undulating laminations and closely spaced. (WITTERING FORMATION)					
1.00 - 2.00	100mm	100%										
			1.20	SPT	N=14 (2,2,3,3,4,4)				(1.20)			
			1.20	B				1.80		55.95		
2.00 - 3.00	80mm	100%	2.00	SPT	N=23 (4,5,6,6,5,6)		Medium dense orange and grey thinly laminated extremely close spaced SAND. (WITTERING FORMATION)		(1.30)			
							... Between 2.65m and 2.85m bgl firm, sandy CLAY.					
3.00 - 4.00	80mm	100%	3.00	SPT	N=12 (3,2,2,3,3,4)			3.10		54.65		
							Firm orange and grey, sandy CLAY. (WITTERING FORMATION) *... From 3.10m bgl rare subrounded to rounded fine to medium flint gravel.*		(1.10)			
4.00 - 5.00	60mm	100%	4.00	SPT	N=15 (2,2,3,3,4,5)			4.20		53.55		
							Firm dark grey and orange, sandy CLAY. (WITTERING FORMATION)	4.60	(0.40)	53.15		
							Firm to stiff, dark grey, slightly sandy silty CLAY. (LONDON CLAY FORMATION)					
			5.00	SPT	N=18 (3,3,4,4,5,5)				(0.85)			
								5.45		52.30		
							End of Borehole at 5.45m					

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Install to 5.0m bgl.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS102 Page No. 1 of 1

Method: Window Sampler	Date(s): 10/09/2020	Logged By: MR	Drilled By: RGI
Client: Places for People	Co-ords: 468939.56, 107238.95	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 57.53m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt. (MADE GROUND)	0.25	(0.25)	57.28		
							Light brown SAND and GRAVEL of brick,concrete and flint. (MADE GROUND)	0.40	(0.15)	57.13		
							Concrete. (MADE GROUND)	0.50	(0.10)	57.03		
							Yellow SAND and GRAVEL of brick,concrete and flint. (MADE GROUND)	0.60	(0.10)	56.93		
1.00 - 2.00	100mm	100%					Medium dense orange and grey thinly laminated extremely close spaced clayey SAND. Occasional bands of 10 to 20mm black clay. Occasional bands of 10 to 20mm gravelly sand. Gravel is subrounded fine to medium of flint. (WITTERING FORMATION)	1				
			1.20	SPT	N=17 (2,2,3,4,5,5)							
							... Between 1.40m and 1.60m firm CLAY.		(1.60)			
2.00 - 3.00	80mm	100%	2.00	SPT	N=8 (3,3,2,3,1,2)			2				
								2.20		55.33		
							Firm, grey and orange mottled slightly sandy to sandy CLAY. Very thin undulating laminations and closely spaced (WITTERING FORMATION)					
			2.60	D								
3.00 - 4.00	80mm	100%	3.00	SPT	N=14 (3,2,3,3,4,4)		*... Between 3.00m and 3.30m sand band.*	3				
									(2.90)			
4.00 - 5.00	60mm	100%	4.00	SPT	N=16 (3,3,4,4,4,4)		*... From 4.20m bgl becoming dark orange and dark grey.*	4				
			4.50	D								
			5.00	SPT	N=19 (2,2,3,4,6,6)			5				
								5.10		52.43		
							Firm to stiff, dark grey, slightly sandy silty CLAY. (LONDON CLAY FORMATION)		(0.35)			
								5.45		52.08		
							End of Borehole at 5.45m					
								6				

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Install to 4.0m bgl.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS103 Page No. 1 of 1	
Method: Window Sampler	Date(s): 09/09/2020	Logged By: YP/MR	Drilled By: RGI
Client: Places for People	Co-ords: 468976.25, 107243.23	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 58.49m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Grass over brown, slightly gravelly slightly sandy SILT with abundant roots and rootlets. Gravel is fine to medium subrounded to rounded flint. (MADE GROUND)	0.20	(0.20)	58.29		
							Yellowish brown, slightly gravelly slightly sandy SILT. Gravel is subrounded fine to medium of flint. Rare brick fragments. (MADE GROUND) *... At 0.30m bgl rare brick fragment about 20mm diameter.*	0.70	(0.50)	57.79		
							Dark brown (compacted) gravelly clayey SAND. Gravel is rounded to angular fine to coarse of flint. (MADE GROUND)	0.80	(0.10)	57.69		
							End of Borehole at 0.80m					

General Remarks:
1. No groundwater encountered.2. Inspection hand pit abandoned at 0.80m bgl due to refusal in HP. 2 3. Borehole backfilled with arisings.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS104 Page No. 1 of 1	
Method: Window Sampler	Date(s): 09/09/2020	Logged By: YP	Drilled By: RGI
Client: Places for People	Co-ords: 469018.84, 107206.91	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 57.68m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt.	0.10	(0.10)	57.58		
							(MADE GROUND)					
			0.30	ES			Light brown, slightly silty gravelly SAND. Gravel is subrounded to subangular fine to medium of flint, asphalt, concrete and brick fragments. (MADE GROUND)	0.40	(0.30)	57.28		
			0.50 - 1.00	B			Soft to firm, light grey and orangish yellow mottled sandy CLAY. Rare subrounded fine to medium gravel comprising brick and asphalt fragments. (MADE GROUND)		(0.70)			
			0.80	ES								
1.00 - 2.00		100%	1.10 - 1.55	D				1.10		56.58		
			1.20	SPT	N=8 (2,2,2,2,2,2)		Firm, light grey and orange mottled, slightly sandy CLAY. (WITTERING FORMATION)					
			1.50	HSV	56kPa							
			1.75	D			*... From 1.75m to 2.00m bgl band of orange and light grey mottled slightly gravelly slightly clayey SAND. Gravel is subrounded to rounded medium of flint.*					
2.00 - 3.00		100%	2.00	SPT	N=9 (1,2,2,2,2,3)							
			2.00 - 2.45	D								
			2.50	HSV	57kPa							
3.00 - 4.00		100%	3.00	SPT	N=10 (2,2,2,2,3,3)							
			3.00 - 3.45	D			*... At 3.15m bgl locally with orange staining.*		(4.35)			
			3.50	HSV	61kPa							
4.00 - 5.00		100%	4.00	SPT	N=16 (3,3,3,4,4,5)							
			4.00 - 4.45	D								
			4.50	HSV	69kPa							
			5.00	SPT	N=19 (3,4,4,4,5,6)							
			5.00 - 5.45	D								
							End of Borehole at 5.45m	5.45		52.23		

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Borehole backfilled with arisings.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS105 Page No. 1 of 1	
Method: Window Sampler	Date(s): 09/09/2020	Logged By: YP	Drilled By: RGI
Client: Places for People	Co-ords: 468954.95, 107200.60	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 58.08m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt. (MADE GROUND)	0.15	(0.15)	57.93		
			0.25	ES			Light brown, slightly gravelly SAND. Gravel is subrounded to subangular fine to medium of flint, tarmc, concrete and brick fragments. (MADE GROUND)	0.30	(0.15)	57.78		
			0.50 - 1.00	B			Soft to firm, light grey and orange mottled slightly sandy slightly gravelly CLAY. Rare subrounded fine to medium gravel comprising brick and asphalt fragments. (MADE GROUND)		(0.70)			
			0.60	ES								
1.00 - 2.00		100%	1.00 - 1.45	D			Soft to firm, light grey and light orange mottled, slightly sandy CLAY. (WITTERING FORMATION)	1.00		57.08		
			1.20	SPT	N=8 (2,1,1,2,2,3)							
2.00 - 3.00		100%	2.00	SPT	N=11 (2,2,2,2,3,4)		*... From 2.00m bgl becoming firm and light brown mottled grey and orange.*	2	(3.30)			
			2.00 - 2.45	D								
3.00 - 4.00		100%	3.00	SPT	N=14 (3,3,3,3,4,4)		*... At 3.10m bgl band of orange slightly clayey fine to medium SAND about 10mm thick.*	3				
			3.00 - 3.45	D								
4.00 - 5.00		100%	4.00	SPT	N=27 (4,5,5,6,7,9)			4				
			4.00 - 4.45	D				4.30		53.78		
							Medium dense orangish brown, slightly gravelly fine to medium SAND. Gravel is subrounded to rounded fine to medium of flint. (WITTERING FORMATION)		(1.15)			
			5.00	SPT	50/295mm (9,10,10,12,14,14)			5				
			5.00 - 5.45	D				5.45		52.63		
							End of Borehole at 5.45m	6				

