Hamson Barron Smith

HBS



Project: Sompting Village Primary School, Four Classroom Extension

Report: RIBA Stage 2 – Drainage Report

Client: West Sussex County Council

Date: December 2018

Report Issue Record

Project No.:	23-20-19-3-6035
Project Title:	Sompting Primary School
Site Location:	Sompting, Lancing, West Sussex BN15 0BN
Client:	West Sussex County Council
Report Title:	RIBA Stage 2 - Civils Engineering Report
Issue Date:	21/12/2018
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1 Introduction & Brief

In December 2018, Hamson Barrron Smith (HBS) was commissioned by NPS on behalf of West Sussex County Council to undertake a RIBA Stage 2 Drainage Design for the proposed extension to Sompting Village Primary School, Sompting. The proposals include a four classbase extension, modification to change use of reprographics room to accommodate a WC, extensions to the existing kitchen, staffroom and hall, a temporary double classroom block, and refurbishment of three existing classrooms.

The objective of this RIBA Stage 2 Drainage Report is to provide high-level commentary in respect of the Drainage aspects of the current design proposals. This will assist further detailed investigations and development of the design in Stages 3 – 5. This commission assumes a single project for the delivery of the new extensions and refurbishments.

2 Investigations

2.1 Civil Engineering Investigations

Available Surveys -

- Topographical and Utility Survey around existing school buildings

Required Surveys –

- Survey (CCTV) to determine the details, condition, capacity and route of existing foul and surface water systems
- In Situ Infiltration testing results
- Ground Water monitoring
- Ground investigation to confirm soil conditions and inform design parameters for any external works design which may be required
- Southern Water Sewer Records
- Roof plans showing the fall of the roof to enable an assessment of the existing drainage provision
- Investigation on the location, type and size of any below ground infiltration systems which may exist

3 Drainage

The final drainage solution for the proposals will be subject to the findings of appropriate surveys and planning requirements. The topographic survey of the site has identified the existing foul and surface water drainage system on site (See Appendix C). The Southern Water apparatus plans have not yet been received so no review of the existing adopted network has been possible at this stage.

3.1 Foul Water Drainage

From information contained within the Topographical and Utilities survey provided it is observed that the existing school is served by a combined drainage system which it is assumed to connect into the public sewer network in White Styles Road to the North of the school. The exact route of this connection is to be confirmed by CCTV survey and sewer records to be obtained from Southern Water.

It is considered the existing combined drain is likely to have adequate capacity for the proposed building due to the proposals only offering a nominal increase in proposed flows being added to the drainage from the existing school building. This will need to be confirmed by a drainage survey and in discussions with Southern Water.

3.1.1 Western Extension

Foul drainage from the proposed extension will be from single sink units being located within each new classroom. Due to the low flows from the sinks requiring a minimum 1 in 40 gradient, and the depth the existing combined network on the site, a gravity connection to the existing on-site combined drainage system is not feasible. A small package pumping station would therefore be required, which would pump the flows via a rising main to a new chamber (brake manhole) where it would continue to drain via gravity and connect to an existing chamber. With the requirement for Type 1 pump stations to be a minimum 5m from habitable buildings this would position the proposed pump station to the South of the extension towards the edge of the school playing field. The rising main from this pump station could then connect to either the existing chamber in the Southwest corner of the netball court to the front of the school, or alternatively to the existing chamber in the vicinity of the existing school kitchen. With the drainage from the chamber in the vicinity of the existing kitchen passing under the footprint of the main

school building it is considered preferable to connect to the chamber in the Southwest corner of the netball court for ease of future maintenance.

3.1.2 Central Extensions

There are no explicit details of the proposed foul water connections to be provided within the central extension works although with part of these works being to extend the existing school kitchen it is envisaged that provisions for foul water drainage will be required. Existing survey information provided indicates existing combined water drainage chamber to be present adjacent to the proposed staff room extension. Although it should be noted that this existing drainage is very shallow, 0.3m deep, and consideration should be given to keeping any proposed new drainage connections as close as possible to this existing chamber. Survey information provided also indicates an existing toilet block to be located adjacent to the Northeast corner to the existing staff room which may provide a suitable point for connections from the staff room if located within in this vicinity. It is not anticipated that the Hall extension and adjacent store will require any foul drainage connections however if required an existing combined water chamber is located externally and adjacent to these stores which should provide an adequate point of connection.

3.1.3 Internal Modifications

The foul drainage for the internal modifications would seek to reutilise the existing drainage connection points. From the survey information provided it would appear that the existing foul drainage currently drains in a Northerly direction beneath the building to the front. The proposed WC is adjacent to an existing toilet block and it is anticipated that a suitable connection could be made to the existing foul drainage within this area, though this is subject to confirmation from existing points of connections. Additionally for the proposed new medical room adjacent to the WC, it would be proposed to connect any foul water connections to the existing combined water chamber in close proximity to this location.

The proposed conversion of existing Maths room to PPA room is not anticipated to require any foul water connections to be provided. However if foul water connections are required this room is adjacent to an existing toilet block and it would be proposed to either utilise the existing points of connection within this toilet block or to install a new chamber on the existing combined water drainage run externally to this room to provide an adequate point of connection.

Any foul drainage connections for the proposed modifications to create the three classrooms 19, 20 and 21 would also seek to reutilise existing drainage for points of connection. The floor plan for the existing layout of the school shows some existing drainage features located within the rooms adjacent to classrooms 19 & 21, with consideration to the location of any drainage requirements within the proposed it is likely to be able to connect to the same drainage point. Connection from any drainage proposed with classroom 20 will be more challenging to achieve a suitable point of connection. The topographical survey indicates only surface water drainage to soakaways being located to the rear and outside the school building and therefore not suitable to receive any foul water flows. An existing WC to be removed in classroom 19 may provide a suitable point of connection for classroom 20. An internal courtyard is located across the corridor from these classrooms with the existing drainage to be removed identified as possibly flowing to a chamber located within this courtyard. However no survey information for this courtyard has been included within the topogprhaic survey and this assumption requires confirmation. If an existing chamber is present within this courtyard then this may provide a suitable point of connection. A further potential alternative solution may be to drain the classrooms to a new drainage run to connect into the small private pumping station being proposed for the four classroom extension to the Western end of the main school building, this would connect to the existing drainage on the site via a rising main.

