ENGINEERING CONSULTANCY 49

Foul and Surface Water Drainage Strategy

Project:

Proposed Residential Development on land off Malthouse Lane, Burgess Hill, BN6 9LA

On behalf of:

Cells4Life LLP.

EC49-25-20-01

18 MONTROSE AVENUE DARTON BARNSLEY SOUTH YORKSHIRE S75 5LS

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Version	Written By	Checked By	Date
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APPENDICES

1.0 INTRODUCTION

1.1 EC49 has been commissioned Cells4Life LLP to undertake a domestic foul and surface water Drainage Strategy for the proposed development of seven dwellings on land off Malthouse Lane, Burgess Hill, BN6 9LA.

2.0 PROPOSED DEVELOPMENT

2.1 The proposed development comprises 3No. 4-bedroom detached dwellings and 4No. 3bedroom semi-detached dwellings arranged around a common vehicular access from Malthouse Lane.

3.0 ECO-90 PROPRIETARY VERTICAL DRAINAGE SYSTEM

3.1 The proprietary ECO-90 devices from Groundwater Dynamics are effective at providing a “discharge to ground” solution on sites with soil properties that would normally preclude the use of infiltration. The mechanics of the solution involve the devices redistributing the void formed for installation of the device into a series of micro-fissures radiating from the device out into the natural soils.

3.2 These micro-fissures give a huge increase in the infiltration interface available to discharge water to ground through. This, coupled with the increased water pressure generated by the void space within the device, creates “push” into the natural soils, overcoming the resistance of the capillary action often found in such soils.

3.3 The test drilling exercise undertaken on each site considered for installation of ECO-90 requires drilling of micro-boreholes of depths varying from 1m to 20m depending upon the expected and discovered ground conditions. It is normal for groups of up to 4 micro-boreholes to be drilled as a single “Test Drill” exercise and for multiple test drilling exercises to be undertaken on a site to try to obtain a representative sample of infiltration rates at various depths. It should be noted that the installed ECO-90 devices need a period of time and a number of wetting/drying cycles to form the micro-fissures that provide the improvement to the infiltration into the soils. The wetting/drying cycles are provided by natural weather patterns. This process is referred to as maturation of the system.

3.4 Being a proprietary product, no defined test regime that would give meaningful results was available but the renowned and widely understood BRE365 test is often quoted, referred to, or required by Regulatory Authorities as a benchmark for understanding the natural permeability of the soils present on a site.

3.5 Whilst the BRE365 test is normally undertaken in relatively shallow, open excavations of roughly rectangular shape to facilitate definition of the void volume and surface area, the calculations based on the collected data comprise an interpretation of a falling head test into soils of unknown or undefined properties.

3.6 The BRE 365 test procedure makes use of the principle of creating a void in the site, filling it with water and timing/recording the rate of water drop in the void. This is then compared with the surface area of the void, with some estimations and assumptions, to arrive at an infiltration rate that can be used to define a void of differing proportions – but generally a similar depth – to determine a void that can be proven, via the results of the BRE 365 calculation, to be sufficient to promote the infiltration of water into the ground so as to drain a volume, storm event or defined area within a specified or calculated timeframe.

3.7 The calculations used in the design of an ECO-90 drainage system are based on the BRE 365 calculations with adjustments made for the shape of the void formed and the change in water level rather than the complete emptying of the void. Whilst this means that an infiltration rate can be calculated for any set of results, it does not mean that these infiltration rates are always taken forward as the basis of an ECO-90 design. Criteria such as minimum change in water level and whether groundwater (perched or otherwise) was struck during the test drill are taken into account to ensure that the design of the system presented to Clients and Regulatory Authorities is appropriate in terms of scale can reasonably be expected to drain the development.

3.8 As the site testing is of natural soils, the results and calculations reflect the performance of a newly installed system prior to the maturing process taking place. This means that the system is expected to work to the specified parameters upon installation and that its performance (in terms of discharging water to ground) can be expected to improve, over time, as the maturation process progresses.

4.0 METHODOLOGY

4.1 The infiltration rate calculated from the supplied result has been used to generate an ECO-90 “cluster” design with an associated infiltration rate for comparison with the rainfall data for the Malthouse Lane, Burgess Hill, BN6 9LA area.

4.2 The calculated infiltration rates per cluster design have been used in conjunction with the simulation capabilities of Micro Drainage to establish the volume of storage required to attenuate a range of storm events. By balancing the inflow (rainfall) and outflow (infiltration to ground) with the impermeable area and the available space on the site, a system of micro boreholes and associated attenuation facilities has been designed.

4.3 A “cluster” of ECO-90 is determined by iteration to arrive at a solution that limits the installation of ECO-90 whilst ensuring accounting for constraints such as depth to groundwater on site. The cluster make up is generated from the calculated infiltration rates to establish an equivalent square metre rate to use for the Micro Drainage simulations. This allows the calculation to be scalable which assists the iteration of the design.

4.4 The output of the Micro Drainage simulations shows the maximum volume of attenuation required for the impermeable area considered and the proposed ECO-90 installation. The volume of attenuation can be provided in any practical way as long as it is located directly adjacent (over or alongside) the ECO-90 installation.

5.0 RESULTS

5.1 The calculations in Appendix B show how the site testing results have been converted to infiltration rates and then to a cluster design.

5.2 The Micro Drainage results in Appendix D show the system parameters required to discharge the storm events of 100-year return period with an additional 45% allowance for climate change to ensure that the proposed system can be expected to discharge the critical 100-year storm event within 24 hours. The proposed infiltration array has been designed to drain an impermeable area of 1,840 square metres.

5.3 The proposed ECO-90 and attenuation system has been assessed against the anticipated rainfall for storm events of 100-year return period (storms ranging from 15 minutes to 7 days duration) with 45% allowance for climate change to ensure the half drain time of the system meets the 24-hour requirement.

5.4 The required storage volume has been calculated by reducing the total volume required by the volume of storage provided in the micro boreholes, as shown in Appendix D.

6.0 PROPOSED SURFACE WATER DRAINAGE

6.1 The proposed development will create some 1,840 square metres of roofed/paved area to be positively drained. This impermeable area more fully quantified in Appendix D and on Drawing EC49-25-20-E-02 contained in Appendix E.

Following the hierarchy of discharge contained in the NPPF:-

Discharge to ground:

The limited extent of the site means that no part of it will be 5m from existing /proposed buildings and 5m from the site boundary, so there is insufficient space to construct soakaway facilities that would comply with Building Regulations. The site is understood to be remote from the public sewer network. In situ testing of the natural soils on site has shown that they are of low permeability. In the absence of public sewers or watercourses, proprietary ECO-90 devices are proposed to be employed to support the use of infiltration to ground for both domestic foul and surface water.

Discharge to Watercourse

There is no watercourse available to discharge collected surface water to.

Discharge to surface water sewer

This option has been discounted as the site is understood to be remote from the public sewer networks.

Discharge to combined sewer

This option has been discounted as there are no public sewers in the vicinity of the site.

7.0 PROPOSED SURFACE WATER DESIGN

7.1 Falling head testing of the infiltration capacity of the natural soils on site was undertaken by Groundwater Dynamics in 2020 The results of this testing have been used as a basis for the discharge of collected surface waters and treated domestic foul effluent. The results of the falling heads tests have been converted to infiltration rates for use with ECO-90 devices for design of the various installations required to drain the site.

8.0 PROPOSED FOUL WATER DESIGN

8.1 It is proposed that each of the dwellings will have its own package treatment plant to provide primary treatment of domestic foul effluent from the property. These plants have been sized in accordance with the guidance in Flows and Loads 4 published by British Water. The plant sizing is shown in the calculations in Appendix C.