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Borehole backfilled with arisings.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS106 Page No. 1 of 1	
Method: Window Sampler	Date(s): 09/09/2020	Logged By: YP	Drilled By: RGI
Client: Places for People	Co-ords: 469029.85, 107176.94	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 57.66m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt. (MADE GROUND)	0.20	(0.20)	57.46		
			0.30	ES			Light brown, gravelly, slightly silty SAND. Gravel is subrounded fine to medum of flint, asphalt, concrete and brick fragments. (MADE GROUND)	0.40	(0.20)	57.26		
			0.50 - 1.00	B			Soft to firm, light greenish grey mottled orange CLAY with occasional white rootlets. Rare subrounded fine to medium gravel of flint. (WITTERING FORMATION)					
			0.60	ES								
1.00 - 2.00		100%						1				
			1.20	SPT	N=8 (1,1,2,2,2,2)							
			1.20 - 1.65	D								
			1.50	HSV	69kPa		*... From 1.50m bgl becoming firm.*		(2.60)			
2.00 - 3.00		100%	2.00	SPT	N=10 (1,2,2,2,3,3)		*... At 1.90m bgl subrounded medium sized gravel of flint around 30mm diameter.*	2				
			2.00 - 2.45	D								
			2.60	HSV	74kPa							
							... At 2.90m bgl becoming slightly sandy.	3.00		54.66		
3.00 - 4.00		100%	3.00	SPT	N=26 (4,4,5,6,7,8)		Medium dense orangish brown, slightly gravelly slightly clayey fine to medium SAND with occasional pockets of light grey sandy clay about 30x30x20mm. (WITTERING FORMATION)	3				
			3.00 - 3.45	D			*... Between 3.40 to 3.50m bgl occasional dark orange staining.*		(0.75)			
								3.75		53.91		
			4.00	SPT	50/285mm (8,9,12,14,14,10)		Very dense light grey and orange mottled, slightly gravelly fine to medium SAND. Gravel is subrounded fine to medium of flint. (WITTERING FORMATION) *... At 3.75m bgl subrounded medium sized gravel of flint around 60mm diameter.* *... At 4.00m SPT refused due to flint.*	4				
			4.00 - 4.45	D					(0.70)			
								4.45		53.21		
							End of Borehole at 4.45m					
								5				
								6				

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Install to 4.00m bgl.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS107 Page No. 1 of 1	
Method: Window Sampler	Date(s): 10/09/2020	Logged By: MR	Drilled By: RGI
Client: Places for People	Co-ords: 468894.58, 107187.13	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 57.06m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt. (MADE GROUND)	0.15	(0.15)	56.91		
			0.30	ES			Brown, slightly sandy GRAVEL. Gravel is subrounded fine to medium of flint. (MADE GROUND)	0.40	(0.25)	56.66		
							Slightly greyish green and orange mottled, slightly sandy silty CLAY. (WITTERING FORMATION) *... At 0.40m bgl black plastic membrane.*	1.00	(0.60)	56.06		
1.00 - 2.00	100mm	100%	1.10	D			Medium dense orange and grey thinly laminated extremely close spaced SAND with rare inclusions of black silt around 10x30x10mm. Occasional bands of 10 to 20mm black clay. Occasional bands of 10 to 20mm gravelly sand. Gravel is subrounded fine to medium of flint. (WITTERING FORMATION)					
			1.20	SPT	N=11 (1,1,1,2,3,5)							
			1.20	ES								
			1.40 - 2.00	B					(1.10)			
2.00 - 3.00	80mm	100%	2.00	SPT	N=11 (2,2,2,2,3,4)		*... From 2.0m bgl becoming clayey.*	2.10		54.96		
			2.10 - 2.40	B			Firm grey and orange mottled slightly sandy to sandy CLAY. Very thin undulating laminations and closely spaced (WITTERING FORMATION)		(1.00)			
3.00 - 4.00	80mm	100%	3.00	SPT	N=12 (3,2,2,2,4,4)		*... Between 2.90m and 3.10m becoming clayey SAND.*	3.10		53.96		
			3.50	D			Firm grey and orange, sandy CLAY. (WITTERING FORMATION)					
4.00 - 5.00	60mm	100%	4.00	SPT	N=12 (2,3,3,2,3,4)				(1.60)			
							Stiff, blueish grey, slightly sandy silty CLAY. (LONDON CLAY FORMATION)	4.70		52.36		
			4.90	D								
			5.00	SPT	N=16 (3,3,3,4,4,5)				(0.75)			
							End of Borehole at 5.45m	5.45		51.61		

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Borehole backfilled with arisings.

Logged in general accordance with BS5930:2015

Hydrock	Project: Havant and South Downs College	Borehole No WS108 Page No. 1 of 1	
Method: Window Sampler	Date(s): 10/09/2020	Logged By: MR	Drilled By: RGI
Client: Places for People	Co-ords: 468952.20, 107159.66	Checked By: ARJ	Rig: Premier
Hydrock Project No: 16422	Ground Level: 57.12m OD		Scale: 1:30

Sample Run Info			Testing			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend	Instrum-entation / Backfill
Sample Run	Run Ø	Recovery	Depth (m)	Type	Results							
							Asphalt. (MADE GROUND)	0.25	(0.25)	56.87		
			0.30	ES			Purplish grey slightly clayey sandy GRAVEL. (MADE GROUND)	0.40	(0.15)	56.72		
			0.50 0.50	B D			Slightly greyish green and orange mottled, slightly sandy silty CLAY. (WITTERING FORMATION)	1.00	(0.60)	56.12		
1.00 - 2.00	100mm	100%	1.20 1.20	SPT D	N=8 (1,1,1,2,2,3)		Soft, orange and grey mottled very thin laminated extremely close spaced, slightly sandy CLAY. (WITTERING FORMATION) *... From 1.50m bgl becming sandy.* *... From 1.80m bgl becoming very sandy.*					
2.00 - 3.00	80mm	100%	2.00 2.50	SPT D	N=10 (3,3,2,2,3,3)		*... From 2.0m bgl becoming firm.* *... From 2.20m bgl becoming sandy.*		(3.50)			
3.00 - 4.00	80mm	100%	3.00 3.80	SPT D	N=12 (3,2,2,3,3,4)		*... From 3.00m bgl becoming slightly sandy.* *... From 3.50m bgl becoming dark orangish brown and sandy.*					
4.00 - 5.00	60mm	100%	4.00 4.80 5.00	SPT D SPT	N=19 (3,3,4,5,5,5) N=15 (3,3,3,3,4,5)		Stiff, blueish grey, slightly sandy silty CLAY. (LONDON CLAY FORMATION)	4.50	(0.95)	52.62		
							End of Borehole at 5.45m	5.45		51.67		

General Remarks:
1. Inspection hand pit dug to 1.20m bgl. 2. No groundwater encountered. 3. UXO scanned every 1.00m bgl. No potential UXO hazard detected. 4. Borehole backfilled with arisings.

Logged in general accordance with BS5930:2015

James Blyth

From: Angus Johnstone <Angus.Johnstone@placesforpeople.co.uk>
Sent: 03 February 2022 16:41
To: James Blyth; Alex Wozniczko
Subject: FW: HSDC South Downs - Soakage Tests
Attachments: GWPR4602 TP logs[1].pdf; GWPR4602 Figure 1 Trial Hole Location Plan.pdf

Hi James,

I got some infiltration info from the college (see attached). Not sure how useful it is but can't hurt to have it.

Best Regards,

Angus Johnstone
Development Manager (South West)
Places for People Development
Suite B, Kings Point House, 5 Queen Mother Square, Poundbury, DT1 3BW
T: 01305 344 014
M: 07885 367 678
www.placesforpeople.co.uk

Before printing, think about the environment.

From: Tristan Le Butt <Tristan@petermarshconsulting.com>
Sent: 03 February 2022 16:33
To: Angus Johnstone <Angus.Johnstone@placesforpeople.co.uk>
Cc: Ben Neville <Ben@petermarshconsulting.com>
Subject: [EXTERNAL] HSDC South Downs - Soakage Tests

Dear Angus,

As discussed, please find attached for your information purposes.

