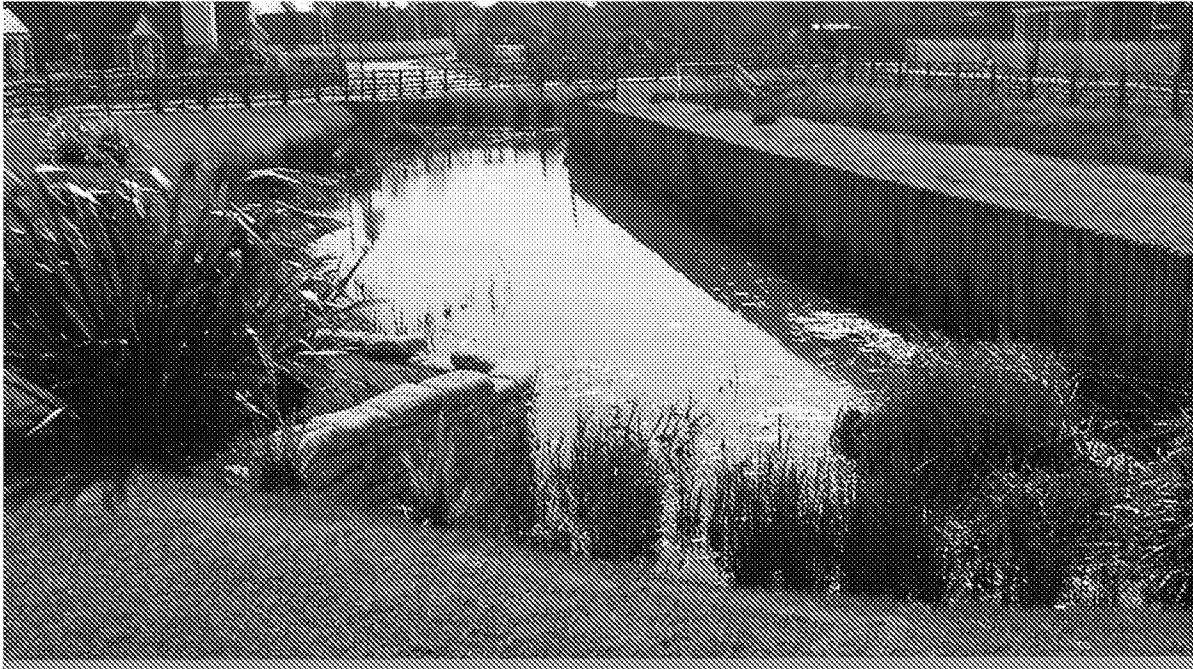




Flood Risk Assessment

Former Bartons Infant School, North Bersted

Bognor Regis PO22 9BD

Client

West Sussex Property Development LLP

Kent House
14 - 17 Market Place
London
W1W 8AJ
Ref: 11642

Date: March 2022

Consulting Engineers

GTA Civils Ltd

Gloucester House
66a Church Walk
Burgess Hill
West Sussex
RH15 9AS

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B	Environment Agency Flood Data
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D	Site Investigation Reports
E	Drainage Strategy Layout and MicroDrainage Calculations

Issue	Issue date	Compiled	Checked
Preliminary Issue	01 March 2022	JP	MR
First Issue	18 March 2022	JP	MR
Corrected First Issue	29 March 2022	JP	MR

1 Introduction

- 1.1 This FRA report has been prepared for West Sussex Property Development LLP in relation to the former Bartons Infant School, North Bersted, Bognor Regis PO22 9BD. No responsibility is accepted to any third party for all or part of this study in connection with this or any other development.
- 1.2 GTA Civils & Transport Limited was appointed by the client to provide a Flood Risk Assessment (FRA) as required by the Environment Agency and Arun District Council in order to achieve Planning Approval at said property.
- 1.3 This report will take the form of a formal Flood Risk Assessment in accordance with the 2021 National Planning Policy Framework (NPPF) and the current Planning Practice Guidance (PPG).

2 Existing Site

- 2.1 The site lies within the area administered by Arun District Council (ADC). The site, measuring approximately 0.6ha, comprises a former school campus with hardcourts and grass playing fields. The site has access from Romney Broadwalk to the west. A site location map and aerial view are shown in Appendix A.
- 2.2 Hydrology: The Aldingbourne Rife, originating to the north of the site, flows broadly south passing the site approximately 1.5km to the northeast, before flowing into the English Channel. Approximately 1.1km to the north of the site two parallel watercourses flow into an area of wetland. Another watercourse runs a few metres outside the site's east boundary before flowing away from the site in the direction of the Aldingbourne Rife.
- 2.3 Topography: a topographic survey was commissioned – see Appendix C. Broadly speaking, the site has a slope from south to north, with ambient levels ranging between 3.96m AOD and 2.81m AOD.
- 2.4 Geology: the BGS's online geology map shows the bedrock consists of 5 formations: Lewes Nodular Chalk, Seaford Chalk, Newhaven Chalk, Culver Chalk and Portsdown Chalk. A stratum of River Terrace Deposits (sand, silt and clay) overlies this solid bedrock.
- 2.5 Soil soakage testing was carried out in accordance with BRE Digest 365 at 4 locations within the site. The report is shown in Appendix D. The first location (SA1) yielded no result, while the rates varied between 1.86×10^{-6} m/s and 4.13×10^{-6} m/s at the other 3 test locations.
- 2.6 A groundwater monitoring exercise was carried out at 3 borehole locations within this site between 11/01/20 and the end of March 21. The report is shown in Appendix D. The shallowest recorded levels at each location ranged between 1.04m bgl and 1.15m bgl. It is clear that 1m of standoff will not be possible once the depth of any infiltration structure is included.
- 2.7 Existing Sewers: Southern Water's sewer records (see Appendix C) show a 150mm $\varnothing$ surface water sewer's head of run outside the site's entrance on Romney Broadwalk. This joins a 225mm $\varnothing$ pipe before bearing east along Van Gogh Place through a 300mm $\varnothing$ pipe. There are no existing foul water pipes immediately accessible to the site.
- 2.8 The site currently discharges surface water to a natural watercourse to the east of the site via a 150mm diameter drain located within 'proposed Plot 13'.

3 Current Flood Conditions

- 3.1 Fluvial flooding: the Environment Agency's (EA) Rivers and Seas flood map in Appendix B shows the site lies within fluvial Flood Zone 1 (FZ1). Sites in fluvial FZ1 have an annual expectation of less than 0.1% (or less than once in 1000 years on average) of flooding.
- 3.2 Surface water flooding: can occur when excess rainwater does not infiltrate into the ground, or is not intercepted by urban drainage systems, and instead flows across the surface. The EA's Online 'Surface Water Depth - Low Risk Scenario' (1 in 1000 years) Flood Map in Appendix B shows the north and northwest of the site are susceptible to flooding up to 300mm in depth. The narrow area along the NE boundary is an overland flown route, while the area affected in the NW corner originates within the site. The overland flow route does not impact the developed area. This source of flood risk is of no consequence, therefore.
- 3.3 Artificial sources: flooding from reservoirs, canals and docks. The EA reservoir flooding map in Appendix B shows the site is removed from this threat. There are no docks or canals in this vicinity.
- 3.4 Historical Flooding: the EA's historical flood map in Appendix B shows the site is removed from the nearest recorded event.
- 3.5 Groundwater flooding can occur when groundwater rises up from the underlying aquifer to flood subsurface infrastructure or to emerge at the ground surface. The EA's Groundwater Vulnerability Zone map shows the site to be overlying a 'Medium – High' Aquifer. The EA's Online Groundwater Source Protection Zones Map shows the site lies outside of all source protection zones (see Appendix B).
- 3.6 In conclusion, the flood risk profile of this site is 'Low,' effectively as the small areas affected by surface water flooding either will be allowed to flow as currently – along the NE boundary – or will be picked up by the SuDS drainage (to the NW corner).

4 Proposed Development, 'The Sequential Test' and SuDS

- 4.1 The development proposal is to build 21 residential units on the site.
- 4.2 Sequential / Exception Tests: The Sequential and Exception Tests are policy mechanisms created to discourage 'vulnerable use' developments in FZ3 – and Highly Vulnerable developments in FZ2. Unless wider planning benefits exist that offset the flood risk issues, this process 'steers' higher vulnerability uses to lower flood-risk zones (eg FZ2 and FZ1).
- 4.3 Vulnerability and the Sequential Test: the vulnerability classification of any new development should be considered. Dwellings are classed as More Vulnerable in Table 2 of the NPPF. More Vulnerable uses are 'appropriate development' in FZ1. As the site lies in FZ1 and is at low flood risk from all other sources, the proposal is 'appropriate development'. It does not have to pass the Sequential Test.
- 4.4 SuDS hierarchy: the groundwater monitoring exercise undertaken in 2020/21 revealed high groundwater levels – as set out in Section 2.6 above. Infiltration features are not viable as at least 1m of standoff will be expected between the formation level of any such features and the highest water table level. That said, there may be limited soakage potential for shallow permeable paved areas where the levels will be lifted by means of imported fill. These areas will have a shallower construction depth than the highway's makeup.
- 4.5 The proposed means of disposal of surface water is to the watercourse to the east, via a new 150mm diameter outfall exiting the site from the road between Plots 14 and 15.
- 4.6 The flow restriction to the watercourse will be restricted to 2.0l/s by means of a vortex (eg Hydro-Brake) flow control device. This flow restriction is generally accepted as the practical minimum limit of vortex devices for Major Developments (this keeps the flood risk from blockages to acceptable limits.)
- 4.7 The Micro Drainage calculation sheets in Appendix D show that 186.4m³ is needed at node 1.003. Storage will be provided in cellular crates of volume 177m³ located within the green space at the centre of the site. This, combined with the swales and volume remaining in the pipes and manholes, will enable runoff from up to the 1 in 100 years storm + 40% to be contained within the drainage network - without any flooding.