3.1.4 Temporary Double Classroom

Within the proposals is for a proposed double temporary classroom to be positioned to the Western edge of the hard play area to the front of the main school building. It would be proposed for any foul water drainage connections required for this temporary classroom to be collected by a new short drainage run and directed into the existing combined water drainage chamber located in the Northwest corner of this playground.

3.2 Surface Water Drainage

The use of ponds, basins or other open features as a form of surface water storage prior to infiltration is not considered an appropriate method of storing surface water given the proposed site is a school with young children, and the potential health and safety risks that would be encountered. Therefore, the proposal is for a system comprising cellular storm water units to provide an environmentally sustainable and economically viable alternative to soft SuDS solutions.

The existing surface water regime employed at the school is disposal via infiltration utilising soakaways, with the information contained within the topographical survey showing no positive drainage to any offsite connection for surface water drainage currently present on the site. Given no positive surface water drainage connection to the public sewer, it is therefore proposed to continue to use infiltration for surface water disposal. Full scale site BRE 365 testing will be required to establish the appropriate infiltration rate for the design of any soakaways. Locations for the test locations being suitable for positioning of any soakaways to conform with the requirement for a minimum 5m clearance from any structure, and to be outside the zone of influence of any existing soakaways. Groundwater monitoring should also be undertaken to confirm the ground water depth and provide assurance that the proposed soakaway inverts are at least 1.0m above the groundwater horizon.

The proposed strategies have sought to provide acceptable parameters to which stakeholders will accept. The current proposals for below ground storage (infiltration) have been adopted as an alternative to above ground storage, in consideration of safety due to the sensitive site use as a school.

The size of the soakaway would be subject to the infiltration rate obtained as part of the full BRE365 testing and designed top the 100 year return period event, plus a 40% allowance for climate change, in line with current guidance.

3.2.1 Western Extension

The proposals for the new four classbase extension will result in an increase in impermeable area to the school site of approximately to 300m^2. Surface water run-off from the proposed extension will be collected via rainwater downpipes and linear drainage channels with these flows being directed into an appropriately sized and located soakaway feature.

Hydraulic calculations using MicroDrainage design software to provide an indication as to possible size of soakaway that would be required and using a conservative infiltration rate of 250mm/hr, shows a cellular soakaway of approximate size 7.5m x 4.0m x 0.4m. For any storm events which exceed this it is proposed to control any excess surface water volume within the confines of the existing school playing field.

3.2.2 Central Extensions

The proposed extensions for the kitchen, hall and staff room will see no overall increase in impermeable area being drained, with the extensions replacing existing areas of hard standing being drained. Additional survey investigation will be required to establish the existing areas being drained by existing downpipes and gullies that would require removal to accommodate the extensions. These areas would need to be included within the design calculations for any new surface water drainage provisions for the new extensions. Surface water run-off from the proposed extensions will be collected via rainwater downpipes and linear drainage channels with these flows being direct into an appropriately sized and located soakaway feature. Hydraulic calculations using MicroDrainage design software to provide an indication as to possible size of soakaway that would be required and using a conservative infiltration rate of 250mm/hr, shows a cellular soakaway of approximate size 5.0m x 2.5m x 0.4m. The logical location for this soakaway would be beneath the school playing field to the South of the extensions. Information contained within the topographical survey indicates an existing soakaway being located beneath the playing field. The location of any new infiltration feature would require siting to sufficient distance between the features to avoid any interference between them.

For any storm events which exceed the proposed design standard (noted above) it is proposed to control any excess surface water volume within the confines of the existing school playing field.

3.2.3 Temporary Double Classroom

The location shown for the temporary double classroom is shown to be on an area of existing hard standing which drains to a linear drainage channel on it's Southern boundary. It would therefore be proposed that this would be maintained with the surface water run-off from the temporary double continuing to drain across the hard standing to this existing drainage channel.

3.2.4 Attenuated Surface Water

Should drainage via infiltration be determined unfeasible following full BRE365 testing then the surface water for the proposals would require connection to a suitable point of within the existing drainage network located on the site. Information contained within the survey provided does not indicate any drainage network other than soakaways being

located to the South of the school. Therefore as an alternative to soakaways the surface water from both the Central and Western works be attenuated with a single attenuation tank which will require pumping at a practical minimum discharge rate of 2.0l/s to a suitable point of outfall. An approximate size for the attenuation tank that would be require is 9.0m x 4.5m x 0.4m, with this tank being sited within the soft landscaping to the South of the school. This is not considered a very sustainable solution but with a lack of an appropriate outfall at a suitable low point this option will only be sought in the event of no other solutions being viable.

3.3 Flood Exceedance and Drainage System Failure Routes

The onsite layout and topography will be maintained to accommodate and route excess surface water runoff from the site into existing or equivalent escape routes so that this too will not increase onsite or offsite risk of flooding. Surface Water flood routing across the site would be from the North towards the South. In the event of exceedance/failure or blockage of the proposed system the overland routing of water will be directed to the South and onto the school playing field.

