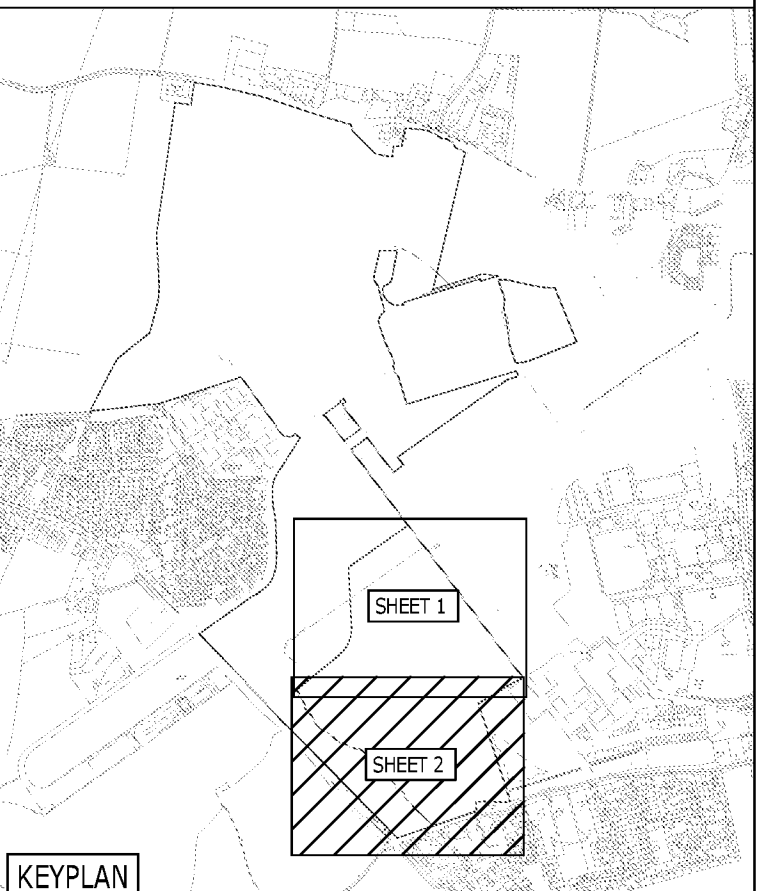


- NOTES:
1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH THE RELEVANT SPECIFICATION, INC. RISK ASSESSMENTS AND ALL OTHER RELATED DRAWINGS ISSUED BY THE ENGINEER.
 2. DO NOT SCALE FROM THIS DRAWING. WORK FROM FIGURED DIMENSIONS ONLY.
 3. ALL DIMENSIONS SHOWN ON THIS DRAWING ARE IN METRES UNLESS OTHERWISE STATED.
 4. ALL DIMENSIONS, LEVELS AND SURVEY GRID CO-ORDINATES ARE TO BE CHECKED ON SITE AND THE ENGINEER NOTIFIED IMMEDIATELY OF ANY DISCREPANCIES PRIOR TO THE COMMENCEMENT OF THE WORKS.
 5. NO DEVIATION FROM THE DETAILS SHOWN ON THIS DRAWING IS PERMITTED WITHOUT PRIOR PERMISSION FROM THE ENGINEER.
 6. ANY WORKS OUTSIDE RED SITE BOUNDARY ARE FOR INFORMATION PURPOSES ONLY. UNLESS SPECIFICALLY NOTED, ALL WORKS OUTSIDE THE SITE BOUNDARY WILL BE UNDERTAKEN BY OTHERS UNDER A SEPARATE CONTRACT.

- KEY
- LAND OWNERSHIP BOUNDARY
 - PLANNING APPLICATION BOUNDARY
 - RM4 SURFACE WATER PIPE AND CHAMBER (ARROW DENOTES FLOW)
 - RM4 FOUL WATER PIPE AND CHAMBER (ARROW DENOTES FLOW)
 - ENABLING INFRASTRUCTURE SURFACE WATER DRAINAGE AND CHAMBER
 - ENABLING INFRASTRUCTURE FOUL WATER DRAINAGE AND CHAMBER
 - ENABLING INFRASTRUCTURE FOUL RISING MAIN
 - EXISTING SURFACE WATER SEWER
 - RM4 SWALE



0m 5m 25m
Scale: 1:500 @ A0

PRELIMINARY

FOR PLANNING

A	REVISED TO SUIT NEW SITE LAYOUT	MCE	EF	MR	10.08.24
-	PRELIM ISSUE	IK	EF	MR	09.08.24
Rev	Description	Drn	Chk	App	Date
ARDENT CONSULTING ENGINEERS AN EMPLOYEE OWNED COMPANY					
Third Floor The Halkmark Building 52-56 Leadenhall Street London EC3M 5UE Tel: 020 7680 4088 Web: www.ardent-ce.co.uk E-mail: enquiries@ardent-ce.co.uk					
Client: VISTRY SOUTH EAST					

Project Title:
THE LANDING, LAND AT FORD AIRFIELD, FORD

Drawing Title:
RM4 - DRAINAGE STRATEGY (SHEET 2)

Drawn by IK	Checked by EF	Approved by MR
A0 Scale 1:500	Date 09.08.24	Revision A

Drawing Number
2205771-143



FOR DETENTION BASIN 4 - SOUTH DETAILS REFER TO INFRASTRUCTURE RM DRAWING 2205771-136 DRAINAGE STRATEGY (SHEET 1)

FOR DETENTION BASIN 5 - SOUTH DETAILS REFER TO INFRASTRUCTURE RM DRAWING 2205771-136 DRAINAGE STRATEGY (SHEET 1)

PROPOSED OUTFALL 3
TOP OF FOUL MAIN 4.50m
BY REGIONAL LB 1:1000
DISCHARGED OUTFALL
DEPTH 1.40m
LB

Appendix E

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1		5.00	6.344	1350	499330.171	103511.064	1.795
HW1			6.000	1350	499345.857	103509.645	1.702
HW2 - B1	8.836	5.00	6.000	1350	499358.825	103557.883	1.800
S18 - FC			6.000	1350	499360.000	103571.198	2.000
S2			3.800	1350	499382.829	103647.539	1.750
HW3			3.800	1350	499386.244	103657.629	1.780
S278 - TANK		5.00	6.275	1050	499294.496	103681.029	2.320
S278 - FC	0.268	5.00	6.985	1350	499303.518	103680.595	3.137
HW4			3.800	1350	499365.057	103693.471	1.780
HW5 - B2	12.104	5.00	3.800	1350	499437.031	103759.897	1.800
S3 - FC			3.952	2100	499432.495	103768.320	2.272
S4			3.446	1200	499409.929	103808.231	1.959
Ex. HW			2.330	1200	499412.938	103825.150	1.130