8.2 The treated effluent from each of the package treatment plants will then pass along a secondary treatment trench sized in accordance with BS6297 before reaching an area containing ECO-90 devices to promote the infiltration of the treated effluent to ground. The ECO-90 arrays for each treatment trench have been based upon the infiltration rates tested in closest proximity to each of the proposed installations.

9.0 SUSTAINABLE DRAINAGE ASSESSMENT

9.1 In accordance with best practice, the surface water collection system is proposed to make use of sustainable drainage features to remove anticipated levels of pollutants from the collected surface waters and improve the quality of the water prior to discharging it from the site to the wider water environment.

9.2 An assessment of the surface water collection system has been undertaken in accordance with the Simple Index Approach described in Ciria C753 The SuDS Manual. The assessment has taken Pollution Hazard Indices from Table 26.2 of C753, and SuDS mitigation indices from Table 26.3 of C753.

Pollution Hazard Indices

Modern drainage designs should be assessed using the Simple Index Approach, or similar, as described in the SuDS manual (Published by Ciria ref. C753). Whilst the simple index approach is an excellent tool for assessing drainage designs comprising traditional and standard drainage elements, the system proposed in this instance utilises modern and proprietary items. The appropriate pollution hazard indices are given in the table below.

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	Very Low	0.2	0.2	0.05
Residential Car Parks	Low	0.5	0.4	0.4

SuDS Mitigation Indices

The system is proposing to discharge collected surface water to the ground on site. The proposed surface water collection system will drain runoff from roof areas and vehicular hard standings.

9.3 The new vehicular access and car parking spaces are proposed to be constructed using a permeable pavement system that will collect the rain falling on these areas. The collected rainfall will percolate through the permeable pavement construction (including a layer of Inbitex geomembrane to capture and treat hydrocarbons in the runoff) and be collected in a perforated pipe laid in the base of the construction. The perforated pipe will convey the collected rainfall to the soakaway where it will discharge to ground. In severe storm events, the soakaway will fill, and the perforated pipe will surcharge. This will result in the base of the permeable pavement being used as an infiltration interface to discharge the additional runoff associated with the more severe rainfall events. The system has been designed to accommodate the runoff anticipated from 100-year return period storm events, with an additional 45% allowance for climate change.

9.4 The dwelling roof areas will be collected via gutters and downpipes in the traditional manner. The below ground conveyance from the RWP's will be via perforated pipes in gravel filter beds to allow pollution and contamination in the runoff to be filtered through the gravel prior to the runoff being discharged to ground via the soakaway.

The SuDS mitigation indices for the treatment train described above, in accordance with Table 26.3 of C753 the SuDS Manual are as shown in the table below.

SuDS Mitigation	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable pavement construction	0.7	0.6	0.7
Filter drain	0.4	0.4	0.4

9.5 In each instance, the mitigation indices exceed the pollution hazard indices. The anticipated levels of pollution are therefore deemed to be sufficiently mitigated by the proposed drainage network.

Appendices

Appendix A

DESIGN NOTES

1. STORAGE DESIGN BASED ON 1 IN 100 YR STORM + 40%.

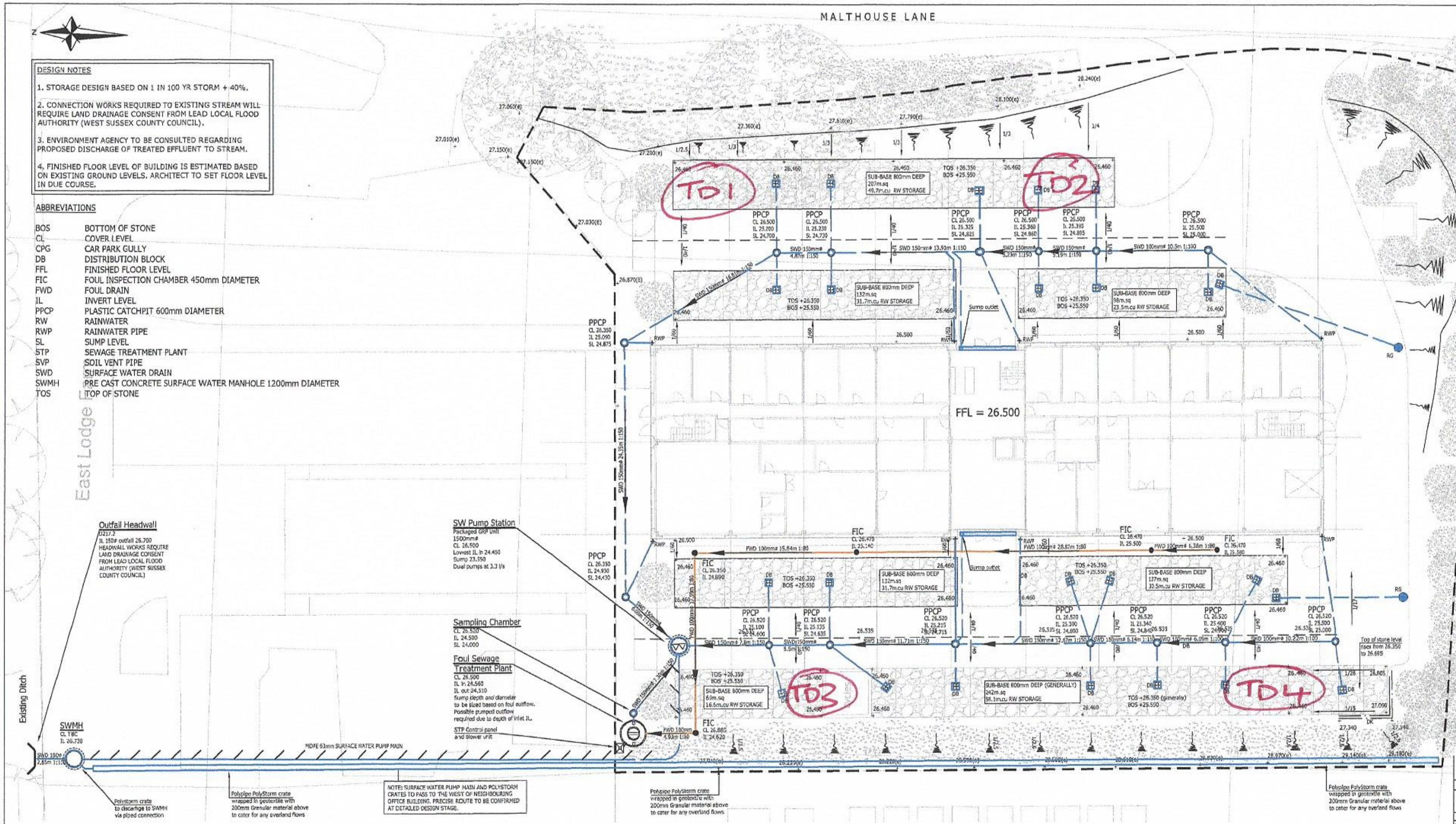
2. CONNECTION WORKS REQUIRED TO EXISTING STREAM WILL REQUIRE LAND DRAINAGE CONSENT FROM LEAD LOCAL FLOOD AUTHORITY (WEST SUSSEX COUNTY COUNCIL).

3. ENVIRONMENT AGENCY TO BE CONSULTED REGARDING PROPOSED DISCHARGE OF TREATED EFFLUENT TO STREAM.

4. FINISHED FLOOR LEVEL OF BUILDING IS ESTIMATED BASED ON EXISTING GROUND LEVELS. ARCHITECT TO SET FLOOR LEVEL IN DUE COURSE.