3.4 Operation and Maintenance

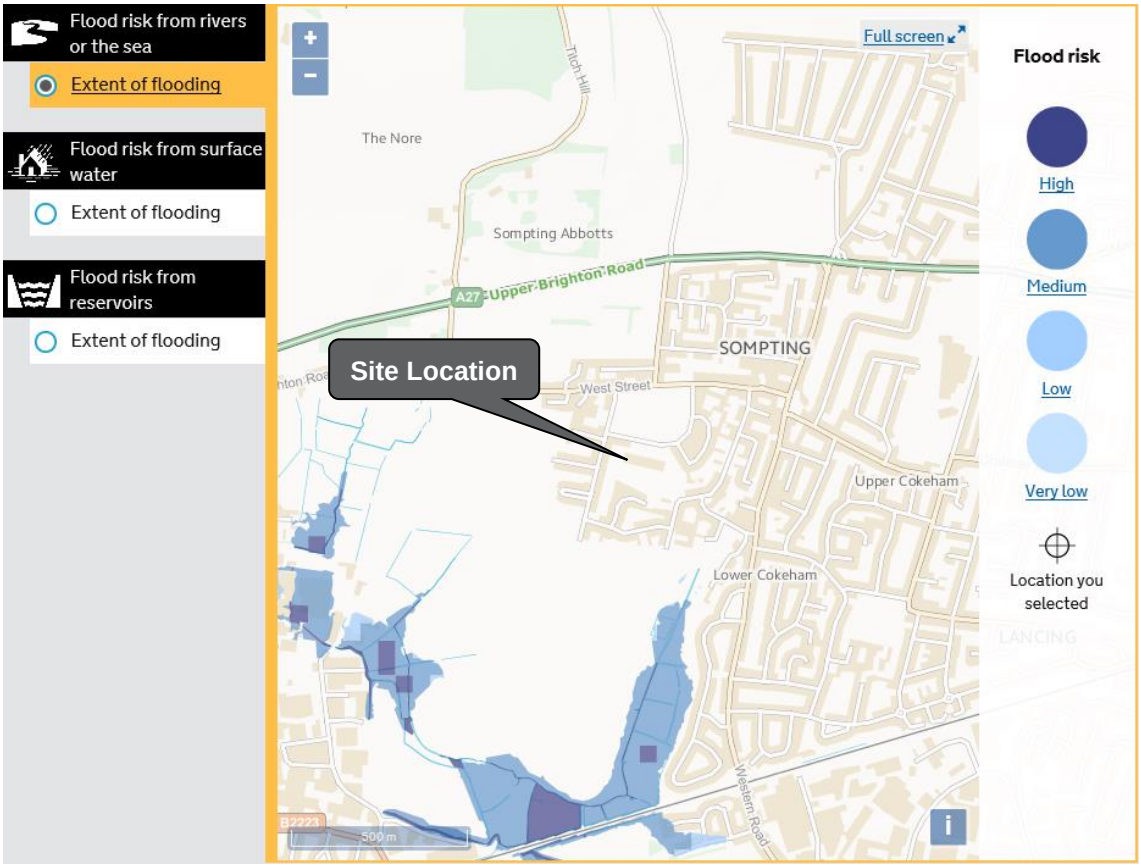
Drainage for buildings, access roads, car parks, landscaping, etc. in private ownership will be the responsibility of the school to be managed and maintained appropriately. There will be no transfer of adoption of the surface water drainage to Southern Water or the Highway Authority.

Details for the management and maintenance of any SuDS within the site will be agreed with West Sussex Council prior to construction. It is anticipated that the site will include these details with their other maintenance obligations. To ensure that any private shared ownership SuDS will operate effectively for its lifetime a management plan for the operation and maintenance of the SuDS will be produced, prior to construction, based on Chapter 32 of Ciria C753.

3.5 Flood Risk

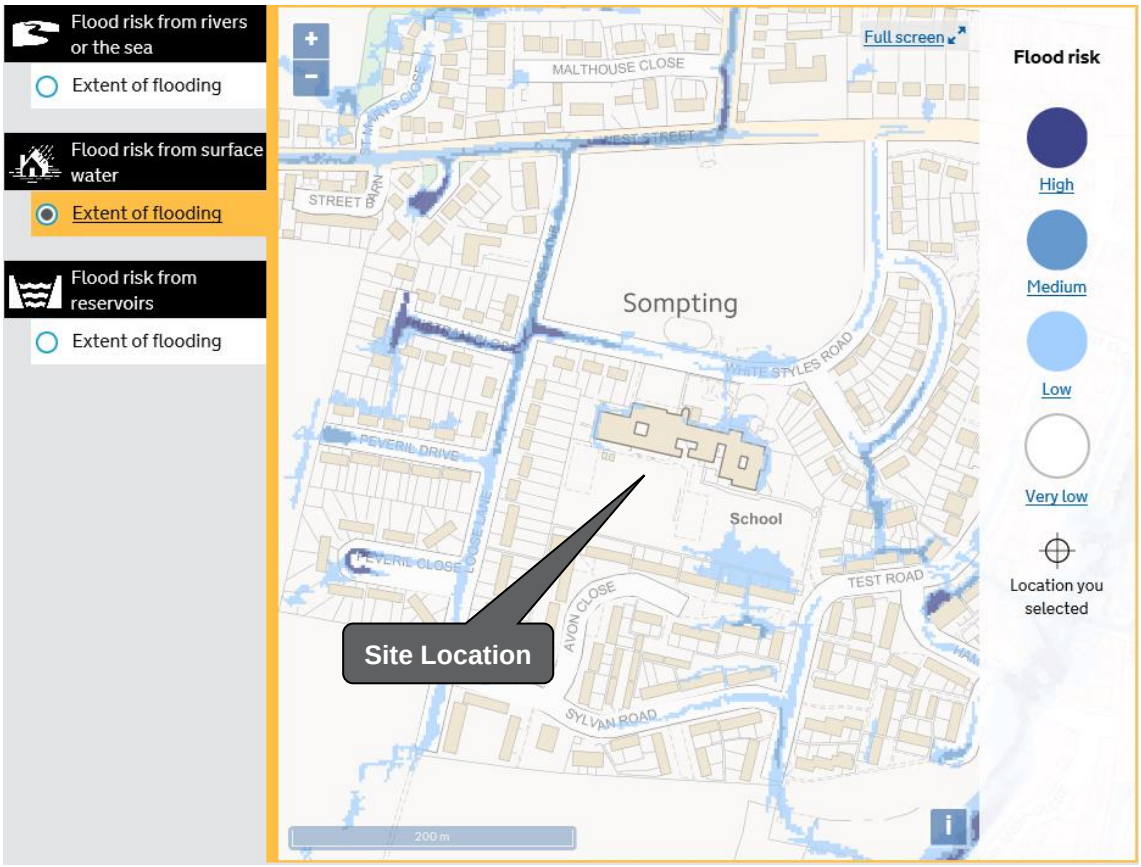
3.5.1 Fluvial Flood Risk

The site is located outside the Environment Agency's indicative flood plain (Flood Zone 1 – Low Risk).



3.5.2 Surface Water Flood Risk

The site is identified on the EA's mapping as at low risk from possible surface water exceedance events. An Extract from the EA's mapping below shows there is limited risk to the subject site from surface water flooding. The site is not located within the Critical Drainage Area and therefore not required to provide additional surface water drainage provision to manage site discharge further than is standard practice.



4 External Areas

4.1 Highway Access

The existing access to the school access will remain unchanged by the proposals.

4.2 Car Park

Site car parking will be unaltered as part of the proposals to extend the school.