BRE 365 Soakage Testing Results

Trial Hole	Test Number	Depth (m bgl)	Start Depth (m bgl)	Finish Depth (m bgl)	Time Taken (mins)	Infiltration Rate (m/sec)
TP1*	1	1.50	0.34	0.71	240	3.44 x 10^-6
TP1**	2	1.50	0.26	1.50	1140	3.29 x 10^-5
TP1*	3	1.50	0.42	0.89	410	2.64 x 10 ^-5
TP2*	1	1.30	0.35	0.65	240	3.51 x 10^-6
TP2**	2	1.30	0.35	1.50	1133	3.84 x 10^-6
TP2*	3	1.30	0.35	0.47	360	1.08 x 10^-6

*Given the relatively slow infiltration rate encountered, the volume of water did not drain by 75%.
** These tests were left overnight and measured in the morning.

Can I suggest we have a Teams Call at 10AM on Tuesday 8th Feb to discuss the retaining wall? Let me know if that works, or alternatively it could be useful to walk the site again.

Kind Regards,

Tristan

Peter Marsh Consulting Ltd,
Regency House, 13 St Clement Street, Winchester, SO23 9DR
Tel: 01962 657157
Mob: 07715 256694
www.petermarshconsulting.com

Please note that we are altering our working patterns to help us provide continuity of service in response to Covid-19. For fuller details please see: https://petermarshconsulting.com/business-continuity-plans/

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Machine Excavated Trial Pit

NTS

HSDC South Downs College Rd, Widley, Waterlooville PO7 8AA	
Scott White and Hookins	**January 2022**
Figure 1 – Trial Hole Location Plan	**GWPR4602**

ground&water

Trial Pit Log

Project Name: HSDC South Downs College Rd, Widley, Waterlooville PO7 8AA	Client: Scott White and Hookins LLP	Date:
Location:	Contractor:	
Project No. : GWPR4602	Crew Name:	Equipment: 3 Tonne Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP1	TP		RJ	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
					0.10			Topsoil.
		0.20	D		0.25			MADE GROUND: Dark brown gravelly silty fine to coarse sand. Gravel is angular to subrounded fine to coarse flint, brick, plastic and occasional charcoal-like material. Sand is fine to coarse.
		0.50	D					Orange brown mottle grey slightly silty slightly gravelly fine to coarse SAND with frequent horizons of very sandy very silty clay. (WITTERING FORMATION)
		1.00	D					
		1.50	D		1.50			End of Borehole at 1.500m

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.35	0.35	Trial pit stable					

Remarks

No roots encountered in trial pit. No groundwater encountered in trial pit.

Trial Pit Log

Project Name: HSDC South Downs College Rd, Widley, Waterlooville PO7 8AA	Client: Scott White and Hookins LLP	Date:
Location:	Contractor:	
Project No. : GWPR4602	Crew Name:	Equipment: 3 tonne Excavator

Location Number	Location Type	Level	Logged By	Scale	Page Number
TP2	TP		RJ	1:25	Sheet 1 of 1

Well	Water Strikes	Sample and In Situ Testing: Depth (m)	Type	Results	Depth (m)	Level (m)	Legend	Stratum Description
		0.10	D		0.20			Topsoil.
		0.50	D					Orange brown mottled grey and light brown silty fine to coarse SAND with frequent horizons of very silty very sandy clay. (WITTERING FORMATION)
		0.80	D					
		1.30	D		1.30			End of Borehole at 1.300m

1 2 3 4 5

Dimensions		Trench Support and Comment			Pumping Data		
Pit Length	Pit Width	Pit Stability	Shoring Used	Remarks	Date	Rate	Remarks
1.35	0.35	Trial pit stable					

Remarks

No roots encountered in trial pit. No groundwater encountered in trial pit.

Appendix C Proposed Masterplan

KEY

Site boundary

Accommodation Schedule:

NOTE
AREAS AS PER STANDARD
HOUSE TYPE PORTFOLIO
'GROSS FLOOR AREA' MEASUREMENTS

Standard House Types

HT23	20 x 2B4P (2st) 2 bed / 4 person	area: 80sqm
HT37	25 x 3B6P (2.5st) 3bed / 6 person	area: 108.64sqm
HT42	11 x 4B7P (2.5st) 4 bed / 7 person	area: 115.36sqm

20 x 2bed House total area: 1600sqm
25 x 3bed House total area: 2716sqm
11 x 4bed House total area: 1269sqm

Total 56 Houses @ 5,585.36 sq.m
60,120.3 sq.ft

Flats

BLOCK A	4 x 1B2P (4st) 12 x 2B4P	total area: 1042sqm
BLOCK B	6 x 2B4P (3st)	total area: 420sqm
BLOCK C	6 x 2B4P (3st)	total area: 420sqm
BLOCK D	4 x 1B2P (3st) 5 x 2B4P	total area: 550sqm
BLOCK E	3 x 1B2P (3st) 3 x 2B4P	total area: 360sqm
FOG	3 x 2B4P (2st)	total area: 210sqm

46 x 1&2B Flats

Total 46 Flats @ 3,002 sq.m
32,313.2 sq.ft

OVERALL TOTAL 102 Units @ 8,587.36 sq.m
92,433.5 sq.ft

Site area

22,751.204 sq.m
2.2751204 HA

44.8 Dwellings / Hectare

Parking Provision

Specification by H.B.C.
2bed House - 2 parking spaces
3bed House - 2 parking spaces
4bed House - 2 parking spaces
1&2Bed Flat - 1 parking space

Achieved
56 Houses x 2 = 112 spaces
43 Flats x 1 = 43 spaces
3 FOGs x 2 = 6 spaces
8 visitor spaces

Total: 169 parking spaces

N

0 40 80 120 160m

Please Note:

Dimensions to be checked on site and any discrepancies are to be highlighted to the Architect prior to construction.

Topographical / Ordnance Survey information shown has been prepared by a third party, HGP accept no responsibility for accuracy or completeness of the survey.

This drawing is to be read in conjunction with all other project drawings, construction notes and / or project specifications including those by other project consultants and specialists. All discrepancies should be reported immediately.

Design subject to detail development / approval. Measurements and accommodation schedules subject to amendments following coordinated input by others. Costings cannot be finalised until approval /confirmation by relevant authorities and Client.

Rev.	Description	Date	DB	/ CB
02	For Information	11.03.2022	VF	/ CC
01	For Information	02.02.2022	VF	/ CK

Date	March 2022
Drawn By/Checked By	VF/CC
Scale	1:500@A1
Revision	**P2**
Project	**Havant College**
Title	**Layout & Accommodation Schedule**
Dwg #	**20.001.SK045**
Status	**FOR INFORMATION**