- 4.8 Re-use of the existing outfall is unfeasible as it is located within the rear garden of No.12 Gogh Place – adjacent to this development. The site's drainage network will also drain the public highway – so this will be offered for adoption. Southern Water will not agree to adopting drainage that passes through a private garden.
- 4.9 In addition to the attenuation system, SuDS measures comprise a) permeable paving with infiltration to ground on private driveways and b) sections of swale, providing water treatment to surface water runoff prior to discharge to the outfall.
- 4.10 Exceedance flows: any flow in exceedance of the design event or following a failure of the control device will flow safely eastwards into the watercourse. Note that overtopping will occur at the lowest cover level, namely at
- 4.11 Maintenance of the SuDS network will remain the responsibility of the applicant. Maintenance responsibilities for the drainage system are likely to be contracted out to an estate management company. The schedules for reviewing all the components will be set up in line with established best practice and guidance documents including The SuDS Manual (CIRIA C753, 2015) - plus other resources available at the susdrain website (www.susdrain.org). The Annex to this report contains the first draft of such a Plan.
- 4.12 Proposed Foul Water Drainage: The houses' effluent shall be routed by gravity via 100mm and 150mm diameter pipes to the existing outfall manhole at the south boundary. The foul network shall remain private i.e. not offered for adoption. The connection into the existing outfall will be subject to approval from Southern Water by way of an application Section 106 of the Water Industry Act.
- 4.13 Conclusion: this proposed development will not increase the flood risk of this site – or that of neighbouring properties. It complies fully with the 2021 National Planning Policy Framework and current Planning Practice Guidance (PPG).

- End of Report -

Appendix A

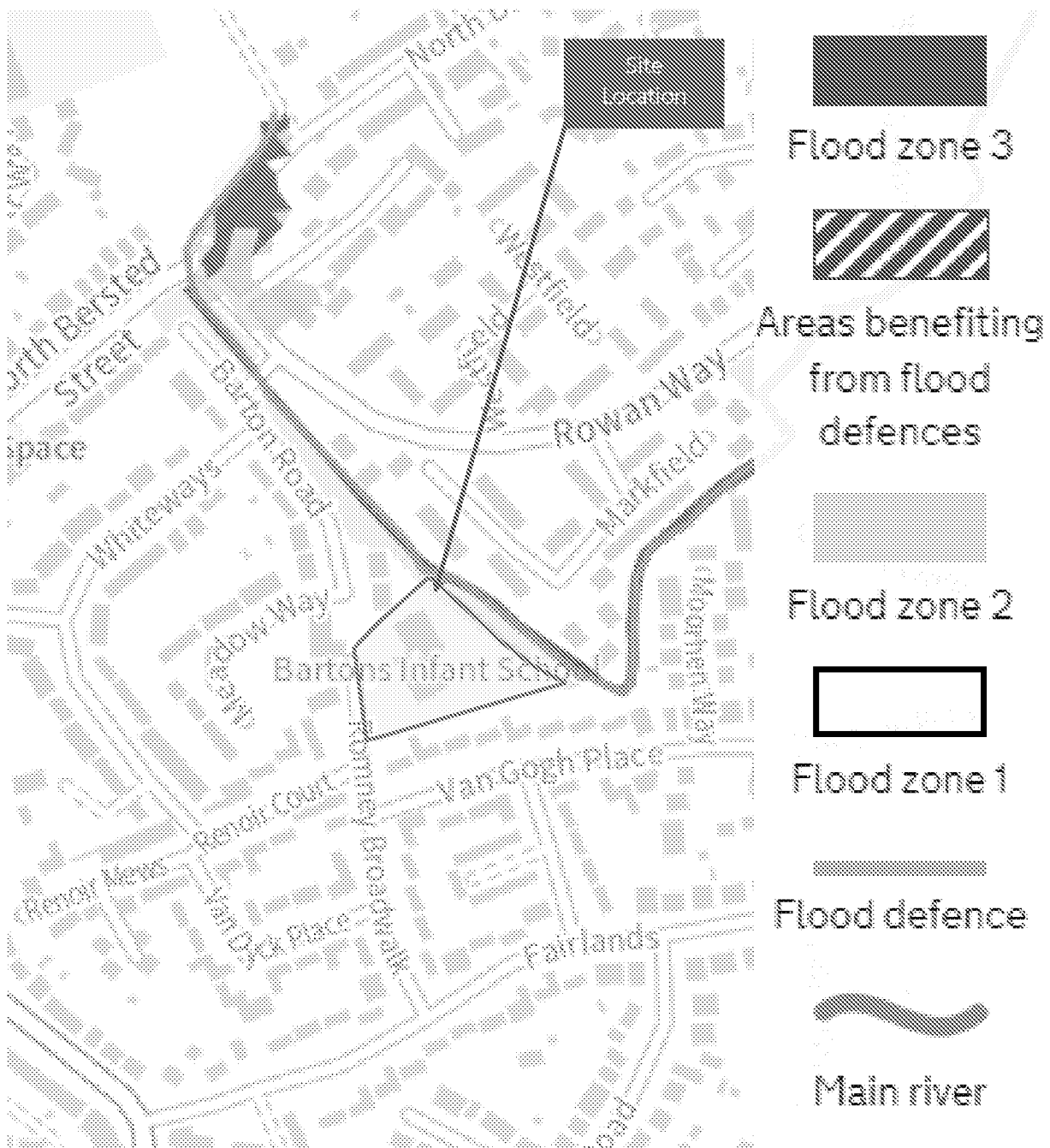
Site Location Map & Aerial Photo





Appendix B

Environment Agency Flood Data

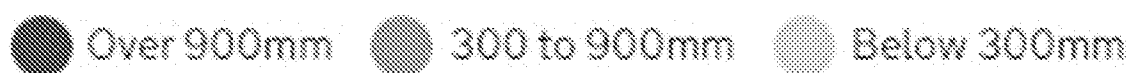


EA's Online Flood Map for Planning (Rivers and Seas)

The site is in fluvial Flood Zone 1 (FZ1)

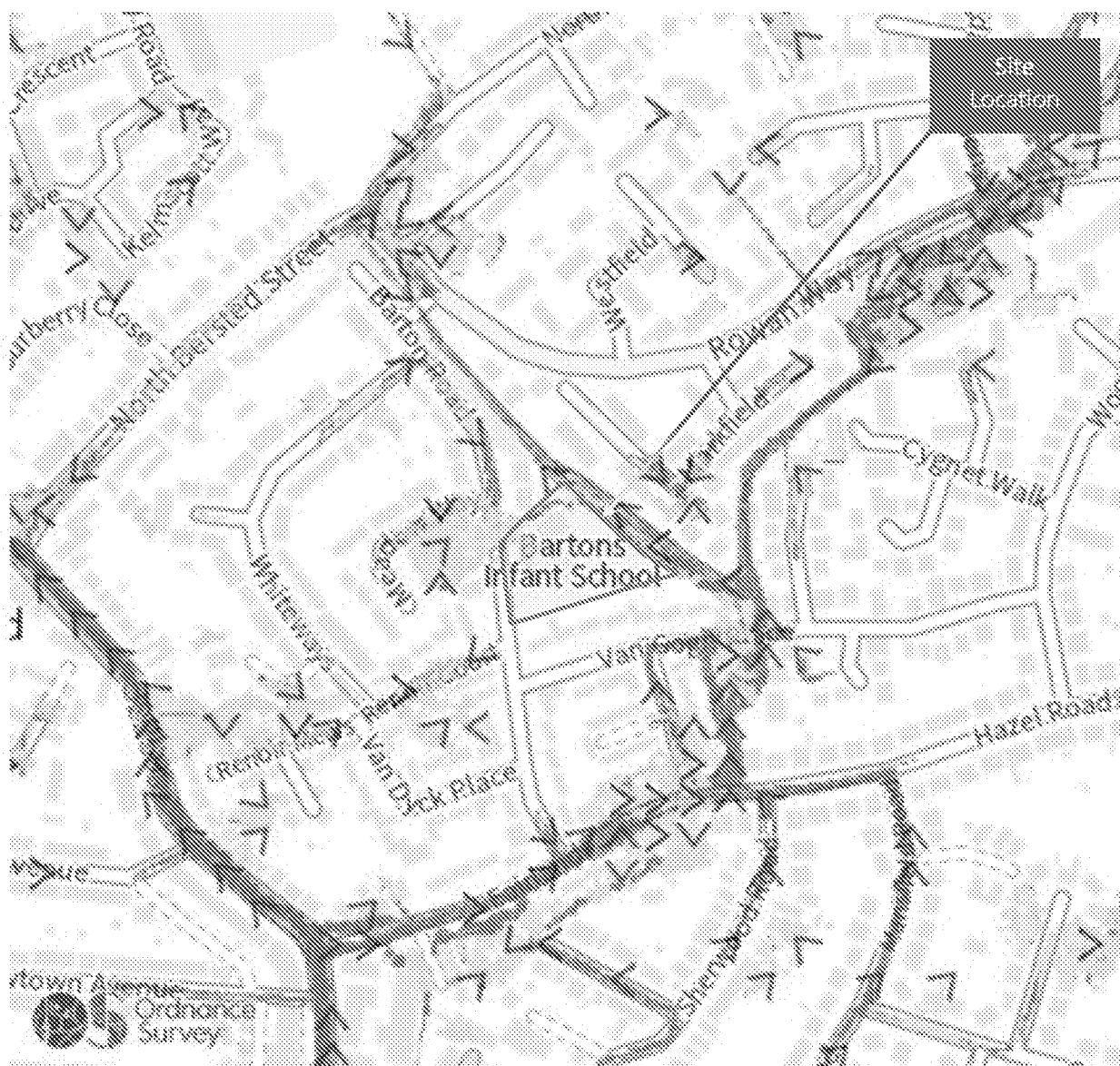


Surface water flood risk: water depth in a low risk scenario Flood depth (millimetres)