4.3 Hard Play Areas

Replacement or upgrade may be required depending on the final drainage solution, and would be specified in accordance with the Landscape Architects surfacing requirements.

4.4 Paved Areas

Any new paved area will be designed for the appropriate loading. The structural design will be subject to the results of the Ground Investigation requirements as set out in 2.1.

4.5 Construction Access

It is proposed that the access in the Southeast corner of the site off Test Road will be used for construction deliveries.

5 Closure

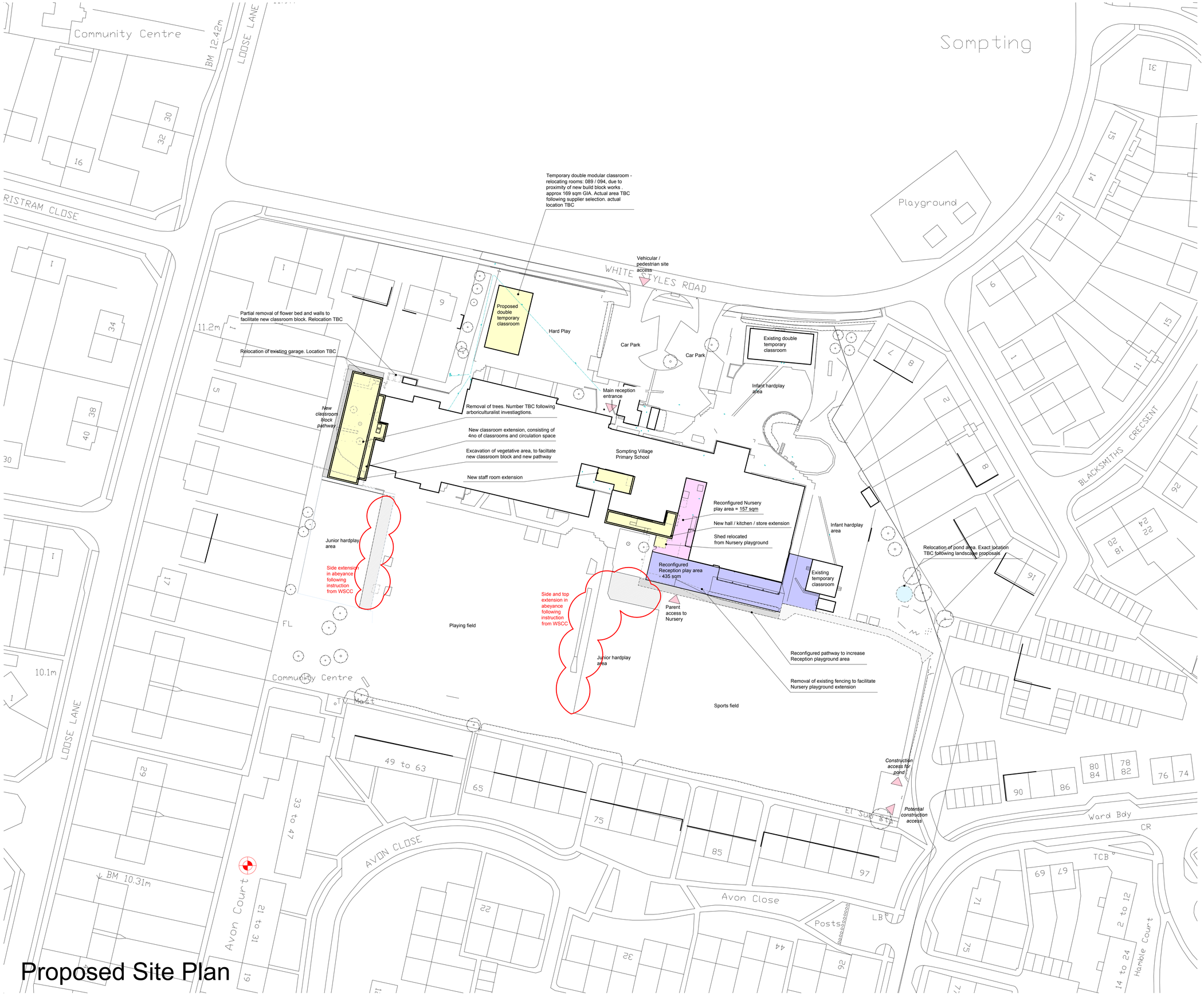
This report has been prepared by Hamson Barron Smith Limited with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of West Sussex County Council; no warranties or guarantees are expressed or should be inferred by any third parties unless written agreement has been obtained. This report may not be relied upon by other parties without written consent from Hamson Barron Smith Limited.

Hamson Barron Smith Limited disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Appendix A

Site Location Plan



Proposed Site Plan

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Rev	Amendments	by	chkd	Date
P1	Double temporary class shown. Notation added to drawing. Nursery play area and junior hard play area extension shown	MW	DS	10/12/18
P2	Changes made in accordance with C.E.M 2 on 11.12.18	MW	DS	14/12/18

Items TBC:
-Landscape works
-Arboricultural investigations
-Ecological investigations
-Opening up works
-M&E / structural design
-Daylighting calcs

Note: WIP
Design for purposes of consultation with client only.

Key:

- Items to be removed, relocated, demolised
- New build
- Existing buildings
- Existing hardlandscape
- Proposed hardlandscape
- Existing softlandscape

- Topographical survey based on information provided by SiTech Surveying. Received Nov 2018, ref: '12763a-18'
- OS map data and license based on information provided by Faithful & Gould Received Sept 2018
- Building record information based on information retrieved from Faithful & Gould. Received Sept 2018

west sussex county council
multi disciplinary consultant PARTNERSHIP

0m 5m 10m 25m 50m

Scale 1:500

Project
WSCC Schools
Sompting Village Primary School

Drawn By	Checked By	HNW Project No.	Date Created
MW	JW	18038	NOV 2018

Scale
A1- 1:500

Drawing Title
PROPOSED SITE PLAN

Drawing Status
PRELIMINARY

Revision
P2

Drawing Number
18038-HNW-SO-ZZ-DR-A-2100

61 North Street, Chichester, West Sussex, PO19 1NB

hnw architects

Appendix B

RIBA Stage 2 Drainage Layout (Infiltration Design Option 1)