ABBREVIATIONS

BOS	BOTTOM OF STONE
CL	COVER LEVEL
CPG	CAR PARK GULLY
DB	DISTRIBUTION BLOCK
FFL	FINISHED FLOOR LEVEL
FIC	FOUL INSPECTION CHAMBER 450mm DIAMETER
FWD	FOUL DRAIN
IL	INVERT LEVEL
PPCP	PLASTIC CATCHPIT 600mm DIAMETER
RW	RAINWATER
RWP	RAINWATER PIPE
SL	SUMP LEVEL
STP	SEWAGE TREATMENT PLANT
SVP	SOIL VENT PIPE
SWD	SURFACE WATER DRAIN
SWMH	PRE CAST CONCRETE SURFACE WATER MANHOLE 1200mm DIAMETER
TOS	TOP OF STONE



GENERAL NOTES

1. The location, size, depth and identification of existing services that may be shown or referred to on this drawing have been assessed from non intrusive observations, record drawings or the like. The contractor shall safely carry out intrusive investigations, trial holes or soundings prior to commencing work to satisfy himself that it is safe to proceed and that the assessments are accurate. any discrepancies shall be notified to gta prior to works commencing.

2. Tender or billing drawings shall not be used for construction or the ordering of materials.

3. Do not scale. All dimensions and levels to be site confirmed.

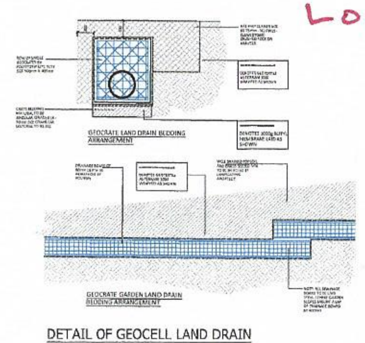
4. This drawing shall be read in conjunction with all relevent architects, consultants drawings and specifications, together with H&S plan requirements.

5. Copyright : This drawing must not be copied, amended nor reproduced without the prior written agreement of gta.

6. All drawings specifications and recommendations made by gta are subject to Local Authority and other relevant Statutory Authorities approval. Any works or services made abortive due to the client proceeding prior to these approvals is considered wholly at the Clients risk. gta hold no responsibility for resulting abortive works or costs.

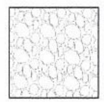
LEGEND

- Surface water drain
- RWP — Rainwater pipe
- PPCP — Plastic Catchpit 600mm diameter
- SWMH — Surface water manhole, pre-cast concrete rings 1200mm diameter
- CPG — Car park gully
- DB — Distribution block
- Surface water pump main
- Surface water drainage channel
- Foul drain
- SVP — Soil vent pipe
- FIC — Foul inspection chamber, plastic 450mm diameter
- Site boundary
- +26,460 — Proposed ground level
- +26,460(e) — Existing ground level



DETAIL OF GEOCELL LAND DRAIN

GWD TEST DRILLING LOCATIONS 18th/19th MAY '20



PERMEABLE SURFACING

Total area = 1,008m.sq
241.8m.cu rainwater storage available under +26.350
Sub-base storage sized for the 1 in 100 + 40% event
Sub-base depth 800mm

Rev	Amendments	Date	Dsn	Chk
B	REVISED TO LATEST SITE PLAN.	09.10.2018	JR	MR
A	LOCATION OF DITCH CONNECTION AND PUMP ROUTE AMENDED. LAND DRAIN ADDED.	22.06.2018	JR	MR
-	INITIAL ISSUE	11.06.2018	JR	MR

Status: PLANNING

Client: C4L PROPERTY SERVICES LLP

Architect: START TO FINISH

Project: EAST LODGE FARM MALTHOUSE LANE, HURSTPIERPOINT

Title: SITE DRAINAGE STRATEGY

Date: JUNE 2018	Scale @ A1: 1:200
Clients Ref:	Project Ref: 7428

gtaCivils Consulting Engineers
Gloucester House, 66a Church Walk, Burgess Hill, West Sussex, RH15 9AS
Tel.01444 871444 Fax.01444 871401 Web: www.gtacivils.co.uk

Drawing Number: 7428/101 Rev: B

Infiltration Test Drilling	Location	East Lodge Farm	Date	18/05/2020
Area	1	Augers		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	10	25	100	700
2	25	30	190	1000
3	35	35	320	1150
4	45	35	410	1320
5	45	40	520	1480
6	50	45	600	1520
7	55	50	710	1560
8	55	50	800	1585
9	60	55	920	1605
10	65	60	1020	1630
15	80	75	1160	1700
20	90	85	1200	1740
25	100	95	1230	1780
30	110	115	1320	1820
40	130	135	1410	1860
50	145	150	1480	1900
60	160	165	1550	1940

Max - Min	Max - Min	150	140	1450	1240	mm
Max - Min * 0.25	25%	37.5	35	362.5	310	mm
Max - Min * 0.75	75%	112.5	105	1087.5	930	mm
75% - 25%	Delta Z	75	70	725	620	mm
water drop per minute		2.44	2.55	51.93	78.18	mm/min
Time taken to 25	t25%	5.5	10	4.48	2.07	min
Time taken to 75	t75%	36.25	37.5	18.44	10	min
	t75-25	30.75	27.5	13.96	7.93	min
wetted area =pi D x delta Z						
		3.9564E-01	8.1224E-01	1.4469E+00	2.9861E+00	sq.m
	discharge vol	4.6659E-04	4.3548E-04	4.5103E-03	3.8571E-03	cu.m
	dis per min	1.5174E-05	1.5836E-05	3.2309E-04	4.8639E-04	cu.m
	dis per hr	9.1041E-04	9.5014E-04	1.9385E-02	2.9184E-02	cu.m
	infil rate	**2.3011E-03**	**1.1698E-03**	**1.3397E-02**	**9.7730E-03**	**m/hr**
BH infil rate						
Surface Area		0.4236	0.8473	1.6946	3.3892	sq.m
infiltration rate per bh		9.748590E-04	9.911315E-04	2.270306E-02	3.312221E-02	**m/hr**

Area 1 Infiltration Rate Calculation

Infiltration Test Drilling	Location	East Lodge Farm	Date	18/05/2020
Area	2	Augers		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	20	20	40	840
2	30	40	60	1250
3	35	50	75	1830
4	35	60	85	2150
5	45	65	100	2340
6	50	75	110	2430
7	55	85	120	2530
8	60	90	135	2620
9	60	100	145	2700
10	70	110	155	2800
15	85	125	170	2910
20	100	140	190	3050
25	110	150	215	3190
30	120	170	235	3310
40	135	185	255	3490
50	150	195	270	3680
60	160	210	290	3790

Max - Min	Max - Min	140	190	250	2950	mm
Max - Min * 0.25	25%	35	47.5	62.5	737.5	mm
Max - Min * 0.75	75%	105	142.5	187.5	2212.5	mm
75% - 25%	Delta Z	70	95	125	1475	mm
water drop per minute		2.66	5.94	5.46	85.31	mm/min
Time taken to 25	t25%	7	5.25	5.25	2.8	min
Time taken to 75	t75%	33.33	21.25	28.125	20.09	min
	t75-25	26.33	16	22.875	17.29	min
wetted area =pi D x delta Z						
		3.9424E-01	8.0665E-01	1.6315E+00	2.7079E+00	sq.m
	discharge vol	4.3548E-04	5.9101E-04	7.7764E-04	9.1762E-03	cu.m
	dis per min	1.6539E-05	3.6938E-05	3.3995E-05	5.3072E-04	cu.m
	dis per hr	9.9236E-04	2.2163E-03	2.0397E-03	3.1843E-02	cu.m
	infil rate	**2.5172E-03**	**2.7475E-03**	**1.2502E-03**	**1.1759E-02**	**m/hr**
BH infil rate						
Surface Area		0.4236	0.8473	1.6946	3.3892	sq.m
infiltration rate per bh		1.066375E-03	2.327930E-03	2.118606E-03	3.985378E-02	**m/hr**