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FS 10342

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Places for People

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Chichester,
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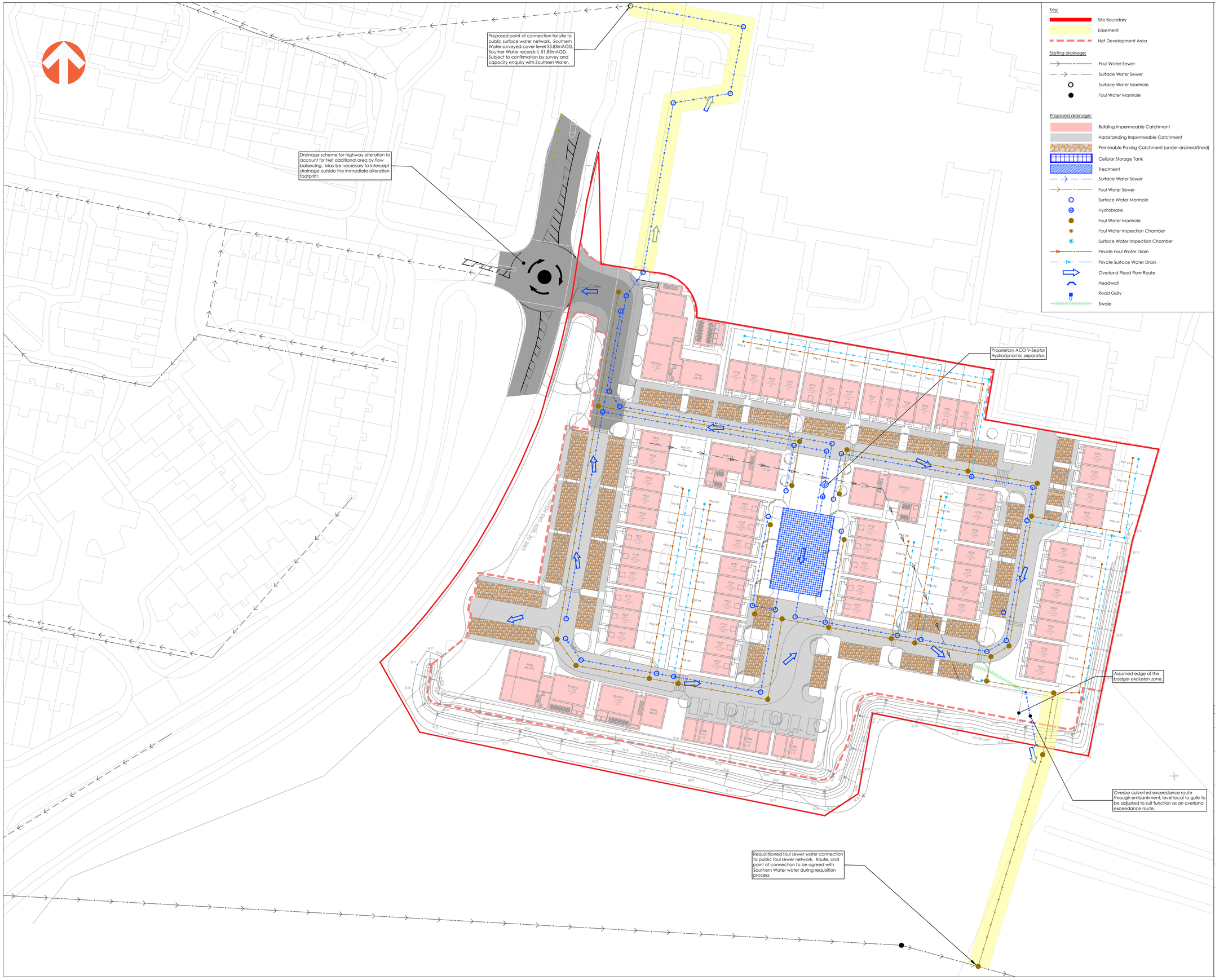
01243 790572

Appendix D Preliminary Drainage Layout



Key:

- Site Boundary
- Easement
- Net Development Area

Existing drainage:

- Foul Water Sewer
- Surface Water Sewer
- Surface Water Manhole
- Foul Water Manhole

Proposed drainage:

- Building Impermeable Catchment
- Hardstanding Impermeable Catchment
- Permeable Paving Catchment (under-drained/lined)
- Cellular Storage Tank
- Treatment
- Surface Water Sewer
- Foul Water Sewer
- Surface Water Manhole
- Hydrobrake
- Foul Water Manhole
- Foul Water Inspection Chamber
- Surface Water Inspection Chamber
- Private Foul Water Drain
- Private Surface Water Drain
- Overland Flood Flow Route
- Headwall
- Road Gully
- Swale

Area Summary Schedule

Net Developable Area	1.928 ha
Impermeable Catchment	1.076 ha
PIMP %	56%

Pre-Development (Greenfield) Runoff

The greenfield runoff rates have been assessed for the 'net developable area' using the FEH Method. The calculation excludes large areas of open space which will remain undeveloped.

Existing Greenfield Runoff Rates

Return Period	Greenfield Rate (l/s)
2yr	8.76
30yr	22.88
100yr	31.74

Attenuation Summary

Cellular Storage Tanks

Catchment	1.122 ha
Hydraulic Control	Hydrobrake @IL 0.00m Ref: MD-SHE-0128-8700-1600-8700 100mm Orifice @ IL 0.725m
Porosity	95%
Dimension	352.5m^2 X 1.6m Deep 352.5m^2 X 1.6m Deep
Total 100yr+40% Peak Discharge	27.5l/s
Total Volume Required:	**531.5 m^3**
Total 100yr+40% Peak Discharge	**27.5 l/s**

Notes:

1. The proposed development has been assessed in line with the NPPF, to allow the planning application to be progressed and to show that the development can be undertaken in an acceptable manner from a flood risk perspective.
2. The extents of built development are limited to 'Flood Zone 1' only and are not susceptible to surface flooding from pluvial, groundwater, infrastructure or artificial sources.
3. To ensure the development is safe throughout its lifetime, the surface water strategy accounts for runoff in up to the 100 year return period.
4. The strategy also safeguards against the upper end allowances for climate change (40%), providing betterment over undeveloped conditions, where the rate and volume of runoff would continue to increase due to climate change.
5. The Ground Investigation indicates the site has a low infiltration rate that precludes the use of soakaways by virtue of excessive half drain-down time (in excess 7 days).
6. The outline strategy also provides a 10% allowance for future urban creep and discharge at existing greenfield runoff rates. The cumulative impact of the various design allowances will ensure that flood risk within the downstream catchment is reduced as a result of the proposed development.
7. The drainage arrangements include a treatment scheme to mitigate against degradation of water quality as a result of the development. The proposals contribute to the provision of amenity space, and provide potential for planting to improve biodiversity of the development.
8. It is anticipated that flood risk from alteration to the highway can be mitigated by local inclusion of storage and flow controls subject to adoption detailed design.
9. During exceedance events runoff will be directed away from buildings and toward low points where exceedance drainage provision is provided.
10. Foul flows generated by the development are proposed to be discharges via a requisitioned connection to the pubic foul sewer to the south of the site.

REV	DATE	DESCRIPTION	BY	CHK	APD
A	25.03.2022	INITIAL ISSUE	VS	JB	CPY

DRAWING STATUS: PLANNING APPLICATION

CLIENT: PLACE FOR PEOPLE

PROJECT: SOUTH DOWNS COLLEGE

TITLE: PRELIMINARY DRAINAGE LAYOUT

PROJECT No:	DRAWING No:	REV:
1017	01-PDL-1001	A

SCALE @ A1: 0 1:500 25 metres

DESIGN BY:

awcockward partnership
Awcock Ward Partnership, Ada House, Pynes Hill, Exeter, EX2 5TU
Tel: 01392 409007 Web: www.awpexeter.com

Appendix E Long Term Storage, Greenfield Rates and MicroDrainage Output

Head (m)	Flow (l/s)
0	0
0.016	0.167
0.032	0.638
0.048	1.363
0.065	2.28
0.081	3.318
0.097	4.388
0.113	5.367
0.129	6.195
0.145	6.926
0.162	7.259
0.178	7.463
0.194	7.643
0.21	7.801
0.226	7.94
0.242	8.062
0.259	8.168
0.275	8.261
0.291	8.342
0.307	8.412
0.323	8.471
0.339	8.522
0.356	8.564
0.372	8.598
0.388	8.626
0.404	8.648
0.42	8.665

Hydro International
Hydraulic modelling data for
SHE-0128-8700-1600-8700
Hydro-Brake Optimum®

Site South Down's College
Ref 1017

TECHNICAL
SPECIFICATION

	Head (m)	Flow (l/s)
Design	1.6	8.7
Flush-Flo	0.473	8.686
Kick-Flo®	0.983	6.925
Mean Flow over head		7.606

Minimum Clearance (0.0131

Guides to modelling the Hydro-Brake Optimum®
using a number of commercial modelling packages
are available from Hydro International

James Blyt ########

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Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	James Blyth
Site name:	1017 - South Downs College
Site location:	Waterlooville

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

Site Details

Latitude:	50.86100° N
Longitude:	1.02123° W
Reference:	2683945034
Date:	Mar 17 2022 16:32

Runoff estimation approach FEH Statistical

Site characteristics

Total site area (ha): 1.9284

Methodology

Q_{MED} estimation method:	Calculate from BFI and SAAR
BFI and SPR method:	Specify BFI manually
HOST class:	N/A
BFI / BFIHOST:	0.409
Q_{MED} (l/s):	
Q_{BAR} / Q_{MED} factor:	1.14

Hydrological characteristics	Default	Edited
SAAR (mm):	751	751
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

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

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

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

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

(3) Is SPR/SPRHOST ≤ 0.3?