TEMPORARY DRAINAGE CONNECTIONS TO EXISTING SEWER

POSSIBLE DIVERSION OF EXISTING SEWER

Proposed double temporary classroom

Existing double temporary classroom

Car Park (asphalt)

Hard Play

Car Park

Car Park

Infant hardplay area

Main reception entrance

CONNECTION TO EXISTING DRAINAGE

WESTERN EXTENSION

CENTRAL EXTENSIONS

Garage

Grass/ Shrubs

Road

Sompting Village Primary School

FOUL WATER PUMPING CHAMBER

M.U.G.A (asphalt)

EXISTING SOAKAWAYS, EXACT POSITION TO BE DETERMINED WITH NEW SOAKAWAYS LOCATED MINIMUM 5m CLEARANCE FROM EXISTING SOAKAWAYS AND BUILDINGS

APPROXIMATE POSITION FOR CELLULAR SOAKAWAY
7.5m x 4.0m x 0.4m MINIMUM 95% VOIDS
DESIGN EVENT 1 IN 100 YR + 40% ALLOWANCE FOR CLIMATE CHANGE INDICATIVE INFILTRATION RATE FOR PRELIMINARY DESIGN 0.25m/hr

APPROXIMATE POSITION FOR CELLULAR SOAKAWAY
5.0m x 2.5m x 0.4m MINIMUM 95% VOIDS
DESIGN EVENT 1 IN 100 YR + 40% ALLOWANCE FOR CLIMATE CHANGE INDICATIVE INFILTRATION RATE FOR PRELIMINARY DESIGN 0.25m/hr

M.U.G.A. (TARMAC)

Playing Field (Grass)

Bike Sheds

Existing temporary classroom

Reconfigured pathway to increase Reception playground area

Construction access for pond

N E S W

HAZARD WARNINGS

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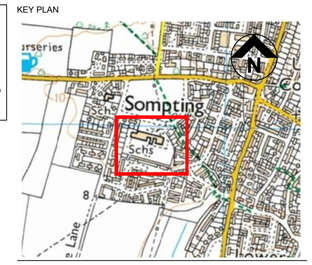
KEY PLAN



Notes:

FOUL DRAINAGE
SURFACE DRAINAGE
COMBINED DRAINAGE
PUMPING MAIN

Foul Water Drainage
Foul Water Rising Main
Surface Water Drainage
Surface Water Rising Main

Soakaway formed with Polystorm Lite modular cells or similar approved.

Extent of new building works

Extent of internal modifications

External resurfacing works

FIRST ISSUE						
P1	MHW	21.12.2018	SDH	21.12.2018	SDH	21.12.2018
REV	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE

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1:1

ORIGINAL SHEET SIZE A1

CLIENT
WEST SUSSEX COUNTY COUNCIL

PROJECT
SOMPTING VILLAGE PRIMARY SCHOOL

TITLE
INDICATIVE DRAINAGE LAYOUT
SURFACE WATER INFILTRATION
PRIMARY OPTION

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SCALES	DISCIPLINE	PROJECT NUMBER
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DRAWING NUMBER		REV CODE
HBS-DR-C-(00)-060		P1
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S0	PRELIMINARY	MW

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Date Plotted: 21 December 2018 12:01:02

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Appendix C

RIBA Stage 2 Drainage Layout (Attenuation Design Option 2)

TEMPORARY DRAINAGE CONNECTIONS TO EXISTING SEWER

POSSIBLE DIVERSION OF EXISTING SEWER

Proposed double temporary classroom

Existing double temporary classroom

Car Park (asphalt)

Hard Play

Car Park

Car Park

Infant hardplay area

Main reception entrance

CONNECTION TO EXISTING DRAINAGE

WESTERN EXTENSION

Garage

Grass/ Shrubs

Road

Sompting Village Primary School

CENTRAL EXTENSIONS

Existing temporary classroom

Bike Sheds

FOUL WATER PUMPING CHAMBER

SURFACE WATER PUMPING CHAMBER 2.0l/s DISCHARGE

APPROXIMATE POSITION FOR ATTENUATION TANK
9.0m x 4.5m x 0.4m MINIMUM 95% VOIDS
DESIGN EVENT 1 IN 100 YR
+ 40% ALLOWANCE FOR CLIMATE CHANGE

M.U.G.A. (asphalt)

Playing Field (Grass)

M.U.G.A. (TARMAC)

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Reconfigured pathway to increase Reception playground area

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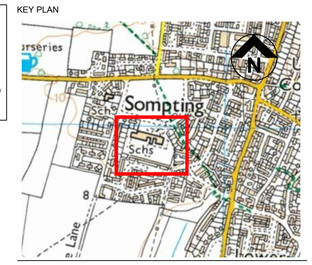
KEY PLAN



Notes:

FOUL DRAINAGE
SURFACE DRAINAGE
COMBINED DRAINAGE
PUMPING MAIN

Foul Water Drainage
Foul Water Rising Main
Surface Water Drainage
Surface Water Rising Main

Soakaway formed with Polystorm Lite modular cells or similar approved.

Extent of new building works

Extent of internal modifications

External resurfacing works

REV	DRAWN	DATE	CHECKED	DATE	APPROVED	DATE
P1	MHW	21.12.2018	SDH	21.12.2018	SDH	21.12.2018

FIRST ISSUE

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ORIGINAL SHEET SIZE A1

CLIENT
WEST SUSSEX COUNTY COUNCIL

PROJECT
SOMPTING VILLAGE PRIMARY SCHOOL

TITLE
INDICATIVE DRAINAGE LAYOUT
SURFACE WATER ATTENUATION
ALTERNATIVE OPTION

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Date Plotted: 21 December 2018 12:01:42