Area 2 Infiltration Rate Calculation

Infiltration Test Drilling	Location	East Lodge Farm	Date	19/05/2020
Area	3	Augers		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	5	10	10	5
2	5	15	10	10
3	10	20	10	15
4	10	20	20	15
5	15	25	20	20
6	15	25	20	20
7	15	25	30	25
8	20	30	30	25
9	20	30	35	30
10	20	35	40	30
15	25	35	40	30
20	30	35	45	35
25	35	40	50	35
30	35	45	55	45
40	40	55	60	55
50	45	65	65	65
60	45	80	70	75

Max - Min	Max - Min	40	70	60	70	mm
Max - Min * 0.25	25%	10	17.5	15	17.5	mm
Max - Min * 0.75	75%	30	52.5	45	52.5	mm
75% - 25%	Delta Z	20	35	30	35	mm
water drop per minute		1	0.875	1.28	0.97	mm/min
Time taken to 25	t25%	5	7.5	6.5	6.5	min
Time taken to 75	t75%	25	47.5	30	42.5	min
	t75-25	20	40	23.5	36	min
wetted area =pi D x delta Z						
		4.1241E-01	8.2622E-01	1.6664E+00	3.3440E+00	sq.m
	discharge vol	1.2442E-04	2.1774E-04	1.8663E-04	2.1774E-04	cu.m
	dis per min	6.2211E-06	5.4435E-06	7.9419E-06	6.0483E-06	cu.m
	dis per hr	3.7327E-04	3.2661E-04	4.7651E-04	3.6290E-04	cu.m
	infil rate	**9.0508E-04**	**3.9530E-04**	**2.8595E-04**	**1.0852E-04**	**m/hr**
	BH infil rate					
Surface Area		0.4236	0.8473	1.6946	3.3892	sq.m
infiltration rate per bh		0.000383	0.000335	0.000485	0.000368	**m/hr**

Area 3 Infiltration Rate Calculation

Infiltration Test Drilling	Location	East Lodge Farm	Date	19/05/2020
Area	4	**Augers**		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	No movement	No movement	No movement	200
2				400
3				610
4				790
5				1020
6				1230
7				1450
8				1680
9				1890
10				2050
15				2190
20				2330
25				2380
30				2450
40				2560
50				2600
60				2630

Max - Min	Max - Min	2430	mm
Max - Min * 0.25	25%	607.5	mm
Max - Min * 0.75	75%	1822.5	mm
75% - 25%	Delta Z	1215	mm
water drop per minute		210.9375	mm/min
Time taken to 25	t25%	4.07	min
Time taken to 75	t75%	9.83	min
	t75-25	5.76	min
wetted area =pi D x delta Z			
		2.9596E+00	sq.m
	discharge vol	7.5587E-03	cu.m
	dis per min	1.3123E-03	cu.m
	dis per hr	7.8736E-02	cu.m
	infil rate	**2.6604E-02**	**m/hr**
	BH infil rate		
Surface Area		3.3892	sq.m
infiltration rate per bh		0.090164	**m/hr**

Area 4 Infiltration Rate Calculation

Appendix B

Infiltration Test Drilling	Location	East Lodge Farm	Date	18/05/2020
Area	1	**Augers**		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	10	25	100	700
2	25	30	190	1000
3	35	35	320	1150
4	45	35	410	1320
5	45	40	520	1480
6	50	45	600	1520
7	55	50	710	1560
8	55	50	800	1585
9	60	55	920	1605
10	65	60	1020	1630
15	80	75	1160	1700
20	90	85	1200	1740
25	100	95	1230	1780
30	110	115	1320	1820
40	130	135	1410	1860
50	145	150	1480	1900
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Max - Min	Max - Min	150	140	1450	1240	mm
Max - Min * 0.25	25%	37.5	35	362.5	310	mm
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Time taken to 75	t75%	36.25	37.5	18.44	10	min
	t75-25	30.75	27.5	13.96	7.93	min
wetted area =pi D x delta Z						
		3.9564E-01	8.1224E-01	1.4469E+00	2.9861E+00	sq.m
	discharge vol	4.6659E-04	4.3548E-04	4.5103E-03	3.8571E-03	cu.m
	dis per min	1.5174E-05	1.5836E-05	3.2309E-04	4.8639E-04	cu.m
	dis per hr	9.1041E-04	9.5014E-04	1.9385E-02	2.9184E-02	cu.m
	infil rate	**2.3011E-03**	**1.1698E-03**	**1.3397E-02**	**9.7730E-03**	**m/hr**
BH infil rate						
Surface Area		0.4236	0.8473	1.6946	3.3892	sq.m
infiltration rate per bh		9.748590E-04	9.911315E-04	2.270306E-02	3.312221E-02	**m/hr**

Area 1 Infiltration Rate Calculation

Infiltration Test Drilling	Location	East Lodge Farm	Date	18/05/2020
Area	2	Augers		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	20	20	40	840
2	30	40	60	1250
3	35	50	75	1830
4	35	60	85	2150
5	45	65	100	2340
6	50	75	110	2430
7	55	85	120	2530
8	60	90	135	2620
9	60	100	145	2700
10	70	110	155	2800
15	85	125	170	2910
20	100	140	190	3050
25	110	150	215	3190
30	120	170	235	3310
40	135	185	255	3490
50	150	195	270	3680
60	160	210	290	3790

Max - Min	Max - Min	140	190	250	2950	mm
Max - Min * 0.25	25%	35	47.5	62.5	737.5	mm
Max - Min * 0.75	75%	105	142.5	187.5	2212.5	mm
75% - 25%	Delta Z	70	95	125	1475	mm
water drop per minute		2.66	5.94	5.46	85.31	mm/min
Time taken to 25	t25%	7	5.25	5.25	2.8	min
Time taken to 75	t75%	33.33	21.25	28.125	20.09	min
	t75-25	26.33	16	22.875	17.29	min
wetted area =pi D x delta Z						
		3.9424E-01	8.0665E-01	1.6315E+00	2.7079E+00	sq.m
	discharge vol	4.3548E-04	5.9101E-04	7.7764E-04	9.1762E-03	cu.m
	dis per min	1.6539E-05	3.6938E-05	3.3995E-05	5.3072E-04	cu.m
	dis per hr	9.9236E-04	2.2163E-03	2.0397E-03	3.1843E-02	cu.m
	infil rate	**2.5172E-03**	**2.7475E-03**	**1.2502E-03**	**1.1759E-02**	**m/hr**
BH infil rate						
Surface Area		0.4236	0.8473	1.6946	3.3892	sq.m
infiltration rate per bh		1.066375E-03	2.327930E-03	2.118606E-03	3.985378E-02	**m/hr**

Area 2 Infiltration Rate Calculation

Infiltration Test Drilling	**Location**	**East Lodge Farm**	**Date**	**19/05/2020**
Area	3	**Augers**		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	5	10	10	5
2	5	15	10	10
3	10	20	10	15
4	10	20	20	15
5	15	25	20	20
6	15	25	20	20
7	15	25	30	25
8	20	30	30	25
9	20	30	35	30
10	20	35	40	30
15	25	35	40	30
20	30	35	45	35
25	35	40	50	35
30	35	45	55	45
40	40	55	60	55
50	45	65	65	65
60	45	80	70	75