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

Greenfield runoff rates	Default	Edited
Q_{BAR} (l/s):		9.95
1 in 1 year (l/s):		8.46
1 in 30 years (l/s):		22.88
1 in 100 year (l/s):		31.74
1 in 200 years (l/s):		37.21

1in2yr 0.88 x 9.95 = 8.76 l/s

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

Long Term Storage (LTS) Volume Calculation

Project No.	1017
Project Title	South Downs College
Client	Places for People Homes
Calcs by	JB
Reviewed by	CPY
Date	14.03.2022
Revision	A

LTS calculation method based on equation 24.10 from CIRIA C753 - The SuDS Manual (2015);

$$Vol_{xs} = RD \times A \times 10\,[PIMP/100 \times (\alpha \times Cv) + (1\text{-}PIMP/100) \times (\beta \times SPR) - SPR]$$

Where; ***Vol $_{xs}$*** Extra runoff volume from a dev. site compared to the greenfield equivalent during the 100 yr 6 hr storm

RD	Rainfall Depth	63	mm	*(for 100 year 6 hour storm)*
A	*Site Area*	1.928	ha	*(Exc. large undeveloped areas)*
	Impermeable Catchment	1.122	ha	
PIMP	*Percentage Impermeable*	58.2	%	
α	Proportion Impermeable to Network	1.0		
Cv	Impermeable Runoff Coefficient	0.84		*(0.84 Modified Rational Method)*
	Permeable Catchment	0.81	ha	
	Permeable Catchment to Network	0.00	ha	
β	Proportion Perm. to Network	0.0		
SPR	Soil Proportion Runoff	0.47		*(Ref. to WRAP map)*

	RD		A				PIMP				α		Cv				PIMP				β		SPR		SPR
Vol$_{xs}$ =	63	x	1.93	x	10	x	(	(	58	/	100	)	x	(	1.00	x	0.84	)	+	(	1 -	58	/	100	) x (0.00 x 0.47) - 0.47)

Volume$_{xs}$ **22.88**

LTS Discharge Rate **3.86** *(2 l/s/ha)*

As above, assuming all permeable surfaces do not enter the drainage system

Vol $_{xs}$ = *22.88*

As above, assuming all permeable surfaces enter the drainage system

Vol $_{xs}$ = *261.54*

Summary of Results for 2 year Return Period (+40%)

Half Drain Time : 242 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	98.298	0.298	0.0	8.4	0.0	8.4	99.7	O K
30 min Summer	98.380	0.380	0.0	8.6	0.0	8.6	127.3	O K
60 min Summer	98.455	0.455	0.0	8.7	0.0	8.7	152.2	O K
120 min Summer	98.558	0.558	0.0	8.7	0.0	8.7	186.8	O K
180 min Summer	98.601	0.601	0.0	8.7	0.0	8.7	201.4	O K
240 min Summer	98.623	0.623	0.0	8.7	0.0	8.7	208.8	O K
360 min Summer	98.640	0.640	0.0	8.7	0.0	8.7	214.2	O K
480 min Summer	98.638	0.638	0.0	8.7	0.0	8.7	213.7	O K
600 min Summer	98.627	0.627	0.0	8.7	0.0	8.7	210.1	O K
720 min Summer	98.612	0.612	0.0	8.7	0.0	8.7	204.8	O K
960 min Summer	98.573	0.573	0.0	8.7	0.0	8.7	191.7	O K
1440 min Summer	98.491	0.491	0.0	8.7	0.0	8.7	164.4	O K
2160 min Summer	98.389	0.389	0.0	8.6	0.0	8.6	130.2	O K
2880 min Summer	98.315	0.315	0.0	8.4	0.0	8.4	105.4	O K
4320 min Summer	98.224	0.224	0.0	7.9	0.0	7.9	75.0	O K
5760 min Summer	98.176	0.176	0.0	7.4	0.0	7.4	58.9	O K
7200 min Summer	98.151	0.151	0.0	7.1	0.0	7.1	50.4	O K
8640 min Summer	98.139	0.139	0.0	6.7	0.0	6.7	46.6	O K
10080 min Summer	98.131	0.131	0.0	6.3	0.0	6.3	43.9	O K
15 min Winter	98.335	0.335	0.0	8.5	0.0	8.5	112.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	50.024	0.0	103.1	0.0	18
30 min Summer	32.725	0.0	135.4	0.0	33
60 min Summer	20.552	0.0	171.9	0.0	62
120 min Summer	13.642	0.0	228.5	0.0	120
180 min Summer	10.553	0.0	265.2	0.0	172
240 min Summer	8.735	0.0	292.8	0.0	202
360 min Summer	6.625	0.0	333.2	0.0	268
480 min Summer	5.416	0.0	363.3	0.0	336
600 min Summer	4.619	0.0	387.3	0.0	406
720 min Summer	4.048	0.0	407.3	0.0	474
960 min Summer	3.274	0.0	439.2	0.0	608
1440 min Summer	2.418	0.0	486.5	0.0	868
2160 min Summer	1.793	0.0	542.5	0.0	1252
2880 min Summer	1.460	0.0	589.0	0.0	1612
4320 min Summer	1.113	0.0	672.5	0.0	2296
5760 min Summer	0.932	0.0	752.6	0.0	3000
7200 min Summer	0.824	0.0	831.1	0.0	3680
8640 min Summer	0.752	0.0	910.0	0.0	4408
10080 min Summer	0.701	0.0	990.0	0.0	5144
15 min Winter	50.024	0.0	115.6	0.0	18

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Summary of Results for 2 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	98.428	0.428	0.0	8.7	0.0	8.7	143.4	O K
60 min Winter	98.514	0.514	0.0	8.7	0.0	8.7	172.3	O K
120 min Winter	98.638	0.638	0.0	8.7	0.0	8.7	213.6	O K
180 min Winter	98.694	0.694	0.0	8.7	0.0	8.7	232.5	O K
240 min Winter	98.721	0.721	0.0	8.7	0.0	8.7	241.3	O K
360 min Winter	98.732	0.732	0.0	8.7	0.0	8.7	245.3	O K
480 min Winter	98.727	0.727	0.0	8.7	0.0	8.7	243.3	O K
600 min Winter	98.707	0.707	0.0	8.7	0.0	8.7	236.9	O K
720 min Winter	98.681	0.681	0.0	8.7	0.0	8.7	228.0	O K
960 min Winter	98.617	0.617	0.0	8.7	0.0	8.7	206.7	O K
1440 min Winter	98.488	0.488	0.0	8.7	0.0	8.7	163.4	O K
2160 min Winter	98.338	0.338	0.0	8.5	0.0	8.5	113.3	O K
2880 min Winter	98.243	0.243	0.0	8.1	0.0	8.1	81.3	O K
4320 min Winter	98.151	0.151	0.0	7.1	0.0	7.1	50.5	O K
5760 min Winter	98.127	0.127	0.0	6.1	0.0	6.1	42.5	O K
7200 min Winter	98.114	0.114	0.0	5.4	0.0	5.4	38.1	O K
8640 min Winter	98.106	0.106	0.0	4.9	0.0	4.9	35.5	O K
10080 min Winter	98.101	0.101	0.0	4.6	0.0	4.6	33.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	32.725	0.0	151.9	0.0	32
60 min Winter	20.552	0.0	192.6	0.0	62
120 min Winter	13.642	0.0	256.0	0.0	118
180 min Winter	10.553	0.0	297.2	0.0	174
240 min Winter	8.735	0.0	328.0	0.0	228
360 min Winter	6.625	0.0	373.3	0.1	290
480 min Winter	5.416	0.0	407.0	0.0	366
600 min Winter	4.619	0.0	433.9	0.0	444
720 min Winter	4.048	0.0	456.3	0.0	520
960 min Winter	3.274	0.0	492.0	0.0	664
1440 min Winter	2.418	0.0	545.1	0.0	936
2160 min Winter	1.793	0.0	607.6	0.0	1300
2880 min Winter	1.460	0.0	659.8	0.0	1644
4320 min Winter	1.113	0.0	753.5	0.0	2288
5760 min Winter	0.932	0.0	843.0	0.0	2992
7200 min Winter	0.824	0.0	930.9	0.0	3680
8640 min Winter	0.752	0.0	1019.3	0.0	4408
10080 min Winter	0.701	0.0	1109.1	0.0	5136

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	2
FEH Rainfall Version	2013
Site Location	GB 468978 107174 SU 68978 07174
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.122

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.076	4	8	0.046

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Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	352.5	460.0	1.601	0.0	563.2
1.600	352.5	563.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0128-8700-1600-8700
Design Head (m)	1.600
Design Flow (l/s)	8.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	128
Invert Level (m)	98.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	8.7
Flush-Flo™	0.473	8.7
Kick-Flo®	0.983	6.9
Mean Flow over Head Range	-	7.6