EA's Online Surface Water Flood Depth Map in the 'Low Risk Scenario' (1 in 1000 years storm event)

The north and northwest of the site are susceptible to flooding – with depths up to 300mm in the main



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

Flood velocity (metres/second)



EA's Online Surface Water Flood Velocity Map in the 'Low Risk Scenario'
(1 in 1000 years storm event)

Surface water in the northwest of the site flows less than 0.25m/s but over 0.25m/s in areas on the north boundary. Any surface water along the east boundary flows northwest parallel to the watercourse at a velocity of over 0.25m/s



Maximum extent of flooding from reservoirs:

- when river levels are normal
 when there is also flooding from rivers

EA's Online Risk of Flooding from Reservoirs' Map

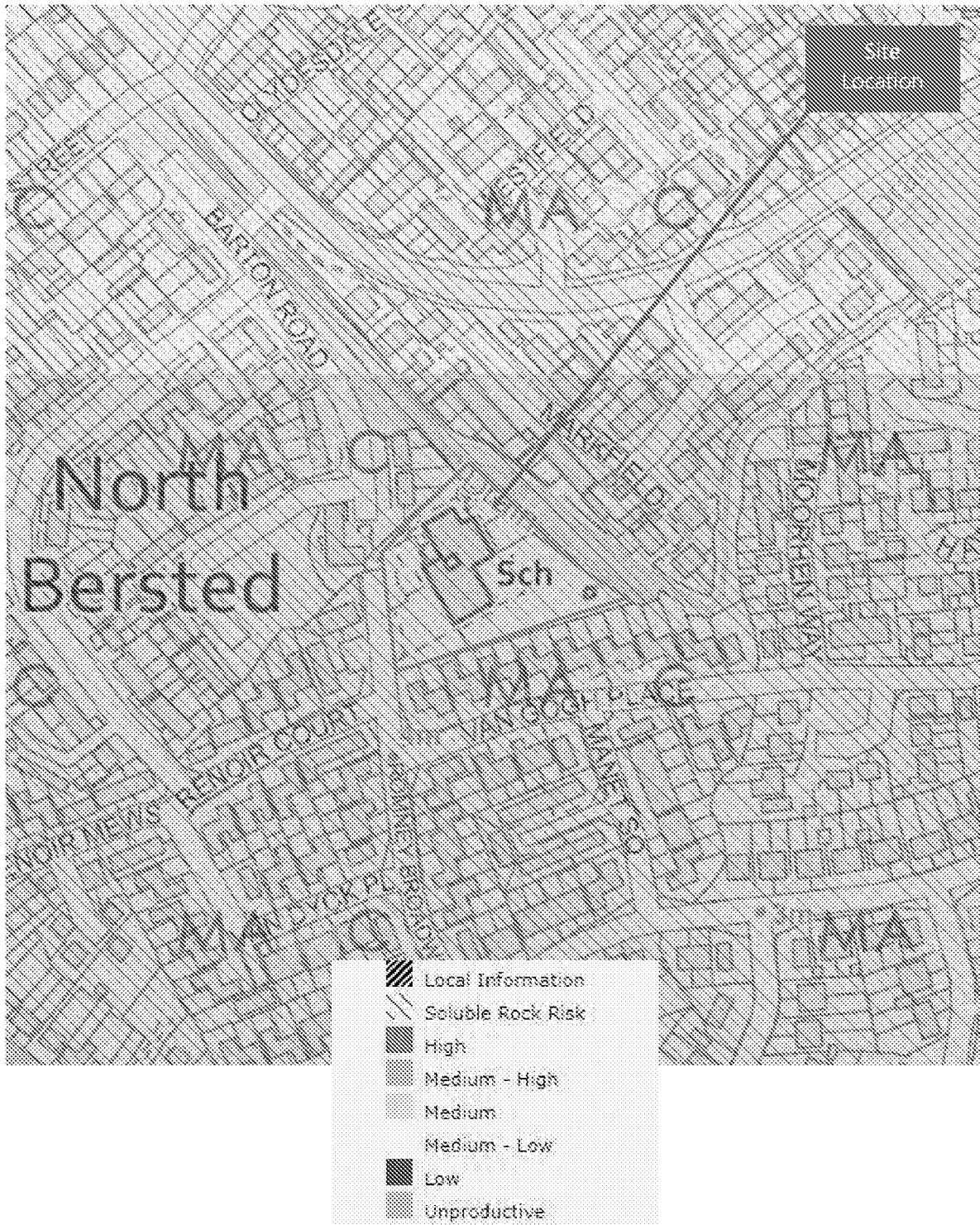
The site is not susceptible to flooding from this source



Historic Flood Map

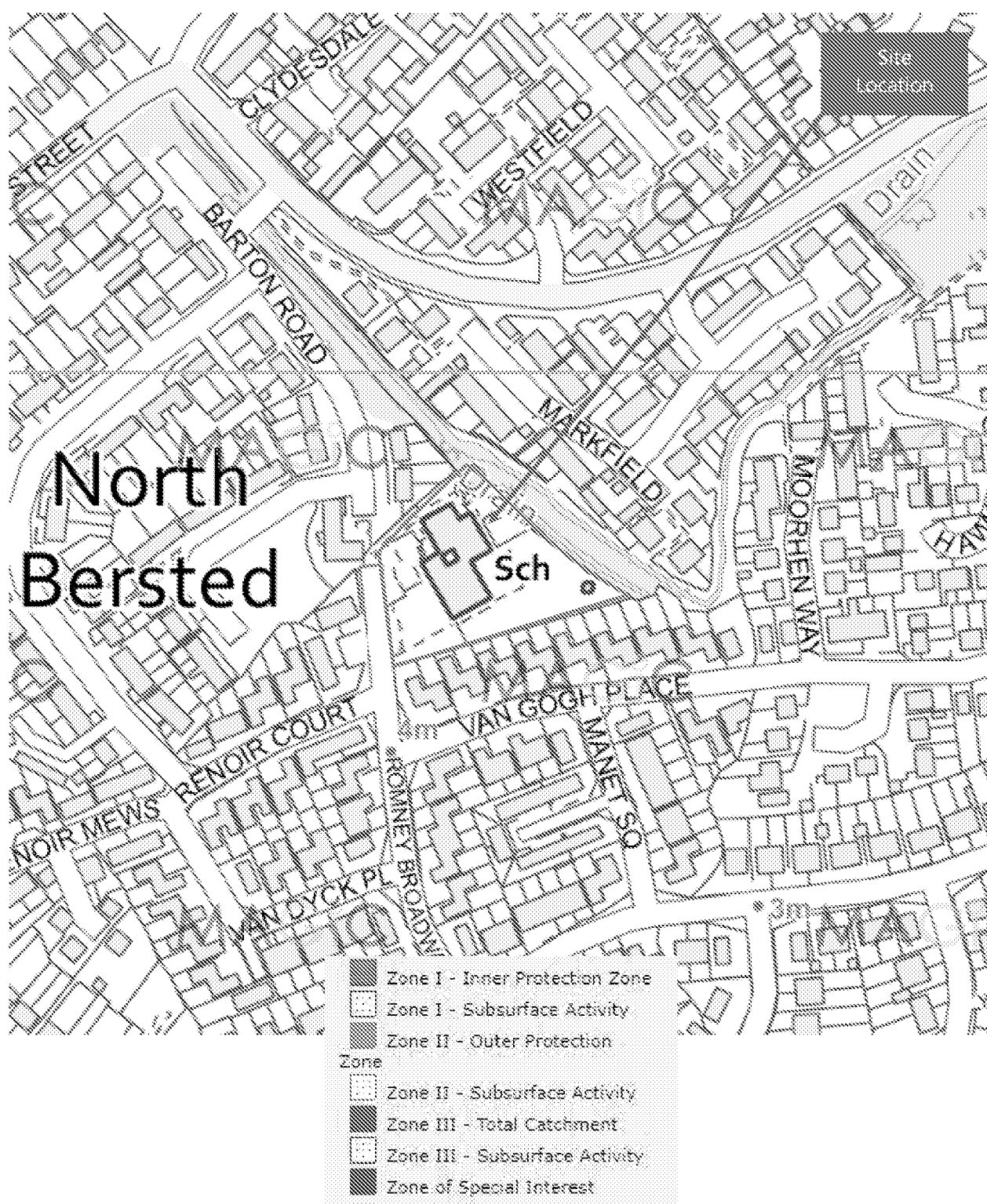
[Environment Agency's Online Historic Flood Map](#)

The site is removed from the nearest recorded Historical Flood



Environment Agency's Groundwater Vulnerability Zone Map

The site overlies a 'Medium – High' Aquifer



Environment Agency's Online Groundwater Source Protection Zones Map

The site lies outside of all source protection zones

Appendix C

Topographic Survey and Sewer Records

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4902	F	3.67	2.58	
4903	F	3.43	2.54	
4904	F	3.56	2.46	
5002	F	4.14	2.47	
5003	F	4.22	2.02	
5701	F	0.00	0.00	
5901	F	3.46	2.55	
5902	F	3.33	2.34	
5903	F	3.31	2.33	
5904	F	3.73	3.39	
5905	F	3.68	3.28	
5906	F	3.54	3.18	
5907	F	3.59	3.26	
5908	F	3.62	3.38	
5909	F	3.64	3.12	
5910	F	3.69	2.96	
6001	F	3.51	1.74	
6002	F	3.34	0.00	
6005	F	0.00	0.00	
6801	F	0.00	0.00	
6802	F	0.00	0.00	
6901	F	3.24	2.28	
6902	F	3.16	2.21	
6903	F	3.30	2.08	
6904	F	3.22	1.88	
6905	F	3.11	1.72	
6906	F	3.23	1.65	
6907	F	3.16	1.55	
6908	F	2.47	1.30	
6909	F	3.27	2.01	
6910	F	2.78	2.18	
6911	F	3.13	2.38	
6912	F	0.00	0.00	
6913	F	0.00	0.00	
7902	F	2.71	1.30	
7903	F	2.69	0.00	
4851	S	3.97	2.24	
4852	S	3.66	2.46	
5051	S	3.54	1.17	
5053	S	0.00	0.00	
5054	S	0.00	0.00	
5752	S	3.59	2.33	
5851	S	3.54	1.97	
5852	S	3.94	2.15	
5853	S	3.64	2.79	
5951	S	3.30	0.95	
5952	S	3.56	2.22	
6051	S	3.04	2.07	

