



Appendix B - 10H Greenfield Runoff Rates

Calculated by: Alejandro Ortiz

Site name: Pagham II

Site location:

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: 50.78329° N

Longitude: 0.73661° W

Reference: 3315680026

Date: Nov 01 2021 09:16

Runoff estimation approach: IH124

Site characteristics

Total site area (ha): 4.9

Methodology

Q_{BAR} estimation method: Calculate from SPR and SAAR

SPR estimation method: Calculate from SOIL type

Soil characteristics	Default	Edited
SOIL type:	3	3
HOST class:	N/A	N/A
SPR/SPRHOST:	0.37	0.37

Hydrological characteristics	Default	Edited
SAAR (mm):	694	694
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 $SPR/SPRHOST \leq 0.3$?

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):	13.94	13.94
1 in 1 year (l/s):	11.85	11.85
1 in 30 years (l/s):	32.05	32.05
1 in 100 year (l/s):	44.45	44.45
1 in 200 years (l/s):	52.12	52.12

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.

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Appendix C - WinDES Detention Calculations

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<table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>0.203</td><td>0.203</td><td>4.8</td><td>238.9</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.252</td><td>0.252</td><td>5.0</td><td>298.8</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.311</td><td>0.311</td><td>5.1</td><td>371.9</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.379</td><td>0.379</td><td>5.1</td><td>458.7</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.423</td><td>0.423</td><td>5.1</td><td>515.5</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.455</td><td>0.455</td><td>5.1</td><td>557.8</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.501</td><td>0.501</td><td>5.1</td><td>618.8</td><td>O K</td></tr><tr><td>480 min Summer</td><td>0.533</td><td>0.533</td><td>5.1</td><td>661.7</td><td>O K</td></tr><tr><td>600 min Summer</td><td>0.557</td><td>0.557</td><td>5.1</td><td>693.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>0.575</td><td>0.575</td><td>5.1</td><td>718.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>0.565</td><td>0.565</td><td>5.1</td><td>705.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>0.540</td><td>0.540</td><td>5.1</td><td>671.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>0.507</td><td>0.507</td><td>5.1</td><td>626.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.475</td><td>0.475</td><td>5.1</td><td>583.7</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.443</td><td>0.443</td><td>5.1</td><td>541.7</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.408</td><td>0.408</td><td>5.1</td><td>496.3</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.374</td><td>0.374</td><td>5.1</td><td>452.3</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.341</td><td>0.341</td><td>5.1</td><td>410.9</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.311</td><td>0.311</td><td>5.1</td><td>373.1</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.227</td><td>0.227</td><td>4.9</td><td>267.9</td><td>O K</td></tr><tr><td>30 min Winter</td><td>0.281</td><td>0.281</td><td>5.0</td><td>335.3</td><td>O K</td></tr></tbody></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	0.203	0.203	4.8	238.9	O K	30 min Summer	0.252	0.252	5.0	298.8	O K	60 min Summer	0.311	0.311	5.1	371.9	O K	120 min Summer	0.379	0.379	5.1	458.7	O K	180 min Summer	0.423	0.423	5.1	515.5	O K	240 min Summer	0.455	0.455	5.1	557.8	O K	360 min Summer	0.501	0.501	5.1	618.8	O K	480 min Summer	0.533	0.533	5.1	661.7	O K	600 min Summer	0.557	0.557	5.1	693.6	O K	720 min Summer	0.575	0.575	5.1	718.0	O K	960 min Summer	0.565	0.565	5.1	705.3	O K	1440 min Summer	0.540	0.540	5.1	671.2	O K	2160 min Summer	0.507	0.507	5.1	626.2	O K	2880 min Summer	0.475	0.475	5.1	583.7	O K	4320 min Summer	0.443	0.443	5.1	541.7	O K	5760 min Summer	0.408	0.408	5.1	496.3	O K	7200 min Summer	0.374	0.374	5.1	452.3	O K	8640 min Summer	0.341	0.341	5.1	410.9	O K	10080 min Summer	0.311	0.311	5.1	373.1	O K	15 min Winter	0.227	0.227	4.9	267.9	O K	30 min Winter	0.281	0.281	5.0	335.3	O K
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6150 Knights Court Solihull Parkway Birmingham, B37 7WY			Catchment		
Date 03/12/2021 12:21			Designed by Brookbanks		
File Catchment (December 202...			Checked by		
Innovyze			Source Control 2019.1		
Summary of Results for 30 year Return Period					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.347	0.347	5.1	417.6	O K
120 min Winter	0.423	0.423	5.1	516.2	O K
180 min Winter	0.473	0.473	5.1	581.1	O K
240 min Winter	0.509	0.509	5.1	629.9	O K
360 min Winter	0.562	0.562	5.1	701.3	O K
480 min Winter	0.600	0.600	5.1	752.6	O K
600 min Winter	0.628	0.628	5.1	791.8	O K
720 min Winter	0.651	0.651	5.1	822.9	O K
960 min Winter	0.645	0.645	5.1	815.3	O K
1440 min Winter	0.619	0.619	5.1	778.7	O K
2160 min Winter	0.573	0.573	5.1	715.8	O K
2880 min Winter	0.530	0.530	5.1	657.3	O K
4320 min Winter	0.478	0.478	5.1	588.0	O K
5760 min Winter	0.422	0.422	5.1	514.0	O K
7200 min Winter	0.367	0.367	5.1	443.8	O K
8640 min Winter	0.318	0.318	5.1	380.8	O K
10080 min Winter	0.274	0.274	5.0	326.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	28.828	0.0	411.0	70	
120 min Winter	18.132	0.0	517.3	128	
180 min Winter	13.824	0.0	589.9	186	
240 min Winter	11.404	0.0	645.9	244	
360 min Winter	8.694	0.0	727.6	360	
480 min Winter	7.172	0.0	779.1	476	
600 min Winter	6.178	0.0	800.9	592	
720 min Winter	5.458	0.0	800.2	708	
960 min Winter	4.288	0.0	786.7	934	
1440 min Winter	3.044	0.0	755.0	1360	
2160 min Winter	2.161	0.0	1142.6	1672	
2880 min Winter	1.695	0.0	1190.8	2112	
4320 min Winter	1.261	0.0	1303.3	2992	
5760 min Winter	1.023	0.0	1461.0	3856	
7200 min Winter	0.869	0.0	1551.3	4616	
8640 min Winter	0.761	0.0	1627.7	5368	
10080 min Winter	0.680	0.0	1691.4	6064	
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Rainfall Details <table><tr><td>Rainfall Model</td><td>FEH</td><td>D2 (1km)</td><td>0.243</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Return Period (years)</td><td>30</td><td>D3 (1km)</td><td>0.359</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>FEH Rainfall Version</td><td>1999</td><td>E (1km)</td><td>0.308</td><td>Shortest Storm (mins)</td><td>15</td></tr><tr><td>Site Location</td><td></td><td>F (1km)</td><td>2.319</td><td>Longest Storm (mins)</td><td>10080</td></tr><tr><td>C (1km)</td><td>-0.026</td><td>Summer Storms</td><td>Yes</td><td>Climate Change %</td><td>+0</td></tr><tr><td>D1 (1km)</td><td>0.419</td><td>Winter Storms</td><td>Yes</td><td></td><td></td></tr></table> Time Area Diagram Total Area (ha) 1.780 <table><tr><th>Time (mins)</th><th>Area</th><th>Time (mins)</th><th>Area</th><th>Time (mins)</th><th>Area</th></tr><tr><th>From: To:</th><th>(ha)</th><th>From: To:</th><th>(ha)</th><th>From: To:</th><th>(ha)</th></tr><tr><td>0 4</td><td>0.593</td><td>4 8</td><td>0.593</td><td>8 12</td><td>0.593</td></tr></table>			Rainfall Model	FEH	D2 (1km)	0.243	Cv (Summer)	0.750	Return Period (years)	30	D3 (1km)	0.359	Cv (Winter)	0.840	FEH Rainfall Version	1999	E (1km)	0.308	Shortest Storm (mins)	15	Site Location		F (1km)	2.319	Longest Storm (mins)	10080	C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+0	D1 (1km)	0.419	Winter Storms	Yes			Time (mins)	Area	Time (mins)	Area	Time (mins)	Area	From: To:	(ha)	From: To:	(ha)	From: To:	(ha)	0 4	0.593	4 8	0.593	8 12	0.593
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Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1138.0	1.500	1773.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0104-5100-1200-5100
Design Head (m)	1.200
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.1
Flush-Flo™	0.358	5.1
Kick-Flo®	0.749	4.1
Mean Flow over Head Range	-	4.5

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	3.5	1.200	5.1	3.000	7.8	7.000	11.7
0.200	4.8	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.1	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.1	1.800	6.2	4.500	9.5	8.500	12.8
0.500	5.0	2.000	6.5	5.000	10.0	9.000	13.2
0.600	4.8	2.200	6.8	5.500	10.4	9.500	13.5
0.800	4.2	2.400	7.0	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