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Appendix D

Micro Drainage Calculations

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

Half Drain Time : 63 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	8.810	0.210	0.5	2.5	O K
30 min Summer	8.862	0.262	0.6	3.1	O K
60 min Summer	8.892	0.292	0.6	3.5	O K
120 min Summer	8.896	0.296	0.6	3.5	O K
180 min Summer	8.882	0.282	0.6	3.3	O K
240 min Summer	8.863	0.263	0.6	3.1	O K
360 min Summer	8.828	0.228	0.6	2.7	O K
480 min Summer	8.795	0.195	0.5	2.3	O K
600 min Summer	8.766	0.166	0.5	2.0	O K
720 min Summer	8.741	0.141	0.5	1.7	O K
960 min Summer	8.700	0.100	0.5	1.2	O K
1440 min Summer	8.654	0.054	0.5	0.6	O K
2160 min Summer	8.639	0.039	0.4	0.5	O K
2880 min Summer	8.632	0.032	0.3	0.4	O K
4320 min Summer	8.623	0.023	0.2	0.3	O K
5760 min Summer	8.619	0.019	0.2	0.2	O K
7200 min Summer	8.616	0.016	0.1	0.2	O K
8640 min Summer	8.614	0.014	0.1	0.2	O K
10080 min Summer	8.612	0.012	0.1	0.1	O K
15 min Winter	8.838	0.238	0.6	2.8	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	128.238	0.0	17
30 min Summer	86.178	0.0	31
60 min Summer	55.250	0.0	52
120 min Summer	34.177	0.0	86
180 min Summer	25.410	0.0	120
240 min Summer	20.436	0.0	154
360 min Summer	15.037	0.0	220
480 min Summer	12.081	0.0	286
600 min Summer	10.185	0.0	348
720 min Summer	8.854	0.0	408
960 min Summer	7.093	0.0	524
1440 min Summer	5.178	0.0	748
2160 min Summer	3.772	0.0	1100
2880 min Summer	3.009	0.0	1468
4320 min Summer	2.184	0.0	2200
5760 min Summer	1.738	0.0	2928
7200 min Summer	1.455	0.0	3592
8640 min Summer	1.260	0.0	4408
10080 min Summer	1.115	0.0	5136
15 min Winter	128.238	0.0	17

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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 Volume (m³)	Status
30 min Winter	8.900	0.300	0.6	3.6	O K
60 min Winter	8.936	0.336	0.6	4.0	O K
120 min Winter	8.937	0.337	0.6	4.0	O K
180 min Winter	8.915	0.315	0.6	3.7	O K
240 min Winter	8.887	0.287	0.6	3.4	O K
360 min Winter	8.832	0.232	0.6	2.8	O K
480 min Winter	8.784	0.184	0.5	2.2	O K
600 min Winter	8.742	0.142	0.5	1.7	O K
720 min Winter	8.707	0.107	0.5	1.3	O K
960 min Winter	8.659	0.059	0.5	0.7	O K
1440 min Winter	8.639	0.039	0.4	0.5	O K
2160 min Winter	8.629	0.029	0.3	0.3	O K
2880 min Winter	8.623	0.023	0.2	0.3	O K
4320 min Winter	8.617	0.017	0.2	0.2	O K
5760 min Winter	8.614	0.014	0.1	0.2	O K
7200 min Winter	8.611	0.011	0.1	0.1	O K
8640 min Winter	8.610	0.010	0.1	0.1	O K
10080 min Winter	8.609	0.009	0.1	0.1	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	86.178	0.0	31
60 min Winter	55.250	0.0	58
120 min Winter	34.177	0.0	92
180 min Winter	25.410	0.0	130
240 min Winter	20.436	0.0	166
360 min Winter	15.037	0.0	236
480 min Winter	12.081	0.0	302
600 min Winter	10.185	0.0	364
720 min Winter	8.854	0.0	422
960 min Winter	7.093	0.0	522
1440 min Winter	5.178	0.0	748
2160 min Winter	3.772	0.0	1104
2880 min Winter	3.009	0.0	1440
4320 min Winter	2.184	0.0	2204
5760 min Winter	1.738	0.0	2928
7200 min Winter	1.455	0.0	3616
8640 min Winter	1.260	0.0	4400
10080 min Winter	1.115	0.0	5168

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.012

Time (mins) From:	To:	Area (ha)
0	4	0.012

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.25000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.25000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	12.5	12.5	0.401	0.0	18.5
0.400	12.5	18.5			

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

Half Drain Time : 78 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	8.830	0.230	1.2	6.5	O K
30 min Summer	8.889	0.289	1.3	8.2	O K
60 min Summer	8.926	0.326	1.3	9.3	O K
120 min Summer	8.934	0.334	1.3	9.5	O K
180 min Summer	8.922	0.322	1.3	9.2	O K
240 min Summer	8.904	0.304	1.3	8.7	O K
360 min Summer	8.868	0.268	1.3	7.6	O K
480 min Summer	8.834	0.234	1.2	6.7	O K
600 min Summer	8.803	0.203	1.2	5.8	O K
720 min Summer	8.774	0.174	1.2	5.0	O K
960 min Summer	8.727	0.127	1.1	3.6	O K
1440 min Summer	8.667	0.067	1.1	1.9	O K
2160 min Summer	8.643	0.043	0.9	1.2	O K
2880 min Summer	8.635	0.035	0.8	1.0	O K
4320 min Summer	8.626	0.026	0.6	0.7	O K
5760 min Summer	8.620	0.020	0.4	0.6	O K
7200 min Summer	8.617	0.017	0.4	0.5	O K
8640 min Summer	8.615	0.015	0.3	0.4	O K
10080 min Summer	8.613	0.013	0.3	0.4	O K
15 min Winter	8.860	0.260	1.2	7.4	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	128.238	0.0	17
30 min Summer	86.178	0.0	31
60 min Summer	55.250	0.0	56
120 min Summer	34.177	0.0	88
180 min Summer	25.410	0.0	124
240 min Summer	20.436	0.0	158
360 min Summer	15.037	0.0	226
480 min Summer	12.081	0.0	290
600 min Summer	10.185	0.0	356
720 min Summer	8.854	0.0	418
960 min Summer	7.093	0.0	536
1440 min Summer	5.178	0.0	762
2160 min Summer	3.772	0.0	1100
2880 min Summer	3.009	0.0	1468
4320 min Summer	2.184	0.0	2196
5760 min Summer	1.738	0.0	2936
7200 min Summer	1.455	0.0	3624
8640 min Summer	1.260	0.0	4272
10080 min Summer	1.115	0.0	5136
15 min Winter	128.238	0.0	17

