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Drainage Statement

Proposed Residential Development at

Waterford Gardens, Climping, West Sussex

On behalf of

Waterford Properties Limited

June 2021

Document History and Status

Project Number 23078

Date	Version	Prepared By	Reviewed By	Approved By
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1 Non Technical Summary

- 1.1 This Drainage Statement has been undertaken on behalf of Waterford Properties Limited in support of a Planning Application for the construction of two semi detached houses with parking and access.
- 1.2 This Statement is to be read in conjunction with all planning, architectural and other reports that accompany the Planning Application for the proposed development.
- 1.3 The proposed development will incorporate a sustainable drainage system which will discharge surface water to ground via infiltration.
- 1.4 Storage will be provided for all storm return periods up to and including the 1:100 year rainfall event with an allowance for climate change.
- 1.5 Foul water will be discharged to the existing public foul sewer located beneath Horsemere Green Lane.
- 1.6 This Statement concludes that a suitable surface water and foul water drainage system can be designed to accommodate the anticipated flows from the proposed development.

2 Design Criteria

- 2.1 The surface water drainage system has been designed in accordance with the National Planning Policy Framework (NPPF), its accompanying Guidance and Technical Standards for SuDS. It also complies with the requirements under Building Regulations Part H.
- 2.2 The surface water drainage system and storage / infiltration have been designed to accept the discharge from a 100 year return period pluvial event with a further 40% allowance for future climate change.
- 2.3 In accordance with CIRIA SuDS Manual 2015 (Report C753), NPPF and Building Regulations Part H surface water drainage design follows a discharge destination hierarchy ranging from infiltration to ground as first priority before consideration for discharging to a watercourse and as a last resort discharging to a public sewer.
- 2.4 The foul drainage system has been designed to Sewers for Adoption 7th Edition to the proposed private wastewater treatment system.

3 Existing Site

3.1 Site Location

3.1.1 The development site is located on land to the south of Horsemere Green Lane, Climping, Littlehampton, West Sussex BN17 5PQ.



Image 1: Site Location

3.1.2 A copy of the site location plan is located in Appendix 1 at the rear of this report.

3.2 Site Description

3.2.1 The site is approximately 600m² in area and currently an open space area.

3.2.2 Existing ground levels are highest at the southern boundary of the site at approximately 6.25m AOD. The site falls towards its northern boundary to a level of approximately 5m AOD.

3.2.3 A copy of the existing site layout plan is located in Appendix 2 at the rear of this report.

3.3 Existing Drainage

3.3.1 The site currently has no positive surface water or foul water drainage infrastructure.

3.3.2 Rainfall currently discharges in part to ground and in part overland as a greenfield runoff to the north of the site.

3.4 Geology and Groundwater

3.4.1 An initial site investigation was carried out as part of the original design work in 2001 when development in this location was first proposed but not constructed. From that site investigation an infiltration rate of 2.03×10^{-6} m/s was recorded.

3.4.2 An additional site investigation was carried out by Ground and Water in January 2021 and comprised the machine excavation of 3 Trial Pits, referenced TP1 – TP3, to depths of between 0.70m – 2.10m bgl. Soakage tests in accordance with the principles of BRE365 were undertaken within TP1 – TP3.

3.4.3 A summary of the ground conditions encountered within the site investigation in January 2021 is as follows:

Strata	Depth Encountered (m bgl)	Final Depth (m bgl)	Thickness (m)
MADE GROUND (All Trial Holes): Brown slightly sandy silty CLAY. The sand was fine to coarse.	0.00	0.30 – 0.40	0.30 – 0.40
UNDIFFERENTIATED RIVER TERRACE DEPOSITS (TP1): Greyish brown to orangish brown sandy silty CLAY. Sand was fine to medium.	0.40	1.50	1.10
RAISED BEACH DEPOSITS (All Trial Holes): Greyish brown to orangish brown and grey gravelly clayey fine to medium SAND. The gravel was angular to sub-rounded fine to coarse flint.	0.30 – 1.50	>0.70 - >2.10	>0.40 – >1.80

Table 1: Ground Conditions

- 3.4.4 No groundwater or perched water was encountered within the trial holes during the investigation.
- 3.4.5 Soakage testing, in accordance with the principles of BRE365, was undertaken within TP1 – TP3 between 0.70m and 2.10m bgl.
- 3.4.6 The infiltration rates recorded are as follows:

Trial Hole / Depth / Stratum	Test 1	Test 2	Test 3
TP1 @ 2.10m bgl, within the 1st Raised Beach Deposits	7.59×10^{-7} m/s **	1.45×10^{-6} m/s	3.22×10^{-6} m/s *
TP2 @ 0.70m bgl, within the 1st Raised Beach Deposits (Silted to 0.63m bgl in Test 3)	5.77×10^{-6} m/s	2.30×10^{-6} m/s	1.48×10^{-6} m/s
TP3 @ 2.10m bgl, within the 1st Raised Beach Deposits (Silted to 2.03m bgl in Test 3)	4.50×10^{-7} m/s	2.56×10^{-6} m/s	2.04×10^{-6} m/s

Table 2: Recorded Infiltration Rates

** Given the close proximity to the pond on site, it was likely the soils were already saturated, as well as from the previous day's rainfall. This could account for the slow infiltration rate.