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)
1.000	S1	HW1	15.750	0.600	4.549	4.510	0.039	403.8	450	5.26	50.0
1.002	HW2 - B1	S18 - FC	13.367	0.600	4.200	4.000	0.200	66.8	450	5.09	50.0
1.003	S18 - FC	S2	79.682	0.600	4.000	2.050	1.950	40.9	450	5.51	50.0
1.004	S2	HW3	10.652	0.600	2.050	2.020	0.030	355.1	450	5.67	50.0
2.000	S278 - TANK	S278 - FC	9.033	0.600	3.955	3.848	0.107	84.4	300	5.09	50.0
2.001	S278 - FC	HW4	62.872	0.600	3.848	2.020	1.828	34.4	300	5.48	50.0
1.006	HW5 - B2	S3 - FC	9.567	0.600	2.000	1.680	0.320	29.9	450	5.04	50.0
1.007	S3 - FC	S4	45.849	0.600	1.680	1.487	0.193	237.6	375	5.70	50.0
1.008	S4	Ex. HW	17.184	0.600	1.487	1.200	0.287	59.9	375	5.82	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.005	159.9	0.0	1.345	1.040	0.000	0.0
1.002	2.489	395.9	1197.5	1.350	1.550	8.836	0.0
1.003	3.187	506.9	1197.5	1.550	1.300	8.836	0.0
1.004	1.073	170.6	1197.5	1.300	1.330	8.836	0.0
2.000	1.712	121.0	0.0	2.020	2.837	0.000	0.0
2.001	2.689	190.1	36.3	2.837	1.480	0.268	0.0
1.006	3.728	593.0	1640.4	1.350	1.822	12.104	0.0
1.007	1.171	129.3	1640.4	1.897	1.584	12.104	0.0
1.008	2.345	259.0	1640.4	1.584	0.755	12.104	0.0

Pipeline Schedule

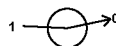
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	15.750	403.8	450	Circular	6.344	4.549	1.345	6.000	4.510	1.040
1.002	13.367	66.8	450	Circular	6.000	4.200	1.350	6.000	4.000	1.550
1.003	79.682	40.9	450	Circular	6.000	4.000	1.550	3.800	2.050	1.300
1.004	10.652	355.1	450	Circular	3.800	2.050	1.300	3.800	2.020	1.330
2.000	9.033	84.4	300	Circular	6.275	3.955	2.020	6.985	3.848	2.837
2.001	62.872	34.4	300	Circular	6.985	3.848	2.837	3.800	2.020	1.480
1.006	9.567	29.9	450	Circular	3.800	2.000	1.350	3.952	1.680	1.822
1.007	45.849	237.6	375	Circular	3.952	1.680	1.897	3.446	1.487	1.584
1.008	17.184	59.9	375	Circular	3.446	1.487	1.584	2.330	1.200	0.755

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	HW1	1350	Junction	
1.002	HW2 - B1	1350	Manhole	Adoptable	S18 - FC	1350	Manhole	Adoptable
1.003	S18 - FC	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.004	S2	1350	Manhole	Adoptable	HW3	1350	Junction	
2.000	S278 - TANK	1050	Manhole	Adoptable	S278 - FC	1350	Manhole	Adoptable
2.001	S278 - FC	1350	Manhole	Adoptable	HW4	1350	Junction	
1.006	HW5 - B2	1350	Manhole	Adoptable	S3 - FC	2100	Manhole	Adoptable
1.007	S3 - FC	2100	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.008	S4	1200	Manhole	Adoptable	Ex. HW	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S1	499330.171	103511.064	6.344	1.795	1350					
							0	1.000	4.549	450
HW1	499345.857	103509.645	6.000	1.702	1350					
							1	1.000	4.510	450
HW2 - B1	499358.825	103557.883	6.000	1.800	1350					
							0	1.002	4.200	450
S18 - FC	499360.000	103571.198	6.000	2.000	1350					
							1	1.002	4.000	450
							0	1.003	4.000	450
S2	499382.829	103647.539	3.800	1.750	1350					
							1	1.003	2.050	450
							0	1.004	2.050	450
HW3	499386.244	103657.629	3.800	1.780	1350					
							1	1.004	2.020	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S278 - TANK	499294.496	103681.029	6.275	2.320	1050		0	2.000	3.955	300
S278 - FC	499303.518	103680.595	6.985	3.137	1350		1	2.000	3.848	300
HW4	499365.057	103693.471	3.800	1.780	1350		0	2.001	3.848	300
HW5 - B2	499437.031	103759.897	3.800	1.800	1350		1	2.001	2.020	300
S3 - FC	499432.495	103768.320	3.952	2.272	2100		0	1.006	2.000	450
S4	499409.929	103808.231	3.446	1.959	1200		1	1.006	1.680	450
Ex. HW	499412.938	103825.150	2.330	1.130	1200		0	1.007	1.680	375
							1	1.007	1.487	375
							0	1.008	1.487	375
							1	1.008	1.200	375

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	240	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 %)
100	40	0	0

Node S18 - FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	4.000	Product Number	CTL-SHE-0073-3000-1700-3000
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node S278 - FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	3.848	Product Number	CTL-SHE-0096-4000-0907-4000
Design Depth (m)	0.907	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.0	Min Node Diameter (mm)	1200

Node S3 - FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	1.680	Product Number	CTL-SHE-0334-7000-1520-7000
Design Depth (m)	1.520	Min Outlet Diameter (m)	0.375
Design Flow (l/s)	70.0	Min Node Diameter (mm)	

Node HW2 - B1 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	98.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.200	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.025

Inlets

HW1

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	4974.0	0.0	1.800	8997.0	0.0

Node S278 - FC Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.955
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	225.0	0.0	0.800	225.0	0.0	0.801	0.0	0.0

Node HW5 - B2 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	114.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.000	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.025

Inlets

HW3 HW4

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	5097.0	0.0	1.800	7515.2	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	512.714	145.080	100 year +40% CC 360 minute summer	61.770	15.895
100 year +40% CC 15 minute winter	359.799	145.080	100 year +40% CC 360 minute winter	40.152	15.895
100 year +40% CC 30 minute summer	343.435	97.180	100 year +40% CC 480 minute summer	47.739	12.616
100 year +40% CC 30 minute winter	241.007	97.180	100 year +40% CC 480 minute winter	31.717	12.616
100 year +40% CC 60 minute summer	235.659	62.278	100 year +40% CC 600 minute summer	38.469	10.522
100 year +40% CC 60 minute winter	156.566	62.278	100 year +40% CC 600 minute winter	26.284	10.522
100 year +40% CC 120 minute summer	140.692	37.181	100 year +40% CC 720 minute summer	33.800	9.059
100 year +40% CC 120 minute winter	93.473	37.181	100 year +40% CC 720 minute winter	22.716	9.059
100 year +40% CC 180 minute summer	106.232	27.337	100 year +40% CC 960 minute summer	27.075	7.130
100 year +40% CC 180 minute winter	69.053	27.337	100 year +40% CC 960 minute winter	17.935	7.130
100 year +40% CC 240 minute summer	82.847	21.894	100 year +40% CC 1440 minute summer	19.000	5.092
100 year +40% CC 240 minute winter	55.042	21.894	100 year +40% CC 1440 minute winter	12.769	5.092