Max - Min	Max - Min	40	70	60	70	mm
Max - Min * 0.25	25%	10	17.5	15	17.5	mm
Max - Min * 0.75	75%	30	52.5	45	52.5	mm
75% - 25%	Delta Z	20	35	30	35	mm
water drop per minute		1	0.875	1.28	0.97	mm/min
Time taken to 25	t25%	5	7.5	6.5	6.5	min
Time taken to 75	t75%	25	47.5	30	42.5	min
	t75-25	20	40	23.5	36	min
wetted area =pi D x delta Z						
		4.1241E-01	8.2622E-01	1.6664E+00	3.3440E+00	sq.m
	discharge vol	1.2442E-04	2.1774E-04	1.8663E-04	2.1774E-04	cu.m
	dis per min	6.2211E-06	5.4435E-06	7.9419E-06	6.0483E-06	cu.m
	dis per hr	3.7327E-04	3.2661E-04	4.7651E-04	3.6290E-04	cu.m
	infil rate	**9.0508E-04**	**3.9530E-04**	**2.8595E-04**	**1.0852E-04**	**m/hr**
	BH infil rate					
Surface Area		0.4236	0.8473	1.6946	3.3892	sq.m
infiltration rate per bh		0.000383	0.000335	0.000485	0.000368	**m/hr**

Area 3 Infiltration Rate Calculation

Infiltration Test Drilling	Location	East Lodge Farm	Date	19/05/2020
Area	4	Augers		
BH Depth (m)	1.5	3	6	12
	Depth to water from Ex Gnd Level (mm)			
1	No movement	No movement	No movement	200
2				400
3				610
4				790
5				1020
6				1230
7				1450
8				1680
9				1890
10				2050
15				2190
20				2330
25				2380
30				2450
40				2560
50				2600
60				2630

Max - Min	Max - Min	2430	mm
Max - Min * 0.25	25%	607.5	mm
Max - Min * 0.75	75%	1822.5	mm
75% - 25%	Delta Z	1215	mm
water drop per minute		210.9375	mm/min
Time taken to 25	t25%	4.07	min
Time taken to 75	t75%	9.83	min
	t75-25	5.76	min
wetted area =pi D x delta Z			
		2.9596E+00	sq.m
	discharge vol	7.5587E-03	cu.m
	dis per min	1.3123E-03	cu.m
	dis per hr	7.8736E-02	cu.m
	infil rate	**2.6604E-02**	**m/hr**
	BH infil rate		
Surface Area		3.3892	sq.m
infiltration rate per bh		0.090164	**m/hr**

Area 4 Infiltration Rate Calculation

Surface Water Cluster Calculation

Micro BH Depth (m)	1.5	3	6	12		
Area 1	0.002301	0.001170	0.013397	0.009773	m/hr	
Area 2	0.002517	0.002748	0.001250	0.011759	m/hr	
Area 3	0.000905	0.000395	0.000286	0.000109	m/hr	
Area 4				0.026604	m/hr	
Averages	0.001908	0.001438	0.004978	0.012061	m/hr/sq.m	
Taken forward		0.002748				
Use 6m devices to keep 1m clear fo groundwater				6	m	
Surface Area	0.4236	0.8473	1.6946	1.6946	sq.m	
BH infil rate	0.0000	0.0023	0.0000	0.0199	m/hr	
Cluster	0	0	0	4		
Equiv. rate for calc.	0	0	0	0.0797076	0.0797076	m/hr/cluster
Equiv. rate per sq.m					**0.0797076**	m/hr/plan sq.m
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
Volume	0.009	0.019	0.038	0.076	cu.m	

Cluster dimensions		
Length	1	m
Width	1	m
Cluster area	1	sq.m

Infiltration and Attenuation System Summary

100 year storm events +45% Climate Change Allowance

Max. Storage Vol. m^3	Storage Facility Dimensions			No. of clusters	Length of boreholes m	Length of ECO-90 m	Storage in Boreholes m^3	Net Storage Volume m^3
	Length	Width	Depth					
148.8	50	10	0.59	81	2041.2	1976.40	12.30	136.51

This is based upon a voids ratio of 0.3

Half Drain Time 1,397 minutes

ECO-90 devices 4 x 6m devices per sq.m

Appendix C

East Lodge Farm, Burgess Hill EC49-25-20-02-01 (FW)

7 Proposed dwellings in total:
House type A is 3bed, 5 person
House type B is 4bed, 6 person
From Flows and Loads 4;
Domestic discharge assumed to be (per person per day);

Standard Residential	150 litres	60 grams of BOD	8 Ammonia as N

Number of occupants on the site:

7	dwellings		
4	House Type A	3 bed	5 person
3	House Type B	4 bed	6 person

Total number of occupants = 38

Multiplied by discharge rate per person
5700 litres per day

Average flow ;
0.07 litres per second 237.5 litres per hour

Peak flow (assumed 3x average flow)
0.20 litres per second 712.5 litres per hour

Foul effluent discharges per plot

Plot No.	No. of Beds	Occupants (p)	Discharge (l/day)	Discharge (l/sec) ave.	Peak Discharge (ave. x 3)	Assumed Vp	infiltration trench (sq.m)	infiltration trench @0.9m	Closest TD result
1	3	5	750	0.01	0.03	15	15	16.7	TD3
2	3	5	750	0.01	0.03	15	15	16.7	TD3
3	3	5	750	0.01	0.03	15	15	16.7	TD3
4	3	5	750	0.01	0.03	15	15	16.7	TD4
5	4	6	900	0.01	0.03	15	18	20	TD4
6	4	6	900	0.01	0.03	15	18	20	TD2
7	4	6	900	0.01	0.03	15	18	20	TD1

Effluent Dischage Summaries

Plot 1 **Solution based on TD Area3**

3Bed 5Person discharging 750l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 3	0.000905	0.000395	0.000286	0.000109	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.0004	0.0003	0.0005	0.0004	m/hr	
Cluster	4	0	0	0		
Equiv. rate for calc.	0.001534	0	0	0	0.0015337	m/hr/cluster
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.009	l/sec	31.250	l/hr	0.03125	cu.m/hr
Clusters req'd	21	clusters required to discharge treated foul to ground				

Plot 2 **Solution based on TD Area3**

3Bed 5Person discharging 750l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 3	0.000905	0.000395	0.000286	0.000109	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.0004	0.0003	0.0005	0.0004	m/hr	
Cluster	4	0	0	0		
Equiv. rate for calc.	0.001534	0	0	0	0.0015337	m/hr/cluster
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.009	l/sec	31.250	l/hr	0.03125	cu.m/hr
Clusters req'd	21	clusters required to discharge treated foul to ground				

Plot 3 **Solution based on TD Area3**

3Bed 5Person discharging 750l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 3	0.000905	0.000395	0.000286	0.000109	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.0004	0.0003	0.0005	0.0004	m/hr	
Cluster	4	0	0	0		
Equiv. rate for calc.	0.001534	0	0	0	0.0015337	m/hr/cluster
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.009	l/sec	31.250	l/hr	0.03125	cu.m/hr
Clusters req'd	21	clusters required to discharge treated foul to ground				

Plot 4 **Solution based on TD Area4**

3Bed 5Person discharging 750l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 4	0.000000	0.000000	0.000000	0.026604	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.0000	0.0000	0.0000	0.0902	m/hr	
Cluster	0	0	0	4		
Equiv. rate for calc.	0	0	0	0.360658	0.3606575	m/hr/cluster
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.009	l/sec	31.250	l/hr	0.03125	cu.m/hr
Clusters req'd	1	cluster required to discharge treated foul to ground			(nominal solution)	