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	4.6	1.200	7.6	3.000	11.7	7.000	17.5
0.200	7.7	1.400	8.2	3.500	12.6	7.500	18.1
0.300	8.4	1.600	8.7	4.000	13.4	8.000	18.7
0.400	8.6	1.800	9.2	4.500	14.2	8.500	19.2
0.500	8.7	2.000	9.7	5.000	14.9	9.000	19.8
0.600	8.6	2.200	10.1	5.500	15.6	9.500	20.3
0.800	8.1	2.400	10.5	6.000	16.3		
1.000	7.0	2.600	10.9	6.500	16.9		

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Orifice Overflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 98.725

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Summary of Results for 30 year Return Period (+40%)

Half Drain Time : 440 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	98.667	0.667	0.0	8.7	0.0	8.7	223.3	O K
30 min Summer	98.861	0.861	0.0	8.7	5.9	13.8	288.3	O K
60 min Summer	99.034	1.034	0.0	8.7	10.6	17.7	346.1	O K
120 min Summer	99.114	1.114	0.0	8.7	12.2	19.5	373.1	O K
180 min Summer	99.132	1.132	0.0	8.7	12.5	19.9	379.0	O K
240 min Summer	99.139	1.139	0.0	8.7	12.6	20.0	381.5	O K
360 min Summer	99.134	1.134	0.0	8.7	12.5	19.9	379.7	O K
480 min Summer	99.114	1.114	0.0	8.7	12.2	19.5	373.1	O K
600 min Summer	99.089	1.089	0.0	8.7	11.7	19.0	364.7	O K
720 min Summer	99.062	1.062	0.0	8.7	11.2	18.4	355.6	O K
960 min Summer	99.008	1.008	0.0	8.7	10.1	17.1	337.5	O K
1440 min Summer	98.915	0.915	0.0	8.7	7.8	15.3	306.3	O K
2160 min Summer	98.832	0.832	0.0	8.7	4.2	12.2	278.8	O K
2880 min Summer	98.765	0.765	0.0	8.7	0.7	9.0	256.1	O K
4320 min Summer	98.561	0.561	0.0	8.7	0.0	8.7	188.0	O K
5760 min Summer	98.424	0.424	0.0	8.7	0.0	8.7	141.9	O K
7200 min Summer	98.337	0.337	0.0	8.5	0.0	8.5	112.8	O K
8640 min Summer	98.281	0.281	0.0	8.3	0.0	8.3	94.0	O K
10080 min Summer	98.243	0.243	0.0	8.1	0.0	8.1	81.4	O K
15 min Winter	98.749	0.749	0.0	8.7	0.3	8.7	250.7	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	109.462	0.0	227.6	0.0	19
30 min Summer	72.010	0.0	300.0	11.7	33
60 min Summer	45.480	0.0	381.5	54.3	62
120 min Summer	26.986	0.0	452.9	92.8	120
180 min Summer	19.837	0.0	499.5	115.9	150
240 min Summer	15.920	0.0	534.5	131.4	182
360 min Summer	11.637	0.0	586.1	149.8	248
480 min Summer	9.301	0.0	624.7	158.5	318
600 min Summer	7.809	0.0	655.6	159.6	386
720 min Summer	6.764	0.0	681.4	153.9	456
960 min Summer	5.385	0.0	723.2	134.7	594
1440 min Summer	3.901	0.0	785.5	94.9	864
2160 min Summer	2.840	0.0	859.5	44.6	1276
2880 min Summer	2.282	0.0	920.9	5.7	1728
4320 min Summer	1.703	0.0	1030.0	0.0	2464
5760 min Summer	1.404	0.0	1133.5	0.0	3168
7200 min Summer	1.224	0.0	1235.1	0.0	3888
8640 min Summer	1.104	0.0	1337.2	0.0	4576
10080 min Summer	1.020	0.0	1440.5	0.0	5248
15 min Winter	109.462	0.0	255.1	0.1	19

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Summary of Results for 30 year Return Period (+40%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	98.962	0.962	0.0	8.7	9.0	16.2	322.2	O K
60 min Winter	99.160	1.160	0.0	8.7	12.9	20.4	388.3	O K
120 min Winter	99.259	1.259	0.0	8.7	14.5	22.3	421.6	O K
180 min Winter	99.277	1.277	0.0	8.7	14.8	22.6	427.6	O K
240 min Winter	99.283	1.283	0.0	8.7	14.9	22.7	429.7	O K
360 min Winter	99.267	1.267	0.0	8.7	14.6	22.4	424.4	O K
480 min Winter	99.233	1.233	0.0	8.7	14.1	21.8	412.9	O K
600 min Winter	99.192	1.192	0.0	8.7	13.5	21.1	399.3	O K
720 min Winter	99.151	1.151	0.0	8.7	12.8	20.2	385.4	O K
960 min Winter	99.073	1.073	0.0	8.7	11.4	18.6	359.4	O K
1440 min Winter	98.945	0.945	0.0	8.7	8.6	15.9	316.5	O K
2160 min Winter	98.836	0.836	0.0	8.7	4.4	12.4	280.0	O K
2880 min Winter	98.736	0.736	0.0	8.7	0.1	8.7	246.6	O K
4320 min Winter	98.430	0.430	0.0	8.7	0.0	8.7	144.0	O K
5760 min Winter	98.273	0.273	0.0	8.3	0.0	8.3	91.4	O K
7200 min Winter	98.195	0.195	0.0	7.7	0.0	7.7	65.4	O K
8640 min Winter	98.155	0.155	0.0	7.2	0.0	7.2	51.8	O K
10080 min Winter	98.141	0.141	0.0	6.7	0.0	6.7	47.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	72.010	0.0	336.2	31.4	33
60 min Winter	45.480	0.0	427.4	83.7	60
120 min Winter	26.986	0.0	507.4	128.9	116
180 min Winter	19.837	0.0	559.6	156.2	166
240 min Winter	15.920	0.0	598.8	174.9	188
360 min Winter	11.637	0.0	656.6	197.8	264
480 min Winter	9.301	0.0	699.8	210.2	340
600 min Winter	7.809	0.0	734.4	215.8	414
720 min Winter	6.764	0.0	763.4	215.6	486
960 min Winter	5.385	0.0	810.1	198.1	626
1440 min Winter	3.901	0.0	880.0	142.2	908
2160 min Winter	2.840	0.0	962.8	61.4	1340
2880 min Winter	2.282	0.0	1031.5	0.4	1848
4320 min Winter	1.703	0.0	1153.9	0.0	2548
5760 min Winter	1.404	0.0	1269.5	0.0	3176
7200 min Winter	1.224	0.0	1383.5	0.0	3824
8640 min Winter	1.104	0.0	1497.8	0.0	4496
10080 min Winter	1.020	0.0	1613.7	0.0	5144

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	30
FEH Rainfall Version	2013
Site Location	GB 468978 107174 SU 68978 07174
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.122

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.076	4	8	0.046

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Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	352.5	460.0	1.601	0.0	563.2
1.600	352.5	563.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0128-8700-1600-8700
Design Head (m)	1.600
Design Flow (l/s)	8.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	128
Invert Level (m)	98.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	8.7
Flush-Flo™	0.473	8.7
Kick-Flo®	0.983	6.9
Mean Flow over Head Range	-	7.6

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	4.6	1.200	7.6	3.000	11.7	7.000	17.5
0.200	7.7	1.400	8.2	3.500	12.6	7.500	18.1
0.300	8.4	1.600	8.7	4.000	13.4	8.000	18.7
0.400	8.6	1.800	9.2	4.500	14.2	8.500	19.2
0.500	8.7	2.000	9.7	5.000	14.9	9.000	19.8
0.600	8.6	2.200	10.1	5.500	15.6	9.500	20.3
0.800	8.1	2.400	10.5	6.000	16.3		
1.000	7.0	2.600	10.9	6.500	16.9		

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Orifice Overflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 98.725