Appendix D

Site Investigation Reports

11th March 2021

MSP/RML 7634

The Civil Engineering Practice
11 Tungsten Building
George Street
Fishersgate
Sussex
BN41 1RA

For the attention of Martin Kempshall

Dear Martin,

**BRE 365 SOIL INFILTRATION TESTING
AT
FORMER BARTONS INFANT SCHOOL, NORTH BERSTED, BOGNOR REGIS, PO22 9BH**

Further to your e-mailed instructions to proceed, dated 18th December 2020, we confirm that we attended the above noted site on Wednesday 10th March 2021 in order to undertake 4 No. BRE 365 Soil Infiltration Tests.

We now have pleasure in enclosing the following factual information.

1. *Figures 1 - 4 - Trial Pit Records (SA1 – SA4)*
2. *Soil Percolation Test Result Sheets (SA1 – SA4)*
3. *Drawing No. RML 7634/1 - Sketch Fieldwork Location Plan*

Soil Percolation Tests (SA1 – SA4) were undertaken at the locations as indicated on the appended Drawing No. RML 7634/1, generally in accordance with the methods described in BRE Digest 365 “Soakaway Design” and B.S. 5930:2015.

Soil Percolation Tests

Trial Pit SA1 was mechanically excavated to a depth of 1.50m below existing ground level and was approximately 1.45m long and 0.40m wide. The trial pit was then filled by a lorry mounted water bowser and the depth to water measured regularly. Only one filling was undertaken owing to the poor soakage rate.

Trial Pit SA2 was mechanically excavated to a depth of 0.70m below existing ground level and was approximately 1.00m long and 0.40m wide. The trial pit was then filled by a lorry mounted water bowser and the depth to water measured regularly. Only one filling was undertaken owing to the poor soakage rate.

Trial Pit SA3 was mechanically excavated to a depth of 1.50m below existing ground level and was approximately 1.50m long and 0.40m wide. The trial pit was then filled by a lorry mounted water bowser and the depth to water measured regularly. Only one filling was undertaken owing to the poor soakage rate.

Trial Pit SA4 was mechanically excavated to a depth of 0.70m below existing ground level and was approximately 1.10m long and 0.30m wide. The trial pit was then filled by a lorry mounted water bowser and the depth to water measured regularly. Only two fillings were undertaken owing to the poor soakage rate.

Owing to the poor soakage rate encountered no Soil Infiltration Test Rate (f) could be determined for Trial Pit SA1. Extrapolated results for Trial Pits SA2, SA3 & SA4 were used to calculate the following Soil Infiltration Test Rates (f);

SA1 $f = \text{N/A}$

SA2 $f = 1.86 \times 10^{-6} \text{ m/s}$

SA3 $f = 4.13 \times 10^{-6} \text{ m/s}$

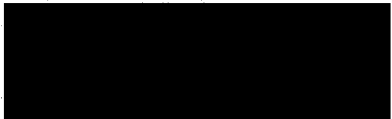
SA4 $f = 3.39 \times 10^{-6} \text{ m/s}$

However, as highlighted above, it should be noted that the results for Trial Pit SA2, SA3 & SA4 are based on extrapolating the percolation graphs and that, in practice, the soakage may not get down to the t_{75} value.

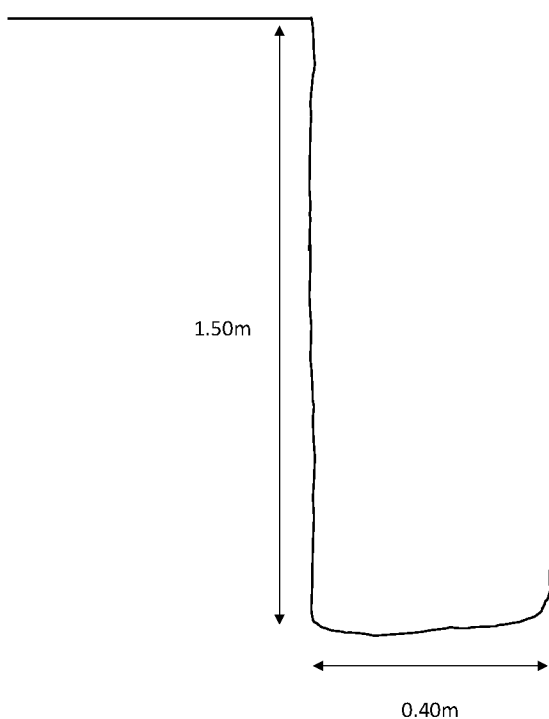
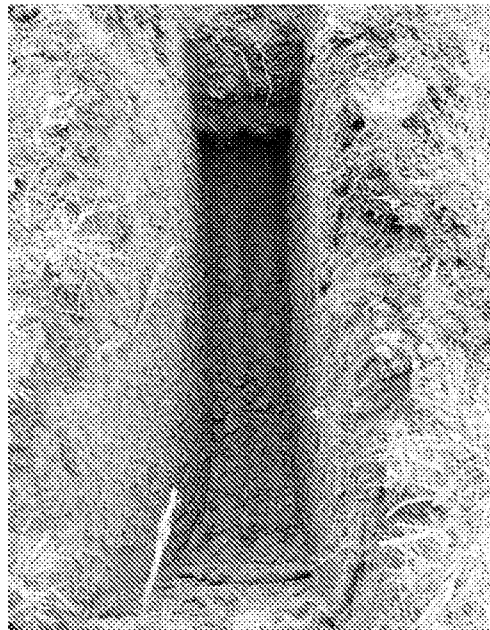
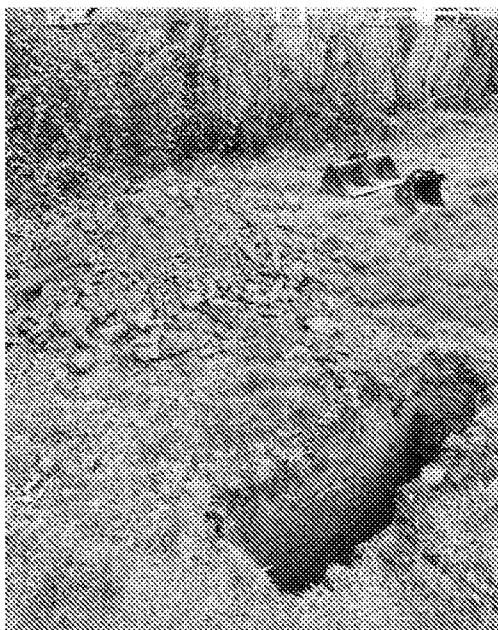
Trial Pit SA4 did record a full test on the first filling, however, owing to the considerable difference in soakage rate observed in the second filling an extrapolated value from the second filling was used to calculate the above Soil Infiltration Rate (f).

We trust that you will find the enclosed self-explanatory, however, should you have any queries please do not hesitate to contact the writer at the above noted address.

yours faithfully,
for RISK MANAGEMENT LIMITED



Richard Price B.Sc. (Hons), F.G.S., MEnv.Sc.
Project Engineer



G.L.
Grass over Topsoil. 0.08m
MADE GROUND
(brown silty sandy clay with occasional brick
fragments, gravel and roots). 0.30m

Brown and orange-brown silty sandy CLAY with
very occasional fine to medium sub-angular to
sub-rounded gravel and roots.

Risk Management

Title : **TRIAL PIT SA1**

Project Location : Former Bartons Infant School, North
Bersted, Bognor Regis, PO22 9BH