Plot 5 **Solution based on TD Area4**

4Bed 6Person discharging 900l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 4	0.000000	0.000000	0.000000	0.026604	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.0000	0.0000	0.0000	0.0902	m/hr	
Cluster	0	0	0	4		
Equiv. rate for calc.	0	0	0	0.360658	0.3606575	m/hr/cluster
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.010	l/sec	37.500	l/hr	0.0375	cu.m/hr
Clusters req'd	1	cluster required to discharge treated foul to ground			(nominal solution)	

Plot 6 **Solution based on TD Area2**

4Bed 6Person discharging 900l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 2	0.002517	0.002748	0.001250	0.011759	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.0011	0.0023	0.0021	0.0399	m/hr	
Cluster	0	0	4	0		
Equiv. rate for calc.	0	0	0.008474	0	0.0084744	m/hr/cluster
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.010	l/sec	37.500	l/hr	0.0375	cu.m/hr
Clusters req'd	5	clusters required to discharge treated foul to ground			(nominal solution)	

Plot 7 **Solution based on TD Area1**

4Bed 6Person discharging 900l/day (from Flows and Loads 4, Published by British Water)

Micro BH Depth (m)	1.5	3	6	12		
Area 1	0.002301	0.001170	0.013397	0.009773	m/hr	
Surface Area	0.4236	0.8473	1.6946	3.3892	sq.m	
BH infil rate	0.000975	0.000991	0.022703	0.033122	m/hr	
Cluster	0	4	0	0		
Equiv. rate for calc.	0	0.003965	0	0	0.0039645	m/hr/cluster

ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
BH Volume	0.009	0.019	0.038	0.076	cu.m	
Average flow	0.010	l/sec	37.500	l/hr	0.0375	cu.m/hr

Clusters req'd 10 clusters required to discharge treated foul to ground (nominal solution)

Appendix D

East Lodge Farm, Burgess Hill EC49-25-20-02-01 (SW)

Grid Reference SE101226 410163,422664

Redline Boundary 6025 sq.m
Impermeable Area 1732 sq.m

Schedule of positively drained areas

	Dwelling	Paving	Sub total	10%	Total		Closest TD result	
Plot 1	72	95	167	16.7	184	sq.m	TD3	
Plot 2	72	49	121	12.1	133	sq.m	TD3	
Plot 3	72	45	117	11.7	129	sq.m	TD3	
Plot 4	72	47	119	11.9	131	sq.m	TD4	
Plot 5	97	57	154	15.4	169	sq.m	TD4	
Plot 6	97	59	156	15.6	172	sq.m	TD2	
Plot 7	97	57	154	15.4	169	sq.m	TD1	
Road		750	750		750	sq.m	TD2	
Total positively drained area					1837	sq.m	0.184	Ha

Proposed drainage solution:
Road and driveways to drain to a single point beneath the greenspace (possible basin)

8 No. ECO-90 installations (7 No. to assist treated foul discharge to ground) & 1 for the surface water.
Plots will require SuDS measures as part of the detailed design.
Road proposed to be permeable construction with inbitex to capture and treat hydrocarbons, permeable base to provide filtration and storage and ECO-90 set 300mm below road formation to allow capture of heavy metals prior to discharge of cleaned surface waters to ground.

Summary of Results for 100 year Return Period (+45%)

Half Drain Time : 1397 minutes.

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
15 min Summer	99.495	0.395	0.9	50.8	O K
30 min Summer	99.529	0.429	0.9	67.8	O K
60 min Summer	99.564	0.464	0.9	85.8	O K
120 min Summer	99.592	0.492	0.9	100.1	O K
180 min Summer	99.609	0.509	0.9	108.5	O K
240 min Summer	99.620	0.520	0.9	114.1	O K
360 min Summer	99.633	0.533	0.9	120.9	O K
480 min Summer	99.640	0.540	0.9	124.5	O K
600 min Summer	99.644	0.544	0.9	126.3	O K
720 min Summer	99.645	0.545	0.9	126.9	O K
960 min Summer	99.643	0.543	0.9	125.9	O K
1440 min Summer	99.633	0.533	0.9	120.9	O K
2160 min Summer	99.625	0.525	0.9	116.8	O K
2880 min Summer	99.619	0.519	0.9	113.6	O K
4320 min Summer	99.606	0.506	0.9	107.1	O K
5760 min Summer	99.591	0.491	0.9	99.5	O K
7200 min Summer	99.572	0.472	0.9	89.8	O K
8640 min Summer	99.554	0.454	0.9	80.6	O K
10080 min Summer	99.537	0.437	0.9	72.2	O K
15 min Winter	99.507	0.407	0.9	57.0	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
15 min Summer	150.002	0.0	19
30 min Summer	100.811	0.0	34
60 min Summer	64.615	0.0	64
120 min Summer	38.625	0.0	124
180 min Summer	28.555	0.0	182
240 min Summer	23.019	0.0	242
360 min Summer	16.941	0.0	362
480 min Summer	13.613	0.0	482
600 min Summer	11.485	0.0	602
720 min Summer	9.995	0.0	722
960 min Summer	8.027	0.0	960
1440 min Summer	5.911	0.0	1240
2160 min Summer	4.388	0.0	1620
2880 min Summer	3.565	0.0	2020
4320 min Summer	2.675	0.0	2852
5760 min Summer	2.181	0.0	3688
7200 min Summer	1.845	0.0	4472
8640 min Summer	1.612	0.0	5272
10080 min Summer	1.442	0.0	6048
15 min Winter	150.002	0.0	19

Summary of Results for 100 year Return Period (+45%)

Storm Event	Max Level (m)	Max Depth (m)	Max Infiltration (l/s)	Max Volume (m³)	Status
30 min Winter	99.545	0.445	0.9	76.2	O K
60 min Winter	99.585	0.485	0.9	96.6	O K
120 min Winter	99.618	0.518	0.9	113.0	O K
180 min Winter	99.637	0.537	0.9	122.9	O K
240 min Winter	99.650	0.550	0.9	129.7	O K
360 min Winter	99.667	0.567	0.9	138.2	O K
480 min Winter	99.677	0.577	0.9	143.2	O K
600 min Winter	99.683	0.583	0.9	146.2	O K
720 min Winter	99.686	0.586	0.9	147.9	O K
960 min Winter	99.688	0.588	0.9	148.8	O K
1440 min Winter	99.682	0.582	0.9	145.7	O K
2160 min Winter	99.667	0.567	0.9	138.2	O K
2880 min Winter	99.658	0.558	0.9	133.5	O K
4320 min Winter	99.636	0.536	0.9	122.5	O K
5760 min Winter	99.611	0.511	0.9	109.5	O K
7200 min Winter	99.580	0.480	0.9	93.9	O K
8640 min Winter	99.551	0.451	0.9	79.2	O K
10080 min Winter	99.525	0.425	0.9	65.9	O K

Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Time-Peak (mins)
30 min Winter	100.811	0.0	33
60 min Winter	64.615	0.0	64
120 min Winter	38.625	0.0	122
180 min Winter	28.555	0.0	180
240 min Winter	23.019	0.0	240
360 min Winter	16.941	0.0	356
480 min Winter	13.613	0.0	474
600 min Winter	11.485	0.0	590
720 min Winter	9.995	0.0	704
960 min Winter	8.027	0.0	932
1440 min Winter	5.911	0.0	1368
2160 min Winter	4.388	0.0	1732
2880 min Winter	3.565	0.0	2192
4320 min Winter	2.675	0.0	3112
5760 min Winter	2.181	0.0	3984
7200 min Winter	1.845	0.0	4832
8640 min Winter	1.612	0.0	5624
10080 min Winter	1.442	0.0	6456

Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	2013
Site Location	GB 529171 118934 TQ 29171 18934
Data Type	Point
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Shortest Storm (mins)	15
Longest Storm (mins)	10080
Climate Change %	+45