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6150 Knights Court Solihull Parkway Birmingham, B37 7WY			Catchment																																																																																																																																							
Date 03/12/2021 12:20 File Catchment (December 202...			Designed by Brookbanks Checked by																																																																																																																																							
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<u>Summary of Results for 100 year Return Period (+40%)</u>																																																																																																																																										
<table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Control (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>0.420</td><td>0.420</td><td>5.1</td><td>512.0</td><td>O K</td></tr><tr><td>30 min Summer</td><td>0.508</td><td>0.508</td><td>5.1</td><td>628.2</td><td>O K</td></tr><tr><td>60 min Summer</td><td>0.611</td><td>0.611</td><td>5.1</td><td>768.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>0.731</td><td>0.731</td><td>5.1</td><td>936.6</td><td>O K</td></tr><tr><td>180 min Summer</td><td>0.808</td><td>0.808</td><td>5.1</td><td>1048.4</td><td>O K</td></tr><tr><td>240 min Summer</td><td>0.865</td><td>0.865</td><td>5.1</td><td>1132.6</td><td>O K</td></tr><tr><td>360 min Summer</td><td>0.948</td><td>0.948</td><td>5.1</td><td>1256.9</td><td>O K</td></tr><tr><td>480 min Summer</td><td>1.007</td><td>1.007</td><td>5.1</td><td>1347.7</td><td>O K</td></tr><tr><td>600 min Summer</td><td>1.052</td><td>1.052</td><td>5.1</td><td>1418.2</td><td>O K</td></tr><tr><td>720 min Summer</td><td>1.088</td><td>1.088</td><td>5.1</td><td>1475.0</td><td>O K</td></tr><tr><td>960 min Summer</td><td>1.089</td><td>1.089</td><td>5.1</td><td>1476.6</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>1.073</td><td>1.073</td><td>5.1</td><td>1450.1</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>1.026</td><td>1.026</td><td>5.1</td><td>1376.9</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>0.978</td><td>0.978</td><td>5.1</td><td>1302.4</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>0.947</td><td>0.947</td><td>5.1</td><td>1255.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>0.914</td><td>0.914</td><td>5.1</td><td>1204.8</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>0.879</td><td>0.879</td><td>5.1</td><td>1152.9</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>0.844</td><td>0.844</td><td>5.1</td><td>1100.2</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>0.807</td><td>0.807</td><td>5.1</td><td>1046.3</td><td>O K</td></tr><tr><td>15 min Winter</td><td>0.467</td><td>0.467</td><td>5.1</td><td>573.9</td><td>O K</td></tr><tr><td>30 min Winter</td><td>0.565</td><td>0.565</td><td>5.1</td><td>704.6</td><td>O K</td></tr></table>							Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status	15 min Summer	0.420	0.420	5.1	512.0	O K	30 min Summer	0.508	0.508	5.1	628.2	O K	60 min Summer	0.611	0.611	5.1	768.6	O K	120 min Summer	0.731	0.731	5.1	936.6	O K	180 min Summer	0.808	0.808	5.1	1048.4	O K	240 min Summer	0.865	0.865	5.1	1132.6	O K	360 min Summer	0.948	0.948	5.1	1256.9	O K	480 min Summer	1.007	1.007	5.1	1347.7	O K	600 min Summer	1.052	1.052	5.1	1418.2	O K	720 min Summer	1.088	1.088	5.1	1475.0	O K	960 min Summer	1.089	1.089	5.1	1476.6	O K	1440 min Summer	1.073	1.073	5.1	1450.1	O K	2160 min Summer	1.026	1.026	5.1	1376.9	O K	2880 min Summer	0.978	0.978	5.1	1302.4	O K	4320 min Summer	0.947	0.947	5.1	1255.2	O K	5760 min Summer	0.914	0.914	5.1	1204.8	O K	7200 min Summer	0.879	0.879	5.1	1152.9	O K	8640 min Summer	0.844	0.844	5.1	1100.2	O K	10080 min Summer	0.807	0.807	5.1	1046.3	O K	15 min Winter	0.467	0.467	5.1	573.9	O K	30 min Winter	0.565	0.565	5.1	704.6	O K
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Brookbanks Consulting					Page 2
6150 Knights Court Solihull Parkway Birmingham, B37 7WY			Catchment		
Date 03/12/2021 12:20 File Catchment (December 202...			Designed by Brookbanks Checked by		
Innovyze			Source Control 2019.1		
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	0.679	0.679	5.1	862.7	O K
120 min Winter	0.811	0.811	5.1	1052.5	O K
180 min Winter	0.896	0.896	5.1	1178.3	O K
240 min Winter	0.959	0.959	5.1	1273.7	O K
360 min Winter	1.051	1.051	5.1	1415.7	O K
480 min Winter	1.117	1.117	5.1	1520.4	O K
600 min Winter	1.168	1.168	5.1	1602.6	O K
720 min Winter	1.209	1.209	5.1	1669.4	Flood Risk
960 min Winter	1.214	1.214	5.1	1677.8	Flood Risk
1440 min Winter	1.202	1.202	5.1	1658.8	Flood Risk
2160 min Winter	1.162	1.162	5.1	1593.7	O K
2880 min Winter	1.111	1.111	5.1	1511.1	O K
4320 min Winter	1.070	1.070	5.1	1446.7	O K
5760 min Winter	1.026	1.026	5.1	1376.9	O K
7200 min Winter	0.976	0.976	5.1	1300.3	O K
8640 min Winter	0.924	0.924	5.1	1220.5	O K
10080 min Winter	0.869	0.869	5.1	1138.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	58.693	0.0	801.0	70	
120 min Winter	36.115	0.0	813.3	130	
180 min Winter	27.184	0.0	789.3	188	
240 min Winter	22.222	0.0	773.8	246	
360 min Winter	16.727	0.0	760.2	364	
480 min Winter	13.673	0.0	761.2	482	
600 min Winter	11.694	0.0	773.1	598	
720 min Winter	10.292	0.0	786.2	716	
960 min Winter	7.998	0.0	785.3	948	
1440 min Winter	5.606	0.0	773.7	1406	
2160 min Winter	3.929	0.0	1528.0	2076	
2880 min Winter	3.053	0.0	1482.4	2708	
4320 min Winter	2.243	0.0	1420.4	3376	
5760 min Winter	1.802	0.0	2566.6	4328	
7200 min Winter	1.521	0.0	2692.1	5264	
8640 min Winter	1.324	0.0	2736.9	6152	
10080 min Winter	1.177	0.0	2624.3	7064	
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6150 Knights Court Solihull Parkway Birmingham, B37 7WY	Catchment	
Date 03/12/2021 12:20 File Catchment (December 202...	Designed by Brookbanks Checked by	
Innovyze	Source Control 2019.1	

Rainfall Details

Rainfall Model	FEH	D2 (1km)	0.243	Cv (Summer)	0.750
Return Period (years)	100	D3 (1km)	0.359	Cv (Winter)	0.840
FEH Rainfall Version	1999	E (1km)	0.308	Shortest Storm (mins)	15
Site Location		F (1km)	2.319	Longest Storm (mins)	10080
C (1km)	-0.026	Summer Storms	Yes	Climate Change %	+40
D1 (1km)	0.419	Winter Storms	Yes		

Time Area Diagram

Total Area (ha) 1.780

Time (mins)	Area	Time (mins)	Area	Time (mins)	Area
From: To:	(ha)	From: To:	(ha)	From: To:	(ha)
0 4	0.593	4 8	0.593	8 12	0.593

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6150 Knights Court Solihull Parkway Birmingham, B37 7WY	Catchment	
Date 03/12/2021 12:20	Designed by Brookbanks	
File Catchment (December 202...	Checked by	
Innovyze	Source Control 2019.1	

Model Details

Storage is Online Cover Level (m) 1.500

Tank or Pond Structure

Invert Level (m) 0.000

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	1138.0	1.500	1773.0

Hydro-Brake® Optimum Outflow Control

Unit Reference	MD-SHE-0104-5100-1200-5100
Design Head (m)	1.200
Design Flow (l/s)	5.1
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	104
Invert Level (m)	0.000
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	5.1
Flush-Flo™	0.358	5.1
Kick-Flo®	0.749	4.1
Mean Flow over Head Range	-	4.5

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	3.5	1.200	5.1	3.000	7.8	7.000	11.7
0.200	4.8	1.400	5.5	3.500	8.4	7.500	12.1
0.300	5.1	1.600	5.8	4.000	9.0	8.000	12.5
0.400	5.1	1.800	6.2	4.500	9.5	8.500	12.8
0.500	5.0	2.000	6.5	5.000	10.0	9.000	13.2
0.600	4.8	2.200	6.8	5.500	10.4	9.500	13.5
0.800	4.2	2.400	7.0	6.000	10.9		
1.000	4.7	2.600	7.3	6.500	11.3		

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 Appendix D – Southern Water Sewer Records



On

Date: 13/10/21

Scale: 1:1250

Map Centre: 489366.99044

Data updated: 20/09/21

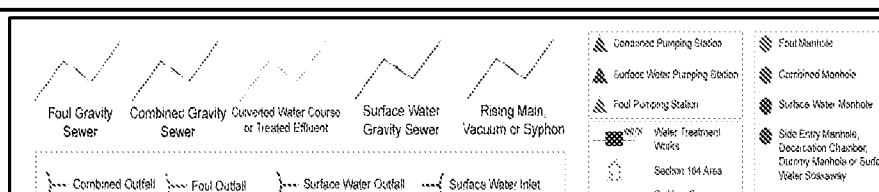
Our Ref: 673132 - 2

Wastewater Plan A0

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 2021 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

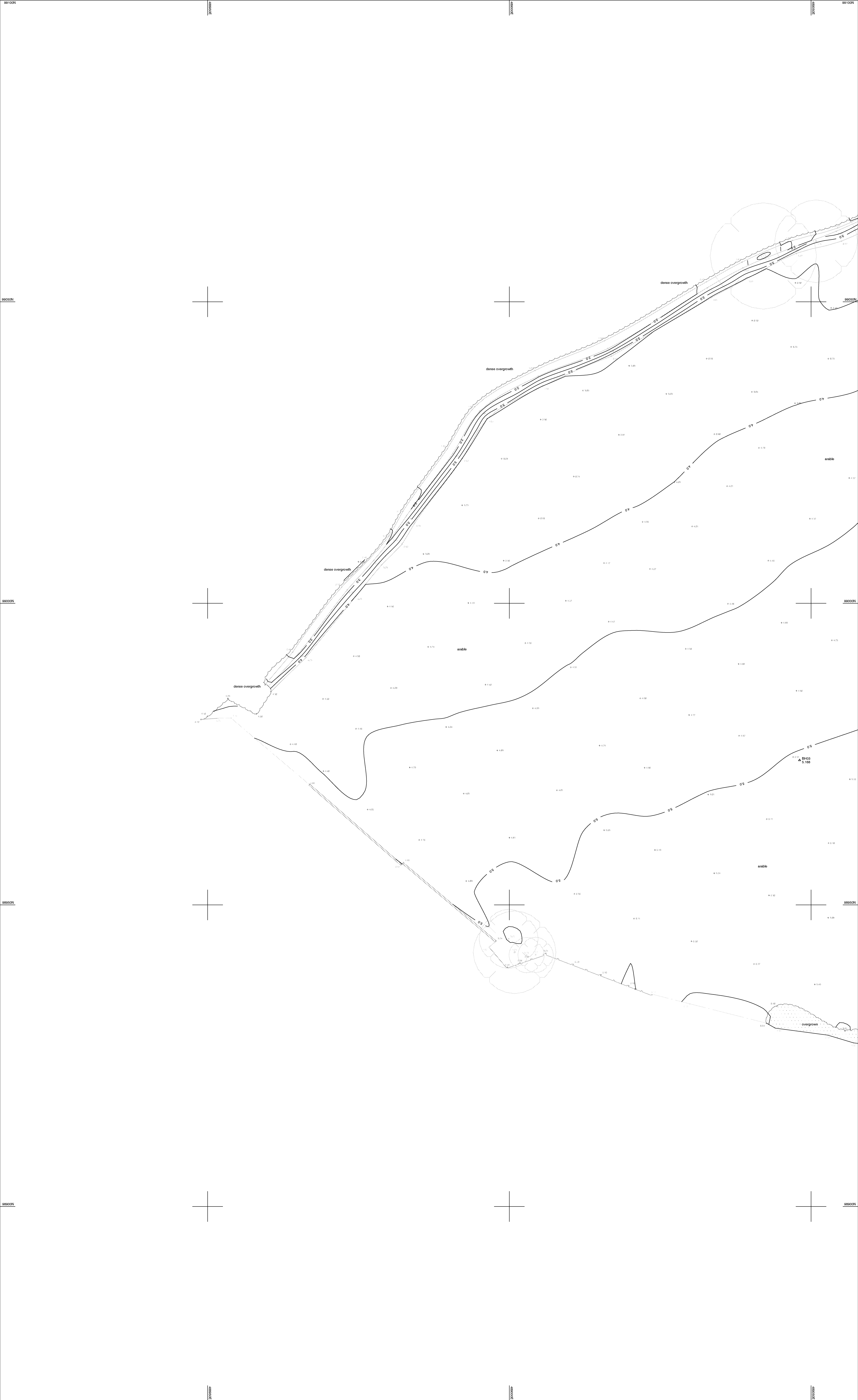


adam.melia@brookbanks.com

Booth



 Appendix E – Topographic Survey



Symbol & Abbreviation Key	
	BARBED WIRE FENCE
	POST & RAIL FENCE
	CLOSE BOARD FENCE
	RAILINGS
	CHAIN LINK FENCE
	OTHER FENCE
	KERB
	DROPPED KERB
	GULLY CHANNEL
	TOP - BOTTOM OF BANK
	FOLIAGE
	DITCH
	VENGE
	OVERHEAD CABLES
	GATE
	HEDGE
	TREE - BROAD LEAVED
	TREE - CONIFEROUS
	BUSH
	BUILDING
	BOREHOLE
	SURVEY STATION
	ORDNANCE SURVEY BENCH MARK
A/C	AIR CONDITIONING UNIT
AV	AIR VALVE
BOL	BOLLARD
BH	BOREHOLE
BL	BED LEVEL
BM	BENCH MARK
BT	BRITISH TELECOM
CTV	CABLE TV
CL	COVER LEVEL
CR	CABLE RISER
DP	DOWN PIPE
ER	EARTH ROD
EP	ELECTRICITY POLE
EM	ELECTRICITY MARKER
FB	FUSE BOX
FH	FIRE HYDRANT
FP	FENCE POST
FL	FLOOR LEVEL
GV	GAS VALVE
GM	GAS MARKER
GU	GULLY
HM	HYDRANT MARKER
L	INVERT LEVEL
KO	KERB OFF/LET
LC	LIGHTING COLUMN
LP	LAMP POST
NP	NAME PLATE
NB	NOTICE BOARD
PS	Pipe RISER
RP	RODGING POINT
RS	ROAD SIGN
SP	SEWER POST
SV	STOP VALVE
TL	TRAFFIC LIGHT
TP	TELEGRAPH POLE
TOF	TOP OF FENCE
TOH	TOP OF HEDGE
TOW	TOP OF WALL
TOR	TOP OF RAILINGS
TOS	SOURCE LEVEL
U/L	UNABLE TO LEFT
VM	VALVE MARKER
VP	VENT PIPE
WL	WATER LEVEL
WM	WATER MARKER
WO	WASH OUT

General.
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Levels related to previous survey, drawing number 210841.



Rev	Details of Revision	Drawn	Date

Surveyed	Drawn	Date	Checked	Date	Approved	Date
BH	BH	16/10/21	GD	18/10/21	GD	18/10/21

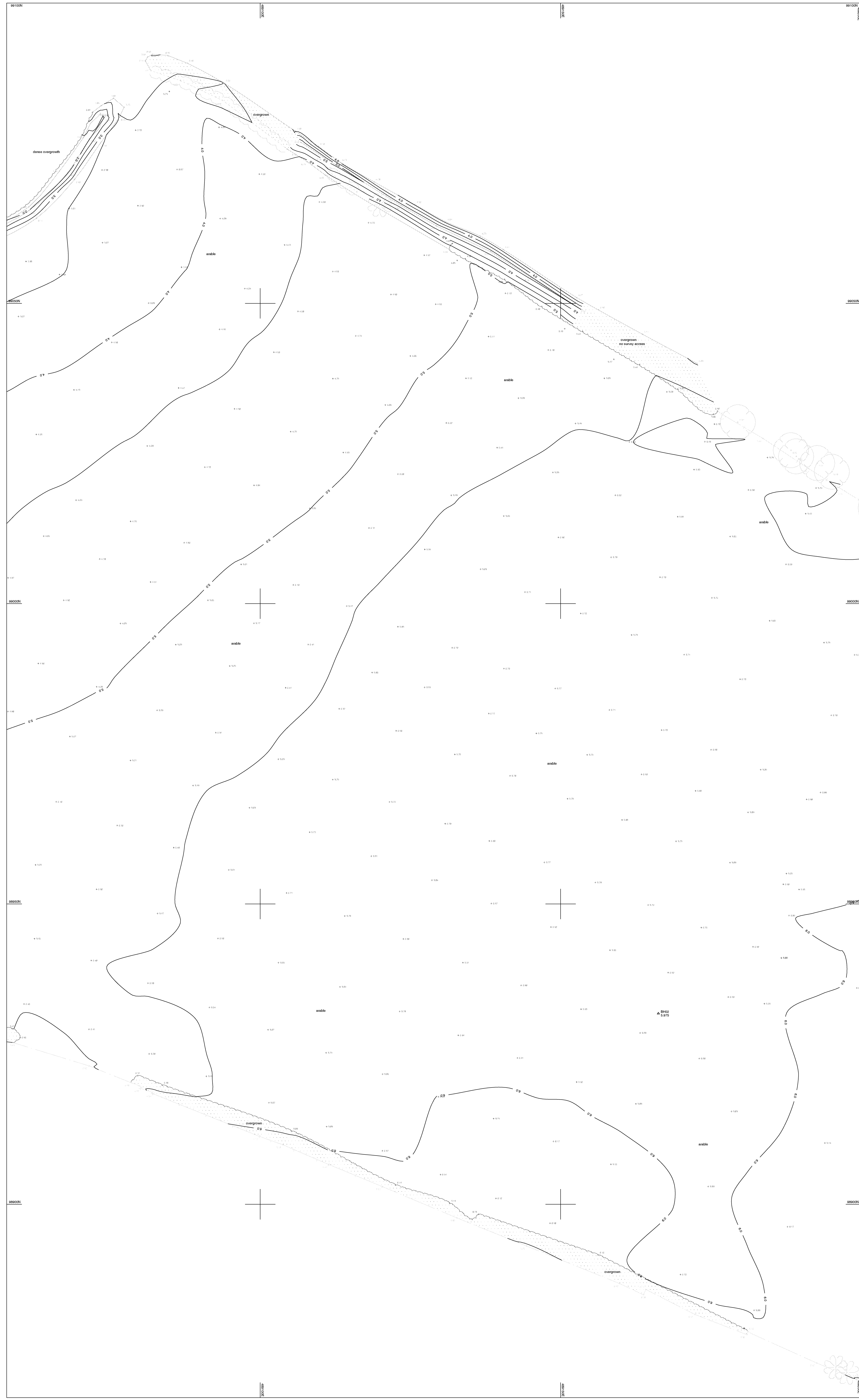
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Client.
HALLAM LAND MANAGEMENT SOUTH EAST EAST
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43 PORTLAND ROAD
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Title.
TOPOGRAPHICAL SURVEY
LAND WEST OF PAGHAM ROAD
PAGHAM
WEST SUSSEX
(PAGHAM II)

Dwg No. **210841** Sheet **1 of 3**
Scale 1:200 A0 Sheet Rev. -



Symbol & Abbreviation Key	
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GV	GAS VALVE
GM	GAS MARKER
GU	GULLY
HM	HYDRANT MARKER
L	INVERT LEVEL
KO	KERB OFFSET
LC	LIGHTING COLUMN
LP	LAMP POST
NP	NAME PLATE
NB	NOTICE BOARD
PS	Pipe RISER
RP	ROOFTOP POINT
RS	ROAD SIGN
SP	SEWER POST
SV	STOP VALVE
TL	TRAFFIC LIGHT
TP	TELEGRAPH POLE
TOF	TOP OF FENCE
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TOW	TOP OF WALL
TOS	TOP OF RAILINGS
TOV	TOP OF VALVE
U/L	UNABLE TO LIFT
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VP	VENT PIPE
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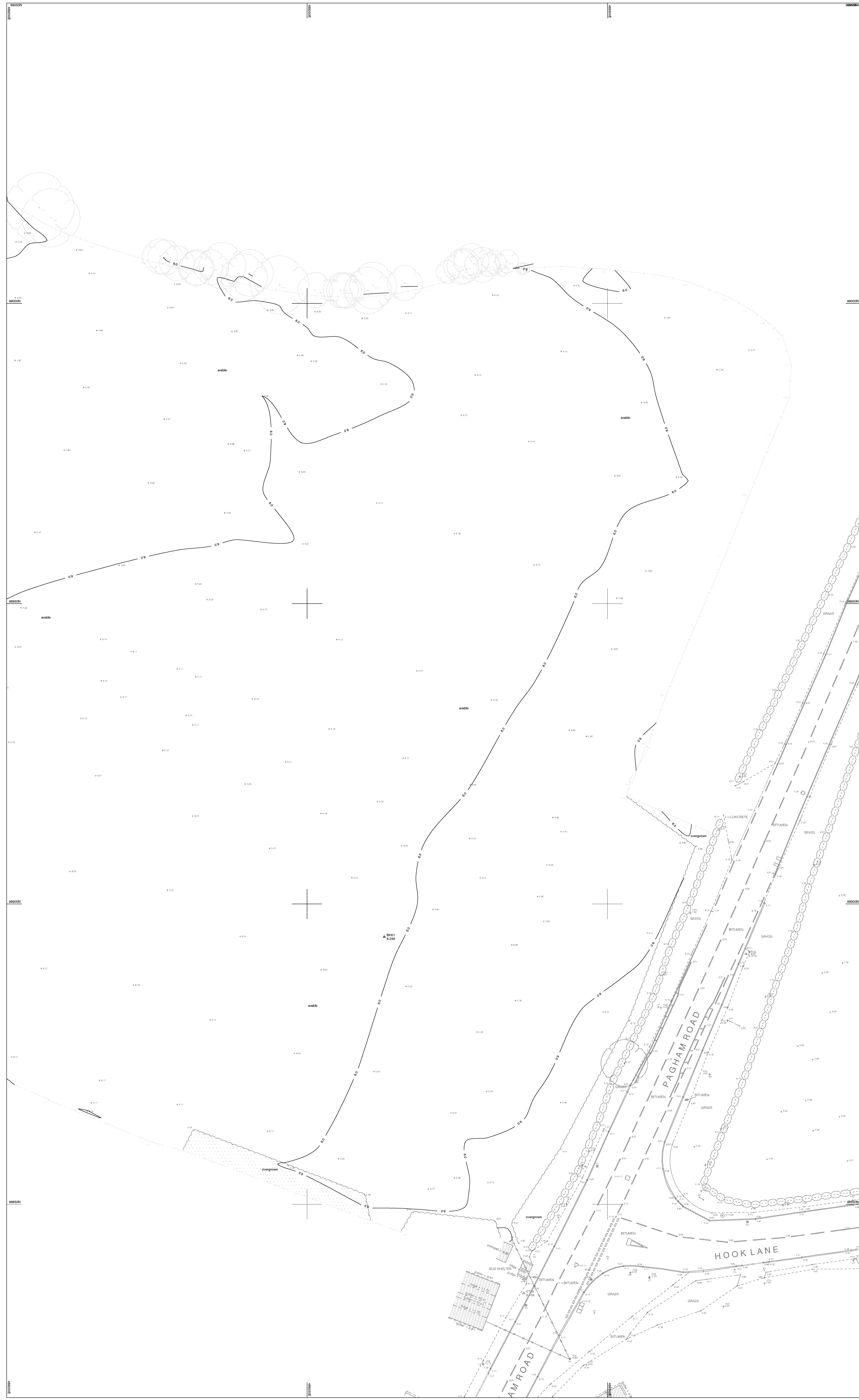
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Title.
TOPOGRAPHICAL SURVEY
LAND WEST OF PAGHAM ROAD
PAGHAM
WEST SUSSEX
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Dwg No **210841** Sheet **2 of 3**
Scale 1:200 A0 Sheet Rev. -



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KO	KERB OFF-LET
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LP	LAMP POST
NP	NAME PLATE
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PS	Pipe RISER
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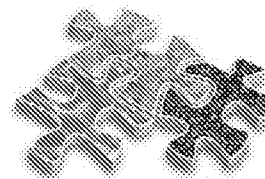
Dwg No. **210841** Sheet **3 of 3**
Scale 1:200 A0 Sheet Rev. -



Appendix F – GEG Groundwater Monitoring

GEG | Geo Environmental Group
Geotechnical, Environmental & Ecological Consultants

GEG House, 17 Graham Road, Malvern, WR14 2HR



***GROUNDWATER & INITIAL GAS MONITORING
FACTUAL REPORT***



***'PAGHAM PHASE II'
LAND WEST OF PAGHAM ROAD
PAGHAM, WEST SUSSEX
PO21 3PY***

APRIL 2021

Prepared for:



**Hallam Land
Management**



BROOKBANKS

Registered Company - GEG Ltd
Registered in England No 6469985
Registered Office: Granta Lodge, 71 Graham Rd, Malvern, WR14 2JS



REPORT TITLE:

**GROUNDWATER
& INITIAL GAS
MONITORING
FACTUAL REPORT**

Site Address:

‘Pagham Phase II’
Land West of Pagham Road
Pagham
West Sussex
PO21 3PY

Performed By:

Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

On Behalf Of:

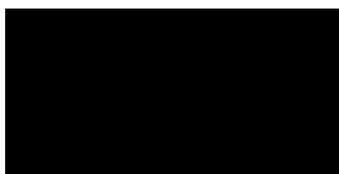
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Associate Director

Project Reference:

GEG-20-666

Report Reference:

GEG-20-666/GW

Issue Status:

FINAL

Date of Issue:

Rev. 00: 6th April 2021



TABLE OF CONTENTS	PAGE
1. INTRODUCTION	1
1.1 General	1
1.2 Available Information	1
1.3 Proposed Site Development	1
1.4 Scope.....	1
2. SITE SETTING	2
2.1 Site Location.....	2
2.2 Site Description	2
2.3 Adjacent Land Uses	2
3. GEOLOGY, HYDROLOGY, HYDROGEOLOGY	2
3.1 Published Geology.....	2
3.2 Hydrogeology	3
3.2.1 Groundwater Designation.....	3
3.2.2 Groundwater Source Protection Zone.....	3
3.3 Hydrology	3
3.3.1 Nearest Watercourse.....	3
3.3.2 Surface Water Flooding	3
3.4 Ordnance	4
4. INTRUSIVE INVESTIGATION	4
4.1 Site Works Overview	4
4.1.1 Limitations of Intrusive Investigation.....	4
4.1.2 Reinstatement	4
4.2 Site Works	4
4.2.1 General.....	4
4.2.2 Window Sample Holes	5
4.2.3 Rationale for Exploratory Holes.....	5
4.2.4 Initial Gas Monitoring.....	5
4.3 Ground Conditions Encountered	6
4.3.1 Made Ground.....	6
4.3.2 Topsoil	6
4.3.3 River Terrace Deposits	6
4.3.4 Raised Beach / Marine Deposits.....	6
4.3.5 London Clay Formation	6
4.3.6 Groundwater.....	7
5. REFERENCES	7
6. LIMITATIONS	8

Title	Appendix
FIGURES AND PLANS	A
Site Location Plan.....	Figure 1
Exploratory Hole Location Plan	Figure 2
PHOTOGRAPHIC RECORD	B
EXPLORATORY HOLE LOGS	C



1. INTRODUCTION

1.1 General

Geo Environmental Group (GEG) were commissioned by Brookbanks on behalf of Hallam Land Management (HLM) (the Client) to undertake groundwater monitoring at a site known as 'Land at Pagham Phase II, West Sussex'.

The aim of the investigation was to:

- Undertake the installation of groundwater monitoring boreholes with subsequent groundwater over the winter months.
- Produce a factual report detailing the work undertaken.

A Phase I Review & Phase II Geo-Environmental Assessment was previously undertaken on a site adjacent to the north east known as 'Land at Pagham, West Sussex' by GEG on behalf of Brookbanks/HLM (Ref. GEG-19-623/PI_PII, dated 30th January 2020).

1.2 Available Information

The following drawings were supplied by Brookbanks:

- 'Pagham Phase II - Groundwater Monitoring Location Plan Request,' Brookbanks on behalf of HLM, Drawing No. 10461-SI-02, dated 10th December 2020.
- Various utility company service drawings.

GEG also purchased additional utility company service drawings of the site.

1.3 Proposed Site Development

It is understood that the site is proposed for residential development; no further information is available at this stage.

1.4 Scope

The works performed by GEG included:

- Preliminary ground investigation for the installation of standpipes for subsequent groundwater monitoring.

Limitations to the scope of the report are outlined in Section 6.



2. SITE SETTING

2.1 Site Location

The site is located in Pagham (approximately 4.5 km west of the centre of Bognor Regis) in West Sussex, at the approximate National Grid Reference 489149E, 98972N. It lies on the western side of Pagham Road south of Rookery Farm and covers an area of approximately 4.6 ha.

A section of the 1:25,000 Ordnance Survey (OS) map identifying the site location is shown in Figure 1 of Appendix A. The site layout plan is presented in Figure 2 (Appendix A) and a photographic record is provided in Appendix B.

2.2 Site Description

The site comprised a relatively level arable agricultural field bounded by mature hedgerow with occasional deciduous trees.

Topographically, the site was relatively level at an elevation of approximately 5m AOD.

2.3 Adjacent Land Uses

A summary of surrounding land-use in the immediate vicinity of the site is provided below.

North East	Small drain followed by Rockery Farm.
South East	Pagham Road followed by an agricultural field.
South West	Residential development.
North West	Residential development and agricultural fields.

3. GEOLOGY, HYDROLOGY, HYDROGEOLOGY

3.1 Published Geology

Reference to the 1:50,000 scale British Geological Survey digital mapping of the area (solid and drift) indicates that the solid geology beneath the site comprises the London Clay Formation of the Palaeogene period. It is described as poorly laminated, blue grey or grey brown, slightly calcareous, silty to very silty clay, clayey silt and sometimes silt, with some layers of sandy clay. It commonly contains thin courses of carbonate concretions ('cementstone nodules') and disseminated pyrite. It also includes a few thin beds of shells and fine sand partings or pockets of sand.

The solid geology is conjectured to be overlain by superficial deposits of River Terrace Deposits (RTD) across the majority of the site, described generically as sand and gravel, locally with lenses of silt, clay or peat. The westernmost section of the site is conjectured to be overlain by Raised Beach Deposits 1, generically described as shingle, sand, silt and clay. Raised Marine Deposits (clay, silt, sand and gravel) are also indicated to overlie the central part of the western boundary.



No faults are conjectured to intersect the site at the surface.

3.2 Hydrogeology

3.2.1 Groundwater Designation

The database search report indicates that the solid geology directly beneath the site is designated as Unproductive Strata.

Unproductive Strata - are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The superficial deposits of the River Terrace Deposits are characterised as a Secondary A Aquifer and the Raised Beach and Marine Deposits as a Secondary Undifferentiated Aquifer.

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

Secondary (Undifferentiated) Aquifers are assigned where it is not possible to attribute either category A or B to a rock type. In general these layers have previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

3.2.2 Groundwater Source Protection Zone

The site does not lie within a currently defined Groundwater Source Protection Zone (GWSPZ).

3.3 Hydrology

3.3.1 Nearest Watercourse

The nearest surface water feature is a drain adjacent to the north of the site flowing westwards (via a pond approximately 25m west of the site) towards the Pagham Rife approximately 225m west of the site.

3.3.2 Surface Water Flooding

According to the Environment Agency online 'Flood Map for Planning', the majority of the site lies within Flood Zone 1, being land that lies outside the 1 in 1000 year (0.1%AEP) flood risk area and hence has a low probability of flooding.

However, Flood Zones 2 and 3 marginally extend over the north western boundary of the site.

Flood Zone 2: This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.



Flood Zone 3: This zone comprises land assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

3.4 Ordnance

According to regional unexploded bomb risks maps provided by Zetica, the site falls within an area of low bomb risk and therefore no further action is required.

4. INTRUSIVE INVESTIGATION

4.1 Site Works Overview

The following section outlines the scope of the intrusive investigation carried out by GEG in accordance with the Brookbanks specification and details the ground conditions encountered and the chemical testing undertaken.

All work was undertaken in general accordance with British Standard guidance (BS:5930:2015 and BS:10175) and the ICE UK Specification for Ground Investigation (2nd Edition 2012) guidelines.

Prior to commencement of the works, service plans were viewed in order to investigate the location of all major services and each exploratory hole location screened with a cable avoidance tool.

The exploratory holes were logged and sampled by an experienced geo-environmental engineer from GEG. The ground conditions encountered were recorded on the exploratory hole logs (Appendix C). Where the sample is disturbed but some guidance as to the in-situ consistency can be sensibly given, the consistency term is given in brackets, in accordance with BS:5930:2015.

The locations of the exploratory holes are shown on Figure 2 presented in Appendix A.

4.1.1 Limitations of Intrusive Investigation

There were no limitations to access across the site for the duration of the intrusive investigation.

4.1.2 Reinstatement

All boreholes were installed with 50mm diameter gas and groundwater monitoring standpipes and lockable flush cover. The surface covers were removed following completion of the groundwater monitoring to allow crop rotation.

4.2 Site Works

4.2.1 General

The intrusive investigation was undertaken on 21st and 22nd January 2021 and comprised window sample boreholes.



4.2.2 Window Sample Holes

7 No. window sample boreholes (WS01-WS07) were drilled using a Competitor Dart dynamic sampling rig to a maximum depth of 5.00m. Each window sample hole was preceded by concrete coring and a hand excavated service avoidance pit to a maximum depth of 1.20m below ground level (BGL).

All boreholes were installed with 50mm diameter standpipes to depths detailed on the exploratory hole logs for subsequent groundwater monitoring. Although, boreholes typically refused on dense SAND prior to reaching 5.00m depth, all standpipes were installed below the groundwater level encountered during drilling.

4.2.3 Rationale for Exploratory Holes

The rationale for the exploratory locations, which was undertaken in accordance with the Brookbanks' specification, is given in Table 1 below. A plan showing the location of the exploratory holes is included as Figure 2.

Table 1. Rationale for Exploratory Holes

Exploratory Hole	Rationale
WS01-WS07	General coverage

4.2.4 Initial Gas Monitoring

Initial gas monitoring was undertaken on 26th February and 26th March 2021. The standpipes were monitored for methane, carbon dioxide, oxygen, hydrogen sulphide and the borehole flow rate using a GA2000 gas analyser. Atmospheric pressure and trend was also recorded.

Table 2. Gas Monitoring Results

Borehole	Date	Atmospheric Pressure (mb)	Atmospheric Pressure Trend	Methane (% Vol.)	Carbon Dioxide (% Vol.)	Oxygen (% Vol.)	Hydrogen Sulphide (ppm)	Borehole Flow (l/hr)
WS01	26/02/21	Borehole location flooded at surface						
	26/03/21	1008	Falling	0.0	0.3	18.8	0	0.0
WS02	26/02/21	1035	Rising	0.0	0.2	19.6	0	0.5
	26/03/21	1008	Falling	0.0	0.5	16.5	0	0.0
WS03	26/02/21	1033	Rising	0.0	0.0	20.3	0	0.7
	26/03/21		Falling	0.0	0.0	21.1	0	0.0
WS04	26/02/21	Borehole location flooded at surface						
	26/03/21	1007	Falling	0.0	0.1	20.5	0	0.0
WS05	26/02/21	1035	Rising	0.0	0.1	21.1	0	0.3



Borehole	Date	Atmospheric Pressure (mb)	Atmospheric Pressure Trend	Methane (% Vol.)	Carbon Dioxide (% Vol.)	Oxygen (% Vol.)	Hydrogen Sulphide (ppm)	Borehole Flow (l/hr)
	26/03/21	1008	Falling	0.0	0.1	20.8	0	0.0
WS06	26/02/21	1033	Rising	0.0	0.6	20.1	0	1.0
	26/03/21	1007	Falling	0.0	0.9	19.4	0	0.1
WS07	26/02/21	1035	Rising	0.0	0.0	21.2	0	0.2
	26/03/21	1007	Falling	0.0	0.3	20.7	0	0.1

The gas monitoring results recorded low methane concentrations of 0.0% and low carbon dioxide concentrations of 0.0% to 0.9% with a maximum borehole flow rate 1.0 l/hr.

The water levels were monitored using a dip meter; results are presented in Section 4.3.6.

4.3 Ground Conditions Encountered

The ground conditions encountered are described below and broadly confirmed the published geology.

4.3.1 Made Ground

No Made Ground was encountered in the exploratory holes.

4.3.2 Topsoil

Typically soft CLAY topsoil was encountered across site to depths of 0.30m to 0.40m.

4.3.3 River Terrace Deposits

River Terrace Deposits were encountered underlying the topsoil to depths of >2.50m to >4.00m and typically comprised horizons of variably gravelly firm CLAY and medium dense to dense SAND. Soft to firm CLAY was encountered from 1.60m to 2.30m in WS05.

4.3.4 Raised Beach / Marine Deposits

Raised Beach / Marine Deposits were not encountered in the exploratory holes. However, as these deposits are potentially similar in composition to the River Terrace Deposits, differentiation between the strata is sometimes problematic.

4.3.5 London Clay Formation

The London Clay Formation was encountered underlying the River Terrace Deposits in 1 No. location (WS02) from a depth of 3.00m to the base the exploratory hole. It comprised stiff CLAY.



4.3.6 Groundwater

Groundwater was encountered in all of the exploratory holes during the investigation, as detailed in Table 3A.

Table 3A. Groundwater Inflows Recorded During the Investigation

Exploratory Hole	Groundwater Depth (m)	Stratum
WS01	1.00	River Terrace Deposits
WS02	0.83	
WS03	0.78	
WS04	0.30	
WS05	0.90	
WS06	0.79	
WS07	0.38	

Groundwater levels recorded in the boreholes during the subsequent monitoring visits are summarised in Table 3B.

Table 3B. Groundwater Levels Recorded During the Monitoring Visits

Borehole	Date	Depth of Installation (m)	Groundwater Depth (m)
WS01	26.02.21	2.50	Flooded at Surface
	26.03.21		0.74
WS02	26.02.21	4.00	0.88
	26.03.21		1.08
WS03	26.02.21	2.00	0.77
	26.03.21		0.85
WS04	26.02.21	2.00	0.44
	26.03.21		0.81
WS05	26.02.21	2.00	0.86
	26.03.21		1.08
WS06	26.02.21	2.50	1.15
	26.03.21		1.38
WS07	26.02.21	1.50	0.76
	26.03.21		0.99

It should be noted that groundwater levels may vary due to seasonal and other effects.

5. REFERENCES

1. British Standard Institute (1990) BS: 1377 Parts 1-9. Methods of Tests for Soils for Civil Engineering Purposes.
2. British Standard Institute (2015) BS: 5930 Code of Practice for Site Investigations. BSI, London.
3. British Standard Institute (2015+A1:2019) BS: 8485 Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings.



4. British Standard Institute (2011) BS: 10175 Code of Practice for Investigation of Potentially Contaminated Sites. BSI, London.
5. BRE Report 414 (2001). Protective measures for housing on gas-contaminated land. BRE Press, Berkshire.
6. BRE Digest 412 (February 1996). Desiccation in clay soils.
7. ICE Publishing (2012) UK Specification for Ground Investigation – Second Edition. Site Investigation Steering Group.
8. Wilson, S. & Card, G. CIRIA/Environmental Protection UK Ground Gas Seminar – 22nd June 2011 and 13th September 2011. A pragmatic approach to ground gas risk assessment for the 21st Century.

6. LIMITATIONS

As with all intrusive site investigations, there is a possibility that localised contamination ‘hotspots’/geotechnical features remain undetected on the site. Therefore, as with standard practices, this report does not provide a warranty to cover limited localised contamination ‘hotspots’/geotechnical features or any post-investigation importation of contamination.

The conclusions and recommendations stated herein are based on information available at the time of production. These may not necessarily apply if the site is to be utilised for a more or less sensitive purpose in the future, or if operational procedures or management alter over time.

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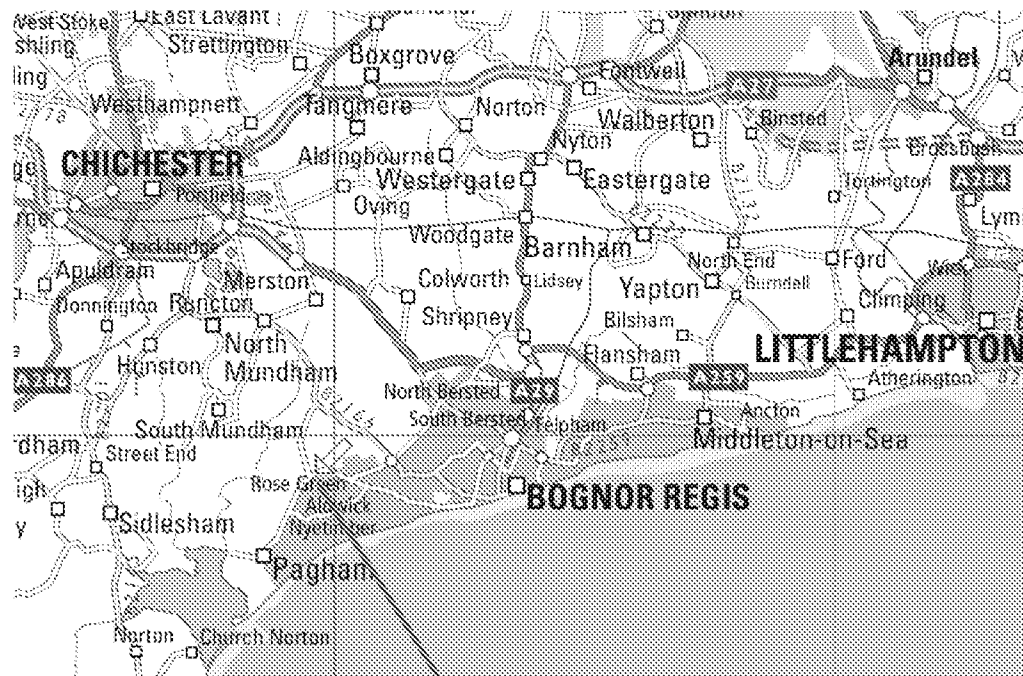
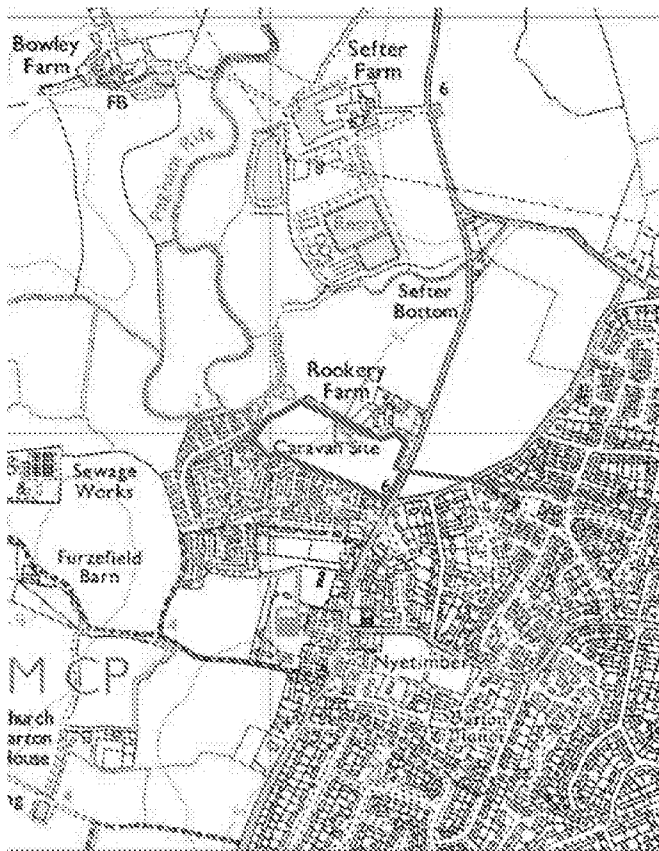
It should be noted that any warranty or liability offered or incurred by GEG, related to this report commences from the date of first issue of this report and is not altered by subsequent report revisions.

Whilst GEG may identify the presence of potential invasive plant species during the standard geo-environmental walkover and/or investigations, the Client should be aware that ecological issues including an invasive species surveys etc. are beyond the scope of the works and as such no associated liability is accepted by GEG.



APPENDIX A

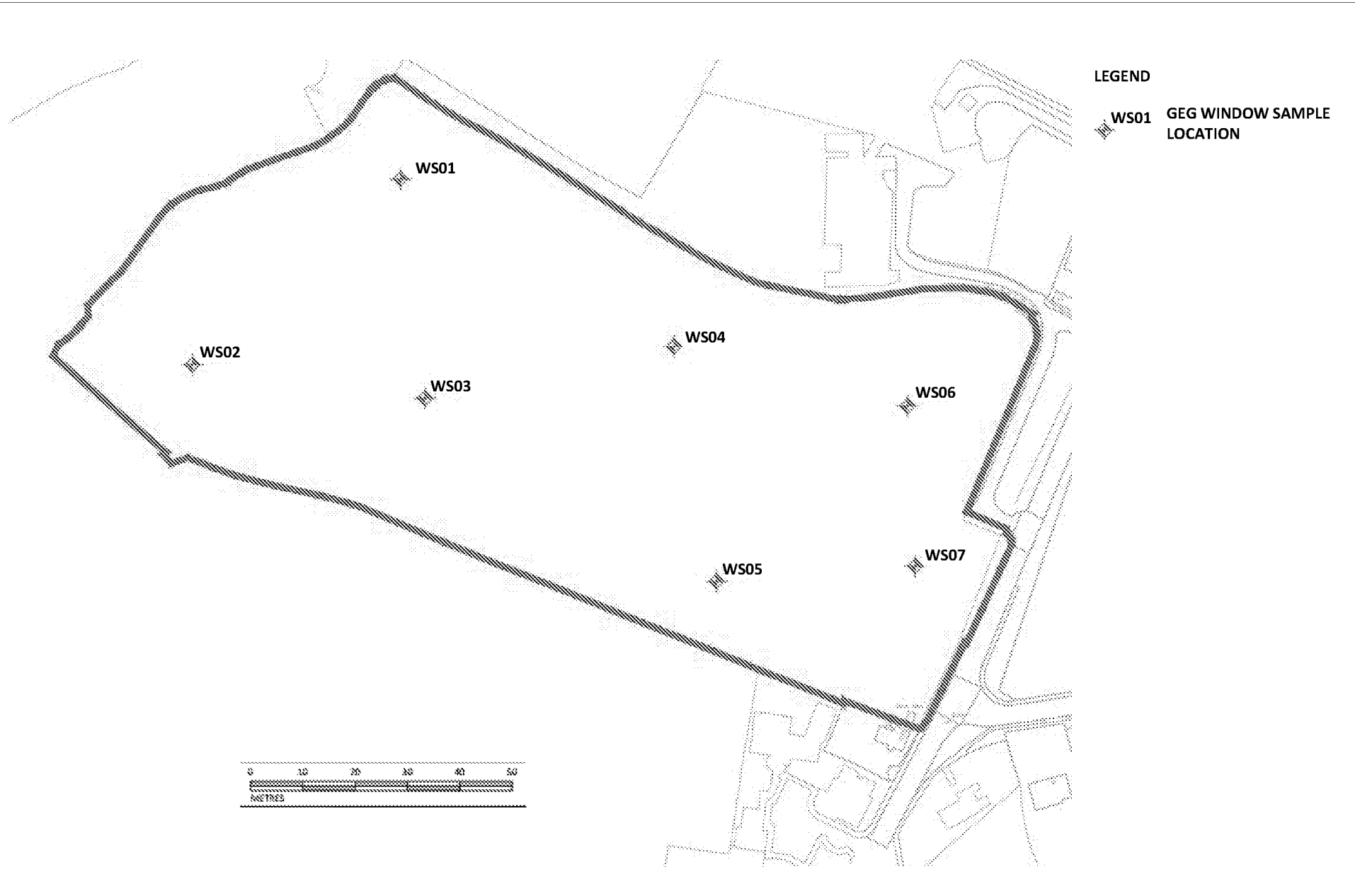
FIGURES AND PLANS



SITE LOCATION

Ordnance Survey © Crown Copyright 2021 All rights reserved. License number 100048258

TITLE: FIGURE 1: SITE LOCATION PLAN		CLIENT: BROOKBANKS / HLM		DRAWN/CHECKED: MP / MR		GEG House, 17 Graham Road Malvern, WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk, www.g-eg.co.uk	Geo Environmental Group	
SITE: PAGHAM PHASE II, WEST SUSSEX		PROJECT No.: GEG-20-666	SCALE: NTS	DATE: 03/02/21	REVISION: A			



TITLE: FIGURE 2: EXPLORATORY HOLE LOCATION PLAN		CLIENT: BROOKBANKS / HLM		DRAWN/CHECKED: JM / MP		GEG House, 17 Graham Road Malvern, WR14 2HR Tel. 01684 212526 Fax 01684 576917 admin@g-eg.co.uk, www.g-eg.co.uk	Geo Environmental Group	
SITE: PAGHAM PHASE II, WEST SUSSEX		PROJECT No.: GEG-20-666	SCALE: AS SHOWN	DATE: 15/03/21	REVISION: A			



APPENDIX B

PHOTOGRAPHIC RECORD

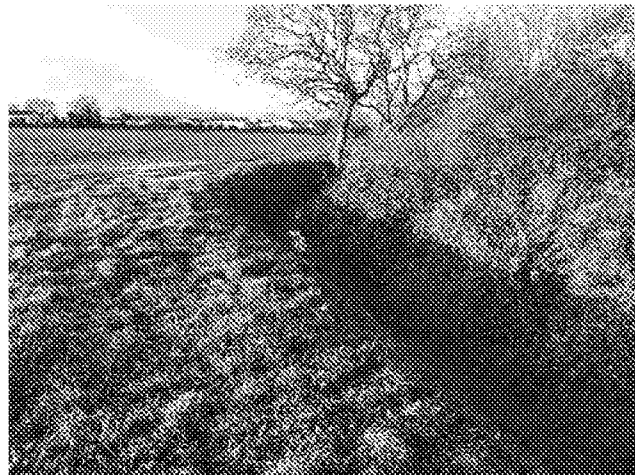


Photo 1: View west across the northern boundary of the site.



Photo 2: View south across the eastern section of the site.



Photo 3: View south west across the site.



Photo 4: View west across the site.