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

Half Drain Time : 537 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	98.837	0.837	0.0	8.7	4.5	12.4	280.2	O K
30 min Summer	99.088	1.088	0.0	8.7	11.7	18.9	364.4	O K
60 min Summer	99.315	1.315	0.0	8.7	15.3	23.3	440.2	O K
120 min Summer	99.392	1.392	0.0	8.7	16.4	24.5	466.2	O K
180 min Summer	99.403	1.403	0.0	8.7	16.5	24.7	469.8	O K
240 min Summer	99.405	1.405	0.0	8.7	16.6	24.7	470.5	O K
360 min Summer	99.392	1.392	0.0	8.7	16.4	24.5	466.0	O K
480 min Summer	99.362	1.362	0.0	8.7	16.0	24.1	456.2	O K
600 min Summer	99.327	1.327	0.0	8.7	15.5	23.5	444.4	O K
720 min Summer	99.290	1.290	0.0	8.7	15.0	22.8	432.0	O K
960 min Summer	99.219	1.219	0.0	8.7	13.9	21.6	408.2	O K
1440 min Summer	99.099	1.099	0.0	8.7	11.9	19.2	368.2	O K
2160 min Summer	98.971	0.971	0.0	8.7	9.2	16.3	325.2	O K
2880 min Summer	98.884	0.884	0.0	8.7	6.9	14.6	296.0	O K
4320 min Summer	98.792	0.792	0.0	8.7	2.0	10.2	265.4	O K
5760 min Summer	98.639	0.639	0.0	8.7	0.0	8.7	214.0	O K
7200 min Summer	98.505	0.505	0.0	8.7	0.0	8.7	169.0	O K
8640 min Summer	98.413	0.413	0.0	8.7	0.0	8.7	138.3	O K
10080 min Summer	98.351	0.351	0.0	8.6	0.0	8.6	117.4	O K
15 min Winter	98.935	0.935	0.0	8.7	8.4	15.7	313.2	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
15 min Summer	137.122	0.0	285.5	7.1	19
30 min Summer	91.457	0.0	381.5	59.8	33
60 min Summer	58.005	0.0	486.8	123.7	62
120 min Summer	33.742	0.0	566.5	169.9	120
180 min Summer	24.554	0.0	618.5	197.7	150
240 min Summer	19.586	0.0	657.9	216.8	180
360 min Summer	14.227	0.0	716.9	241.2	248
480 min Summer	11.321	0.0	760.6	254.8	316
600 min Summer	9.476	0.0	795.8	262.0	386
720 min Summer	8.192	0.0	825.5	264.0	454
960 min Summer	6.509	0.0	874.5	251.4	588
1440 min Summer	4.702	0.0	947.1	213.2	852
2160 min Summer	3.405	0.0	1030.9	159.9	1252
2880 min Summer	2.723	0.0	1099.0	107.8	1620
4320 min Summer	2.012	0.0	1217.1	25.4	2464
5760 min Summer	1.644	0.0	1327.4	0.0	3280
7200 min Summer	1.423	0.0	1435.9	0.0	3968
8640 min Summer	1.276	0.0	1544.7	0.0	4664
10080 min Summer	1.172	0.0	1655.0	0.0	5344
15 min Winter	137.122	0.0	320.0	24.2	19

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

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Overflow (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	99.220	1.220	0.0	8.7	13.9	21.6	408.4	O K
60 min Winter	99.479	1.479	0.0	8.7	17.5	25.9	495.2	O K
120 min Winter	99.578	1.578	0.0	8.7	18.7	27.4	528.5	O K
180 min Winter	99.587	1.587	0.0	8.7	18.8	27.5	531.5	O K
240 min Winter	99.585	1.585	0.0	8.7	18.8	27.5	530.9	O K
360 min Winter	99.557	1.557	0.0	8.7	18.5	27.0	521.4	O K
480 min Winter	99.508	1.508	0.0	8.7	17.9	26.3	504.9	O K
600 min Winter	99.452	1.452	0.0	8.7	17.2	25.5	486.3	O K
720 min Winter	99.397	1.397	0.0	8.7	16.5	24.6	467.7	O K
960 min Winter	99.294	1.294	0.0	8.7	15.0	22.9	433.4	O K
1440 min Winter	99.131	1.131	0.0	8.7	12.4	19.8	378.7	O K
2160 min Winter	98.966	0.966	0.0	8.7	9.1	16.2	323.6	O K
2880 min Winter	98.866	0.866	0.0	8.7	6.3	14.1	290.0	O K
4320 min Winter	98.724	0.724	0.0	8.7	0.0	8.7	242.5	O K
5760 min Winter	98.450	0.450	0.0	8.7	0.0	8.7	150.8	O K
7200 min Winter	98.305	0.305	0.0	8.4	0.0	8.4	102.1	O K
8640 min Winter	98.226	0.226	0.0	7.9	0.0	7.9	75.8	O K
10080 min Winter	98.181	0.181	0.0	7.5	0.0	7.5	60.6	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Overflow Volume (m³)	Time-Peak (mins)
30 min Winter	91.457	0.0	427.5	89.4	33
60 min Winter	58.005	0.0	545.4	163.4	60
120 min Winter	33.742	0.0	634.7	217.2	116
180 min Winter	24.554	0.0	692.9	249.9	166
240 min Winter	19.586	0.0	736.9	272.8	188
360 min Winter	14.227	0.0	803.0	302.8	264
480 min Winter	11.321	0.0	852.0	320.4	340
600 min Winter	9.476	0.0	891.5	330.7	414
720 min Winter	8.192	0.0	924.8	336.1	484
960 min Winter	6.509	0.0	979.7	334.2	626
1440 min Winter	4.702	0.0	1061.0	287.3	896
2160 min Winter	3.405	0.0	1154.6	207.8	1300
2880 min Winter	2.723	0.0	1231.0	123.6	1676
4320 min Winter	2.012	0.0	1363.5	0.0	2684
5760 min Winter	1.644	0.0	1486.8	0.0	3344
7200 min Winter	1.423	0.0	1608.3	0.0	3968
8640 min Winter	1.276	0.0	1730.2	0.0	4664
10080 min Winter	1.172	0.0	1854.0	0.0	5336

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Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 468978 107174 SU 68978 07174
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+40

Time Area Diagram

Total Area (ha) 1.122

Time (mins) From:	To:	Area (ha)	Time (mins) From:	To:	Area (ha)
0	4	1.076	4	8	0.046

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Model Details

Storage is Online Cover Level (m) 100.000

Cellular Storage Structure

Invert Level (m) 98.000 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	352.5	460.0	1.601	0.0	563.2
1.600	352.5	563.2			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0128-8700-1600-8700
Design Head (m)	1.600
Design Flow (l/s)	8.7
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	128
Invert Level (m)	98.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	8.7
Flush-Flo™	0.473	8.7
Kick-Flo®	0.983	6.9
Mean Flow over Head Range	-	7.6

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	4.6	1.200	7.6	3.000	11.7	7.000	17.5
0.200	7.7	1.400	8.2	3.500	12.6	7.500	18.1
0.300	8.4	1.600	8.7	4.000	13.4	8.000	18.7
0.400	8.6	1.800	9.2	4.500	14.2	8.500	19.2
0.500	8.7	2.000	9.7	5.000	14.9	9.000	19.8
0.600	8.6	2.200	10.1	5.500	15.6	9.500	20.3
0.800	8.1	2.400	10.5	6.000	16.3		
1.000	7.0	2.600	10.9	6.500	16.9		