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 92.24%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S1	1470	5.799	1.250	0.2	1.7894	0.0000	SURCHARGED
1440 minute winter	HW1	1470	5.799	1.501	152.1	0.0000	0.0000	OK
1440 minute winter	HW2 - B1	1470	5.799	1.599	313.4	159.3214	0.0000	FLOOD RISK
1440 minute winter	S18 - FC	1470	5.799	1.799	13.8	2.5750	0.0000	FLOOD RISK
720 minute winter	S2	720	3.773	1.723	3.0	2.4658	0.0000	FLOOD RISK
720 minute winter	HW3	705	3.773	1.753	7.6	0.0000	0.0000	OK
240 minute winter	S278 - TANK	232	5.894	1.939	1.6	1.6790	0.0000	SURCHARGED
240 minute winter	S278 - FC	232	5.893	2.045	41.0	177.6365	0.0000	SURCHARGED
720 minute winter	HW4	705	3.774	1.754	40.7	0.0000	0.0000	OK
720 minute winter	HW5 - B2	705	3.772	1.772	763.8	240.8096	0.0000	FLOOD RISK
720 minute winter	S3 - FC	705	3.763	2.083	70.3	7.2163	0.0000	FLOOD RISK
60 minute summer	S4	37	2.362	0.875	69.9	0.9893	0.0000	SURCHARGED
15 minute summer	Ex. HW	1	2.330	1.130	68.4	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S1	1.000	HW1	-0.2	-0.014	-0.001	2.4955	
1440 minute winter	HW1	Flow through pond	HW2 - B1	-152.1	-0.013	-0.001	10401.2109	
1440 minute winter	HW2 - B1	1.002	S18 - FC	13.8	0.154	0.035	2.1179	
1440 minute winter	S18 - FC	1.003	S2	3.1	0.293	0.006	6.4493	
720 minute winter	S2	1.004	HW3	6.3	0.120	0.037	1.6877	
720 minute winter	HW3	Flow through pond	HW5 - B2	-328.4	-0.029	-0.003	10715.6035	
240 minute winter	S278 - TANK	2.000	S278 - FC	-1.6	-0.022	-0.013	0.6361	
240 minute winter	S278 - FC	2.001	HW4	6.4	0.729	0.034	2.4022	
720 minute winter	HW4	Flow through pond	HW5 - B2	-328.4	-0.029	-0.003	10715.6035	
720 minute winter	HW5 - B2	1.006	S3 - FC	70.3	0.444	0.119	1.5158	
720 minute winter	S3 - FC	1.007	S4	69.9	0.634	0.540	5.0570	
60 minute summer	S4	1.008	Ex. HW	69.9	0.634	0.270	1.8953	1109.5

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
S1		5.00	6.344	1350	499330.171	103511.064	1.795
HW1			6.000	1350	499345.857	103509.645	1.702
HW2 - B1	8.836	5.00	6.000	1350	499358.825	103557.883	1.800
S18 - FC			6.000	1350	499360.000	103571.198	2.000
S2			3.800	1350	499382.829	103647.539	1.750
HW3			3.800	1350	499386.244	103657.629	1.780
S278 - TANK		5.00	6.275	1050	499294.496	103681.029	2.320
S278 - FC	0.268	5.00	6.985	1350	499303.518	103680.595	3.137
HW4			3.800	1350	499365.057	103693.471	1.780
HW5 - B2	12.104	5.00	3.800	1350	499437.031	103759.897	1.800
S3 - FC			3.952	2100	499432.495	103768.320	2.272
S4			3.446	1200	499409.929	103808.231	1.959
Ex. HW			2.330	1200	499412.938	103825.150	1.130

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)
1.000	S1	HW1	15.750	0.600	4.549	4.510	0.039	403.8	450	5.26	50.0
1.002	HW2 - B1	S18 - FC	13.367	0.600	4.200	4.000	0.200	66.8	450	5.09	50.0
1.003	S18 - FC	S2	79.682	0.600	4.000	2.050	1.950	40.9	450	5.51	50.0
1.004	S2	HW3	10.652	0.600	2.050	2.020	0.030	355.1	450	5.67	50.0
2.000	S278 - TANK	S278 - FC	9.033	0.600	3.955	3.848	0.107	84.4	300	5.09	50.0
2.001	S278 - FC	HW4	62.872	0.600	3.848	2.020	1.828	34.4	300	5.48	50.0
1.006	HW5 - B2	S3 - FC	9.567	0.600	2.000	1.680	0.320	29.9	450	5.04	50.0
1.007	S3 - FC	S4	45.849	0.600	1.680	1.487	0.193	237.6	375	5.70	50.0
1.008	S4	Ex. HW	17.184	0.600	1.487	1.200	0.287	59.9	375	5.82	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.005	159.9	0.0	1.345	1.040	0.000	0.0
1.002	2.489	395.9	1197.5	1.350	1.550	8.836	0.0
1.003	3.187	506.9	1197.5	1.550	1.300	8.836	0.0
1.004	1.073	170.6	1197.5	1.300	1.330	8.836	0.0
2.000	1.712	121.0	0.0	2.020	2.837	0.000	0.0
2.001	2.689	190.1	36.3	2.837	1.480	0.268	0.0
1.006	3.728	593.0	1640.4	1.350	1.822	12.104	0.0
1.007	1.171	129.3	1640.4	1.897	1.584	12.104	0.0
1.008	2.345	259.0	1640.4	1.584	0.755	12.104	0.0

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)
1.000	15.750	403.8	450	Circular	6.344	4.549	1.345	6.000	4.510	1.040
1.002	13.367	66.8	450	Circular	6.000	4.200	1.350	6.000	4.000	1.550
1.003	79.682	40.9	450	Circular	6.000	4.000	1.550	3.800	2.050	1.300
1.004	10.652	355.1	450	Circular	3.800	2.050	1.300	3.800	2.020	1.330
2.000	9.033	84.4	300	Circular	6.275	3.955	2.020	6.985	3.848	2.837
2.001	62.872	34.4	300	Circular	6.985	3.848	2.837	3.800	2.020	1.480
1.006	9.567	29.9	450	Circular	3.800	2.000	1.350	3.952	1.680	1.822
1.007	45.849	237.6	375	Circular	3.952	1.680	1.897	3.446	1.487	1.584
1.008	17.184	59.9	375	Circular	3.446	1.487	1.584	2.330	1.200	0.755

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	S1	1350	Manhole	Adoptable	HW1	1350	Junction	
1.002	HW2 - B1	1350	Manhole	Adoptable	S18 - FC	1350	Manhole	Adoptable
1.003	S18 - FC	1350	Manhole	Adoptable	S2	1350	Manhole	Adoptable
1.004	S2	1350	Manhole	Adoptable	HW3	1350	Junction	
2.000	S278 - TANK	1050	Manhole	Adoptable	S278 - FC	1350	Manhole	Adoptable
2.001	S278 - FC	1350	Manhole	Adoptable	HW4	1350	Junction	
1.006	HW5 - B2	1350	Manhole	Adoptable	S3 - FC	2100	Manhole	Adoptable
1.007	S3 - FC	2100	Manhole	Adoptable	S4	1200	Manhole	Adoptable
1.008	S4	1200	Manhole	Adoptable	Ex. HW	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S1	499330.171	103511.064	6.344	1.795	1350					
							0	1.000	4.549	450
HW1	499345.857	103509.645	6.000	1.702	1350					
							1	1.000	4.510	450
HW2 - B1	499358.825	103557.883	6.000	1.800	1350					
							0	1.002	4.200	450
S18 - FC	499360.000	103571.198	6.000	2.000	1350					
							1	1.002	4.000	450
							0	1.003	4.000	450
S2	499382.829	103647.539	3.800	1.750	1350					
							1	1.003	2.050	450
							0	1.004	2.050	450
HW3	499386.244	103657.629	3.800	1.780	1350					
							1	1.004	2.020	450

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S278 - TANK	499294.496	103681.029	6.275	2.320	1050					
						0	2.000	3.955	300	
S278 - FC	499303.518	103680.595	6.985	3.137	1350		1	2.000	3.848	300
						0	2.001	3.848	300	
HW4	499365.057	103693.471	3.800	1.780	1350		1	2.001	2.020	300
HW5 - B2	499437.031	103759.897	3.800	1.800	1350					
						0	1.006	2.000	450	
S3 - FC	499432.495	103768.320	3.952	2.272	2100		1	1.006	1.680	450
						0	1.007	1.680	375	
S4	499409.929	103808.231	3.446	1.959	1200		1	1.007	1.487	375
						0	1.008	1.487	375	
Ex. HW	499412.938	103825.150	2.330	1.130	1200		1	1.008	1.200	375

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Detailed	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	240	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 %)
100	40	0	0

Node S18 - FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	4.000	Product Number	CTL-SHE-0073-3000-1700-3000
Design Depth (m)	1.700	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	3.0	Min Node Diameter (mm)	1200

Node S278 - FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	3.848	Product Number	CTL-SHE-0096-4000-0907-4000
Design Depth (m)	0.907	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	4.0	Min Node Diameter (mm)	1200

Node S3 - FC Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	1.680	Product Number	CTL-SHE-0334-7000-1520-7000
Design Depth (m)	1.520	Min Outlet Diameter (m)	0.375
Design Flow (l/s)	70.0	Min Node Diameter (mm)	

Node HW2 - B1 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	98.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.200	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.025

Inlets

HW1

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	4974.0	0.0	1.800	8997.0	0.0

Node S278 - FC Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.955
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	225.0	0.0	0.800	225.0	0.0	0.801	0.0	0.0

Node HW5 - B2 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	114.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	2.000	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.025

Inlets

HW3 HW4

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	5097.0	0.0	1.800	7515.2	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	512.714	145.080	100 year +40% CC 360 minute summer	61.770	15.895
100 year +40% CC 15 minute winter	359.799	145.080	100 year +40% CC 360 minute winter	40.152	15.895
100 year +40% CC 30 minute summer	343.435	97.180	100 year +40% CC 480 minute summer	47.739	12.616
100 year +40% CC 30 minute winter	241.007	97.180	100 year +40% CC 480 minute winter	31.717	12.616
100 year +40% CC 60 minute summer	235.659	62.278	100 year +40% CC 600 minute summer	38.469	10.522
100 year +40% CC 60 minute winter	156.566	62.278	100 year +40% CC 600 minute winter	26.284	10.522
100 year +40% CC 120 minute summer	140.692	37.181	100 year +40% CC 720 minute summer	33.800	9.059
100 year +40% CC 120 minute winter	93.473	37.181	100 year +40% CC 720 minute winter	22.716	9.059
100 year +40% CC 180 minute summer	106.232	27.337	100 year +40% CC 960 minute summer	27.075	7.130
100 year +40% CC 180 minute winter	69.053	27.337	100 year +40% CC 960 minute winter	17.935	7.130
100 year +40% CC 240 minute summer	82.847	21.894	100 year +40% CC 1440 minute summer	19.000	5.092
100 year +40% CC 240 minute winter	55.042	21.894	100 year +40% CC 1440 minute winter	12.769	5.092

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 90.57%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	S1	1470	5.593	1.044	0.2	1.4936	0.0000	SURCHARGED
1440 minute winter	HW1	1470	5.593	1.295	127.5	0.0000	0.0000	OK
1440 minute winter	HW2 - B1	1470	5.593	1.393	263.3	138.7319	0.0000	SURCHARGED
1440 minute winter	S18 - FC	1470	5.593	1.593	13.2	2.2792	0.0000	SURCHARGED
600 minute winter	S2	600	3.501	1.451	2.8	2.0758	0.0000	FLOOD RISK
600 minute winter	HW3	600	3.502	1.482	7.7	0.0000	0.0000	OK
240 minute winter	S278 - TANK	236	4.629	0.674	0.2	0.5841	0.0000	SURCHARGED
240 minute winter	S278 - FC	236	4.629	0.781	34.4	146.7235	0.0000	SURCHARGED
600 minute winter	HW4	585	3.502	1.482	41.3	0.0000	0.0000	OK
600 minute winter	HW5 - B2	600	3.498	1.498	742.3	203.6637	0.0000	SURCHARGED
600 minute winter	S3 - FC	600	3.491	1.811	70.3	6.2734	0.0000	SURCHARGED
360 minute winter	S4	200	2.362	0.875	69.9	0.9893	0.0000	SURCHARGED
15 minute summer	Ex. HW	1	2.330	1.130	49.5	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	S1	1.000	HW1	-0.2	-0.012	-0.001	2.4955	
1440 minute winter	HW1	Flow through pond	HW2 - B1	-127.5	-0.008	-0.001	8704.9453	
1440 minute winter	HW2 - B1	1.002	S18 - FC	13.2	0.252	0.033	2.1179	
1440 minute winter	S18 - FC	1.003	S2	2.9	0.358	0.006	6.4439	
600 minute winter	S2	1.004	HW3	5.7	0.121	0.033	1.6877	
600 minute winter	HW3	Flow through pond	HW5 - B2	-321.3	-0.024	-0.003	8743.4355	
240 minute winter	S278 - TANK	2.000	S278 - FC	-0.2	-0.004	-0.002	0.6361	
240 minute winter	S278 - FC	2.001	HW4	5.3	0.708	0.028	2.3981	
600 minute winter	HW4	Flow through pond	HW5 - B2	-321.3	-0.024	-0.003	8743.4355	
600 minute winter	HW5 - B2	1.006	S3 - FC	70.3	0.444	0.119	1.5158	
600 minute winter	S3 - FC	1.007	S4	69.9	0.634	0.541	5.0570	
360 minute winter	S4	1.008	Ex. HW	69.9	0.634	0.270	1.8953	1761.5

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	1.000
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWALE		5.00	6.100	1200	498937.849	102703.735	1.531
H	7.919	5.00	6.065	1500	498925.600	102670.785	1.565
H1		5.00	6.065	1500	499003.730	102550.518	1.700
HB 1			6.065	3000	499010.272	102540.247	1.775
S1			6.080	1500	499034.035	102503.991	1.980
S2	0.299	5.00	5.850	1500	499056.709	102474.968	1.960
HB 2			5.850	1500	499055.686	102473.158	2.225
EX MH			5.610	1200	499044.029	102452.829	2.065
EX HEADWALL			5.060	1200	499037.436	102431.742	1.470
S1 - S	1.303	5.00	7.500	1500	499067.816	102534.674	1.900
S2 - S			7.300	1500	499042.782	102511.605	2.300