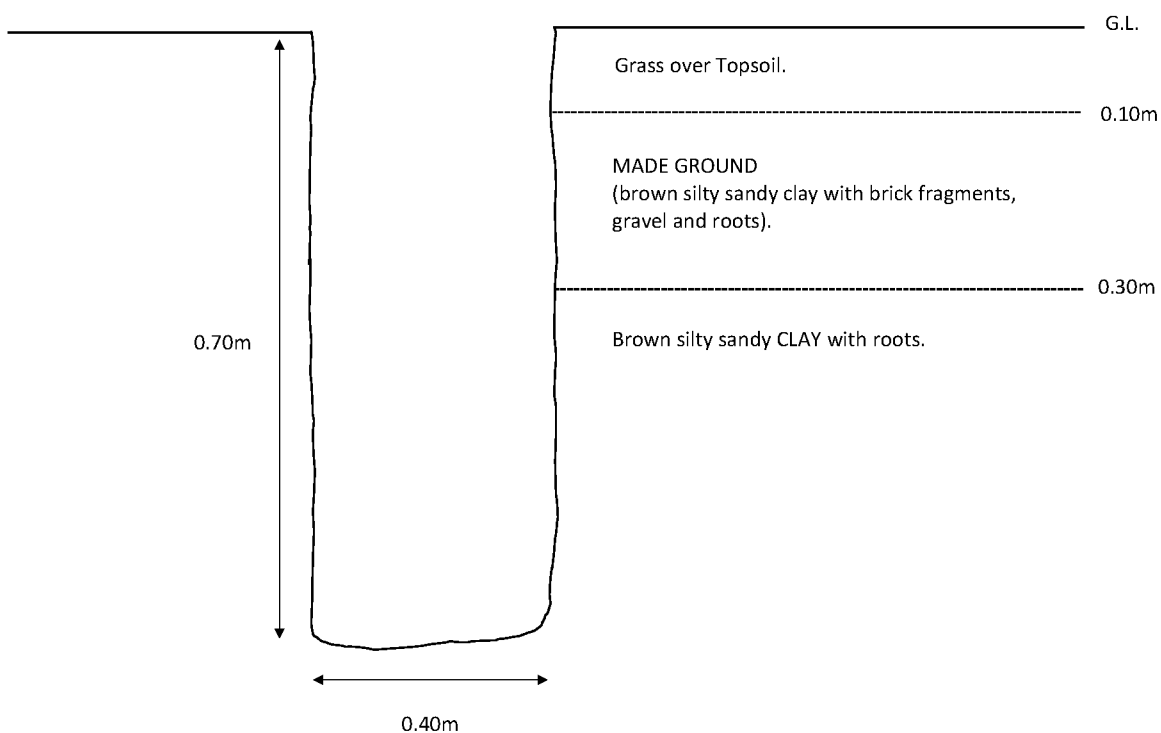
**RECORD OF MECHANICALLY
EXCAVATED TRIAL PIT**

Job No : RML 7634

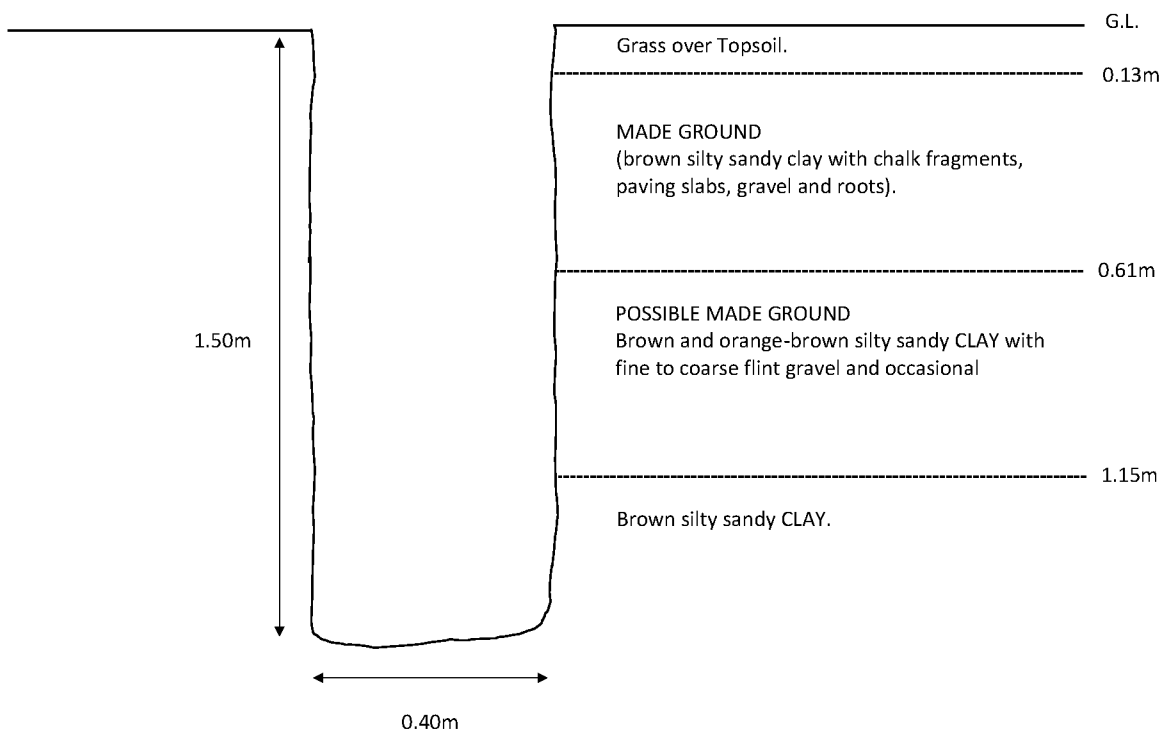
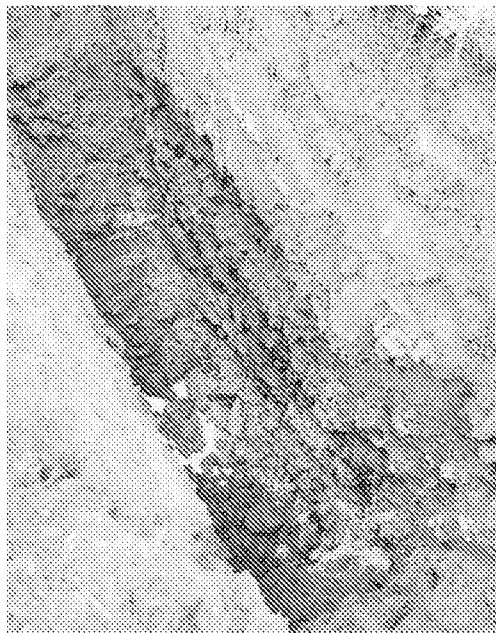
Scale : Not To Scale

Figure No. **1**

Date : 10th March 2021



	Title : TRIAL PIT SA2	
	Project Location : Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH	
RECORD OF MECHANICALLY EXCAVATED TRIAL PIT	Job No : RML 7634	Scale : Not To Scale
	Figure No. 2	Date : 10th March 2021



Risk Management

Title : **TRIAL PIT SA3**

Project Location : Former Bartons Infant School, North
Bersted, Bognor Regis, PO22 9BH

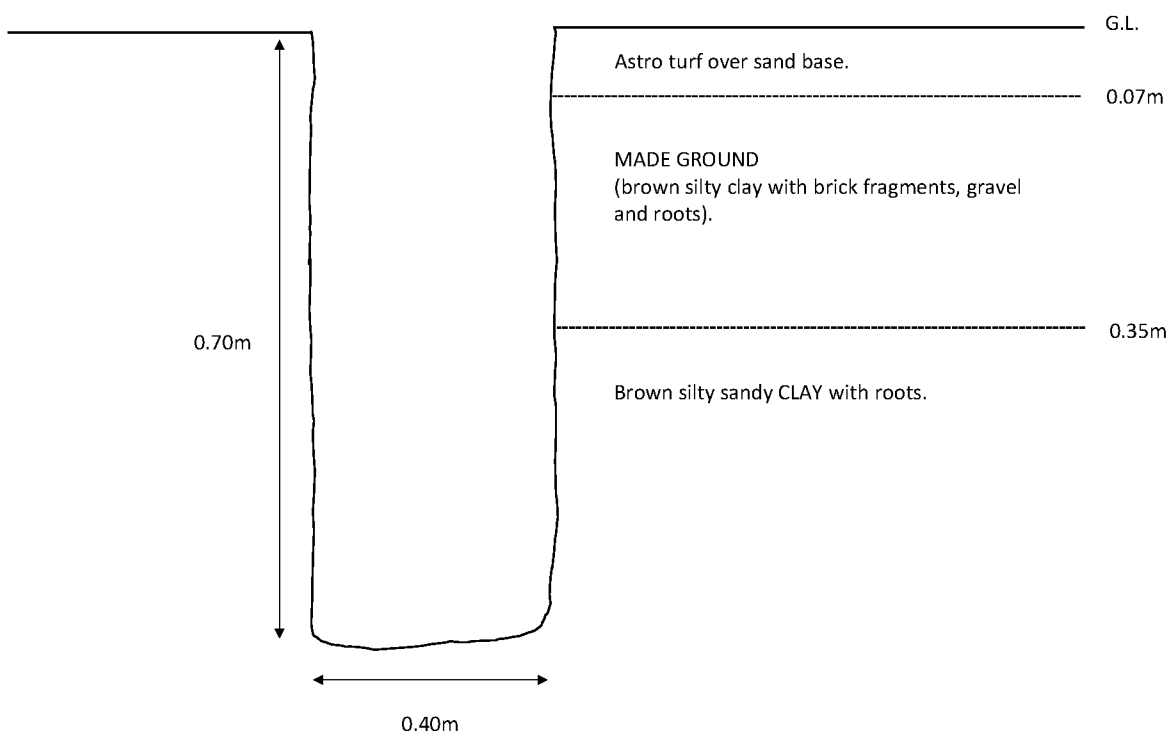
RECORD OF MECHANICALLY EXCAVATED TRIAL PIT

Job No : RML 7634

Scale : Not To Scale

Figure No. **3**

Date : 10th March 2021



	Title : TRIAL PIT SA4	
	Project Location : Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH	
	Job No : RML 7634	Scale : Not To Scale
	Figure No. 4	Date : 10th March 2021

RECORD OF MECHANICALLY EXCAVATED TRIAL PIT

Project Name : Former Bartons Infant School, North Bersted,
Bognor Regis, PO22 9BH