4 Development Proposals

4.1 Description

- 4.1.1 The proposed development will consist of the construction of two semi-detached houses with parking and access on land to the south of Horsemere Green Lane, Climping, Littlehampton, West Sussex BN17 5PQ.

4.2 Impermeable areas

- 4.2.1 The impermeable areas of the various elements of the development are summarised as follows:

- Roof areas 130m²
- Access road and parking areas 85m²

4.3 Surface Water Drainage

- 4.3.1 CIRIA report C753 The SuDS Manual-v6 provides guidance on the redevelopment of brownfield sites. The aim for surface water runoff is to match greenfield runoff rates and volumes where reasonably achievable.

- 4.3.2 For surface water discharge, the drainage hierarchy notes the following list of drainage options in order of preference:

1. Infiltration to ground
2. Discharge to a watercourse
3. Discharge to a surface water sewer
4. Discharge to a foul water sewer

- 4.3.3 The proposed surface water drainage strategy will be based on infiltration to ground with sufficient storage provided to accommodate a 1:100 year storm event including an additional 40% to account for the predicted effects of future climate change.

- 4.3.4 Preliminary calculations have been prepared in order to demonstrate that surface water drainage can be adequately accommodated within the site without any increased flood risk elsewhere.

- 4.3.5 Within the calculations the lowest infiltration rate recorded has been used apart from TP1 which was noted to have the initial test influenced by the adjacent pond. In this instance the second lowest infiltration rate has been used.

4.3.6 Surface water from the driveway will discharge via a permeable surface to two 95% voided crate soakaways to the west of the site.

4.3.7 Surface water from the building roofs will discharge to two 95% voided crate soakaways to the east of the site.

4.3.8 Surface water runoff will be intercepted such that it cannot leave the site during any rainfall event up to the 100 year plus 40% rainfall event. A drainage channel located across the site entrance will ensure no surface water from the site enters the public highway.

4.3.9 Causeway Flow calculations are attached in Appendix 4 at the rear of this report.

4.3.10 The final drainage proposals will be confirmed at detailed design stage.

4.4 Foul Water Drainage

4.4.1 It is proposed to discharge foul water by gravity into the public foul sewer adjacent to the site. The connection will be made across Horsemere Green Lane via a new manhole constructed over the sewer.

4.4.2 Copies of the proposed drainage strategy plan and calculations are located in Appendix 3 at the rear of this report.

4.5 Water Quality

4.5.1 The proposed development is for residential use. In accordance with CIRIA SuDS Manual 2015 (Report C753), the pollution hazard level for this type of development is between very low and low depending on the use / area of the site.

4.5.2 The surface water scheme will include mitigation to ensure that surface water is suitably treated and any pollution risk adequately managed prior to discharge.

4.5.3 Table 26.2 in Chapter 26 of CIRIA report C753 The SuDS Manual provides Pollution Hazard Indices for varying land types. Those of relevance to the development proposals are as follows:

Land Use	Pollution hazard level	Total suspended solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car park, low-traffic roads	Low	0.5	0.4	0.4

Table 3: Pollution Hazard Indices

4.5.4 Where multiple drainage components are used in series the individual mitigation index of secondary and tertiary components is lowered by 50% due to reduced performance associated with primary treatment.

SuDS Type	Total suspended solids (TSS)	Metals	Hydrocarbons
Permeable pavement	0.7	0.6	0.7
Soakaway with 300mm minimum depth underlying soil drainage media	0.4	0.4	0.4

Table 4: Pollution Mitigation Indices

4.5.5 The proposed use of permeable paving and soakaways will meet the target treatment level required for runoff with very low to low risk of pollution hazard thus demonstrating that the surface water drainage system for the site can be designed to adequately mitigate against the risk of pollution.

4.5.6 An outline drainage maintenance schedule is located in Appendix 4 at the rear of this report.

5 Flood Routing for Exceedance Flows and Risk to Others

- 5.1 The proposed surface water drainage system has been designed to current standards incorporating SuDS elements providing treatment, attenuation and storage which will minimise runoff leaving the site during times of heavy rain.
- 5.2 Allowance has been made for 40% increase in rainfall intensities which accords with the latest figures published by the Environment Agency and in accordance with the requirements under the National Planning Policy Framework.
- 5.3 The likelihood of a storm event exceeding the 100 year +40% event is extremely low and the risk of surface water flooding to others due to the development proposals is negligible.
- 5.4 In the extremely unlikely event that the future 1:100 year design storm is exceeded the additional surface water would flow overland to the north of the site where it would be intercepted by the existing watercourse (ditch) along the northern site boundary following the route of any exceedance flow from the existing site.