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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 Volume (m³)	Status
30 min Winter	8.930	0.330	1.3	9.4	O K
60 min Winter	8.977	0.377	1.3	10.8	O K
120 min Winter	8.984	0.384	1.3	10.9	O K
180 min Winter	8.965	0.365	1.3	10.4	O K
240 min Winter	8.937	0.337	1.3	9.6	O K
360 min Winter	8.882	0.282	1.3	8.0	O K
480 min Winter	8.830	0.230	1.2	6.6	O K
600 min Winter	8.784	0.184	1.2	5.3	O K
720 min Winter	8.744	0.144	1.2	4.1	O K
960 min Winter	8.682	0.082	1.1	2.3	O K
1440 min Winter	8.643	0.043	0.9	1.2	O K
2160 min Winter	8.632	0.032	0.7	0.9	O K
2880 min Winter	8.625	0.025	0.5	0.7	O K
4320 min Winter	8.619	0.019	0.4	0.5	O K
5760 min Winter	8.615	0.015	0.3	0.4	O K
7200 min Winter	8.612	0.012	0.3	0.4	O K
8640 min Winter	8.611	0.011	0.2	0.3	O K
10080 min Winter	8.610	0.010	0.2	0.3	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	86.178	0.0	31
60 min Winter	55.250	0.0	58
120 min Winter	34.177	0.0	94
180 min Winter	25.410	0.0	134
240 min Winter	20.436	0.0	170
360 min Winter	15.037	0.0	242
480 min Winter	12.081	0.0	310
600 min Winter	10.185	0.0	374
720 min Winter	8.854	0.0	434
960 min Winter	7.093	0.0	546
1440 min Winter	5.178	0.0	738
2160 min Winter	3.772	0.0	1104
2880 min Winter	3.009	0.0	1472
4320 min Winter	2.184	0.0	2168
5760 min Winter	1.738	0.0	2904
7200 min Winter	1.455	0.0	3672
8640 min Winter	1.260	0.0	4384
10080 min Winter	1.115	0.0	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.031

Time (mins) From:	To:	Area (ha)
0	4	0.031

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.25000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.25000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	30.0	30.0	0.401	0.0	39.2
0.400	30.0	39.2			

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

Half Drain Time : 65 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Σ Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	8.829	0.229	0.0	2.0	2.0	8.8	O K
30 min Summer	8.891	0.291	0.0	2.0	2.0	11.2	O K
60 min Summer	8.929	0.329	0.0	2.0	2.0	12.6	O K
120 min Summer	8.936	0.336	0.0	2.0	2.0	12.9	O K
180 min Summer	8.922	0.322	0.0	2.0	2.0	12.4	O K
240 min Summer	8.901	0.301	0.0	2.0	2.0	11.6	O K
360 min Summer	8.853	0.253	0.0	2.0	2.0	9.7	O K
480 min Summer	8.810	0.210	0.0	2.0	2.0	8.1	O K
600 min Summer	8.773	0.173	0.0	2.0	2.0	6.7	O K
720 min Summer	8.743	0.143	0.0	2.0	2.0	5.5	O K
960 min Summer	8.704	0.104	0.0	2.0	2.0	4.0	O K
1440 min Summer	8.677	0.077	0.0	1.7	1.7	3.0	O K
2160 min Summer	8.661	0.061	0.0	1.3	1.3	2.3	O K
2880 min Summer	8.652	0.052	0.0	1.0	1.0	2.0	O K
4320 min Summer	8.643	0.043	0.0	0.8	0.8	1.7	O K
5760 min Summer	8.638	0.038	0.0	0.6	0.6	1.5	O K
7200 min Summer	8.634	0.034	0.0	0.5	0.5	1.3	O K
8640 min Summer	8.632	0.032	0.0	0.4	0.4	1.2	O K
10080 min Summer	8.630	0.030	0.0	0.4	0.4	1.1	O K
15 min Winter	8.860	0.260	0.0	2.0	2.0	10.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
15 min Summer	128.238	0.0	10.1	17
30 min Summer	86.178	0.0	13.5	31
60 min Summer	55.250	0.0	17.4	56
120 min Summer	34.177	0.0	21.5	88
180 min Summer	25.410	0.0	24.0	122
240 min Summer	20.436	0.0	25.7	158
360 min Summer	15.037	0.0	28.4	222
480 min Summer	12.081	0.0	30.4	284
600 min Summer	10.185	0.0	32.1	344
720 min Summer	8.854	0.0	33.4	398
960 min Summer	7.093	0.0	35.7	510
1440 min Summer	5.178	0.0	39.1	738
2160 min Summer	3.772	0.0	42.8	1100
2880 min Summer	3.009	0.0	45.5	1468
4320 min Summer	2.184	0.0	49.5	2184
5760 min Summer	1.738	0.0	52.5	2936
7200 min Summer	1.455	0.0	55.0	3640
8640 min Summer	1.260	0.0	57.1	4400
10080 min Summer	1.115	0.0	59.0	5032
15 min Winter	128.238	0.0	11.3	17

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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 Σ Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	8.931	0.331	0.0	2.0	2.0	12.7	O K
60 min Winter	8.976	0.376	0.0	2.0	2.0	14.5	O K
120 min Winter	8.980	0.380	0.0	2.0	2.0	14.6	O K
180 min Winter	8.958	0.358	0.0	2.0	2.0	13.8	O K
240 min Winter	8.926	0.326	0.0	2.0	2.0	12.5	O K
360 min Winter	8.851	0.251	0.0	2.0	2.0	9.7	O K
480 min Winter	8.784	0.184	0.0	2.0	2.0	7.1	O K
600 min Winter	8.733	0.133	0.0	2.0	2.0	5.1	O K
720 min Winter	8.701	0.101	0.0	2.0	2.0	3.9	O K
960 min Winter	8.679	0.079	0.0	1.7	1.7	3.0	O K
1440 min Winter	8.661	0.061	0.0	1.3	1.3	2.3	O K
2160 min Winter	8.649	0.049	0.0	0.9	0.9	1.9	O K
2880 min Winter	8.643	0.043	0.0	0.8	0.8	1.7	O K
4320 min Winter	8.636	0.036	0.0	0.5	0.5	1.4	O K
5760 min Winter	8.632	0.032	0.0	0.4	0.4	1.2	O K
7200 min Winter	8.629	0.029	0.0	0.4	0.4	1.1	O K
8640 min Winter	8.627	0.027	0.0	0.3	0.3	1.0	O K
10080 min Winter	8.625	0.025	0.0	0.3	0.3	0.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)
30 min Winter	86.178	0.0	15.2	31
60 min Winter	55.250	0.0	19.5	58
120 min Winter	34.177	0.0	24.1	94
180 min Winter	25.410	0.0	26.9	132
240 min Winter	20.436	0.0	28.8	170
360 min Winter	15.037	0.0	31.8	238
480 min Winter	12.081	0.0	34.1	298
600 min Winter	10.185	0.0	35.9	352
720 min Winter	8.854	0.0	37.5	398
960 min Winter	7.093	0.0	40.0	504
1440 min Winter	5.178	0.0	43.8	738
2160 min Winter	3.772	0.0	47.9	1104
2880 min Winter	3.009	0.0	50.9	1456
4320 min Winter	2.184	0.0	55.4	2204
5760 min Winter	1.738	0.0	58.8	2880
7200 min Winter	1.455	0.0	61.6	3640
8640 min Winter	1.260	0.0	64.0	4320
10080 min Winter	1.115	0.0	66.1	5152