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)
1.000	SWALE	H	35.153	0.600	4.569	4.500	0.069	509.5	600	5.55	50.0
1.002	H1	HB 1	12.178	0.600	4.365	4.290	0.075	162.4	600	5.11	50.0
1.003	HB 1	S1	43.350	0.600	4.290	4.100	0.190	228.2	300	5.80	50.0
1.004	S1	S2	36.830	0.600	4.100	3.965	0.135	272.8	300	6.45	50.0
1.005	S2	HB 2	2.079	0.600	3.890	3.625	0.265	7.8	375	6.45	50.0
1.006	HB 2	EX MH	23.434	0.600	3.625	3.545	0.080	292.9	600	6.73	50.0
1.007	EX MH	EX HEADWALL	22.094	0.600	3.770	3.590	0.180	122.7	300	6.99	50.0
2.000	S1 - S	S2 - S	25.041	0.600	5.600	5.000	0.600	41.7	300	5.17	50.0
2.001	S2 - S	S1	20.615	0.600	5.000	4.100	0.900	22.9	300	5.28	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.072	303.0	0.0	0.931	0.965	0.000	0.0
1.002	1.908	539.5	0.0	1.100	1.175	0.000	0.0
1.003	1.036	73.3	0.0	1.475	1.680	0.000	0.0
1.004	0.947	66.9	247.2	1.680	1.585	1.303	0.0
1.005	6.501	718.0	304.0	1.585	1.850	1.602	0.0
1.006	1.417	400.8	304.0	1.625	1.465	1.602	0.0
1.007	1.418	100.2	304.0	1.540	1.170	1.602	0.0
2.000	2.440	172.5	247.2	1.600	2.000	1.303	0.0
2.001	3.299	233.2	247.2	2.000	1.680	1.303	0.0

Pipeline Schedule

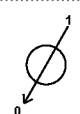
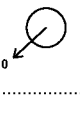
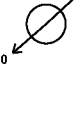
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	35.153	509.5	600	Circular	6.100	4.569	0.931	6.065	4.500	0.965
1.002	12.178	162.4	600	Circular	6.065	4.365	1.100	6.065	4.250	1.175
1.003	43.350	228.2	300	Circular	6.065	4.290	1.475	6.080	4.100	1.680
1.004	36.830	272.8	300	Circular	6.080	4.100	1.680	5.850	3.965	1.585
1.005	2.079	7.8	375	Circular	5.850	3.890	1.585	5.850	3.625	1.850
1.006	23.434	292.9	600	Circular	5.850	3.625	1.625	5.610	3.545	1.465
1.007	22.094	122.7	300	Circular	5.610	3.770	1.540	5.060	3.590	1.170
2.000	25.041	41.7	300	Circular	7.500	5.600	1.600	7.300	5.000	2.000
2.001	20.615	22.9	300	Circular	7.300	5.000	2.000	6.080	4.100	1.680

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SWALE	1200	Manhole	Adoptable	H	1500	Manhole	Adoptable
1.002	H1	1500	Manhole	Adoptable	HB 1	3000	Manhole	Adoptable
1.003	HB 1	3000	Manhole	Adoptable	S1	1500	Manhole	Adoptable
1.004	S1	1500	Manhole	Adoptable	S2	1500	Manhole	Adoptable
1.005	S2	1500	Manhole	Adoptable	HB 2	1500	Manhole	Adoptable
1.006	HB 2	1500	Manhole	Adoptable	EX MH	1200	Manhole	Adoptable
1.007	EX MH	1200	Manhole	Adoptable	EX HEADWALL	1200	Manhole	Adoptable
2.000	S1 - S	1500	Manhole	Adoptable	S2 - S	1500	Manhole	Adoptable
2.001	S2 - S	1500	Manhole	Adoptable	S1	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SWALE	498937.849	102703.735	6.100	1.531	1200		0	1.000	4.569	600
H	498925.600	102670.785	6.065	1.565	1500		1	1.000	4.500	600
H1	499003.730	102550.518	6.065	1.700	1500		0	1.002	4.365	600
HB 1	499010.272	102540.247	6.065	1.775	3000		1	1.002	4.250	600
							0	1.003	4.290	300
S1	499034.035	102503.991	6.080	1.980	1500		1	1.001	4.100	300
							2	1.003	4.100	300
							0	1.004	4.100	300
S2	499056.709	102474.968	5.850	1.960	1500		1	1.004	3.965	300
							0	1.005	3.890	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HB 2	499055.686	102473.158	5.850	2.225	1500		1	1.005	3.625
EX MH	499044.029	102452.829	5.610	2.065	1200		1	1.006	3.545
EX HEADWALL	499037.436	102431.742	5.060	1.470	1200		1	1.007	3.590
S1 - S	499067.816	102534.674	7.500	1.900	1500		0	2.000	5.600
S2 - S	499042.782	102511.605	7.300	2.300	1500		1	2.000	5.000
							0	2.001	5.000

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	1440	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 %)
100	40	0	0

Node HB 1 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	4.290	Product Number	CTL-SHE-0102-5400-1475-5400
Design Depth (m)	1.475	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.4	Min Node Diameter (mm)	1200

Node HB 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.625	Product Number	CTL-SHE-0133-8800-1265-8800
Design Depth (m)	1.265	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.8	Min Node Diameter (mm)	1200

Node S2 - S Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	5.000	Product Number	CTL-SHE-0058-2000-1800-2000
Design Depth (m)	1.800	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node H1 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	167.850
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.365	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.020

Inlets

H

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	4755.0	0.0	1.700	7500.0	0.0

Node S2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.890
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	1320

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	105.0	0.0	1.300	419.5	0.0	1.301	0.0	0.0

Node S1 - S Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1216.0	0.0	1.200	1216.0	0.0	1.201	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	512.714	145.080	100 year +40% CC 360 minute summer	61.770	15.895
100 year +40% CC 15 minute winter	359.799	145.080	100 year +40% CC 360 minute winter	40.152	15.895
100 year +40% CC 30 minute summer	343.435	97.180	100 year +40% CC 480 minute summer	47.739	12.616
100 year +40% CC 30 minute winter	241.007	97.180	100 year +40% CC 480 minute winter	31.717	12.616
100 year +40% CC 60 minute summer	235.659	62.278	100 year +40% CC 600 minute summer	38.469	10.522
100 year +40% CC 60 minute winter	156.566	62.278	100 year +40% CC 600 minute winter	26.284	10.522
100 year +40% CC 120 minute summer	140.692	37.181	100 year +40% CC 720 minute summer	33.800	9.059
100 year +40% CC 120 minute winter	93.473	37.181	100 year +40% CC 720 minute winter	22.716	9.059
100 year +40% CC 180 minute summer	106.232	27.337	100 year +40% CC 960 minute summer	27.075	7.130
100 year +40% CC 180 minute winter	69.053	27.337	100 year +40% CC 960 minute winter	17.935	7.130
100 year +40% CC 240 minute summer	82.847	21.894	100 year +40% CC 1440 minute summer	19.000	5.092
100 year +40% CC 240 minute winter	55.042	21.894	100 year +40% CC 1440 minute winter	12.769	5.092