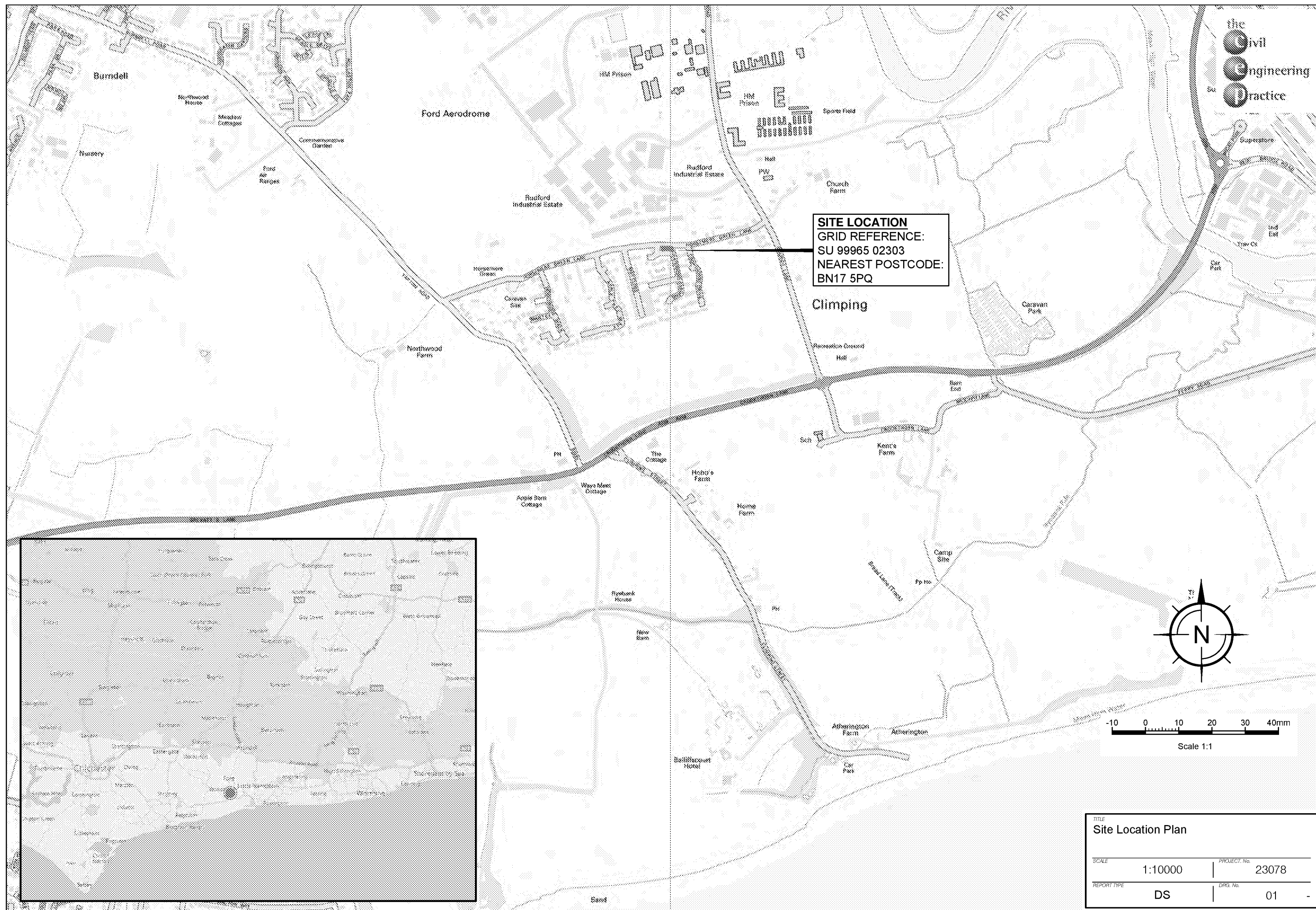
6 Conclusions

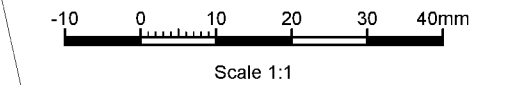
- 6.1 The proposed development will incorporate a sustainable drainage system which will discharge surface water to ground via infiltration.
- 6.2 A suitable SuDS drainage system is proposed which accords with the requirements of national and local policy.
- 6.3 Preliminary calculations confirm that surface water runoff generated by the proposed development can be attenuated on site for all rainfall events up to the 1:100 year event including an allowance for climate change.
- 6.4 Water quality improvement will be provided to mitigate against any risk to any receiving waterbody.
- 6.5 Foul drainage will be discharged to the existing public foul sewer located beneath Horsemere Green Lane.
- 6.6 A suitable surface water and foul water drainage system can be designed to accommodate the anticipated flows from the proposed development and in terms of drainage the development proposals are suitable at this location.