Time Area Diagram

Total Area (ha) 0.184

Time (mins) From:	To:	Area (ha)
0	4	0.184

Model Details

Storage is Online Cover Level (m) 100.000

Complex Structure

Infiltration Trench

Infiltration Coefficient Base (m/hr)	0.07971	Trench Width (m)	10.0
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	8.1
Safety Factor	2.0	Slope (1:X)	0.0
Porosity	0.10	Cap Volume Depth (m)	0.000
Invert Level (m)	99.100	Cap Infiltration Depth (m)	0.000

Tank or Pond

Invert Level (m) 99.400

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	500.0	0.601	0.0	1.400	0.0	2.100	0.0
0.100	500.0	0.800	0.0	1.500	0.0	2.200	0.0
0.200	500.0	0.900	0.0	1.600	0.0	2.300	0.0
0.300	500.0	1.000	0.0	1.700	0.0	2.400	0.0
0.400	500.0	1.001	0.0	1.800	0.0	2.500	0.0
0.500	500.0	1.200	0.0	1.900	0.0		
0.600	500.0	1.300	0.0	2.000	0.0		

Surface Water Cluster Calculation

Micro BH Depth (m)	1.5	3	6	12		
Area 1	0.002301	0.001170	0.013397	0.009773	m/hr	
Area 2	0.002517	0.002748	0.001250	0.011759	m/hr	
Area 3	0.000905	0.000395	0.000286	0.000109	m/hr	
Area 4				0.026604	m/hr	
Averages	0.001908	0.001438	0.004978	0.012061	m/hr/sq.m	
Taken forward		0.002748				
Use 6m devices to keep 1m clear fo groundwater				6	m	
Surface Area	0.4236	0.8473	1.6946	1.6946	sq.m	
BH infil rate	0.0000	0.0023	0.0000	0.0199	m/hr	
Cluster	0	0	0	4		
Equiv. rate for calc.	0	0	0	0.0797076	0.0797076	m/hr/cluster
Equiv. rate per sq.m					**0.0797076**	m/hr/plan sq.m
ECO-90 Length	1.525	3.050	6.100	12.200	m	
Drilling Depth	1.8	3.3	6.3	12.3	m	
Volume	0.009	0.019	0.038	0.076	cu.m	
Cluster dimensions						
Length	1	m				
Width	1	m				
Cluster area	1	sq.m				

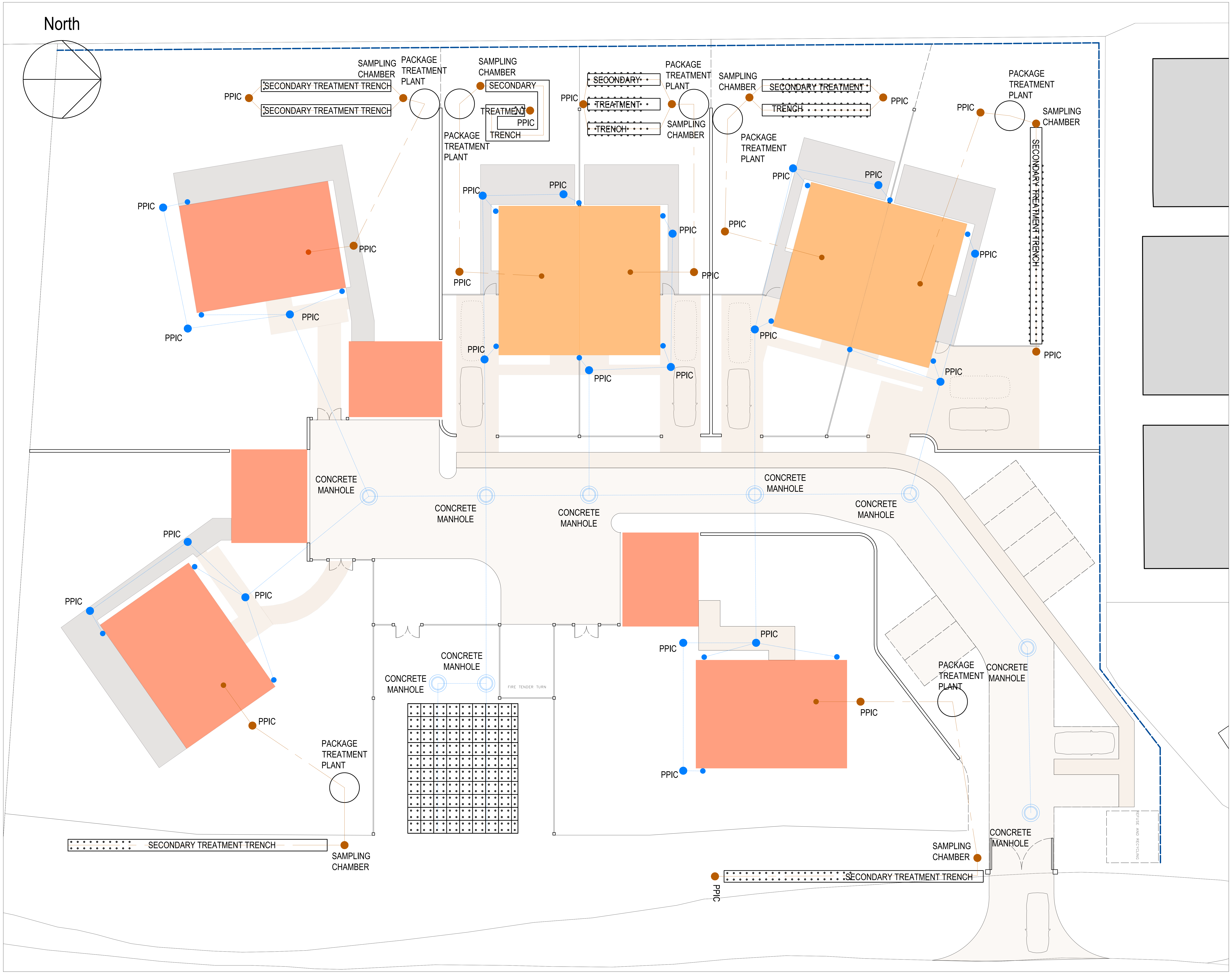
Infiltration and Attenuation System Summary

100 year storm events +45% Climate Change Allowance

Max. Storage Vol. m^3	Storage Facility Dimensions Length	Width	Depth	No. of clusters	Length of boreholes m	Length of ECO-90 m	Storage in Boreholes m^3	Net Storage Volume m^3
148.8	50	10	0.59	81	2041.2	1976.40	12.30	136.51

This is based upon a voids ratio of		0.3	
Half Drain Time		1,397	minutes
ECO-90 devices	4 x	6m devices	per sq.m

Appendix E



NOTES

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All dimensions are in metres unless noted otherwise

DO NOT SCALE FROM THIS DRAWING

1. All work shall be carried out in accordance with Local Authority, statutory authority, health & safety requirements and regulations.
2. The infiltration and attenuation designs shown on this drawing are based on the findings of EC49's report ref EC49-25-20-01 and should be read in conjunction with it.
3. Rainwater collected from structure roofs is proposed to pass through a raingarden and/or a gravel filter prior to entering the attenuaton facility. The attenuation facility is proposed to discharge collected surface waters to ground. See report ref EC49-25-20-01.
4. Vehicular access areas are proposed to be permeably paved to allow water to collect through the surface. the construction will include a layer of Inbitex proprietary membrane to capture and treat hydrocarbons in the runoff prior to being filtered through the permeable sub-base (30% voids ratio granular material) of the construction.
5. The package treatment plants to provide primary treatment of domestic foul effluents have been located 7m away from habitable rooms in accordance with the Building Regulations requirements.
6. The low permeability of the natural soils on site is proposed to be addressed through the use of ECO-90 proprietary devices by Groundwater Dynamics Ltd.
7. Secondary treatment trenches have been designed to the minimum dimensions allowed in accordance with BS6297.
8. The level of foul discharge for each plot is within the limit for compliance with the General Binding Rules for small sewage discharges but Building Control may require an environmental permit to be applied for due to the need for ECO-90 devices to support the infiltration to ground.
9. The designs shown on this drawing are in principle only, to demonstrate that surface water and domestic foul effluent from the site can be effectively drained to ground.
10. These designs will need to be validated by detailed design once the proposed development levels are available.
11. SuDS features and proof by the Simple Index Approach, or similar, will be required prior to construction.