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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.500	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.042

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

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Model Details

Storage is Online Cover Level (m) 10.000

Cellular Storage Structure

Invert Level (m) 8.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	40.5	40.5	0.401	0.0	51.3
0.400	40.5	51.3			

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0076-2000-0400-2000
Design Head (m)	0.400
Design Flow (l/s)	2.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	76
Invert Level (m)	8.600
Minimum Outlet Pipe Diameter (mm)	100
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	0.400	2.0
Flush-Flo™	0.124	2.0
Kick-Flo®	0.286	1.7
Mean Flow over Head Range	-	1.7

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

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	2.0	1.200	3.3	3.000	5.1	7.000	7.6
0.200	1.9	1.400	3.5	3.500	5.4	7.500	7.9
0.300	1.8	1.600	3.8	4.000	5.8	8.000	8.2
0.400	2.0	1.800	4.0	4.500	6.1	8.500	8.4
0.500	2.2	2.000	4.2	5.000	6.5	9.000	8.7
0.600	2.4	2.200	4.4	5.500	6.8	9.500	8.9
0.800	2.7	2.400	4.6	6.000	7.1		
1.000	3.0	2.600	4.7	6.500	7.4		

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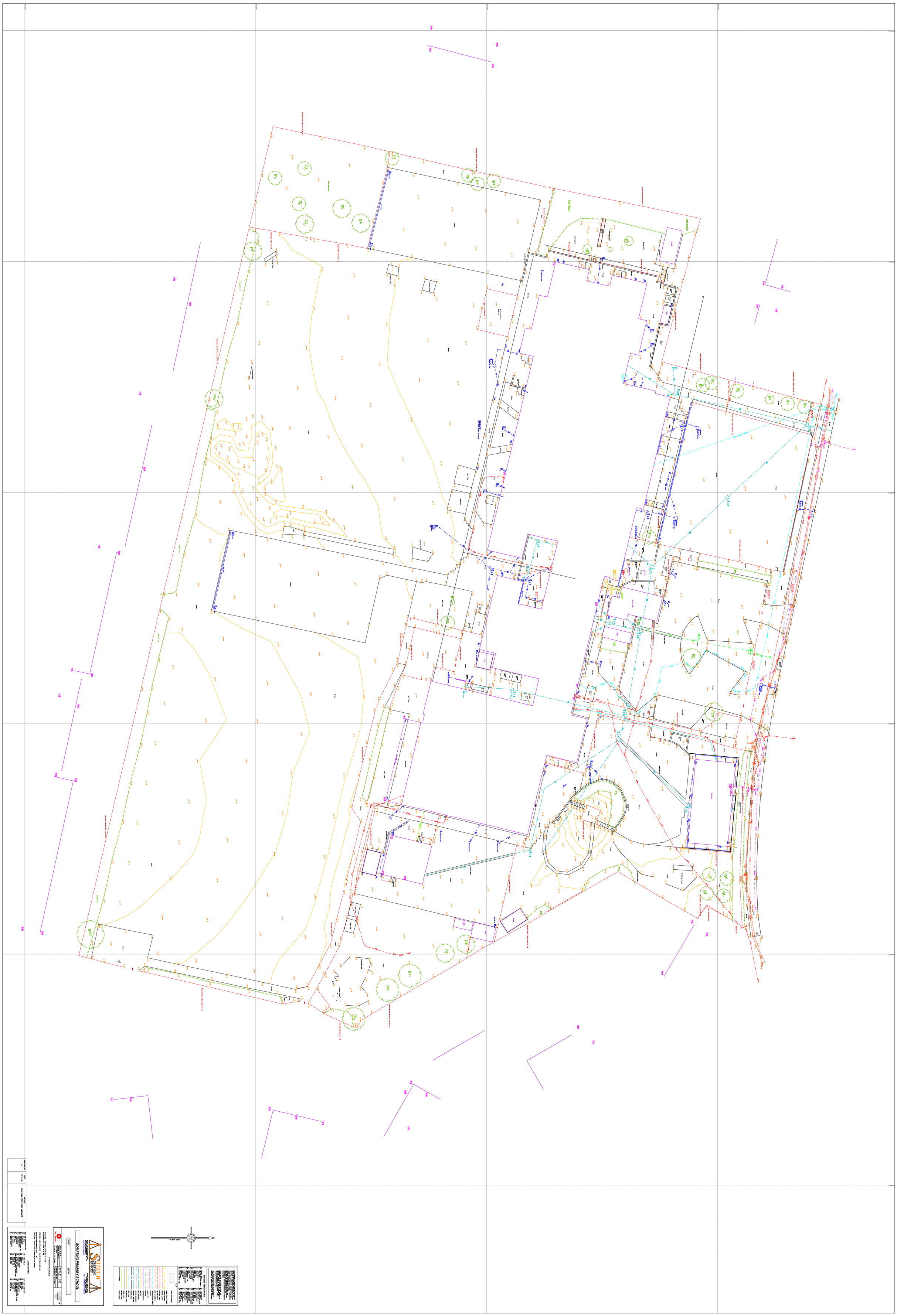
Appendix E

Topographic Survey



AMENDMENT	DATE	WATER
A	25/10/18	BUILDING FOOTPRINT AMENDED

SITECH SURVEYING SURVEYORS
SOMPTING PRIMARY SCHOOL
CLIENT: HNW
SHEET SIZE: A1
SCALE: 1:100
DRAWING NUMBER: 1
REVISION: A