7 List of Appendices, Images and Tables

Appendix 1	Site Location Plan
Appendix 2	Existing Site Layout Plan
Appendix 3	Proposed Drainage Strategy Plan and Calculations
Appendix 4	Outline Drainage Maintenance Schedule

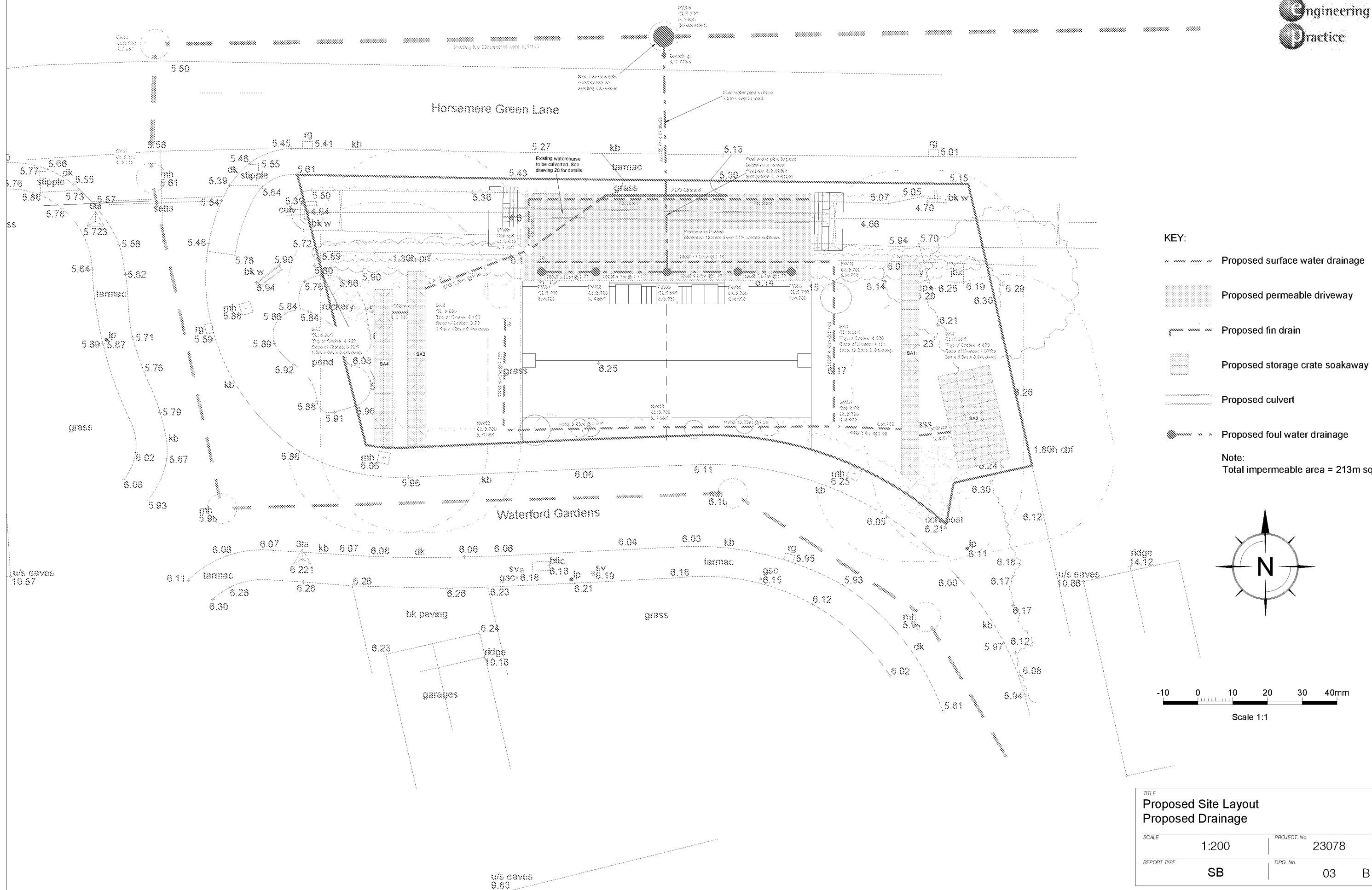
Table 1	Ground Conditions
Table 2	Recorded Infiltration Rates
Table 3	Pollution Hazard Indices
Table 4	Pollution Mitigation Indices





Appendix 3

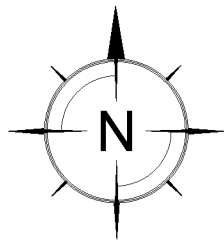
Proposed Drainage Strategy Plan and Calculations