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Orifice Overflow Control

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 98.725

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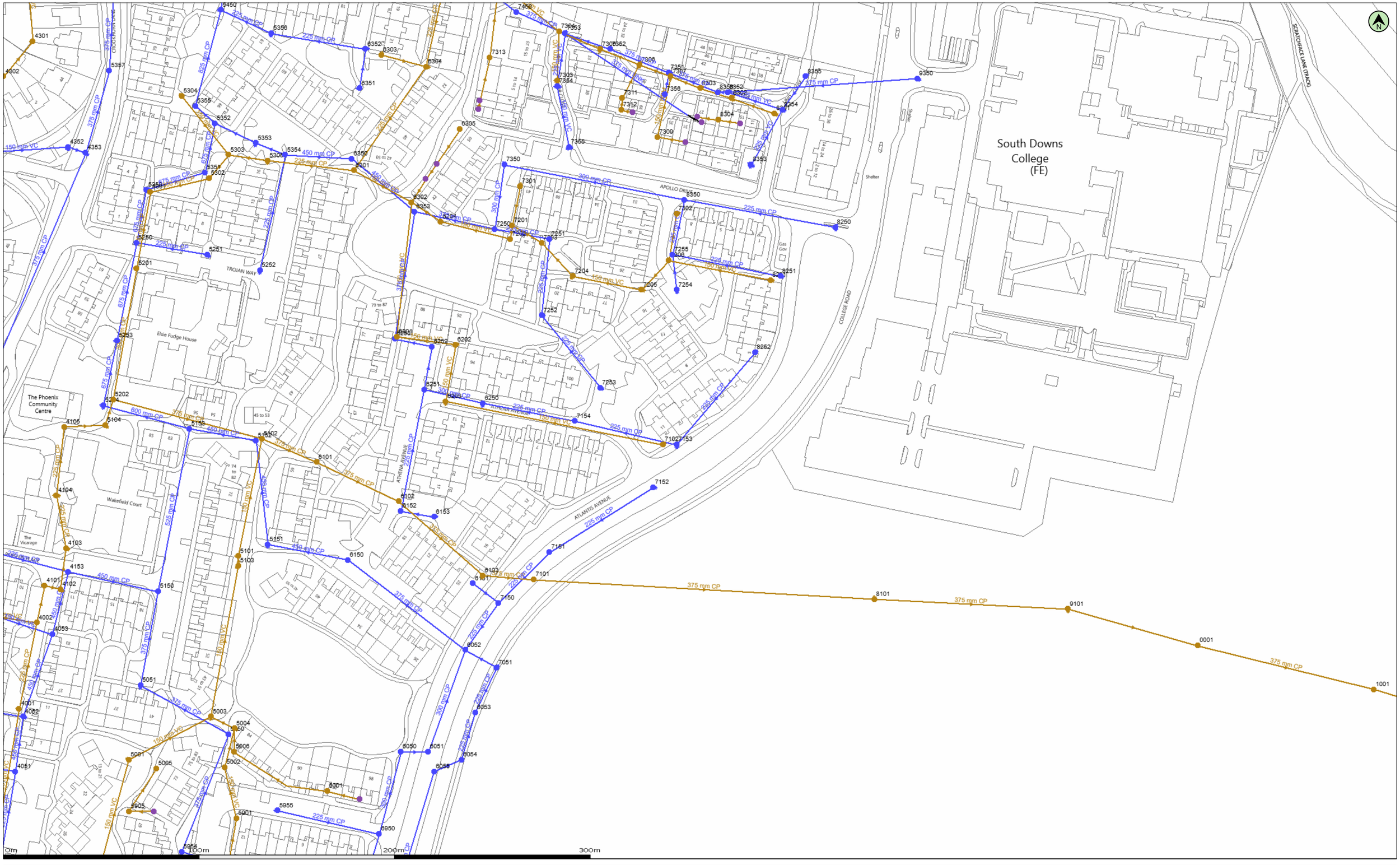
Appendix F Southern Water Information



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The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

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

Foul Gravity Sewer | Combined Gravity Sewer | Culverted Water Course or Treated Effluent | Surface Water Gravity Sewer | Rising Main, Vacuum or Syphon | Combined Pumping Station | Surface Water Pumping Station | Foul Pumping Station | Water Treatment Works | Section 104 Area | Building Over Agreement Area | Foul Manhole | Combined Manhole | Surface Water Manhole | Side Entry Manhole, Decantation Chamber, Dummy Manhole or Surface Water Soakaway | Combined Outfall | Foul Outfall | Surface Water Outfall | Surface Water Inlet

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1017 - HSDC

WATER for LIFE from Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	47.93	44.50	
1001	F	44.35	0.00	
4001	F	56.24	54.92	
4002	F	54.86	53.12	
4101	F	54.42	52.73	
4102	F	54.48	52.57	
4103	F	54.37	52.25	
4104	F	53.94	52.06	
4105	F	53.38	51.47	
4301	F	0.00	0.00	
4302	F	0.00	0.00	
5001	F	58.19	56.08	
5002	F	57.64	56.08	
5003	F	56.65	54.34	
5004	F	57.00	54.37	
5005	F	0.00	0.00	
5006	F	0.00	0.00	
5101	F	54.15	52.54	
5102	F	52.98	47.14	
5103	F	54.44	52.68	
5104	F	52.98	51.13	
5201	F	51.09	47.78	
5202	F	52.90	47.45	
5301	F	50.91	47.86	
5302	F	50.40	48.14	
5303	F	50.11	48.30	
5304	F	49.80	48.66	
5305	F	49.91	48.64	
5901	F	58.25	56.31	
5905	F	0.00	0.00	
6001	F	0.00	0.00	
6101	F	53.37	47.07	
6102	F	53.73	46.82	
6103	F	54.13	46.68	
6201	F	53.86	51.94	
6202	F	54.11	52.41	
6203	F	53.96	52.50	
6204	F	0.00	0.00	
6301	F	50.68	49.27	
6302	F	51.86	49.68	
6303	F	51.07	49.92	
6304	F	51.30	49.70	
6305	F	0.00	0.00	
7101	F	53.17	46.43	
7102	F	55.51	53.21	
7201	F	52.08	50.49	
7202	F	0.00	0.00	
7203	F	52.56	50.62	
7204	F	53.48	51.21	
7205	F	53.75	51.57	
7206	F	53.65	51.73	
7301	F	51.91	50.64	
7302	F	53.68	51.89	
7303	F	52.25	50.68	
7304	F	52.58	50.47	
7305	F	53.37	50.67	
7306	F	53.07	50.87	
7307	F	53.37	51.02	
7309	F	0.00	0.00	
7311	F	0.00	0.00	
7312	F	0.00	0.00	
7313	F	0.00	0.00	
8101	F	49.85	45.87	
8201	F	56.06	54.16	
8301	F	54.05	51.42	
8302	F	53.67	51.25	
8303	F	53.43	51.13	
8304	F	0.00	0.00	
9101	F	50.35	0.00	
4051	S	57.88	54.67	
4052	S	56.45	54.27	
4053	S	55.24	53.45	
4153	S	54.11	52.54	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4352	S	51.52	50.37	
4353	S	51.20	50.13	
5050	S	57.09	55.43	
5051	S	56.20	54.44	
5150	S	54.78	51.48	
5151	S	53.76	49.88	
5152	S	52.92	49.66	
5153	S	52.48	49.26	
5250	S	50.80	48.24	
5251	S	51.14	49.54	
5252	S	51.44	49.95	
5253	S	52.13	48.71	
5254	S	53.05	48.85	
5350	S	51.00	48.06	
5351	S	50.26	47.87	
5352	S	49.99	47.39	
5353	S	49.43	47.95	
5354	S	49.79	48.19	
5355	S	49.82	47.24	
5356	S	49.94	48.57	
5357	S	50.49	49.83	
5450	S	49.81	47.06	
5954	S	59.08	56.82	
5955	S	57.77	56.26	
6050	S	55.57	53.73	
6051	S	55.20	53.54	
6052	S	54.16	50.77	
6053	S	53.56	51.98	
6054	S	54.69	53.06	
6055	S	55.34	53.25	
6150	S	53.62	50.14	
6151	S	54.17	52.02	
6152	S	53.71	52.09	
6153	S	53.87	52.32	
6250	S	54.49	52.16	
6251	S	53.60	51.83	
6252	S	53.74	0.00	
6253	S	53.83	51.31	
6350	S	50.66	48.57	
6351	S	50.92	49.19	
6352	S	51.04	48.98	
6353	S	51.84	49.39	
6950	S	56.89	55.30	
7051	S	52.86	51.08	
7150	S	53.61	51.65	
7151	S	53.72	51.98	
7152	S	55.67	53.21	
7153	S	55.29	53.33	
7154	S	55.12	52.85	
7250	S	52.07	49.80	
7251	S	52.55	51.57	
7252	S	54.18	52.23	
7253	S	54.90	52.70	
7254	S	53.89	52.40	
7255	S	53.94	52.16	
7350	S	51.60	49.99	
7351	S	53.36	50.45	
7352	S	53.34	50.11	
7353	S	52.60	49.81	
7354	S	52.17	50.20	
7355	S	51.87	50.81	
7356	S	53.16	50.91	
7450	S	52.41	49.55	
8250	S	56.41	54.37	
8251	S	56.35	53.72	
8252	S	56.11	54.03	
8350	S	53.65	51.80	
8352	S	53.65	50.82	
8353	S	54.63	52.58	
8354	S	54.03	51.13	
8355	S	54.26	52.67	
8356	S	53.59	50.76	
9350	S	55.37	51.85	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert