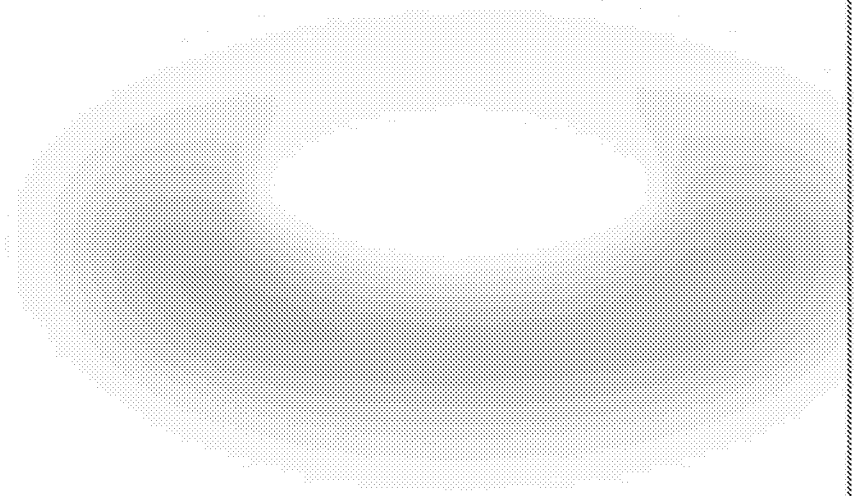




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Project: 1-4 Holm Oaks, Yapton – Microdrainage Calculations
Prepared for: Salt Earth Ltd
Reference: 3611
Date: Dec 2017
Version: Draft v1.0



Document Issue Record

Project: 1-4 Holm Oaks, Yapton – Microdrainage Calculations

Prepared for: Salt Earth Ltd

Reference: 3611

Site Location: 1-4 Holm Oaks, Burndell Road, Yapton, Arundel, West Sussex, BN18 0HR

Proposed Development: Proposals are for the demolition and re-construction of the existing buildings to include a proposed residential development and new car parking.

Consultant		Date	Signature
Author	Stavros Drakopoulos	05.12.17	
Document Check	Bojidar Boiadjiev	06.12.17	
Authorisation	Mark Naumann	06.12.17	

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1. Introduction

- 1.1 Ambiental Technical Solutions Limited has been appointed by Salt Earth Ltd to undertake calculations for soakaways and permeable paving as indicated on (Drg. No. 2017/1/12, KWJ Design) proposed for 1-4 Holm Oaks, Burndell Road, Yapton, Arundel, West Sussex, BN18 0HR.
- 1.2 The client stipulated that the site was previously used for sports, with a total impermeable area of approximately 0.05ha. Following development the total impermeable area on-site will increase with approximately 0.014ha, to a total of 0.064ha. The redline site application boundary area is approximately 0.143ha.
- 1.3 The provided drainage strategy indicates the use of SuDS permeable pavement to attenuate runoff from the proposed site hardstanding areas, and soakaways to attenuate and infiltrate runoff arising on the roof of the houses. One additional soakaway is shown at the front of the site to infiltrate the runoff from the permeable pavement. See provided site plan in Appendix 3.
- 1.4 Site specific infiltration results (as provided on drawing Drg. No. 2017/1/12) indicates that highest groundwater table recording was at 650mm below the ground level and further testing was interrupted thereafter. However, at the start of the investigation, soil infiltration rates of 3.72×10^{-5} m/s and 6.25×10^{-5} m/s were recorded. The lower limit was used in the calculations, of 6.25×10^{-5} m/s (or 0.225 m/hr).
- 1.5 **Best practice SuDS guidance (CIRIA report C753 The SuDS Manual-v1) stipulates a minimum distance of 1m between the formation level of the SuDS component and ground water level. Therefore permission for the use of soakways on site should be obtained from the Local Planning Authority, Environment Agency or Building Control as appropriate. Further assessment of the proposed SuDS strategy or alterations to the proposed infiltration devices may be necessary.**
- 1.6 The Greenfield Runoff Rate for the 1 in 100 year event is 0.7 l/s. As per the West Sussex SuDS guidelines the runoff post-development should be limited as close as possible to the Greenfield runoff rate, if feasible. Infiltration could be used to manage runoff wholly on site based on the infiltration rates provided.
- 1.7 The site areas used in the calculations are:
 - Total Existing Impermeable Areas – 0.05ha
 - Total Proposed Impermeable Areas – 0.064ha
 - Total Roof Area – 0.0212ha
 - For ½ of Roof Area – 0.006ha
 - Total Driveway/Parking Area - 0.034ha
 - Total Pathways Area – 0.009ha
 - Total hardstanding areas – 0.043ha
- 1.8 The calculation results for the 1%AEP + 40% Climate Change storm event scenario can be found in Appendix 2.

- 1.9 An alternative design has been provided utilising Type C (No Infiltration) Permeable Paving solution, with an outflow of 0.7 l/s into the ditch at the frontage of the site. This would require a sub-base attenuation storage depth of 350mm with porosity of 30%.
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2. Drainage Calculations

- ✱ Greenfield Runoff Rates
- ✱ Pre-Development Runoff Rates
- ✱ SuDS Soakaway Front
- ✱ SuDS Soakaway Rear
- ✱ SuDS Permeable Paving to Soakaway

- ✱ SuDS P.P. (Total Imp. Area) Non-infiltration design

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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd Greenfield Runoff Rates	
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ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.400
Area (ha)	0.064	Urban	0.000
SAAR (mm)	741	Region Number	Region 7

Results 1/s

QBAR Rural	0.2
QBAR Urban	0.2
Q100 years	0.7
Q1 year	0.2
Q30 years	0.5
Q100 years	0.7

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STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.000	Add Flow / Climate Change (%)	0
Ratio R	0.350	Minimum Backdrop Height (m)	0.200
Maximum Rainfall (mm/hr)	50	Maximum Backdrop Height (m)	1.500
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	1.200
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	5.000	0.063	80.0	0.050	4.000	0.0	0.600	o	150	Pipe/Conduit	
1.001	5.000	0.063	80.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	I.Area (ha)	Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	50.00	4.07	5.000	0.050	0.0	0.0	0.0	1.12	19.9	6.8
1.001	50.00	4.15	5.938	0.050	0.0	0.0	0.0	1.12	19.9	6.8

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.050	0.050	0.050
1.001	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.050	0.050	0.050

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
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1.001		6.400	5.875	0.000	0	0
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Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Storm Duration (mins)	30
Ratio R	0.350		

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1 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coeffiecient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 0 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1 15	Summer	1	+0%	30/15	Summer			6.069
1.001	2 15	Summer	1	+0%	100/15	Summer			6.006

PN	US/MH Name	Depth (m)	Volume (m³)	Surcharged Flooded		Pipe		Level Exceeded
				Flow / Cap.	Overflow (l/s)	Flow (l/s)	Status	
1.000	1	-0.081	0.000	0.43		6.8	OK	
1.001	2	-0.081	0.000	0.43		6.7	OK	

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30 year Return Period Summary of Critical Results by Maximum Level (Rank 1)
for Storm

Simulation Criteria

Areal Reduction Factor 1.000 Additional Flow - % of Total Flow 0.000
 Hot Start (mins) 0 MADD Factor * 10m³/ha Storage 2.000
 Hot Start Level (mm) 0 Inlet Coefficient 0.800
 Manhole Headloss Coeff (Global) 0.500 Flow per Person per Day (l/per/day) 0.000
 Foul Sewage per hectare (l/s) 0.000

Number of Input Hydrographs 0 Number of Storage Structures 0
 Number of Online Controls 0 Number of Time/Area Diagrams 0
 Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Ratio R 0.350
 Region England and Wales Cv (Summer) 0.750
 M5-60 (mm) 19.000 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
 Analysis Timestep Fine Inertia Status OFF
 DTS Status ON

Profile(s) Summer and Winter
 Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
 Return Period(s) (years) 1, 30, 100
 Climate Change (%) 0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	30	+0%	30/15 Summer				6.150
1.001	2	15 Winter	30	+0%	100/15 Summer				6.062

PN	US/MH Name	Depth (m)	Volume (m³)	Surcharged Flooded		Pipe Flow (l/s)	Level Exceeded
				Flow / Cap.	Overflow (l/s)		
1.000	1	0.000	0.000	1.01	15.7	SURCHARGED	
1.001	2	-0.025	0.000	1.00	15.7	OK	

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100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs	0	Number of Storage Structures	0
Number of Online Controls	0	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	Ratio R	0.350
Region England and Wales Cv (Summer)			0.750
M5-60 (mm)	19.000	Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)

Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440	Summer and Winter
Return Period(s) (years)		1, 30, 100
Climate Change (%)		0, 0, 0

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)
1.000	1	15 Winter	100	+0%	30/15 Summer				6.233
1.001	2	15 Winter	100	+0%	100/15 Summer				6.124

PN	US/MH Name	Depth (m)	Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	0.083	0.000	1.28		20.0	SURCHARGED	
1.001	2	0.036	0.000	1.29		20.2	SURCHARGED	

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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Front																																																																																																																																																																																																																			
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<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 47 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>4.269</td><td>0.369</td><td>0.3</td><td>1.2</td><td>O K</td></tr><tr><td>30 min Summer</td><td>4.349</td><td>0.449</td><td>0.3</td><td>1.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>4.388</td><td>0.488</td><td>0.4</td><td>1.6</td><td>O K</td></tr><tr><td>120 min Summer</td><td>4.384</td><td>0.484</td><td>0.4</td><td>1.5</td><td>O K</td></tr><tr><td>180 min Summer</td><td>4.354</td><td>0.454</td><td>0.3</td><td>1.4</td><td>O K</td></tr><tr><td>240 min Summer</td><td>4.319</td><td>0.419</td><td>0.3</td><td>1.3</td><td>O K</td></tr><tr><td>360 min Summer</td><td>4.253</td><td>0.353</td><td>0.3</td><td>1.1</td><td>O K</td></tr><tr><td>480 min Summer</td><td>4.197</td><td>0.297</td><td>0.3</td><td>0.9</td><td>O K</td></tr><tr><td>600 min Summer</td><td>4.149</td><td>0.249</td><td>0.3</td><td>0.8</td><td>O K</td></tr><tr><td>720 min Summer</td><td>4.107</td><td>0.207</td><td>0.3</td><td>0.7</td><td>O K</td></tr><tr><td>960 min Summer</td><td>4.042</td><td>0.142</td><td>0.2</td><td>0.5</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>3.965</td><td>0.065</td><td>0.2</td><td>0.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>3.941</td><td>0.041</td><td>0.2</td><td>0.1</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>3.933</td><td>0.033</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>3.924</td><td>0.024</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>3.919</td><td>0.019</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>3.916</td><td>0.016</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>3.914</td><td>0.014</td><td>0.1</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>3.912</td><td>0.012</td><td>0.1</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>4.319</td><td>0.419</td><td>0.3</td><td>1.3</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>17</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>30</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>48</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>82</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>116</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>150</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>216</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>280</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>342</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>402</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>520</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>750</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>1460</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>2180</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>2912</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>3664</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>4352</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>5040</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>17</td></tr></tbody></table>			Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	4.269	0.369	0.3	1.2	O K	30 min Summer	4.349	0.449	0.3	1.4	O K	60 min Summer	4.388	0.488	0.4	1.6	O K	120 min Summer	4.384	0.484	0.4	1.5	O K	180 min Summer	4.354	0.454	0.3	1.4	O K	240 min Summer	4.319	0.419	0.3	1.3	O K	360 min Summer	4.253	0.353	0.3	1.1	O K	480 min Summer	4.197	0.297	0.3	0.9	O K	600 min Summer	4.149	0.249	0.3	0.8	O K	720 min Summer	4.107	0.207	0.3	0.7	O K	960 min Summer	4.042	0.142	0.2	0.5	O K	1440 min Summer	3.965	0.065	0.2	0.2	O K	2160 min Summer	3.941	0.041	0.2	0.1	O K	2880 min Summer	3.933	0.033	0.1	0.1	O K	4320 min Summer	3.924	0.024	0.1	0.1	O K	5760 min Summer	3.919	0.019	0.1	0.1	O K	7200 min Summer	3.916	0.016	0.1	0.1	O K	8640 min Summer	3.914	0.014	0.1	0.0	O K	10080 min Summer	3.912	0.012	0.1	0.0	O K	15 min Winter	4.319	0.419	0.3	1.3	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	17	30 min Summer	83.789	0.0	30	60 min Summer	53.779	0.0	48	120 min Summer	33.337	0.0	82	180 min Summer	24.832	0.0	116	240 min Summer	20.006	0.0	150	360 min Summer	14.706	0.0	216	480 min Summer	11.818	0.0	280	600 min Summer	9.966	0.0	342	720 min Summer	8.665	0.0	402	960 min Summer	6.943	0.0	520	1440 min Summer	5.071	0.0	750	2160 min Summer	3.696	0.0	1100	2880 min Summer	2.949	0.0	1460	4320 min Summer	2.142	0.0	2180	5760 min Summer	1.705	0.0	2912	7200 min Summer	1.427	0.0	3664	8640 min Summer	1.235	0.0	4352	10080 min Summer	1.093	0.0	5040	15 min Winter	124.633	0.0	17
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600 min Summer	4.149	0.249	0.3	0.8	O K																																																																																																																																																																																																															
720 min Summer	4.107	0.207	0.3	0.7	O K																																																																																																																																																																																																															
960 min Summer	4.042	0.142	0.2	0.5	O K																																																																																																																																																																																																															
1440 min Summer	3.965	0.065	0.2	0.2	O K																																																																																																																																																																																																															
2160 min Summer	3.941	0.041	0.2	0.1	O K																																																																																																																																																																																																															
2880 min Summer	3.933	0.033	0.1	0.1	O K																																																																																																																																																																																																															
4320 min Summer	3.924	0.024	0.1	0.1	O K																																																																																																																																																																																																															
5760 min Summer	3.919	0.019	0.1	0.1	O K																																																																																																																																																																																																															
7200 min Summer	3.916	0.016	0.1	0.1	O K																																																																																																																																																																																																															
8640 min Summer	3.914	0.014	0.1	0.0	O K																																																																																																																																																																																																															
10080 min Summer	3.912	0.012	0.1	0.0	O K																																																																																																																																																																																																															
15 min Winter	4.319	0.419	0.3	1.3	O K																																																																																																																																																																																																															
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)																																																																																																																																																																																																																	
15 min Summer	124.633	0.0	17																																																																																																																																																																																																																	
30 min Summer	83.789	0.0	30																																																																																																																																																																																																																	
60 min Summer	53.779	0.0	48																																																																																																																																																																																																																	
120 min Summer	33.337	0.0	82																																																																																																																																																																																																																	
180 min Summer	24.832	0.0	116																																																																																																																																																																																																																	
240 min Summer	20.006	0.0	150																																																																																																																																																																																																																	
360 min Summer	14.706	0.0	216																																																																																																																																																																																																																	
480 min Summer	11.818	0.0	280																																																																																																																																																																																																																	
600 min Summer	9.966	0.0	342																																																																																																																																																																																																																	
720 min Summer	8.665	0.0	402																																																																																																																																																																																																																	
960 min Summer	6.943	0.0	520																																																																																																																																																																																																																	
1440 min Summer	5.071	0.0	750																																																																																																																																																																																																																	
2160 min Summer	3.696	0.0	1100																																																																																																																																																																																																																	
2880 min Summer	2.949	0.0	1460																																																																																																																																																																																																																	
4320 min Summer	2.142	0.0	2180																																																																																																																																																																																																																	
5760 min Summer	1.705	0.0	2912																																																																																																																																																																																																																	
7200 min Summer	1.427	0.0	3664																																																																																																																																																																																																																	
8640 min Summer	1.235	0.0	4352																																																																																																																																																																																																																	
10080 min Summer	1.093	0.0	5040																																																																																																																																																																																																																	
15 min Winter	124.633	0.0	17																																																																																																																																																																																																																	
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AEA - Ambiental				Page 2	
Science Park Square Brighton East Sussex		3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Front			
Date 05/12/2017		Designed by SD Checked by MN			
XP Solutions		Source Control 2017.1			
Summary of Results for 100 year Return Period (+40%)					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	4.415	0.515	0.4	1.6	O K
60 min Winter	4.460	0.560	0.4	1.8	O K
120 min Winter	4.446	0.546	0.4	1.7	O K
180 min Winter	4.397	0.497	0.4	1.6	O K
240 min Winter	4.343	0.443	0.3	1.4	O K
360 min Winter	4.247	0.347	0.3	1.1	O K
480 min Winter	4.168	0.268	0.3	0.9	O K
600 min Winter	4.103	0.203	0.3	0.6	O K
720 min Winter	4.050	0.150	0.3	0.5	O K
960 min Winter	3.974	0.074	0.2	0.2	O K
1440 min Winter	3.941	0.041	0.2	0.1	O K
2160 min Winter	3.930	0.030	0.1	0.1	O K
2880 min Winter	3.924	0.024	0.1	0.1	O K
4320 min Winter	3.917	0.017	0.1	0.1	O K
5760 min Winter	3.914	0.014	0.1	0.0	O K
7200 min Winter	3.912	0.012	0.1	0.0	O K
8640 min Winter	3.910	0.010	0.0	0.0	O K
10080 min Winter	3.909	0.009	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	83.789	0.0	30		
60 min Winter	53.779	0.0	50		
120 min Winter	33.337	0.0	88		
180 min Winter	24.832	0.0	126		
240 min Winter	20.006	0.0	160		
360 min Winter	14.706	0.0	230		
480 min Winter	11.818	0.0	294		
600 min Winter	9.966	0.0	356		
720 min Winter	8.665	0.0	416		
960 min Winter	6.943	0.0	522		
1440 min Winter	5.071	0.0	736		
2160 min Winter	3.696	0.0	1100		
2880 min Winter	2.949	0.0	1468		
4320 min Winter	2.142	0.0	2204		
5760 min Winter	1.705	0.0	2936		
7200 min Winter	1.427	0.0	3680		
8640 min Winter	1.235	0.0	4400		
10080 min Winter	1.093	0.0	5032		
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AEA - Ambiantal		Page 3
Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Front	
Date 05/12/2017	Designed by SD Checked by MN	
XP Solutions		Source Control 2017.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.006

Time (mins)	Area
From:	To: (ha)
0	4 0.006

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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Front																					
Date 05/12/2017	Designed by SD Checked by MN																					
XP Solutions		Source Control 2017.1																				
<u>Model Details</u> Storage is Online Cover Level (m) 6.600 <u>Lined Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.22500</td> <td>Ring Diameter (m)</td> <td>1.50</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.22500</td> <td>Pit Multiplier</td> <td>1.7</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Number Required</td> <td>1</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>3.900</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.22500	Ring Diameter (m)	1.50	Infiltration Coefficient Side (m/hr)	0.22500	Pit Multiplier	1.7	Safety Factor	2.0	Number Required	1	Porosity	0.30	Cap Volume Depth (m)	0.000	Invert Level (m)	3.900	Cap Infiltration Depth (m)	0.000
Infiltration Coefficient Base (m/hr)	0.22500	Ring Diameter (m)	1.50																			
Infiltration Coefficient Side (m/hr)	0.22500	Pit Multiplier	1.7																			
Safety Factor	2.0	Number Required	1																			
Porosity	0.30	Cap Volume Depth (m)	0.000																			
Invert Level (m)	3.900	Cap Infiltration Depth (m)	0.000																			
©1982-2017 XP Solutions																						

AEA - Ambiental			Page 1																																																																																																																																																																																																																			
Science Park Square Brighton East Sussex		3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Rear																																																																																																																																																																																																																				
Date 05/12/2017		Designed by SD Checked by MN																																																																																																																																																																																																																				
XP Solutions		Source Control 2017.1																																																																																																																																																																																																																				
Summary of Results for 100 year Return Period (+40%) Half Drain Time : 42 minutes. <table><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr><tr><td>15 min Summer</td><td>4.169</td><td>0.269</td><td>0.4</td><td>1.2</td><td>O K</td></tr><tr><td>30 min Summer</td><td>4.225</td><td>0.325</td><td>0.4</td><td>1.4</td><td>O K</td></tr><tr><td>60 min Summer</td><td>4.252</td><td>0.352</td><td>0.4</td><td>1.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>4.243</td><td>0.343</td><td>0.4</td><td>1.5</td><td>O K</td></tr><tr><td>180 min Summer</td><td>4.216</td><td>0.316</td><td>0.4</td><td>1.3</td><td>O K</td></tr><tr><td>240 min Summer</td><td>4.186</td><td>0.286</td><td>0.4</td><td>1.2</td><td>O K</td></tr><tr><td>360 min Summer</td><td>4.131</td><td>0.231</td><td>0.3</td><td>1.0</td><td>O K</td></tr><tr><td>480 min Summer</td><td>4.085</td><td>0.185</td><td>0.3</td><td>0.8</td><td>O K</td></tr><tr><td>600 min Summer</td><td>4.047</td><td>0.147</td><td>0.3</td><td>0.6</td><td>O K</td></tr><tr><td>720 min Summer</td><td>4.016</td><td>0.116</td><td>0.3</td><td>0.5</td><td>O K</td></tr><tr><td>960 min Summer</td><td>3.972</td><td>0.072</td><td>0.3</td><td>0.3</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>3.944</td><td>0.044</td><td>0.2</td><td>0.2</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>3.933</td><td>0.033</td><td>0.2</td><td>0.1</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>3.926</td><td>0.026</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>3.919</td><td>0.019</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>3.915</td><td>0.015</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>3.913</td><td>0.013</td><td>0.1</td><td>0.1</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>3.911</td><td>0.011</td><td>0.1</td><td>0.0</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>3.910</td><td>0.010</td><td>0.1</td><td>0.0</td><td>O K</td></tr><tr><td>15 min Winter</td><td>4.207</td><td>0.307</td><td>0.4</td><td>1.3</td><td>O K</td></tr></table> <table><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>17</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>30</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>46</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>80</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>114</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>148</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>214</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>276</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>334</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>392</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>504</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>734</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>1100</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>1460</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>2196</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>2920</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>3632</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>4272</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>5000</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>17</td></tr></table>					Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	4.169	0.269	0.4	1.2	O K	30 min Summer	4.225	0.325	0.4	1.4	O K	60 min Summer	4.252	0.352	0.4	1.5	O K	120 min Summer	4.243	0.343	0.4	1.5	O K	180 min Summer	4.216	0.316	0.4	1.3	O K	240 min Summer	4.186	0.286	0.4	1.2	O K	360 min Summer	4.131	0.231	0.3	1.0	O K	480 min Summer	4.085	0.185	0.3	0.8	O K	600 min Summer	4.047	0.147	0.3	0.6	O K	720 min Summer	4.016	0.116	0.3	0.5	O K	960 min Summer	3.972	0.072	0.3	0.3	O K	1440 min Summer	3.944	0.044	0.2	0.2	O K	2160 min Summer	3.933	0.033	0.2	0.1	O K	2880 min Summer	3.926	0.026	0.1	0.1	O K	4320 min Summer	3.919	0.019	0.1	0.1	O K	5760 min Summer	3.915	0.015	0.1	0.1	O K	7200 min Summer	3.913	0.013	0.1	0.1	O K	8640 min Summer	3.911	0.011	0.1	0.0	O K	10080 min Summer	3.910	0.010	0.1	0.0	O K	15 min Winter	4.207	0.307	0.4	1.3	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	17	30 min Summer	83.789	0.0	30	60 min Summer	53.779	0.0	46	120 min Summer	33.337	0.0	80	180 min Summer	24.832	0.0	114	240 min Summer	20.006	0.0	148	360 min Summer	14.706	0.0	214	480 min Summer	11.818	0.0	276	600 min Summer	9.966	0.0	334	720 min Summer	8.665	0.0	392	960 min Summer	6.943	0.0	504	1440 min Summer	5.071	0.0	734	2160 min Summer	3.696	0.0	1100	2880 min Summer	2.949	0.0	1460	4320 min Summer	2.142	0.0	2196	5760 min Summer	1.705	0.0	2920	7200 min Summer	1.427	0.0	3632	8640 min Summer	1.235	0.0	4272	10080 min Summer	1.093	0.0	5000	15 min Winter	124.633	0.0	17
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status																																																																																																																																																																																																																	
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4320 min Summer	2.142	0.0	2196																																																																																																																																																																																																																			
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7200 min Summer	1.427	0.0	3632																																																																																																																																																																																																																			
8640 min Summer	1.235	0.0	4272																																																																																																																																																																																																																			
10080 min Summer	1.093	0.0	5000																																																																																																																																																																																																																			
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Science Park Square Brighton East Sussex		3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Rear			
Date 05/12/2017		Designed by SD Checked by MN			
XP Solutions		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	4.274	0.374	0.4	1.6	O K
60 min Winter	4.303	0.403	0.4	1.7	O K
120 min Winter	4.284	0.384	0.4	1.6	O K
180 min Winter	4.241	0.341	0.4	1.5	O K
240 min Winter	4.195	0.295	0.4	1.3	O K
360 min Winter	4.114	0.214	0.3	0.9	O K
480 min Winter	4.050	0.150	0.3	0.6	O K
600 min Winter	4.000	0.100	0.3	0.4	O K
720 min Winter	3.964	0.064	0.3	0.3	O K
960 min Winter	3.944	0.044	0.2	0.2	O K
1440 min Winter	3.932	0.032	0.2	0.1	O K
2160 min Winter	3.924	0.024	0.1	0.1	O K
2880 min Winter	3.919	0.019	0.1	0.1	O K
4320 min Winter	3.914	0.014	0.1	0.1	O K
5760 min Winter	3.911	0.011	0.1	0.0	O K
7200 min Winter	3.909	0.009	0.1	0.0	O K
8640 min Winter	3.908	0.008	0.0	0.0	O K
10080 min Winter	3.907	0.007	0.0	0.0	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	83.789	0.0	30		
60 min Winter	53.779	0.0	48		
120 min Winter	33.337	0.0	88		
180 min Winter	24.832	0.0	124		
240 min Winter	20.006	0.0	158		
360 min Winter	14.706	0.0	226		
480 min Winter	11.818	0.0	288		
600 min Winter	9.966	0.0	344		
720 min Winter	8.665	0.0	392		
960 min Winter	6.943	0.0	494		
1440 min Winter	5.071	0.0	736		
2160 min Winter	3.696	0.0	1096		
2880 min Winter	2.949	0.0	1468		
4320 min Winter	2.142	0.0	2140		
5760 min Winter	1.705	0.0	2936		
7200 min Winter	1.427	0.0	3576		
8640 min Winter	1.235	0.0	4280		
10080 min Winter	1.093	0.0	4992		
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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Rear	
Date 05/12/2017	Designed by SD Checked by MN	
XP Solutions		Source Control 2017.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.006

Time (mins)	Area
From:	To: (ha)
0	4 0.006

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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS Soakaway Rear																					
Date 05/12/2017	Designed by SD Checked by MN																					
XP Solutions		Source Control 2017.1																				
<u>Model Details</u> Storage is Online Cover Level (m) 6.600 <u>Lined Soakaway Structure</u> <table> <tr> <td>Infiltration Coefficient Base (m/hr)</td> <td>0.22500</td> <td>Ring Diameter (m)</td> <td>1.80</td> </tr> <tr> <td>Infiltration Coefficient Side (m/hr)</td> <td>0.22500</td> <td>Pit Multiplier</td> <td>1.6</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Number Required</td> <td>1</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Cap Volume Depth (m)</td> <td>0.000</td> </tr> <tr> <td>Invert Level (m)</td> <td>3.900</td> <td>Cap Infiltration Depth (m)</td> <td>0.000</td> </tr> </table>			Infiltration Coefficient Base (m/hr)	0.22500	Ring Diameter (m)	1.80	Infiltration Coefficient Side (m/hr)	0.22500	Pit Multiplier	1.6	Safety Factor	2.0	Number Required	1	Porosity	0.30	Cap Volume Depth (m)	0.000	Invert Level (m)	3.900	Cap Infiltration Depth (m)	0.000
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Summary of Results for 100 year Return Period (+40%) Half Drain Time : 167 minutes. <table><thead><tr><th>Storm Event</th><th>Max Level (m)</th><th>Max Depth (m)</th><th>Max Infiltration (l/s)</th><th>Max Volume (m³)</th><th>Status</th></tr></thead><tbody><tr><td>15 min Summer</td><td>6.108</td><td>2.208</td><td>0.9</td><td>7.8</td><td>O K</td></tr><tr><td>30 min Summer</td><td>6.135</td><td>2.235</td><td>0.9</td><td>10.8</td><td>O K</td></tr><tr><td>60 min Summer</td><td>6.161</td><td>2.261</td><td>0.9</td><td>13.5</td><td>O K</td></tr><tr><td>120 min Summer</td><td>6.180</td><td>2.280</td><td>0.9</td><td>15.4</td><td>O K</td></tr><tr><td>180 min Summer</td><td>6.184</td><td>2.284</td><td>0.9</td><td>15.9</td><td>O K</td></tr><tr><td>240 min Summer</td><td>6.185</td><td>2.285</td><td>0.9</td><td>16.0</td><td>O K</td></tr><tr><td>360 min Summer</td><td>6.182</td><td>2.282</td><td>0.9</td><td>15.7</td><td>O K</td></tr><tr><td>480 min Summer</td><td>6.177</td><td>2.277</td><td>0.9</td><td>15.2</td><td>O K</td></tr><tr><td>600 min Summer</td><td>6.171</td><td>2.271</td><td>0.9</td><td>14.5</td><td>O K</td></tr><tr><td>720 min Summer</td><td>6.164</td><td>2.264</td><td>0.9</td><td>13.8</td><td>O K</td></tr><tr><td>960 min Summer</td><td>6.151</td><td>2.251</td><td>0.9</td><td>12.4</td><td>O K</td></tr><tr><td>1440 min Summer</td><td>6.127</td><td>2.227</td><td>0.9</td><td>9.8</td><td>O K</td></tr><tr><td>2160 min Summer</td><td>6.102</td><td>2.202</td><td>0.9</td><td>7.2</td><td>O K</td></tr><tr><td>2880 min Summer</td><td>5.746</td><td>1.846</td><td>0.8</td><td>5.9</td><td>O K</td></tr><tr><td>4320 min Summer</td><td>5.223</td><td>1.323</td><td>0.6</td><td>4.2</td><td>O K</td></tr><tr><td>5760 min Summer</td><td>4.893</td><td>0.993</td><td>0.5</td><td>3.2</td><td>O K</td></tr><tr><td>7200 min Summer</td><td>4.660</td><td>0.760</td><td>0.4</td><td>2.4</td><td>O K</td></tr><tr><td>8640 min Summer</td><td>4.495</td><td>0.595</td><td>0.4</td><td>1.9</td><td>O K</td></tr><tr><td>10080 min Summer</td><td>4.368</td><td>0.468</td><td>0.4</td><td>1.5</td><td>O K</td></tr><tr><td>15 min Winter</td><td>6.119</td><td>2.219</td><td>0.9</td><td>9.0</td><td>O K</td></tr></tbody></table> <table><thead><tr><th>Storm Event</th><th>Rain (mm/hr)</th><th>Flooded Volume (m³)</th><th>Time-Peak (mins)</th></tr></thead><tbody><tr><td>15 min Summer</td><td>124.633</td><td>0.0</td><td>18</td></tr><tr><td>30 min Summer</td><td>83.789</td><td>0.0</td><td>33</td></tr><tr><td>60 min Summer</td><td>53.779</td><td>0.0</td><td>62</td></tr><tr><td>120 min Summer</td><td>33.337</td><td>0.0</td><td>120</td></tr><tr><td>180 min Summer</td><td>24.832</td><td>0.0</td><td>152</td></tr><tr><td>240 min Summer</td><td>20.006</td><td>0.0</td><td>182</td></tr><tr><td>360 min Summer</td><td>14.706</td><td>0.0</td><td>250</td></tr><tr><td>480 min Summer</td><td>11.818</td><td>0.0</td><td>318</td></tr><tr><td>600 min Summer</td><td>9.966</td><td>0.0</td><td>386</td></tr><tr><td>720 min Summer</td><td>8.665</td><td>0.0</td><td>454</td></tr><tr><td>960 min Summer</td><td>6.943</td><td>0.0</td><td>586</td></tr><tr><td>1440 min Summer</td><td>5.071</td><td>0.0</td><td>836</td></tr><tr><td>2160 min Summer</td><td>3.696</td><td>0.0</td><td>1172</td></tr><tr><td>2880 min Summer</td><td>2.949</td><td>0.0</td><td>1532</td></tr><tr><td>4320 min Summer</td><td>2.142</td><td>0.0</td><td>2252</td></tr><tr><td>5760 min Summer</td><td>1.705</td><td>0.0</td><td>3000</td></tr><tr><td>7200 min Summer</td><td>1.427</td><td>0.0</td><td>3744</td></tr><tr><td>8640 min Summer</td><td>1.235</td><td>0.0</td><td>4416</td></tr><tr><td>10080 min Summer</td><td>1.093</td><td>0.0</td><td>5144</td></tr><tr><td>15 min Winter</td><td>124.633</td><td>0.0</td><td>18</td></tr></tbody></table>						Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status	15 min Summer	6.108	2.208	0.9	7.8	O K	30 min Summer	6.135	2.235	0.9	10.8	O K	60 min Summer	6.161	2.261	0.9	13.5	O K	120 min Summer	6.180	2.280	0.9	15.4	O K	180 min Summer	6.184	2.284	0.9	15.9	O K	240 min Summer	6.185	2.285	0.9	16.0	O K	360 min Summer	6.182	2.282	0.9	15.7	O K	480 min Summer	6.177	2.277	0.9	15.2	O K	600 min Summer	6.171	2.271	0.9	14.5	O K	720 min Summer	6.164	2.264	0.9	13.8	O K	960 min Summer	6.151	2.251	0.9	12.4	O K	1440 min Summer	6.127	2.227	0.9	9.8	O K	2160 min Summer	6.102	2.202	0.9	7.2	O K	2880 min Summer	5.746	1.846	0.8	5.9	O K	4320 min Summer	5.223	1.323	0.6	4.2	O K	5760 min Summer	4.893	0.993	0.5	3.2	O K	7200 min Summer	4.660	0.760	0.4	2.4	O K	8640 min Summer	4.495	0.595	0.4	1.9	O K	10080 min Summer	4.368	0.468	0.4	1.5	O K	15 min Winter	6.119	2.219	0.9	9.0	O K	Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)	15 min Summer	124.633	0.0	18	30 min Summer	83.789	0.0	33	60 min Summer	53.779	0.0	62	120 min Summer	33.337	0.0	120	180 min Summer	24.832	0.0	152	240 min Summer	20.006	0.0	182	360 min Summer	14.706	0.0	250	480 min Summer	11.818	0.0	318	600 min Summer	9.966	0.0	386	720 min Summer	8.665	0.0	454	960 min Summer	6.943	0.0	586	1440 min Summer	5.071	0.0	836	2160 min Summer	3.696	0.0	1172	2880 min Summer	2.949	0.0	1532	4320 min Summer	2.142	0.0	2252	5760 min Summer	1.705	0.0	3000	7200 min Summer	1.427	0.0	3744	8640 min Summer	1.235	0.0	4416	10080 min Summer	1.093	0.0	5144	15 min Winter	124.633	0.0	18
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Science Park Square Brighton East Sussex		3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. to Soakaway			
Date 05/12/2017		Designed by SD Checked by MN			
XP Solutions		Source Control 2017.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	6.150	2.250	0.9	12.3	O K
60 min Winter	6.180	2.280	0.9	15.5	O K
120 min Winter	6.203	2.303	0.9	17.9	O K
180 min Winter	6.203	2.303	0.9	18.5	O K
240 min Winter	6.207	2.307	0.9	18.4	O K
360 min Winter	6.202	2.302	0.9	17.8	O K
480 min Winter	6.194	2.294	0.9	17.0	O K
600 min Winter	6.184	2.284	0.9	15.9	O K
720 min Winter	6.174	2.274	0.9	14.8	O K
960 min Winter	6.153	2.253	0.9	12.6	O K
1440 min Winter	6.117	2.217	0.9	8.9	O K
2160 min Winter	5.807	1.907	0.8	6.1	O K
2880 min Winter	5.373	1.473	0.7	4.7	O K
4320 min Winter	4.848	0.948	0.5	3.0	O K
5760 min Winter	4.540	0.640	0.4	2.0	O K
7200 min Winter	4.337	0.437	0.3	1.4	O K
8640 min Winter	4.193	0.293	0.3	0.9	O K
10080 min Winter	4.085	0.185	0.3	0.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)		
30 min Winter	83.789	0.0	32		
60 min Winter	53.779	0.0	60		
120 min Winter	33.337	0.0	118		
180 min Winter	24.832	0.0	170		
240 min Winter	20.006	0.0	194		
360 min Winter	14.706	0.0	270		
480 min Winter	11.818	0.0	346		
600 min Winter	9.966	0.0	420		
720 min Winter	8.665	0.0	492		
960 min Winter	6.943	0.0	626		
1440 min Winter	5.071	0.0	866		
2160 min Winter	3.696	0.0	1208		
2880 min Winter	2.949	0.0	1584		
4320 min Winter	2.142	0.0	2292		
5760 min Winter	1.705	0.0	3008		
7200 min Winter	1.427	0.0	3744		
8640 min Winter	1.235	0.0	4488		
10080 min Winter	1.093	0.0	5152		
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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. to Soakaway	
Date 05/12/2017	Designed by SD Checked by MN	
XP Solutions		Source Control 2017.1

Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.043

Time (mins)	Area
From:	To: (ha)
0	4 0.043

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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. to Soakaway	
Date 05/12/2017	Designed by SD Checked by MN	
XP Solutions		Source Control 2017.1

Model Details

Storage is Online Cover Level (m) 6.600

Complex Structure

Lined Soakaway

Infiltration Coefficient Base (m/hr) 0.22500	Ring Diameter (m) 1.50
Infiltration Coefficient Side (m/hr) 0.22500	Pit Multiplier 1.7
Safety Factor 2.0	Number Required 1
Porosity 0.30	Cap Volume Depth (m) 0.000
Invert Level (m) 3.900	Cap Infiltration Depth (m) 0.000

Porous Car Park

Infiltration Coefficient Base (m/hr) 0.00000	Width (m) 18.5
Membrane Percolation (mm/hr) 1000	Length (m) 18.5
Max Percolation (l/s) 95.1	Slope (1:X) 0.0
Safety Factor 2.0	Depression Storage (mm) 5
Porosity 0.30	Evaporation (mm/day) 3
Invert Level (m) 6.100	Membrane Depth (m) 150

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Science Park Square Brighton East Sussex			3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. (Total Imp. Area)				
Date 05/12/2017			Designed by SD Checked by MN				
XP Solutions			Source Control 2017.1				
<u>Summary of Results for 100 year Return Period (+40%)</u> Half Drain Time : 459 minutes.							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
15 min Summer	6.225	0.125	0.0	0.5	0.5	12.9	O K
30 min Summer	6.272	0.172	0.0	0.6	0.6	17.6	O K
60 min Summer	6.319	0.219	0.0	0.6	0.6	22.5	O K
120 min Summer	6.362	0.262	0.0	0.7	0.7	26.9	O K
180 min Summer	6.381	0.281	0.0	0.7	0.7	28.9	O K
240 min Summer	6.389	0.289	0.0	0.7	0.7	29.7	O K
360 min Summer	6.393	0.293	0.0	0.7	0.7	30.0	O K
480 min Summer	6.392	0.292	0.0	0.7	0.7	30.0	O K
600 min Summer	6.389	0.289	0.0	0.7	0.7	29.7	O K
720 min Summer	6.385	0.285	0.0	0.7	0.7	29.3	O K
960 min Summer	6.375	0.275	0.0	0.7	0.7	28.3	O K
1440 min Summer	6.354	0.254	0.0	0.6	0.6	26.1	O K
2160 min Summer	6.326	0.226	0.0	0.6	0.6	23.2	O K
2880 min Summer	6.300	0.200	0.0	0.6	0.6	20.5	O K
4320 min Summer	6.256	0.156	0.0	0.5	0.5	16.1	O K
5760 min Summer	6.222	0.122	0.0	0.5	0.5	12.5	O K
7200 min Summer	6.194	0.094	0.0	0.5	0.5	9.7	O K
8640 min Summer	6.172	0.072	0.0	0.4	0.4	7.4	O K
10080 min Summer	6.154	0.054	0.0	0.4	0.4	5.6	O K
15 min Winter	6.243	0.143	0.0	0.5	0.5	14.6	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
15 min Summer	124.633	0.0	13.2	19			
30 min Summer	83.789	0.0	18.3	33			
60 min Summer	53.779	0.0	24.0	62			
120 min Summer	33.337	0.0	30.1	122			
180 min Summer	24.832	0.0	33.9	182			
240 min Summer	20.006	0.0	36.5	240			
360 min Summer	14.706	0.0	40.3	338			
480 min Summer	11.818	0.0	43.3	394			
600 min Summer	9.966	0.0	45.6	456			
720 min Summer	8.665	0.0	47.6	520			
960 min Summer	6.943	0.0	50.9	656			
1440 min Summer	5.071	0.0	55.6	936			
2160 min Summer	3.696	0.0	60.6	1344			
2880 min Summer	2.949	0.0	64.1	1732			
4320 min Summer	2.142	0.0	69.2	2508			
5760 min Summer	1.705	0.0	72.7	3240			
7200 min Summer	1.427	0.0	75.3	3968			
8640 min Summer	1.235	0.0	77.5	4680			
10080 min Summer	1.093	0.0	79.2	5440			
15 min Winter	124.633	0.0	15.0	19			
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Science Park Square Brighton East Sussex			3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. (Total Imp. Area)				
Date 05/12/2017			Designed by SD Checked by MN				
XP Solutions			Source Control 2017.1				
<u>Summary of Results for 100 year Return Period (+40%)</u>							
Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Control (l/s)	Max Outflow (l/s)	Max Volume (m³)	Status
30 min Winter	6.295	0.195	0.0	0.6	0.6	20.0	O K
60 min Winter	6.349	0.249	0.0	0.6	0.6	25.5	O K
120 min Winter	6.399	0.299	0.0	0.7	0.7	30.7	O K
180 min Winter	6.422	0.322	0.0	0.7	0.7	33.0	O K
240 min Winter	6.433	0.333	0.0	0.7	0.7	34.1	O K
360 min Winter	6.440	0.340	0.0	0.7	0.7	34.9	O K
480 min Winter	6.438	0.338	0.0	0.7	0.7	34.7	O K
600 min Winter	6.434	0.334	0.0	0.7	0.7	34.3	O K
720 min Winter	6.430	0.330	0.0	0.7	0.7	33.9	O K
960 min Winter	6.417	0.317	0.0	0.7	0.7	32.6	O K
1440 min Winter	6.386	0.286	0.0	0.7	0.7	29.3	O K
2160 min Winter	6.343	0.243	0.0	0.6	0.6	25.0	O K
2880 min Winter	6.306	0.206	0.0	0.6	0.6	21.1	O K
4320 min Winter	6.245	0.145	0.0	0.5	0.5	14.9	O K
5760 min Winter	6.200	0.100	0.0	0.5	0.5	10.2	O K
7200 min Winter	6.166	0.066	0.0	0.4	0.4	6.8	O K
8640 min Winter	6.141	0.041	0.0	0.4	0.4	4.2	O K
10080 min Winter	6.122	0.022	0.0	0.4	0.4	2.2	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)			
30 min Winter	83.789	0.0	20.7	33			
60 min Winter	53.779	0.0	27.1	62			
120 min Winter	33.337	0.0	34.0	120			
180 min Winter	24.832	0.0	38.2	178			
240 min Winter	20.006	0.0	41.1	234			
360 min Winter	14.796	0.0	45.4	344			
480 min Winter	11.818	0.0	48.7	446			
600 min Winter	9.966	0.0	51.4	478			
720 min Winter	8.665	0.0	53.6	554			
960 min Winter	6.943	0.0	57.3	710			
1440 min Winter	5.071	0.0	62.6	1010			
2160 min Winter	3.696	0.0	68.2	1448			
2880 min Winter	2.949	0.0	72.3	1848			
4320 min Winter	2.142	0.0	78.0	2640			
5760 min Winter	1.705	0.0	82.2	3400			
7200 min Winter	1.427	0.0	85.2	4112			
8640 min Winter	1.235	0.0	87.7	4840			
10080 min Winter	1.093	0.0	89.9	5544			
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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. (Total Imp. Area)	
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Rainfall Details

Rainfall Model	FSR	Winter Storms	Yes
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	19.000	Shortest Storm (mins)	15
Ratio R	0.350	Longest Storm (mins)	10080
Summer Storms	Yes	Climate Change %	+40

Time Area Diagram

Total Area (ha) 0.064

Time (mins)	Area
From:	To: (ha)
0	4 0.064

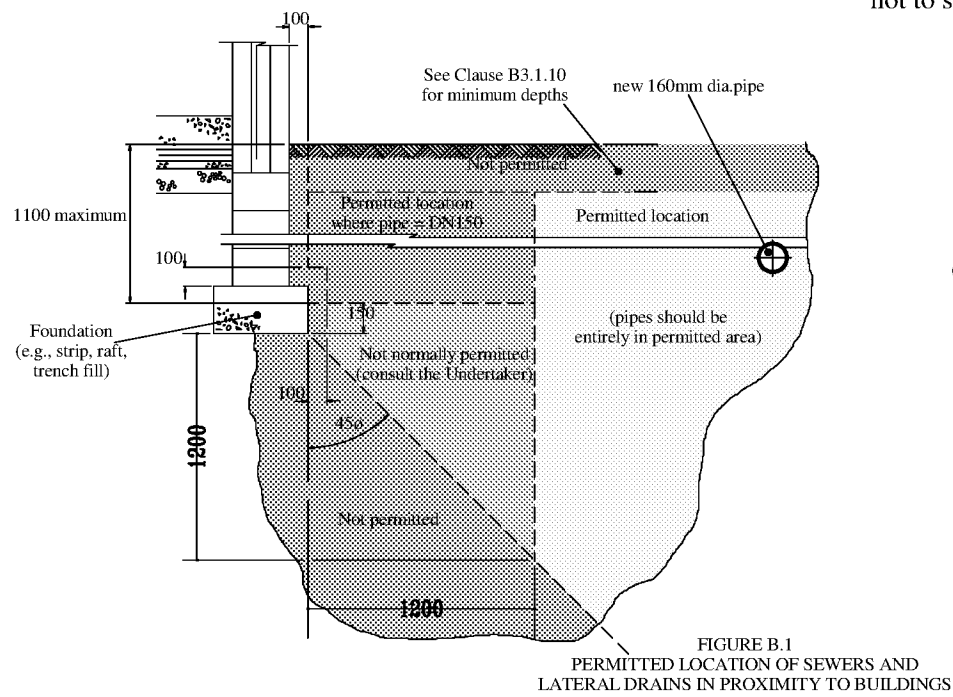
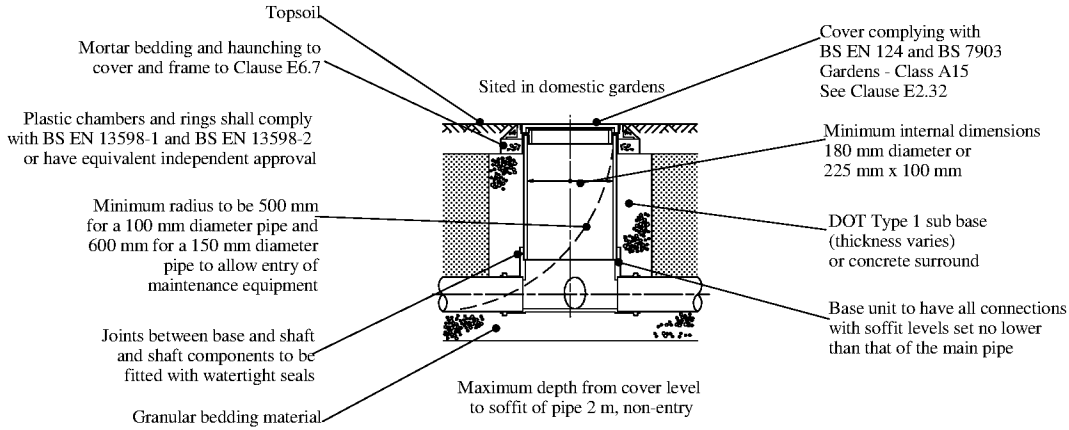
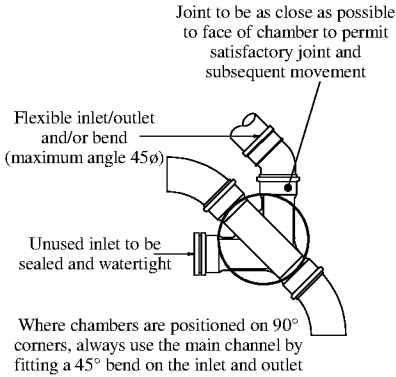
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Science Park Square Brighton East Sussex	3611_SaltEarth_WestSussex Salt Earth Ltd SuDS P.P. (Total Imp. Area)																									
Date 05/12/2017	Designed by SD Checked by MN																									
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<u>Model Details</u> Storage is Online Cover Level (m) 6.600 <u>Porous Car Park Structure</u> <table style="width: 100%; border: none;"> <tr> <td style="width: 33%;">Infiltration Coefficient Base (m/hr)</td> <td style="width: 33%;">0.00000</td> <td style="width: 33%;">Width (m)</td> <td style="width: 33%;">18.5</td> </tr> <tr> <td>Membrane Percolation (mm/hr)</td> <td>1000</td> <td>Length (m)</td> <td>18.5</td> </tr> <tr> <td>Max Percolation (l/s)</td> <td>95.1</td> <td>Slope (1:X)</td> <td>0.0</td> </tr> <tr> <td>Safety Factor</td> <td>2.0</td> <td>Depression Storage (mm)</td> <td>5</td> </tr> <tr> <td>Porosity</td> <td>0.30</td> <td>Evaporation (mm/day)</td> <td>3</td> </tr> <tr> <td>Invert Level (m)</td> <td>6.100</td> <td>Membrane Depth (m)</td> <td>150</td> </tr> </table> <u>Orifice Outflow Control</u> Diameter (m) 0.023 Discharge Coefficient 0.600 Invert Level (m) 6.000			Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	18.5	Membrane Percolation (mm/hr)	1000	Length (m)	18.5	Max Percolation (l/s)	95.1	Slope (1:X)	0.0	Safety Factor	2.0	Depression Storage (mm)	5	Porosity	0.30	Evaporation (mm/day)	3	Invert Level (m)	6.100	Membrane Depth (m)	150
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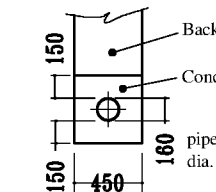
3. Provided Site Plan (Drg. No. 2017/1/12)

Foul Manhole Schedule

M/hole No.	Cover LVL (m)	Invert LVL (m)		Depth (m)		Max. Pipe (mm)	MH Type
		Proposed	Existing	Proposed	Existing		
1	6.80		6.42		.377	160	Existing
2	6.87	6.24		.630		160	New
3	6.66		6.00		.660	160	Existing
4	6.87	6.23		.640		110	New
5	6.87	6.34		.530		110	New
6	6.87	6.28		.590		110	New
7	6.87	6.35		.520		110	New



Class "Z" Bedding



PERMEABLE BRICK PAVIORS (shaded yellow)

Area between plots 2&3	88.85m²
Access, drive & turning area	399.76m²
Parking areas	69.12m²
Total	457.73m²

laid in accordance with manufacturers details on 350mm base layer of 350mm depth of coarse aggregate

PAVING AREAS

Front paths	40.80m²
Side Paths	20.04m²
Pavies & shed bases	57.88m²
Total	88.72m²

all paving in Indian sandstone laid on 200mm depth of clean type 1 mot granular base material with edge restraints to resist the lateral displacement of the sub base slabs bedded on sharp sand/cement base and laid to falls to discharge surface water to surrounding lawn areas

- SOAKAWAYS
- 3 No. soakaways to front of site to be formed with:
 - 2 No. 1500mm diameter concrete rings
 - 1200mm high (total depth 2.4 metres) with 500mm thickness of clean reject stone backfill and geotext woven fabric (Terram)
 - 2 No. soakaways to rear gardens to be 1800mm diameter with same details as above

6.90				
6.80	Manhole No.1			manhole No.2
6.70	existing brick built			new brick built
6.60	380mm cover to invert			inspection chamber
6.50				cover to invert 630mm
6.40				
6.30				
6.20				
6.10				
6.00				
5.90				
Typical schematic section details of diverted pipe run				
total pipe run 42 metres with total fall of 420mm between manholes 1 & 3 giving gradient of 1:100				
chainage linear m	0	new pipe run 18m between manholes	18m	new pipe run 24m between manholes
ground level mAOD	6.80		6.87	6.66
existing sewer invert mAOD	6.42			6.00
proposed sewer invert mAOD			6.24	
proposed pipe size	160mm diameter Rehau Awadukt pp SN10 Rausisto heavy duty drainage system with pipe material capable of withstanding 4000 psi			
proposed pipe strength				
bedding class	class "S" bedding		class "S" bedding	

Ground conditions on the site comprise Topsoil over river terrace deposits (soft to firm silty sandy clays) over upper chalk. The river terrace deposits were found at 0.2m to 0.3m below ground level and comprised variable layers of silty clays, clayey silts and banded silty sands. Boreholes extended to 2.3m below ground level and did not penetrate the upper chalk.

No ground water was found during the investigations in late November 2015 but subsequent ground water monitoring has shown levels rising to 6.50m below ground level in January 2016. All four groundwater monitoring points have shown consistent groundwater level change.

The storm water drainage design is based on percolation tests carried out to BRE365 in two shallow test holes in November 2015. The tests carried out in the deep boreholes have been discounted due to the subsequent high groundwater readings. Soil infiltration rates between 3.72E-5m/s and 6.25E-5m/s were obtained. The lowest value has been used for the surface water drainage design.

Permeable concrete block paving is proposed for the parking and turning areas of the entrance drive these areas will collect all of the surface water and distribute it within the permeable paving to the soakaway in the centre of the site behind the front boundary with an overflow discharging into the channel drain running along the side of the road

The 2 soakaways either side of the turning area at the front of the site under the parking areas will take the storm water from the rain water downpipes at the front of the houses with the rear downpipes discharging into the soakaways in the rear garden paviors between the houses.

All block paving works to be completed in accordance with BS 7533-13:2009 guide for the Design of permeable concrete paving blocks using a type "A" full infiltration system and the SUDS manual published by CIRIA.

concrete block paving laid with open joints with 2-4mm clean crushed stone grit brushed over the surface and into the joints bedded on 50mm of 6mm clean crushed stone open graded with no fines and a 350mm sub base formed with 10/20 clean crushed stone type 3 material for storage with edge restraints to resist the lateral displacement of the sub base.

Do not scale from this drawing, use figured dimensions only

All levels are given in metres above Ordnance Datum (mAOD)

All dimensions are given in metres

The design and details of the proposed works are to be in compliance with Sewers for Adoption (7th edition)

Any Sections of sewer to be abandoned are to be removed from ground not grouted up

Easements are not required where the gravity sewer is less than 300mm diameter and less than 3 metres deep or in the public highway

The manhole details shown on the drawing are a typical manhole for this project and have been selected after reference to the document "Sewers for Adoption" to establish the correct manhole details for the diversion or alterations shown

Class Z bedding to be identified when cover depth is not achievable as per the standards

Soakaways to be a minimum of 5 metres away from the proposed sewers

All dimensions to be checked on site prior to commencement of works or preparing workshop drawings and calculating quantities of materials for ordering.

Any construction work carried out prior to receiving all necessary approval for planning and/or building regulations is entirely at the Contractors/Clients risk.

All building work to be completed to the satisfaction of the Local Authority Building Control Officer and in accordance with the current Building Regulations and as such additional unforeseen building works may be required on site.

It will be the Contractors & Clients responsibility to ensure that all materials and works are fully compliant with the requirements of the relevant Planning & building regulation Approvals

The Contractor shall inspect all adjoining properties which may be affected by the works prior to commencement of works and record and report with the owner any defects.

The Contractor shall be entirely responsible for the security, strength and stability of the building during the course of the works.

This drawing must not be used for construction or installation purposes unless expressly stated.

This Drawing has been produced for the purpose of obtaining Planning and Building Regulation approvals only and as such does not constitute a full working drawing to be used for construction purposes unless agreed in writing.

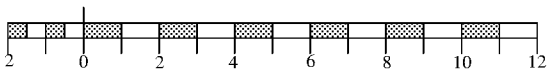
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Structural Engineers calculations and construction notes to take precedence over notes on drawings where variations occur.

Foul and Surface Water Drainage Layout

(for S185 Sewer Diversion Submission)

Scale 1:200 @ A2



re
Proposed Development

on site at

Nos. 1 - 4 Holm Oaks
Burndell Road
Yapton
Arundel
West Sussex BN18 0HR

for

Salt Earth Ltd

Drg. No. 2017/1/12

1/12/2017



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