KEY:

- ~ ~ ~ ~ ~ Proposed surface water drainage
- ▨ Proposed permeable driveway
- - - - - Proposed fin drain
- ▨ Proposed storage crate soakaway
- - - - - Proposed culvert
- — — — — Proposed foul water drainage

Note:
Total impermeable area = 213m sq



-10 0 10 20 30 40mm
Scale 1:1

TITLE Proposed Site Layout Proposed Drainage			
SCALE 1:200		PROJECT No. 23078	
REPORT TYPE SB		DRG. No. 03 B	

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.347	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Depth (m)
SA1	0.013	5.00	6.200	1200	2.100
SA2			6.250	1200	2.175

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
Link Pipe	SA1	SA2	1.000	0.600	4.100	4.075	0.025	40.0	150	5.01	48.4

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
Link Pipe	1.596	28.2	1.7	1.950	2.025	0.013	0.0	25	0.879

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
Link Pipe	1.000	40.0	150	Circular	6.200	4.100	1.950	6.250	4.075	2.025

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Link Pipe	SA1	1200	Manhole	Adoptable	SA2	1200	Manhole	Adoptable

Manhole Schedule

Node	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SA1	6.200	2.100	1200				
					0	Link Pipe	4.100
SA2	6.250	2.175	1200				
					1	Link Pipe	4.075

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	19.000	Drain Down Time (mins)	2000
Ratio-R	0.347	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 30 60 120 180 240 360 480 600 720 960 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	40	0	0
30	40	0	0
100	40	0	0

Node SA1 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00734	Invert Level (m)	4.100	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00734	Time to half empty (mins)	2010	Inf Depth (m)	0.400
Safety Factor	2.0	Pit Width (m)	1.000	Number Required	1
Porosity	0.95	Pit Length (m)	12.500		

Node SA2 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00734	Invert Level (m)	4.075	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00734	Time to half empty (mins)	2576	Inf Depth (m)	0.400
Safety Factor	2.0	Pit Width (m)	3.000	Number Required	1
Porosity	0.95	Pit Length (m)	5.500		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year +40% CC 15 minute summer	268.582	75.999	10 year +40% CC 960 minute summer	16.687	4.394
10 year +40% CC 15 minute winter	188.479	75.999	10 year +40% CC 960 minute winter	11.054	4.394
10 year +40% CC 30 minute summer	177.465	50.217	10 year +40% CC 1440 minute summer	12.173	3.263
10 year +40% CC 30 minute winter	124.537	50.217	10 year +40% CC 1440 minute winter	8.181	3.263
10 year +40% CC 60 minute summer	120.741	31.908	30 year +40% CC 15 minute summer	339.585	96.091
10 year +40% CC 60 minute winter	80.217	31.908	30 year +40% CC 15 minute winter	238.306	96.091
10 year +40% CC 120 minute summer	74.863	19.784	30 year +40% CC 30 minute summer	226.400	64.063
10 year +40% CC 120 minute winter	49.737	19.784	30 year +40% CC 30 minute winter	158.877	64.063
10 year +40% CC 180 minute summer	57.663	14.839	30 year +40% CC 60 minute summer	154.889	40.933
10 year +40% CC 180 minute winter	37.483	14.839	30 year +40% CC 60 minute winter	102.904	40.933
10 year +40% CC 240 minute summer	45.644	12.062	30 year +40% CC 120 minute summer	96.091	25.394
10 year +40% CC 240 minute winter	30.325	12.062	30 year +40% CC 120 minute winter	63.841	25.394
10 year +40% CC 360 minute summer	34.939	8.991	30 year +40% CC 180 minute summer	73.796	18.990
10 year +40% CC 360 minute winter	22.712	8.991	30 year +40% CC 180 minute winter	47.969	18.990
10 year +40% CC 480 minute summer	27.600	7.294	30 year +40% CC 240 minute summer	58.176	15.374
10 year +40% CC 480 minute winter	18.337	7.294	30 year +40% CC 240 minute winter	38.651	15.374
10 year +40% CC 600 minute summer	22.661	6.198	30 year +40% CC 360 minute summer	44.256	11.389
10 year +40% CC 600 minute winter	15.483	6.198	30 year +40% CC 360 minute winter	28.767	11.389
10 year +40% CC 720 minute summer	20.241	5.425	30 year +40% CC 480 minute summer	34.810	9.199
10 year +40% CC 720 minute winter	13.603	5.425	30 year +40% CC 480 minute winter	23.127	9.199