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.78%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWALE	1470	5.968	1.399	0.4	1.5826	0.0000	FLOOD RISK
1440 minute winter	H	1470	5.968	1.468	280.9	151.1864	0.0000	OK
1440 minute winter	H1	1470	5.968	1.603	142.4	2.8330	0.0000	FLOOD RISK
1440 minute winter	HB 1	1470	5.968	1.678	13.1	11.8637	0.0000	FLOOD RISK
720 minute winter	S1	705	5.002	0.902	6.9	1.5931	0.0000	SURCHARGED
720 minute winter	S2	705	5.000	1.110	25.7	270.9402	0.0000	SURCHARGED
720 minute summer	HB 2	735	5.001	1.376	15.0	2.4311	0.0000	SURCHARGED
30 minute winter	EX MH	8	3.895	0.350	8.8	0.3961	0.0000	OK
15 minute summer	EX HEADWALL	1	3.890	0.300	9.2	0.0000	0.0000	OK
1440 minute winter	S1 - S	1440	6.778	1.178	46.2	1450.5990	0.0000	SURCHARGED
1440 minute winter	S2 - S	1440	6.778	1.778	3.3	3.1414	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWALE	1.000	H	-0.4	-0.006	-0.001	9.9018	
1440 minute winter	H	Flow through pond	H1	142.4	0.076	0.002	9092.6475	
1440 minute winter	H1	1.002	HB 1	13.1	0.241	0.024	3.4303	
1440 minute winter	HB 1	Hydro-Brake®	S1	5.4				
720 minute winter	S1	1.004	S2	6.9	0.609	0.102	2.5935	
720 minute winter	S2	1.005	HB 2	16.3	0.305	0.023	0.2293	
720 minute summer	HB 2	Hydro-Brake®	EX MH	8.8				
30 minute winter	EX MH	1.007	EX HEADWALL	8.8	0.166	0.087	1.0846	702.9
1440 minute winter	S1 - S	2.000	S2 - S	3.3	0.218	0.019	1.7634	
1440 minute winter	S2 - S	Hydro-Brake®	S1	2.0				

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	40	Minimum Backdrop Height (m)	1.000
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWALE		5.00	6.100	1200	498937.849	102703.735	1.531
H	7.919	5.00	6.065	1500	498925.600	102670.785	1.565
H1		5.00	6.065	1500	499003.730	102550.518	1.700
HB 1			6.065	3000	499010.272	102540.247	1.775
S1			6.080	1500	499034.035	102503.991	1.980
S2	0.299	5.00	5.850	1500	499056.709	102474.968	1.960
HB 2			5.850	1500	499055.686	102473.158	2.225
EX MH			5.610	1200	499044.029	102452.829	2.065
EX HEADWALL			5.060	1200	499037.436	102431.742	1.470
S1 - S	1.303	5.00	7.500	1500	499067.816	102534.674	1.900
S2 - S			7.300	1500	499042.782	102511.605	2.300

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)
1.000	SWALE	H	35.153	0.600	4.569	4.500	0.069	509.5	600	5.55	50.0
1.002	H1	HB 1	12.178	0.600	4.365	4.290	0.075	162.4	600	5.11	50.0
1.003	HB 1	S1	43.350	0.600	4.290	4.100	0.190	228.2	300	5.80	50.0
1.004	S1	S2	36.830	0.600	4.100	3.965	0.135	272.8	300	6.45	50.0
1.005	S2	HB 2	2.079	0.600	3.890	3.625	0.265	7.8	375	6.45	50.0
1.006	HB 2	EX MH	23.434	0.600	3.625	3.545	0.080	292.9	600	6.73	50.0
1.007	EX MH	EX HEADWALL	22.094	0.600	3.770	3.590	0.180	122.7	300	6.99	50.0
2.000	S1 - S	S2 - S	25.041	0.600	5.600	5.000	0.600	41.7	300	5.17	50.0
2.001	S2 - S	S1	20.615	0.600	5.000	4.100	0.900	22.9	300	5.28	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)
1.000	1.072	303.0	0.0	0.931	0.965	0.000	0.0
1.002	1.908	539.5	0.0	1.100	1.175	0.000	0.0
1.003	1.036	73.3	0.0	1.475	1.680	0.000	0.0
1.004	0.947	66.9	247.2	1.680	1.585	1.303	0.0
1.005	6.501	718.0	304.0	1.585	1.850	1.602	0.0
1.006	1.417	400.8	304.0	1.625	1.465	1.602	0.0
1.007	1.418	100.2	304.0	1.540	1.170	1.602	0.0
2.000	2.440	172.5	247.2	1.600	2.000	1.303	0.0
2.001	3.299	233.2	247.2	2.000	1.680	1.303	0.0

Pipeline Schedule

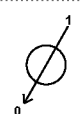
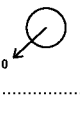
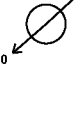
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	35.153	509.5	600	Circular	6.100	4.569	0.931	6.065	4.500	0.965
1.002	12.178	162.4	600	Circular	6.065	4.365	1.100	6.065	4.250	1.175
1.003	43.350	228.2	300	Circular	6.065	4.290	1.475	6.080	4.100	1.680
1.004	36.830	272.8	300	Circular	6.080	4.100	1.680	5.850	3.965	1.585
1.005	2.079	7.8	375	Circular	5.850	3.890	1.585	5.850	3.625	1.850
1.006	23.434	292.9	600	Circular	5.850	3.625	1.625	5.610	3.545	1.465
1.007	22.094	122.7	300	Circular	5.610	3.770	1.540	5.060	3.590	1.170
2.000	25.041	41.7	300	Circular	7.500	5.600	1.600	7.300	5.000	2.000
2.001	20.615	22.9	300	Circular	7.300	5.000	2.000	6.080	4.100	1.680

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SWALE	1200	Manhole	Adoptable	H	1500	Manhole	Adoptable
1.002	H1	1500	Manhole	Adoptable	HB 1	3000	Manhole	Adoptable
1.003	HB 1	3000	Manhole	Adoptable	S1	1500	Manhole	Adoptable
1.004	S1	1500	Manhole	Adoptable	S2	1500	Manhole	Adoptable
1.005	S2	1500	Manhole	Adoptable	HB 2	1500	Manhole	Adoptable
1.006	HB 2	1500	Manhole	Adoptable	EX MH	1200	Manhole	Adoptable
1.007	EX MH	1200	Manhole	Adoptable	EX HEADWALL	1200	Manhole	Adoptable
2.000	S1 - S	1500	Manhole	Adoptable	S2 - S	1500	Manhole	Adoptable
2.001	S2 - S	1500	Manhole	Adoptable	S1	1500	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
SWALE	498937.849	102703.735	6.100	1.531	1200		0	1.000	4.569	600
H	498925.600	102670.785	6.065	1.565	1500		1	1.000	4.500	600
H1	499003.730	102550.518	6.065	1.700	1500		0	1.002	4.365	600
HB 1	499010.272	102540.247	6.065	1.775	3000		1	1.002	4.250	600
S1	499034.035	102503.991	6.080	1.980	1500		0	1.003	4.290	300
							1	1.003	4.100	300
S2	499056.709	102474.968	5.850	1.960	1500		0	1.004	4.100	300
							1	1.004	3.965	300
							0	1.005	3.890	375