One Filling

Job No. RML 7634

Date : March 2021

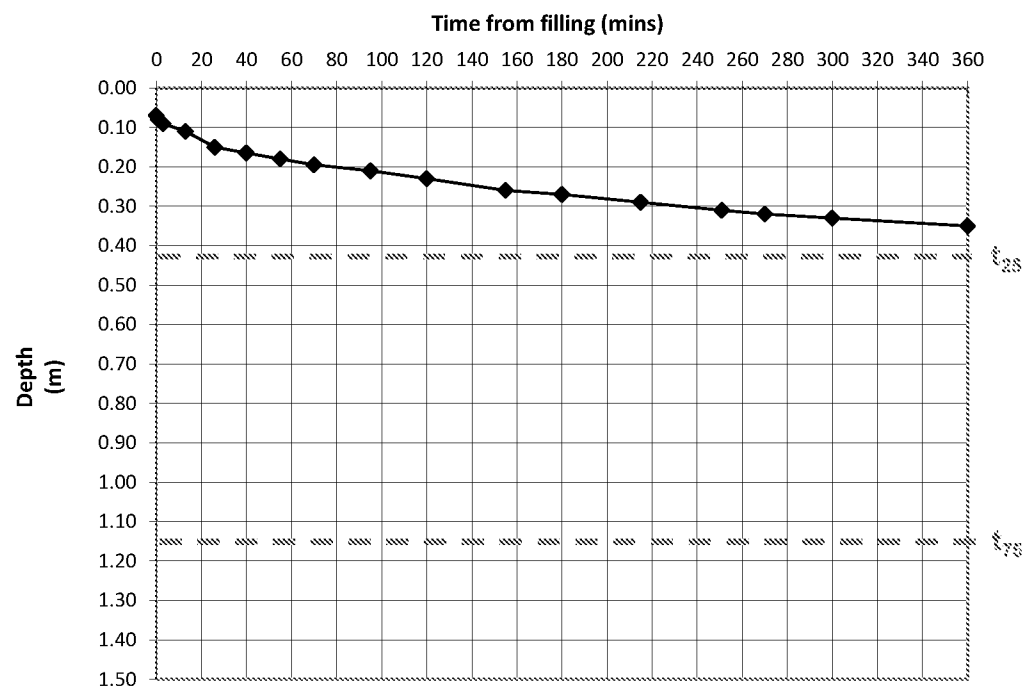
Test Depth (m)

1.50

Depth (m) Time (mins)

0.070	0
0.080	1
0.090	3
0.110	13
0.150	26
0.165	40
0.180	55
0.195	70
0.210	95
0.230	120
0.260	155
0.270	180
0.290	215
0.310	251
0.320	270
0.330	300
0.350	360

TIME TAKEN TO FALL BETWEEN 25% and 75% - N/A



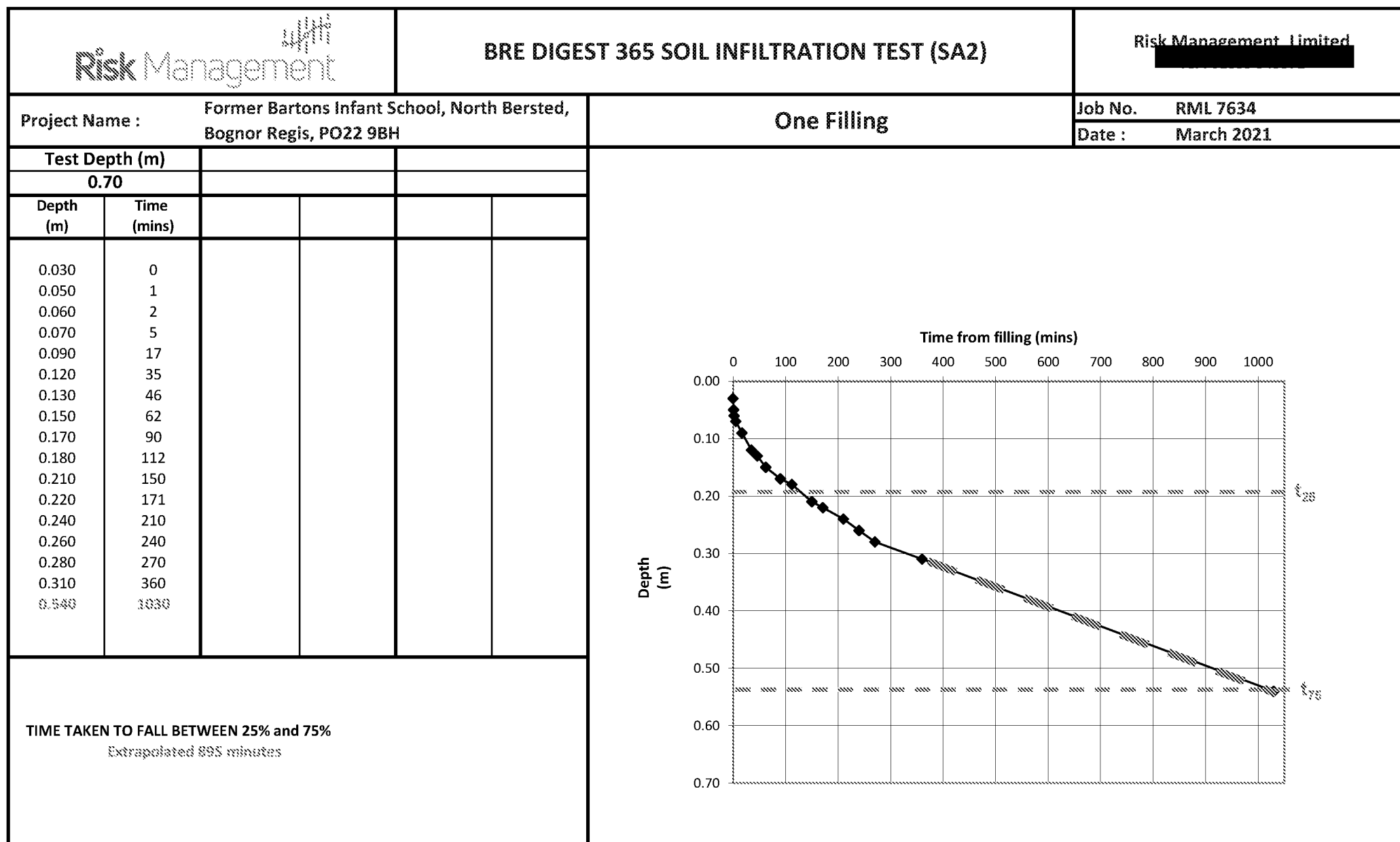
SOIL PERCOLATION TEST SA1

Project Name : Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH

Project No: RML 7634

Date : March 2021

Trial Pit No.	SA1
Depth of pit (m)	1.50
Width of pit (m)	0.40
Length of pit (m)	1.45
Depth of water in pit (m)	1.43
Volume of 75% to 25% (V_{p75})	0.41
Mean surface area through which flow occurs (a_{p50})	3.23
Time for outflow (minutes) 75% to 25% (t_{p75-25})	N/A
Time for outflow (seconds) 75% to 25% (t_{p75-25})	N/A
Soil Infiltration Rate (f) m/s =	N/A



SOIL PERCOLATION TEST SA2

Project Name : Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH

Project No: RML 7634

Date : March 2021

Trial Pit No.	SA2
Depth of pit (m)	0.70
Width of pit (m)	0.40
Length of pit (m)	1.00
Depth of water in pit (m)	0.67
Volume of 75% to 25% (V_{p75})	0.13
Mean surface area through which flow occurs (a_{p50})	1.34
Time for outflow (minutes) 75% to 25% (t_{p75-25})	895
Time for outflow (seconds) 75% to 25% (t_{p75-25})	53700
Soil Infiltration Rate (f) m/s =	1.86E-06

Project Name : Former Bartons Infant School, North Bersted,
Bognor Regis, PO22 9BH

One Filling

Job No. RML 7634

Date : March 2021

Test Depth (m)

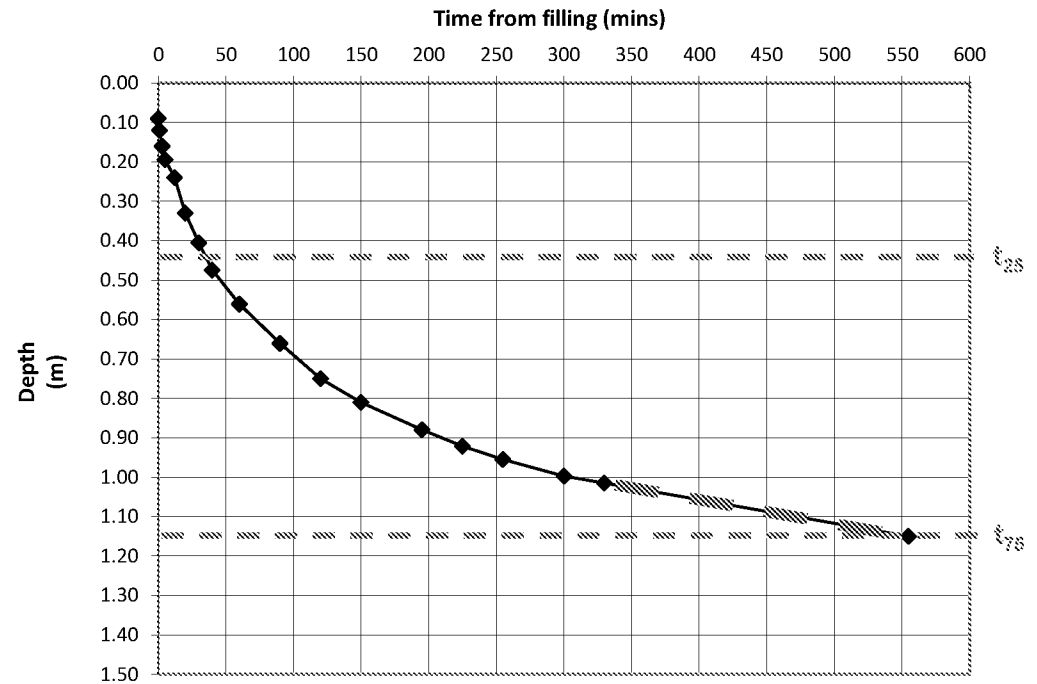
1.50

Depth (m)

Time (mins)

0.090 0
0.120 1
0.160 3
0.195 5
0.240 12
0.330 20
0.405 30
0.475 40
0.561 60
0.660 90
0.750 120
0.810 150
0.880 195
0.921 225
0.955 255
0.997 300
1.015 330
1.150 555