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
30 year +40% CC 600 minute summer	28.481	7.790	100 year +40% CC 180 minute summer	96.703	24.885
30 year +40% CC 600 minute winter	19.460	7.790	100 year +40% CC 180 minute winter	62.859	24.885
30 year +40% CC 720 minute summer	25.365	6.798	100 year +40% CC 240 minute summer	75.892	20.056
30 year +40% CC 720 minute winter	17.047	6.798	100 year +40% CC 240 minute winter	50.421	20.056
30 year +40% CC 960 minute summer	20.808	5.479	100 year +40% CC 360 minute summer	57.342	14.756
30 year +40% CC 960 minute winter	13.784	5.479	100 year +40% CC 360 minute winter	37.274	14.756
30 year +40% CC 1440 minute summer	15.065	4.038	100 year +40% CC 480 minute summer	44.893	11.864
30 year +40% CC 1440 minute winter	10.125	4.038	100 year +40% CC 480 minute winter	29.826	11.864
100 year +40% CC 15 minute summer	439.128	124.258	100 year +40% CC 600 minute summer	36.590	10.008
100 year +40% CC 15 minute winter	308.160	124.258	100 year +40% CC 600 minute winter	25.001	10.008
100 year +40% CC 30 minute summer	295.653	83.660	100 year +40% CC 720 minute summer	32.480	8.705
100 year +40% CC 30 minute winter	207.476	83.660	100 year +40% CC 720 minute winter	21.829	8.705
100 year +40% CC 60 minute summer	203.498	53.779	100 year +40% CC 960 minute summer	26.501	6.978
100 year +40% CC 60 minute winter	135.199	53.779	100 year +40% CC 960 minute winter	17.555	6.978
100 year +40% CC 120 minute summer	126.329	33.385	100 year +40% CC 1440 minute summer	19.030	5.100
100 year +40% CC 120 minute winter	83.930	33.385	100 year +40% CC 1440 minute winter	12.789	5.100

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	SA1	915	4.305	0.205	0.5	2.6959	0.0000	SURCHARGED
960 minute winter	SA2	915	4.305	0.230	0.6	3.8708	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
960 minute winter	SA1	Link Pipe	SA2	0.6	0.504	0.023	0.0176
960 minute winter	SA1	Infiltration		0.0			
960 minute winter	SA2	Infiltration		0.0			

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SA1	1350	4.389	0.289	0.3	3.7985	0.0000	SURCHARGED
1440 minute winter	SA2	1350	4.389	0.314	0.3	5.2821	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute winter	SA1	Link Pipe	SA2	0.3	0.479	0.011	0.0176
1440 minute winter	SA1	Infiltration		0.0			
1440 minute winter	SA2	Infiltration		0.0			

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SA1	1410	4.471	0.371	0.4	4.8767	0.0000	SURCHARGED
1440 minute winter	SA2	1410	4.471	0.396	0.3	6.6622	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
1440 minute winter	SA1	Link Pipe	SA2	0.3	0.479	0.009	0.0176
1440 minute winter	SA1	Infiltration		0.0			
1440 minute winter	SA2	Infiltration		0.0			

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	1	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	19.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.347	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	✓

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Permeable Paving	0.009	5.00	5.400	1200	499981.920	102343.232	0.300
SA3			6.000	1200	499976.462	102343.313	2.250
SA4			6.000	1200	499976.462	102343.313	2.275

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
Link Pipe 1.000	SA3	SA4	1.000	0.600	3.750	3.725	0.025	40.0	100	5.04	48.3
	Permeable Paving	SA3	5.459	0.600	5.100	3.950	1.150	4.7	80	5.03	48.3

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
Link Pipe 1.000	1.223	9.6	1.2	2.150	2.175	0.009	0.0	24	0.831
	3.084	15.5	1.2	0.220	1.970	0.009	0.0	15	1.788

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
Link Pipe 1.000	1.000	40.0	100	Circular	6.000	3.750	2.150	6.000	3.725	2.175
	5.459	4.7	80	Circular	5.400	5.100	0.220	6.000	3.950	1.970

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
Link Pipe 1.000	SA3	1200	Manhole	Adoptable	SA4	1200	Manhole	Adoptable
	Permeable Paving	1200	Manhole	Adoptable	SA3	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
Permeable Paving	499981.920	102343.232	5.400	0.300	1200				
							0	1.000	5.100
SA3	499976.462	102343.313	6.000	2.250	1200				
							1	1.000	3.950
							0	Link Pipe	3.750
									100

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SA4	499976.462	102343.313	6.000	2.275	100	1	Link Pipe	3.725	100



Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	19.000	Drain Down Time (mins)	2000
Ratio-R	0.347	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x

Storm Durations

15 30 60 120 180 240 360 480 600 720 960 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
10	40	0	0
30	40	0	0
100	40	0	0

Node SA3 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00522	Invert Level (m)	3.750	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00522	Time to half empty (mins)		Inf Depth (m)	0.400
Safety Factor	2.0	Pit Width (m)	1.000	Number Required	1
Porosity	0.95	Pit Length (m)	9.000		