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
HB 2	499055.686	102473.158	5.850	2.225	1500		1	1.005	3.625
EX MH	499044.029	102452.829	5.610	2.065	1200		1	1.006	3.545
EX HEADWALL	499037.436	102431.742	5.060	1.470	1200		1	1.007	3.590
S1 - S	499067.816	102534.674	7.500	1.900	1500		0	2.000	5.600
S2 - S	499042.782	102511.605	7.300	2.300	1500		1	2.000	5.000
							0	2.001	5.000

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m³/ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	1440	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 %)
100	40	0	0

Node HB 1 Online Hydro-Brake® Control

Flap Valve	✓	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	4.290	Product Number	CTL-SHE-0102-5400-1475-5400
Design Depth (m)	1.475	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	5.4	Min Node Diameter (mm)	1200

Node HB 2 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.625	Product Number	CTL-SHE-0133-8800-1265-8800
Design Depth (m)	1.265	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.8	Min Node Diameter (mm)	1200

Node S2 - S Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	5.000	Product Number	CTL-SHE-0058-2000-1800-2000
Design Depth (m)	1.800	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	2.0	Min Node Diameter (mm)	1200

Node H1 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	167.850
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.365	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.020

Inlets

H

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	4755.0	0.0	1.700	7500.0	0.0

Node S2 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	3.890
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	900

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	105.0	0.0	1.300	419.5	0.0	1.301	0.0	0.0

Node S1 - S Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	5.600
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1216.0	0.0	1.200	1216.0	0.0	1.201	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	512.714	145.080	100 year +40% CC 360 minute summer	61.770	15.895
100 year +40% CC 15 minute winter	359.799	145.080	100 year +40% CC 360 minute winter	40.152	15.895
100 year +40% CC 30 minute summer	343.435	97.180	100 year +40% CC 480 minute summer	47.739	12.616
100 year +40% CC 30 minute winter	241.007	97.180	100 year +40% CC 480 minute winter	31.717	12.616
100 year +40% CC 60 minute summer	235.659	62.278	100 year +40% CC 600 minute summer	38.469	10.522
100 year +40% CC 60 minute winter	156.566	62.278	100 year +40% CC 600 minute winter	26.284	10.522
100 year +40% CC 120 minute summer	140.692	37.181	100 year +40% CC 720 minute summer	33.800	9.059
100 year +40% CC 120 minute winter	93.473	37.181	100 year +40% CC 720 minute winter	22.716	9.059
100 year +40% CC 180 minute summer	106.232	27.337	100 year +40% CC 960 minute summer	27.075	7.130
100 year +40% CC 180 minute winter	69.053	27.337	100 year +40% CC 960 minute winter	17.935	7.130
100 year +40% CC 240 minute summer	82.847	21.894	100 year +40% CC 1440 minute summer	19.000	5.092
100 year +40% CC 240 minute winter	55.042	21.894	100 year +40% CC 1440 minute winter	12.769	5.092

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.88%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	SWALE	1440	5.752	1.183	0.4	1.3379	0.0000	SURCHARGED
1440 minute winter	H	1440	5.752	1.252	235.9	128.9071	0.0000	OK
1440 minute winter	H1	1440	5.752	1.387	120.2	2.4507	0.0000	SURCHARGED
1440 minute winter	HB 1	1440	5.752	1.462	14.3	10.3342	0.0000	SURCHARGED
720 minute winter	S1	720	4.883	0.783	6.9	1.3831	0.0000	SURCHARGED
720 minute winter	S2	720	4.881	0.991	22.6	227.6392	0.0000	SURCHARGED
720 minute winter	HB 2	720	4.882	1.257	13.0	2.2204	0.0000	SURCHARGED
15 minute summer	EX MH	7	3.899	0.354	8.8	0.4002	0.0000	OK
15 minute summer	EX HEADWALL	1	3.890	0.300	9.1	0.0000	0.0000	OK
1440 minute winter	S1 - S	1440	6.575	0.975	38.8	1201.1260	0.0000	SURCHARGED
1440 minute winter	S2 - S	1440	6.575	1.575	2.4	2.7835	0.0000	SURCHARGED

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	SWALE	1.000	H	-0.4	-0.005	-0.001	9.9018	
1440 minute winter	H	Flow through pond	H1	120.2	0.078	0.002	7571.6069	
1440 minute winter	H1	1.002	HB 1	14.3	0.408	0.026	3.4303	
1440 minute winter	HB 1	Hydro-Brake®	S1	5.4				
720 minute winter	S1	1.004	S2	6.9	0.605	0.103	2.5935	
720 minute winter	S2	1.005	HB 2	13.0	0.298	0.018	0.2293	
720 minute winter	HB 2	Hydro-Brake®	EX MH	8.8				
15 minute summer	EX MH	1.007	EX HEADWALL	9.1	0.172	0.091	1.0967	650.7
1440 minute winter	S1 - S	2.000	S2 - S	2.4	0.221	0.014	1.7634	
1440 minute winter	S2 - S	Hydro-Brake®	S1	1.9				

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	5.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWALE		5.00	6.202	1500	499148.855	102475.804	1.948
H	5.391		5.920	1500	499140.646	102449.008	1.723
H3		5.00	5.920	1350	499192.696	102378.630	1.800
HB3			5.920	1350	499196.436	102375.125	1.817
H4	5.076		5.260	1350	499221.445	102351.677	1.290
H5		5.00	5.260	1350	499316.257	102237.302	1.500
HB4			5.260	1350	499316.940	102232.693	1.533
S3			4.804	1350	499321.899	102201.823	1.262
MH004			4.770	1350	499313.550	102188.482	1.545
EX HEADWALL 2			4.500	1350	499298.297	102176.392	1.470

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)
1.000	SWALE	H	28.025	0.600	4.254	4.202	0.052	538.9	600	5.00	50.0
1.001	H3	HB3	5.126	0.600	4.120	4.103	0.017	301.5	450	5.00	50.0
1.002	HB3	H4	34.282	0.600	4.103	4.012	0.091	376.7	450	5.00	50.0
1.004	H5	HB4	4.659	0.600	3.760	3.727	0.033	141.2	225	5.00	50.0
1.005	HB4	S3	31.266	0.600	3.727	3.542	0.185	169.0	225	5.00	50.0
1.006	S3	MH004	15.738	0.600	3.542	3.450	0.092	171.1	225	5.00	50.0
1.007	MH004	EX HEADWALL 2	19.463	0.600	3.225	3.030	0.195	99.8	450	5.00	50.0

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)
1.000	1.042	294.5	0.0	1.348	1.118	0.000	0.0	0	0.000
1.001	1.165	185.3	0.0	1.350	1.367	0.000	0.0	0	0.000
1.002	1.041	165.6	0.0	1.367	0.798	0.000	0.0	0	0.000
1.004	1.098	43.7	0.0	1.275	1.308	0.000	0.0	0	0.000
1.005	1.003	39.9	0.0	1.308	1.097	0.000	0.0	0	0.000
1.006	0.996	39.6	0.0	1.097	1.095	0.000	0.0	0	0.000
1.007	2.035	323.6	0.0	1.095	1.020	0.000	0.0	0	0.000