TIME TAKEN TO FALL BETWEEN 25% and 75%
Extrapolated 520 minutes



SOIL PERCOLATION TEST SA3

Project Name : Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH

Project No: RML 7634

Date : March 2021

Trial Pit No.	SA3
Depth of pit (m)	1.50
Width of pit (m)	0.40
Length of pit (m)	1.50
Depth of water in pit (m)	1.41
Volume of 75% to 25% (V_{p75})	0.42
Mean surface area through which flow occurs (a_{p50})	3.28
Time for outflow (minutes) 75% to 25% (t_{p75-25})	520
Time for outflow (seconds) 75% to 25% (t_{p75-25})	31200
Soil Infiltration Rate (f) m/s =	4.13E-06

Project Name : Former Bartons Infant School, North Bersted,
Bognor Regis, PO22 9BH

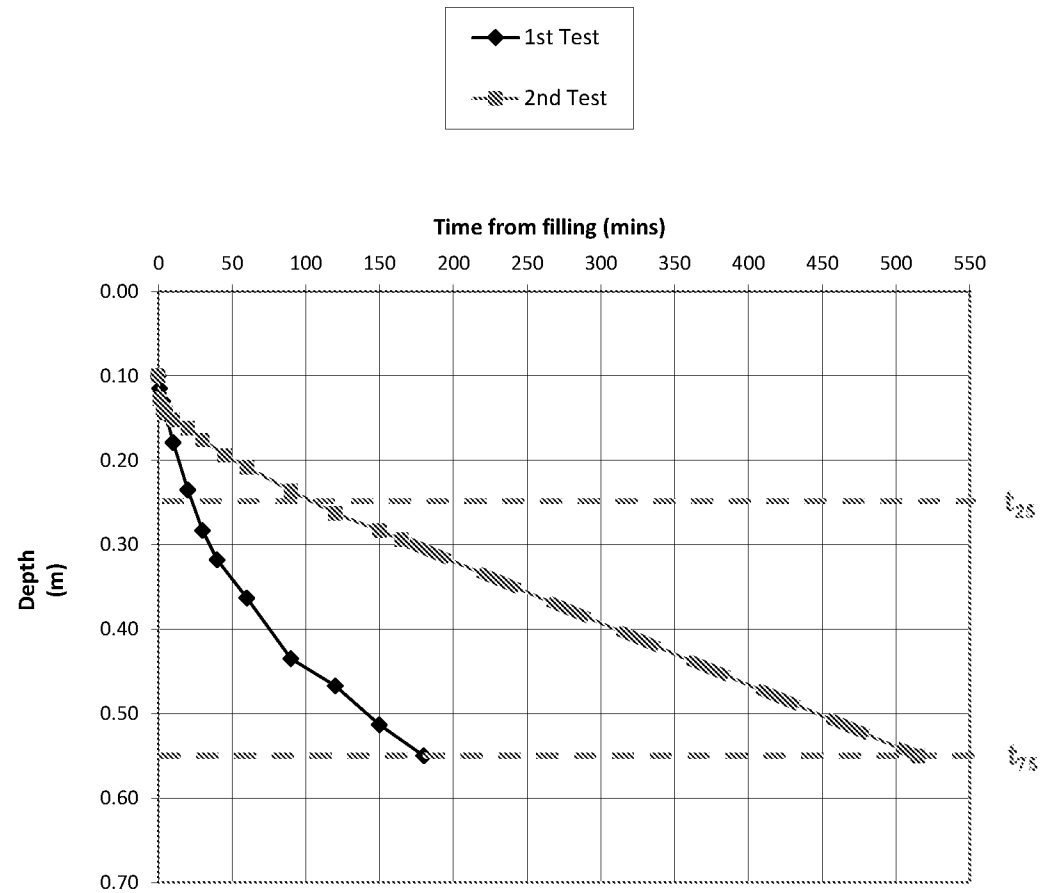
Two Fillings

Job No. RML 7634

Date : March 2021

Test Depth (m)		Test Depth (m)			
0.70		0.70			
Depth (m)	Time (mins)	Depth (m)	Time (mins)		
0.100	0	0.100	0		
0.115	1	0.127	1		
0.130	3	0.138	3		
0.145	5	0.144	5		
0.179	10	0.152	10		
0.235	20	0.162	20		
0.283	30	0.176	30		
0.318	40	0.194	45		
0.363	60	0.208	60		
0.435	90	0.236	90		
0.467	120	0.263	120		
0.513	150	0.283	150		
0.550	180	0.294	165		
		0.550	515		

TIME TAKEN TO FALL BETWEEN 25% and 75% extrapolated 410 mins
TAKEN FROM 2nd TEST



SOIL PERCOLATION TEST SA4

Project Name : Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH

Project No: RML 7634

Date : March 2021

Trial Pit No.	SA4
Depth of pit (m)	0.70
Width of pit (m)	0.30
Length of pit (m)	1.10
Depth of water in pit (m)	0.57
Volume of 75% to 25% (V_{p75})	0.09
Mean surface area through which flow occurs (a_{p50})	1.13
Time for outflow (minutes) 75% to 25% (t_{p75-25})	410
Time for outflow (seconds) 75% to 25% (t_{p75-25})	24600
Soil Infiltration Rate (f) m/s =	3.39E-06

KEY

Trial Pit Location




Risk Management

Title :

**SKETCH FIELDWORK
LOCATION PLAN**

RISK MANAGEMENT LIMITED
Unit 10 Coopers Place, Combe Lane,
Godalming, Surrey GU8 5SZ
Tel : 01883 343572

Project Location :

Former Barton's Infant School, North Bersted, Bognor
Regis, PO22 9BH

Report

Date : March 2021

Scale : NTS

Drawn By : MSP

Drg. No. RML 7634 /1

31st March 2021

MSP/RML 7593

The Civil Engineering Practice
11 Tungsten Building
George Street
Fishersgate
Sussex
BN41 1RA

For the attention of Martin Kempshall

Dear Martin,

**BOREHOLE INVESTIGATION AND GROUNDWATER MONITORING
AT
FORMER BARTONS INFANT SCHOOL, NORTH BERSTED, BOGNOR REGIS, PO22 9BH**

Further to your e-mailed instructions to proceed, dated 18th December 2020, we confirm that we attended the above noted site on Monday 11th January 2021 in order to undertake 3 No. boreholes and install groundwater monitoring standpipes.

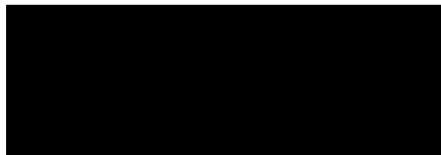
We have pleasure in enclosing the following :-

1. Light Percussion Borehole Records (BH1-BH3)
2. Groundwater Monitoring Results Sheet
3. Drawing No. RML 7593/1 – Sketch Fieldwork Location Plan

The results sheet covers monitoring visits up to the end of March 2021.

We trust that you will find the enclosed self-explanatory, however, should you have any queries please do not hesitate to contact the writer at the above noted address.

yours faithfully,
for RISK MANAGEMENT LIMITED



Malcolm S. Price B.Sc., M.Sc., M.I.C.E., C.Eng., M.I.Env.Sc.
Director

 Risk Management Risk Management Limited Unit 10 Coopers Place Combe Lane Godalming Surrey GU8 5SZ		Borehole Log				Borehole No. BH1 Sheet 1 of 1				
Project No. RML 7593		Coordinates:			Drilling Technique: Light Percussion Rig		Level (m):			
Site Address: Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH			Date: 11/01/2021		Diameter (mm): 85		Scale: 1:50			
1 2 3 4 5 6 7 8 9 10	Stratum Description	Legend	Depth (m)	Level (m)	Samples and In Situ Testing				Water Strikes	Well
	Astro turf over sand base.		0.06		0.15	D1				
	MADE GROUND (brown silty clay with brick fragments, gravel and roots).		0.40		0.50	D2				
	Soft to firm brown silty sandy CLAY.				1.00	D3				
					1.50	D4				
					2.00	D5				
					2.50	D6				
					3.00	D7				
					3.50	D8				
	Brown clayey silty SAND.		3.60		4.00	D9				
					4.50	D10				
					5.00	D11				
	Borehole terminated at 5.00m depth									
Remarks: Service pit excavated to 1.20m depth. Groundwater encountered at 2.20m depth. Standpipe installed to 5.00m depth.					KEY D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample W = Water Sample CPT = Cone Penetration Test SPT = Standard Penetration Test V = Vane Test PP = Pocket Penetrometer MEXE = Insitu CBR test					

 Risk Management Risk Management Limited Unit 10 Coopers Place Combe Lane Godalming Surrey GU8 5SZ		Borehole Log				Borehole No. BH3 Sheet 1 of 1					
Project No. RML 7593		Coordinates:			Drilling Technique: Light Percussion Rig		Level (m):				
Site Address: Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH				Date: 11/01/2021		Diameter (mm): 85		Scale: 1:50			
1 2 3 4 5 6 7 8 9 10	Stratum Description		Legend	Depth (m)	Level (m)	Samples and In Situ Testing				Water Strikes	Well
	Grass over Topsoil			0.08		0.15	D1				
	MADE GROUND (brown silty sandy clay with gravel, brick fragments, pieces of concrete and plastic).			0.45		0.50	D2				
	Soft brown silty sandy CLAY					1.00	D3				
						1.50	D4				
						2.00	D5				
						2.50	D6				
						3.00	D7				
						3.50	D8				
						4.00	D9				
	Off-white, slightly clayey, structureless CHALK.			4.20		4.50	D10				
	Borehole terminated at 5.00m depth			5.00		5.00	D11				
Remarks: Service pit excavated to 1.20m depth. Groundwater encountered at 1.70m depth. Standpipe installed to 5.00m depth.					KEY D = Disturbed Sample U = Undisturbed Sample B = Bulk Sample W = Water Sample CPT = Cone Penetration Test SPT = Standard Penetration Test V = Vane Test PP = Pocket Penetrometer MEXE = Insitu CBR test						