Rev	Details	By	Check	Date
Ø	Initial issue	SAB	SAB	30.11.2025

EC49 Ltd
18 Montrose Avenue
Darton
Barnsley
S75 5LS

Client: Landivar Architects

Project: Proposed Residential Development at East Lodge Farm, Burgess Hill

Title: Proposed Drainage Strategy

Drawn:	Checked:	Date:	Scale:	Original dwg size
SAB	SAB	Nov 2025	1/200	A2

Drawing Reference: EC49-25-20-E-01

Rev: 0

NOTES

This drawing is copyright and must not be copied in part or in whole unless agreed with EC49 Ltd

All dimensions are in metres unless noted otherwise

DO NOT SCALE FROM THIS DRAWING

1. This drawing is based upon the Landivar Proposed development layout and should be read in conjunction with it.
2. The areas shown on this drawing have been measured to determine the impermeable area that will be created as a result of the proposed development.
3. The on plot impermeable areas have been increased by 10% to allow for urban creep within the proposed drainage strategy. The details of the in increase are included in report ref EC49-25-20-01.
4. The vehicular access and adjacent parking areas have not been factored for urban creep.

Rev	Details	By	Check	Date
Ø	Initial issue	SAB	SAB	30.11.2025

EC49 Ltd
18 Montrose Avenue
Darton
Barnsley
S75 5LS

Client:
Landivar Architects

Project:
Proposed Residential Development at East Lodge Farm, Burgess Hill

Title:
Positively Drained Areas

Drawn:	Checked:	Date:	Scale:	Original dwg size
SAB	SAB	Nov 2025	1/200	A2

Drawing Reference: EC49-25-20-E-02

Rev: 0

Appendix F

10.0 Below Ground Drainage Operation and Maintenance Plan

10.1 Introduction

10.1.1 This appendix is intended to give an overview of the operation and maintenance for the drainage features included with the drainage strategy for the proposed development. Where proprietary products are specified, the manufacturer's instructions and recommendations should be followed in priority to this document unless specifically noted otherwise.

10.1.2 The recommended operations and frequencies are typical only and should be more frequent initially to ensure that there are no unforeseen issues during operation and then adjusted to suit the site requirements.

10.1.3 Silt traps and porous paving features have been incorporated within the design to adequately treat and manage any pollutants and silt from the site prior to infiltration of the treated runoff to ground.

10.2 Components

10.2.1 The following components have been included within the drainage design for the proposed development:

- Manholes/Inspection Chambers
- Pipes
- Porous Paving (Water Treatment & Attenuation)
- Silt Traps (Water Treatment)
- Water butts (recycling by rainwater harvesting)
- Proprietary geotextiles "Inbitex" (hydrocarbon capture and treatment

10.2.2 A suitable maintenance strategy should be adopted to ensure the drainage network is cleaned regularly and the routine maintenance and cleansing regime should be documented.

10.2.3 The maintenance of the drainage network will be the responsibility of the land owner

10.2.4 It is recommended that the drainage system is inspected, as a minimum, four times a year, with the system also being inspected after any major storm event. UK Weather warnings should be considered, and local updates should be followed. Where major storm warnings are given in advance, the network should be inspected and any silt/debris removed from the system to avoid potential blockages forming during storm events.

10.2.5 Long-term management practices include regular (monthly as a minimum) sweeping of external paved areas. The sweeping program will remove sand and contaminants directly from paved surfaces before they become mobilised during storm events and transported to the drainage system.

10.2.6 During winter months, drainage features such as gullies and channels should be cleared of ice, snow, debris and/or litter

10.3 Manholes/Inspection Chambers

10.3.1 The locations of Manholes included in the below ground drainage design are indicated on the drainage strategy drawing EC49-25-17-E-01.

10.3.2 Access points have been located at the head of each run, at a change in direction and at a change of pipe size in accordance with Building Regulations Part H.

10.3.3 The appropriate health and safety equipment must be used when accessing manholes. Confined space certificates must be held by any personnel entering a manhole and the appropriate permits should be obtained from the Maintenance Manager prior to any access.

10.4 Pipes

10.4.1 The locations of the drainage pipes are indicated on the drainage strategy drawing EC49-25-17-E-01

10.4.2 Pipes are proprietary products and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used the pipes will be fully compliant with Building Regulations in force at the time of construction.

10.4.3 Pipes are intended to be the main conveyance across the development. These have been designed to be self-cleaning where possible for smaller diameter pipes.

10.4.4 Access for maintenance is provided through access chambers, manholes and rodding eyes.

10.4.5 Regular inspection and maintenance is important to identify areas which may have been obstructed/clogged and may not be draining correctly thus exposing the development to a greater level of flood risk.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as	Initial Inspection should be provided as post construction CCTV survey.	N/A
Regular maintenance\ inspection	Inspect for evidence of poor operation via water level in chambers. If required, take remedial	1 monthly, 24 hours after large storms.
	Check and remove large vegetation growth near pipe	Monthly or as required
Remedial Action	Rod through poorly performing runs as initial remediation	As required.
	If continued poor performance jet and CCTV survey poorly performing	As required.
	Seek advice as to remediation techniques suitable for the type of	As required. If above does not improve performance.

10.5 Permeable Pavements

10.5.1 The private drive is proposed to comprise permeable construction to collect treat and convey surface water falling on the driveway to the surface water drainage network. The exact construction of the permeable driveways is at the discretion of the developer. The finish may be concrete block, porous asphalt or another permeable finish selected by the developer.

- The permeable pavements are intended to be water quality features. These features are intended to be dry except during rainfall events.
- The construction will be designed to be porous or to contain gaps where rain can flow through the upper construction layers in to the voided stone which makes up the subbase and then into a perforated pipe for conveyance to the discharge location.
- Access for maintenance is at surface only due to the nature of this feature.

10.5.2 Inspection and Maintenance Regime

Regular inspection and maintenance is important for the effective operation of the pervious pavement.

Sediment\material removal should be undertaken.

Maintenance Schedule	Required Action	Frequency
Monitoring (to be undertaken more regularly within the first year of operation and adjusted as required)	Initial inspection.	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth. If required take remedial action.	3-monthly, 48 hours after large storms.
	Inspect silt accumulation rates and establish appropriate brushing frequencies. Silt can also be caused by adjacent landscaping areas which should be reprofiled to provide a flat area or	Annually.
	Monitor inspection chambers.	Annually.
Regular maintenance\inspection	Brushing and vacuuming.	Three times/year at end of winter, mid-summer, after autumn leaf fall, or as required based on site-specific observations of
Occasional maintenance	Stabilise and mow contributing and adjacent areas.	As required and as per landscape architect's
	Removal of weed.	As required.
Remedial actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the	As required.
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental	As required.
	Rehabilitation of surface and upper sub-structure. This could include replacement of the jointing and bedding material. The upper geotextiles layer may also need replacing if clogged and Terram 1000 has	As required (if infiltration performance is reduced as a result of significant clogging.