Node SA4 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.00522	Invert Level (m)	3.725	Depth (m)	0.400
Side Inf Coefficient (m/hr)	0.00522	Time to half empty (mins)	3033	Inf Depth (m)	0.400
Safety Factor	2.0	Pit Width (m)	1.000	Number Required	1
Porosity	0.95	Pit Length (m)	10.000		

Node Permeable Paving Carpark Storage Structure

Base Inf Coefficient (m/hr)	0.00520	Invert Level (m)	5.100	Slope (1:X)	999.0
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	295	Depth (m)	0.200
Safety Factor	2.0	Width (m)	9.100	Inf Depth (m)	
Porosity	0.30	Length (m)	9.100		

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
10 year +40% CC 15 minute summer	268.582	75.999	30 year +40% CC 360 minute summer	44.256	11.389
10 year +40% CC 15 minute winter	188.479	75.999	30 year +40% CC 360 minute winter	28.767	11.389
10 year +40% CC 30 minute summer	177.465	50.217	30 year +40% CC 480 minute summer	34.810	9.199
10 year +40% CC 30 minute winter	124.537	50.217	30 year +40% CC 480 minute winter	23.127	9.199
10 year +40% CC 60 minute summer	120.741	31.908	30 year +40% CC 600 minute summer	28.481	7.790
10 year +40% CC 60 minute winter	80.217	31.908	30 year +40% CC 600 minute winter	19.460	7.790
10 year +40% CC 120 minute summer	74.863	19.784	30 year +40% CC 720 minute summer	25.365	6.798
10 year +40% CC 120 minute winter	49.737	19.784	30 year +40% CC 720 minute winter	17.047	6.798
10 year +40% CC 180 minute summer	57.663	14.839	30 year +40% CC 960 minute summer	20.808	5.479
10 year +40% CC 180 minute winter	37.483	14.839	30 year +40% CC 960 minute winter	13.784	5.479
10 year +40% CC 240 minute summer	45.644	12.062	30 year +40% CC 1440 minute summer	15.065	4.038
10 year +40% CC 240 minute winter	30.325	12.062	30 year +40% CC 1440 minute winter	10.125	4.038
10 year +40% CC 360 minute summer	34.939	8.991	100 year +40% CC 15 minute summer	439.128	124.258
10 year +40% CC 360 minute winter	22.712	8.991	100 year +40% CC 15 minute winter	308.160	124.258
10 year +40% CC 480 minute summer	27.600	7.294	100 year +40% CC 30 minute summer	295.653	83.660
10 year +40% CC 480 minute winter	18.337	7.294	100 year +40% CC 30 minute winter	207.476	83.660
10 year +40% CC 600 minute summer	22.661	6.198	100 year +40% CC 60 minute summer	203.498	53.779
10 year +40% CC 600 minute winter	15.483	6.198	100 year +40% CC 60 minute winter	135.199	53.779
10 year +40% CC 720 minute summer	20.241	5.425	100 year +40% CC 120 minute summer	126.329	33.385
10 year +40% CC 720 minute winter	13.603	5.425	100 year +40% CC 120 minute winter	83.930	33.385
10 year +40% CC 960 minute summer	16.687	4.394	100 year +40% CC 180 minute summer	96.703	24.885
10 year +40% CC 960 minute winter	11.054	4.394	100 year +40% CC 180 minute winter	62.859	24.885
10 year +40% CC 1440 minute summer	12.173	3.263	100 year +40% CC 240 minute summer	75.892	20.056
10 year +40% CC 1440 minute winter	8.181	3.263	100 year +40% CC 240 minute winter	50.421	20.056
30 year +40% CC 15 minute summer	339.585	96.091	100 year +40% CC 360 minute summer	57.342	14.756
30 year +40% CC 15 minute winter	238.306	96.091	100 year +40% CC 360 minute winter	37.274	14.756
30 year +40% CC 30 minute summer	226.400	64.063	100 year +40% CC 480 minute summer	44.893	11.864
30 year +40% CC 30 minute winter	158.877	64.063	100 year +40% CC 480 minute winter	29.826	11.864
30 year +40% CC 60 minute summer	154.889	40.933	100 year +40% CC 600 minute summer	36.590	10.008
30 year +40% CC 60 minute winter	102.904	40.933	100 year +40% CC 600 minute winter	25.001	10.008
30 year +40% CC 120 minute summer	96.091	25.394	100 year +40% CC 720 minute summer	32.480	8.705
30 year +40% CC 120 minute winter	63.841	25.394	100 year +40% CC 720 minute winter	21.829	8.705
30 year +40% CC 180 minute summer	73.796	18.990	100 year +40% CC 960 minute summer	26.501	6.978
30 year +40% CC 180 minute winter	47.969	18.990	100 year +40% CC 960 minute winter	17.555	6.978
30 year +40% CC 240 minute summer	58.176	15.374	100 year +40% CC 1440 minute summer	19.030	5.100
30 year +40% CC 240 minute winter	38.651	15.374	100 year +40% CC 1440 minute winter	12.789	5.100