GROUNDWATER MONITORING RESULTS

Project Name: Former Bartons Infant School, North Bersted, Bognor Regis, PO22 9BH

Project No. : RML 7593

Date : March 2021

BH	Date							Groundwater
No.								Level
								(m)
BH1	18th January 2021							1.60
BH1	2nd February 2021							1.04
BH1	15th February 2021							1.04
BH1	2nd March 2021							1.08
BH1	12th March 2021							1.20
BH1	30th March 2021							1.56
BH2	18th January 2021							1.28
BH2	2nd February 2021							1.07
BH2	15th February 2021							1.23
BH2	2nd March 2021							1.37
BH2	12th March 2021							1.38
BH2	30th March 2021							1.45
BH3	18th January 2021							1.15
BH3	2nd February 2021							1.34
BH3	15th February 2021							1.47
BH3	2nd March 2021							1.73
BH3	12th March 2021							1.68
BH3	30th March 2021							1.78

KEY

Borehole Location


Risk Management

Title :

**SKETCH FIELDWORK
LOCATION PLAN****RISK MANAGEMENT LIMITED**
Unit 10 Coopers Place, Combe Lane,
Godalming, Surrey GU8 5SZ
Tel : 01883 343572Project Location : Former Bartons Infant School, North Bersted, Bognor
Regis, PO22 9BHReport
Date : March 2021

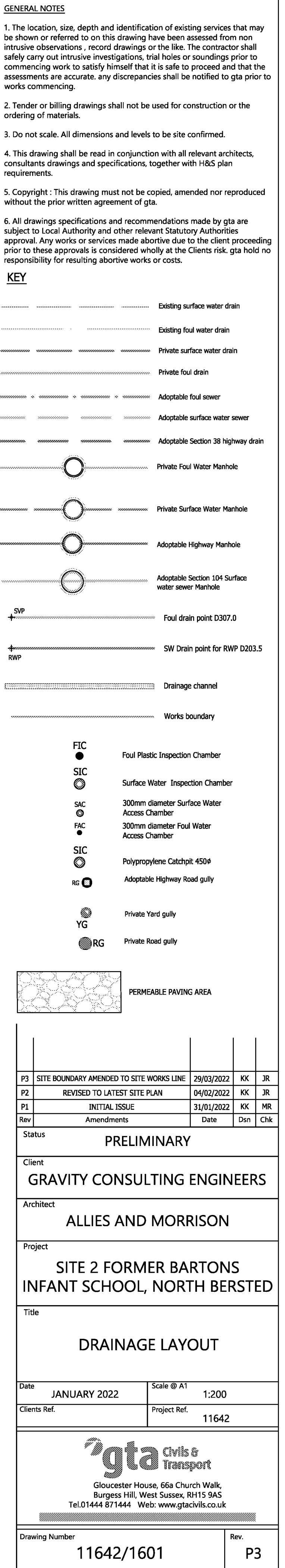
Scale : NTS

Drawn By : MSP

Drg. No. RML 7593 /1

Appendix E

Drainage Strategy Layout and MicroDrainage Calculations



Annex

SuDS Management & Maintenance Plan

1. Ownership & Maintenance Responsibilities

Responsibility for the maintenance of the drainage system will be apportioned as follows.

The drainage features will be cared for by the Estate Management Company which will be set up by the developer to administer the site-wide infrastructure. This includes:

- ✦ porous paving.
- ✦ control manholes / flow restrictors
- ✦ the associated manholes and piped systems.

The following sections set out schedules detailing the maintenance requirements for each of the main drainage items used within the scheme. The Estate Management Company will undertake the inspections and maintenance activities in accordance with these schedules.

Additional reference should be made to currently established best practice and guidance documents such as The SuDS Manual (CIRIA C753, 2015) and other resources available at the susdrain website (www.susdrain.org).

This SuDS Management and Maintenance Plan (SMMP) should be considered a live document. The frequency of maintenance intervals may need to be increased or decreased based on the observed performance of the drainage systems over time. Changes should be agreed with the drainage authority and recorded and dated in the SMMP.

Important safety information is set out in the next section.

2. Health and Safety

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

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

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

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

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

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

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

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

3. Schedule A – Sewers, Manholes, Gullies, Channel Drains

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

Post Completion: a CCTV survey to be carried out on all new and retained existing drainage systems and any downstream receiving systems, prior to connection with adopted sewers.

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

Ongoing maintenance responsibility for all sewers is by Southern Water. All other private gullies and drainage are private and to be maintained by the Estate Management Company in shared areas and the homeowner within conveyed land. Operation and maintenance requirements for all sewers, manholes, gullies and channel drains are described in the following table:

Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	6 Monthly intervals.
	Common yard & car park & other hard standing areas to be swept clear of debris, to prevent possibility of blockages to the receiving drainage systems.	Monthly.
	Lift and inspect receiving manholes to check for any blockages.	Monthly.
	Debris removal from gullies & channel drains (where may cause risks to performance).	6 monthly, after autumn leaf fall, or as required based on observations.
Remedial Actions	Repair any damaged gully or channel drain gratings.	As required.
	Replace / fix any loose channel drain covers	As required.
Monitoring	Carry out full CCTV survey to confirm ongoing integrity of all drains. Inspect all gullies and silt pits & drainage channels during the survey.	10-yearly intervals.

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

In all instances, inspection and cleaning should be carried out only by a specialist contractor and in accordance with the guidelines given in 'Safe Working in Sewers and at Sewage Works' published by National Joint Health and Safety Committee for the Water Services. Further information on safety is set out in Section 2.

4. Schedule B – Permeable Pavements

Inspection Frequency and Maintenance Requirements: as per the table below.

Schedule	Action	Frequency
Regular Maintenance	Standard road sweeper	Annually after autumn leaf fall
Occasional Maintenance	Weed removal	Annually
	Stabilise and mow contributing and adjacent areas	As required
Remedial Actions	Remediate adjacent landscaping to original levels	As required
	Paving repairs including replenishment of lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required if infiltration is reduced by clogging
Monitoring	Initial inspection	Monthly for first three months
	Inspection for evidence of poor operation and/or weed growth	Quarterly, 48 hrs after large storms in first six months
	Inspection for silt accumulation to establish sweeping frequencies	Annually
	Monitor inspection chambers	Annually

1.1 Safety information is set out in Section 2.

5. Schedule C – Attenuation Tanks and Control Chambers

Inspection Frequency and Maintenance Requirements: as per the table below.

Schedule	Action	Frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove sediment from pre-treatment structures and/or internal forebays	Annually, or as required
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required
Control Chambers and Hydrobrakes	Check hydrobrake orifices are clear and retention tank door is closed. Check function of retention tank door and oil if necessary. Similarly, check outfalls and inlets of attenuation tank to ensure pipes are clear and free flowing.	First 2 years of occupation – Monthly Then annually

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

Safety information is set out in Section 2.

6. Swales

Swales will require regular maintenance to ensure continuing operation to design performance standards,

Adequate access should be provided to all swale areas for inspection and maintenance, including for appropriate equipment and vehicles. Litter and debris removal should be undertaken as part of general

landscape maintenance for the site and before any other SuDS management task. All litter should be removed from site.

The major maintenance requirement for dry swales is mowing. Mowing should ideally retain grass lengths of 75–150 mm across the main “treatment” surface, to assist in filtering pollutants and retaining sediments and to reduce the risk of flattening during runoff events. However, longer vegetation lengths, where appropriate, are not considered to pose a significant risk to functionality.

Grass clippings should be disposed of either offsite or outside the area of the swale, to remove nutrients and pollutants.

All vegetation management activities should take account of the need to maximise biosecurity and prevent the spread of invasive species.

Occasionally sediment will need to be removed (eg once deposits exceed 25 mm in depth), although this can be minimised by ensuring that upstream areas are stabilised and by incorporating effective pre-treatment devices.

Inspection Frequency and Maintenance Requirements: as per the table below.

Schedule	Action	Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly

	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

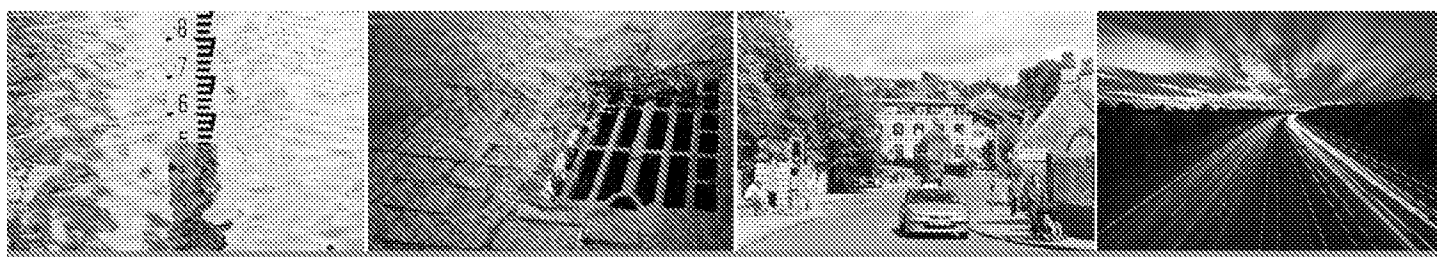
Safety information is set out in Section 2.

7. Contamination or Dilution of Spillage

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

Environment Agency – Emergency Contact Number

In the event of a spillage the Environment Agency should be contacted to notify the event and seek advice. The Environment Agency Incident Hotline is [REDACTED] (one 24hrs).



Civil Engineering - Transport Planning - Flood Risk