Geo Environmental Group
Geotechnical, Environmental &
Ecological Consultants



Geo Environmental Group
GEG House
17 Graham Road
Malvern
WR14 2HR

Client: Brookbanks / HLM

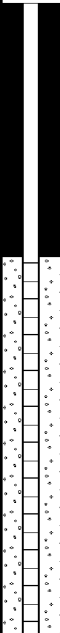
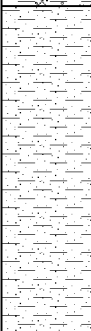
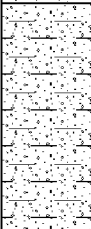
Project: Pagham Phase II, West
Sussex

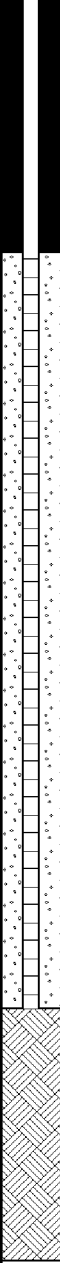
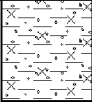
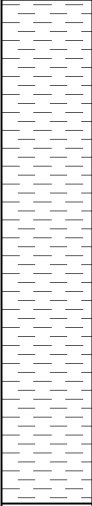
Project No.: GEG-20-666



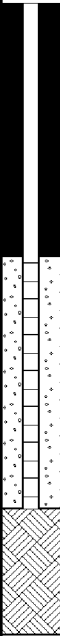
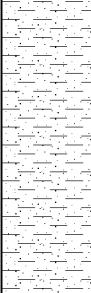
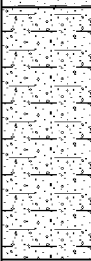
APPENDIX C

EXPLORATORY HOLE LOGS

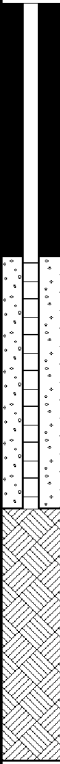
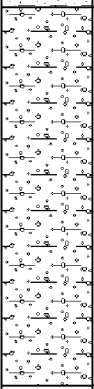
				Borehole Log				Borehole No. WS01 Sheet 1 of 1	
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 21/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00		 Soft brown slightly gravelly silty CLAY. Gravel is fine to medium mixed lithologies. (TOPSOIL)		
					0.30		 Firm light brown slightly sandy CLAY. (RIVER TERRACE DEPOSITS)	0.5	
					1.60		 Medium dense light brown slightly clayey gravelly fine to medium SAND. Gravel is fine to coarse sub-rounded to sub-angular flint. (RIVER TERRACE DEPOSITS)	1.5	
					2.50		End of Borehole at 2.500m	2.0	
									2.5
									3.0
									3.5
									4.0
									4.5
									5.0
									5.5
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 1.00m. 3. Borehole refused on medium dense SAND with continual collapse of sides due to groundwater. 4. 50mm standpipe installed 2.50m, response zone 2.50-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 5. Equipment used: Dando Terrier Window Sampling Rig.									

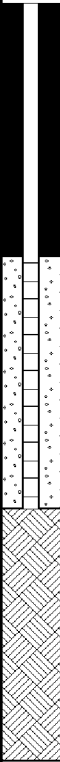
				Borehole Log			Borehole No. WS02 Sheet 1 of 1		
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 22/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00		 Soft brown slightly gravelly silty CLAY. Gravel is fine to coarse sub-angular flint. (TOPSOIL)		
					0.40		 Firm brown slightly sandy CLAY. (RIVER TERRACE DEPOSITS)	0.5	
					0.70		 Firm brown sandy gravelly CLAY. Gravel is fine to coarse sub-angular to sub-rounded flint. (RIVER TERRACE DEPOSITS)		
					1.00		 Firm light brown sandy CLAY. (RIVER TERRACE DEPOSITS)	1.0	
					3.00		 Stiff grey CLAY. (LONDON CLAY FORMATION)	3.0	
					5.00		End of Borehole at 5.000m	5.0	
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 0.83m. 3. 50mm standpipe installed 4.00m, response zone 4.00-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 4. Equipment used: Dando Terrier Window Sampling Rig.									

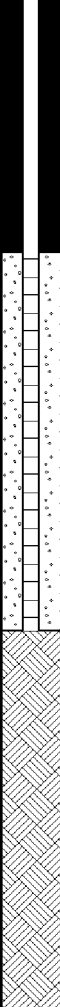
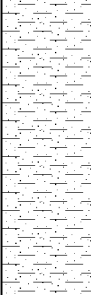
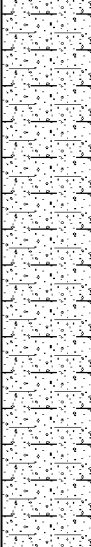


				Borehole Log				Borehole No. WS03 Sheet 1 of 1	
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 22/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00			Soft brown silty CLAY. (TOPSOIL)	
					0.30			Firm light brown sandy CLAY. (RIVER TERRACE DEPOSITS)	0.5
					1.50			Medium dense light brown clayey slightly gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded flint. (RIVER TERRACE DEPOSITS)	1.5
					2.50			End of Borehole at 2.500m	2.5
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 0.78m. 3. Borehole refused on medium dense SAND with continual collapse of sides due to groundwater. 4. 50mm standpipe installed 2.00m, response zone 2.00-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 5. Equipment used: Dando Terrier Window Sampling Rig.									

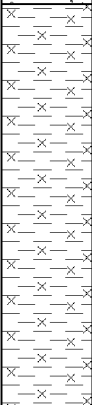


				Borehole Log			Borehole No. WS04 Sheet 1 of 1		
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 21/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00			Soft brown slightly gravelly silty CLAY. Gravel is fine to medium sub-angular to sub-rounded mixed lithologies. (TOPSOIL)	
					0.30			Firm light brown slightly sandy CLAY. (RIVER TERRACE DEPOSITS)	0.5
					1.50			Medium dense orangish brown slightly clayey slightly gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded flint. (RIVER TERRACE DEPOSITS)	1.5
					3.00		End of Borehole at 3.000m		3.0
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 0.30m. 3. Borehole refused on medium dense SAND with continual collapse of sides due to groundwater. 4. 50mm standpipe installed 2.00m, response zone 2.00-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 5. Equipment used: Dando Terrier Window Sampling Rig.									

				Borehole Log				Borehole No. WS05 Sheet 1 of 1	
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 22/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00		 Soft brown silty CLAY. (TOPSOIL)		
					0.30		 Firm brown slightly sandy CLAY. (RIVER TERRACE DEPOSITS)		0.5
					1.60		 Soft to firm light brown sandy slightly gravelly CLAY. Gravel is fine to coarse sub-angular flint. (RIVER TERRACE DEPOSITS)		1.0
					2.30		 Dense light brown slightly gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded flint. (RIVER TERRACE DEPOSITS)		1.5
					3.00		End of Borehole at 3.000m		2.0
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 0.90m. 3. Borehole refused on medium dense SAND with continual collapse of sides due to groundwater. 4. 50mm standpipe installed 2.00m, response zone 2.00-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 5. Equipment used: Dando Terrier Window Sampling Rig.									

				Borehole Log				Borehole No. WS06 Sheet 1 of 1	
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 21/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00		 Soft brown slightly gravelly silty CLAY. Gravel is fine to medium sub-angular to sub-rounded mixed lithologies. (TOPSOIL)		
					0.30		 Firm light brown slightly sandy CLAY. (RIVER TERRACE DEPOSITS)	0.5	
					1.80		 Medium dense light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is fine to coarse sub-angular to sub-rounded flint. (RIVER TERRACE DEPOSITS)	1.0 1.5 2.0	
					4.00		 End of Borehole at 4.000m	2.5 3.0 3.5 4.0	
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 0.79m. 3. Borehole refused on medium dense SAND with continual collapse of sides due to groundwater. 4. 50mm standpipe installed 2.50m, response zone 2.50-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 5. Equipment used: Dando Terrier Window Sampling Rig.									



				Borehole Log				Borehole No. WS07 Sheet 1 of 1	
Project Name: Pagham II				Project No. GEG-20-666		Co-ords:		Hole Type WS	
Location: Hook Lane, Rose Green, Bognor Regis, PO21 3PD						Level:		Scale 1:31	
Client: Brookbanks / HLM						Dates: 21/01/2021		Logged By AT	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.00			Soft brown slightly gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded mixed lithologies. (TOPSOIL)	
					0.30			Firm brown silty CLAY. (RIVER TERRACE DEPOSITS)	0.5
					1.90				1.0
					2.00			Medium dense light brown slightly clayey slightly gravelly fine to medium SAND. Gravel is fine to medium sub-angular flint. (RIVER TERRACE DEPOSITS)	1.5
							End of Borehole at 2.000m		2.0
									2.5
									3.0
									3.5
									4.0
									4.5
									5.0
									5.5
Remarks 1. Service pit to 1.20m. 2. Groundwater encountered at 0.38m. 3. Borehole refused on medium dense SAND with continual collapse of sides due to groundwater. 4. 50mm standpipe installed 1.50m, response zone 1.50-1.00m, bentonite seal 1.00-0.30m, flush cover concreted 0.30-0.00m. 5. Equipment used: Dando Terrier Window Sampling Rig.									

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