Results for 10 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Permeable Paving	12	5.122	0.022	3.1	0.4768	0.0000	OK
600 minute winter	SA3	585	3.958	0.208	0.3	2.0174	0.0000	SURCHARGED
600 minute winter	SA4	585	3.958	0.233	0.3	2.4811	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	Permeable Paving	1.000	SA3	2.4	2.191	0.157	0.0061
15 minute winter	Permeable Paving	Infiltration		0.0			
600 minute winter	SA3	Link Pipe	SA4	0.3	0.499	0.032	0.0078
600 minute winter	SA3	Infiltration		0.0			
600 minute winter	SA4	Infiltration		0.0			

Results for 30 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Permeable Paving	12	5.126	0.026	3.9	0.5706	0.0000	OK
960 minute winter	SA3	885	4.036	0.286	0.3	2.7678	0.0000	SURCHARGED
960 minute winter	SA4	885	4.036	0.311	0.2	3.3052	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	Permeable Paving	1.000	SA3	3.2	2.360	0.207	0.0074
15 minute winter	Permeable Paving	Infiltration		0.0			
960 minute winter	SA3	Link Pipe	SA4	0.2	0.499	0.025	0.0078
960 minute winter	SA3	Infiltration		0.0			
960 minute winter	SA4	Infiltration		0.0			

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	Permeable Paving	12	5.130	0.030	5.1	0.6856	0.0000	OK
960 minute winter	SA3	930	4.113	0.363	0.4	3.5190	0.0000	SURCHARGED
960 minute winter	SA4	930	4.113	0.388	0.2	4.1301	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
15 minute winter	Permeable Paving	1.000	SA3	4.3	2.542	0.274	0.0091
15 minute winter	Permeable Paving	Infiltration		0.0			
960 minute winter	SA3	Link Pipe	SA4	0.2	0.499	0.025	0.0078
960 minute winter	SA3	Infiltration		0.0			
960 minute winter	SA4	Infiltration		0.0			

Appendix 4

Outline Drainage Maintenance Schedule

Drainage Maintenance Schedule



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

Project	Waterford Gardens, Climping, West Sussex
Project Number	23078

By Steve Burgess

Date 20 May 2021

1 Schedule of Maintenance

- 1.1 Once appointed the Contractor will prepare a site specific method statement for the control of silt and other pollutants during construction. CIRIA Report C532, Control of water pollution from construction sites, provides further guidance on this.
- 1.2 The Contractor will maintain the proposed drainage system during construction and until the handing over of the site.
- 1.3 Upon completion management of the shared drainage facilities (where not adopted) will be passed on to a Management Company appointed by the Developer on behalf of the Residents.
- 1.4 In the event that the Management Company becomes unable to discharge its duties within two years of first appointment the Developer will endeavour to appoint an alternative on behalf of the Residents.
- 1.5 Maintenance of individual property drainage connections is the responsibility of the individual property owners.
- 1.6 The following maintenance schedule details the typical tasks to be undertaken at different intervals.

Maintenance Schedule	Required Action	Frequency
Regular Maintenance	Manage vegetation and remove nuisance plants – aesthetics	As required
	Litter and debris removal – catchpits	Monthly or as required
	Remove sediment and debris from silt trap chambers, channel drains and inlet chambers	6 monthly
	Visual inspection of permeable paving for defects and settlement	Annually
	Sweeping / brushing of permeable paving	Every 2 years
	Surface and foul water pipework – jetting / rodding	Every 2 years or as required
	Remove silt and debris from oil interceptors where provided	When alarm indicates



Maintenance Schedule	Required Action	Frequency
Corrective Maintenance	Remove debris / blockages to silt traps / channel drains	As required
	Repairs to access chambers / manhole covers	As required
	Replace any broken permeable blocks / surface, remedial works to any depressions or rutting	As required
	Inspect inlet, outlet from downpipes and gullies for blockages, standing water and clear	As required

Indicative Schedule of Maintenance for the Proposed Drainage System

2 Financing

- 2.1 The regular maintenance of all private drainage, channels, gutters, rainwater pipes and connections will be the responsibility of the individual property owners.
- 2.2 The regular and corrective maintenance of all shared elements of the drainage system will be managed and funded through the Management Company on behalf of the Residents.

Inspection / Action Required	Gullies, Channels and Gutters	Catchpits	Permeable Surface	Surface Water Pipework	Foul Pumping Station
6 Months	✓	✓	✓		
1 Year			✓		✓
After leaf fall in Autumn	✓	✓			
2 Years				✓	
When alarm indicates					✓

Drainage System Maintenance Summary