Pipeline Schedule

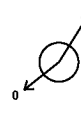
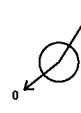
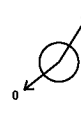
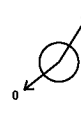
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	28.025	598.9	600	Circular	6.202	4.254	1.348	5.920	4.202	1.118
1.001	5.126	301.5	450	Circular	5.920	4.120	1.350	5.920	4.103	1.367
1.002	34.282	376.7	450	Circular	5.920	4.103	1.367	5.260	4.012	0.798
1.004	4.659	141.2	225	Circular	5.260	3.760	1.275	5.260	3.727	1.308
1.005	31.266	169.0	225	Circular	5.260	3.727	1.308	4.804	3.542	1.037
1.006	15.738	171.1	225	Circular	4.804	3.542	1.037	4.770	3.450	1.095
1.007	19.463	99.8	450	Circular	4.770	3.225	1.095	4.500	3.030	1.020

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SWALE	1500	Manhole	Adoptable	H	1500	Manhole	Adoptable
1.001	H3	1350	Manhole	Adoptable	HB3	1350	Manhole	Adoptable
1.002	HB3	1350	Manhole	Adoptable	H4	1350	Manhole	Adoptable
1.004	H5	1350	Manhole	Adoptable	HB4	1350	Manhole	Adoptable
1.005	HB4	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.006	S3	1350	Manhole	Adoptable	MH004	1350	Manhole	Adoptable
1.007	MH004	1350	Manhole	Adoptable	EX HEADWALL 2	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWALE	499148.855	102475.804	6.202	1.948	1500				
H	499140.646	102449.008	5.920	1.723	1500		0 1.000 4.254 600 1 1.000 4.202 600		
H3	499192.696	102378.630	5.920	1.800	1350		0 1.001 4.120 450		
HB3	499196.436	102375.125	5.920	1.817	1350		1 1.001 4.103 450 0 1.002 4.103 450		
H4	499221.445	102351.677	5.260	1.290	1350		1 1.002 4.012 450		
H5	499316.257	102237.302	5.260	1.500	1350		0 1.004 3.760 225		
HB4	499316.940	102232.693	5.260	1.533	1350		1 1.004 3.727 225 0 1.005 3.727 225		

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S3	499321.899	102201.823	4.804	1.262	1350		1	1.005	3.542	225
MH004	499313.550	102188.482	4.770	1.545	1350		0	1.006	3.542	225
							1	1.006	3.450	225
EX HEADWALL 2	499298.297	102176.392	4.500	1.470	1350		0	1.007	3.225	450
							1	1.007	3.030	450

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m ³ /ha)	20.0
Summer CV	1.000	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	1.000	Drain Down Time (mins)	1440	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 %)
100	40	0	0

Node HB4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.727	Product Number	CTL-SHE-0132-8500-1233-8500
Design Depth (m)	1.233	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1200

Node H3 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	77.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.120	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	74	Main Channel n	0.020

Inlets

H

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1519.0	0.0	1.500	2601.0	0.0	1.501	0.0	0.0

Node H5 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	210.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.760	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.020

Inlets

H4

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	6174.0	0.0	1.500	11154.0	0.0	1.501	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	512.714	145.080	100 year +40% CC 360 minute summer	61.770	15.895
100 year +40% CC 15 minute winter	359.799	145.080	100 year +40% CC 360 minute winter	40.152	15.895
100 year +40% CC 30 minute summer	343.435	97.180	100 year +40% CC 480 minute summer	47.739	12.616
100 year +40% CC 30 minute winter	241.007	97.180	100 year +40% CC 480 minute winter	31.717	12.616
100 year +40% CC 60 minute summer	235.659	62.278	100 year +40% CC 600 minute summer	38.469	10.522
100 year +40% CC 60 minute winter	156.566	62.278	100 year +40% CC 600 minute winter	26.284	10.522
100 year +40% CC 120 minute summer	140.692	37.181	100 year +40% CC 720 minute summer	33.800	9.059
100 year +40% CC 120 minute winter	93.473	37.181	100 year +40% CC 720 minute winter	22.716	9.059
100 year +40% CC 180 minute summer	106.232	27.337	100 year +40% CC 960 minute summer	27.075	7.130
100 year +40% CC 180 minute winter	69.053	27.337	100 year +40% CC 960 minute winter	17.935	7.130
100 year +40% CC 240 minute summer	82.847	21.894	100 year +40% CC 1440 minute summer	19.000	5.092
100 year +40% CC 240 minute winter	55.042	21.894	100 year +40% CC 1440 minute winter	12.769	5.092

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.64%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
120 minute summer	SWALE	86	5.406	1.152	5.2	2.0361	0.0000	SURCHARGED
120 minute summer	H	86	5.406	1.209	2013.6	77.8105	0.0000	OK
120 minute summer	H3	86	5.406	1.286	1173.7	1.8408	0.0000	SURCHARGED
120 minute summer	HB3	94	5.155	1.052	410.8	1.5050	0.0000	SURCHARGED
1440 minute winter	H4	1440	5.125	1.155	300.2	92.5727	0.0000	OK
1440 minute winter	H5	1440	5.125	1.365	155.3	1.9537	0.0000	FLOOD RISK
1440 minute winter	HB4	1440	5.123	1.396	8.5	1.9978	0.0000	FLOOD RISK
360 minute summer	S3	328	4.506	0.964	8.5	1.3792	0.0000	FLOOD RISK
360 minute summer	MH004	328	4.500	1.275	8.5	1.8248	0.0000	FLOOD RISK
15 minute summer	EX HEADWALL 2	1	4.500	1.470	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
120 minute summer	SWALE	1.000	H	-5.2	-0.083	-0.018	7.8940	
120 minute summer	H	Flow through pond	H3	1173.7	0.215	0.026	2458.0964	
120 minute summer	H3	1.001	HB3	410.8	2.593	2.216	0.8122	
120 minute summer	HB3	1.002	H4	410.7	2.593	2.480	5.4318	
1440 minute winter	H4	Flow through pond	H5	155.3	0.076	0.002	10443.5273	
1440 minute winter	H5	1.004	HB4	8.5	0.322	0.195	0.1853	
1440 minute winter	HB4	Hydro-Brake®	S3	8.5				
360 minute summer	S3	1.006	MH004	8.5	0.569	0.215	0.6259	
360 minute summer	MH004	1.007	EX HEADWALL 2	8.5	0.054	0.026	3.0838	803.7

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	30	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	1.000
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	5.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
SWALE		5.00	6.202	1500	499148.855	102475.804	1.948
H	5.391		5.920	1500	499140.646	102449.008	1.723
H3		5.00	5.920	1350	499192.696	102378.630	1.800
HB3			5.920	1350	499196.436	102375.125	1.817
H4	5.076		5.260	1350	499221.445	102351.677	1.290
H5		5.00	5.260	1350	499316.257	102237.302	1.500
HB4			5.260	1350	499316.940	102232.693	1.533
S3			4.804	1350	499321.899	102201.823	1.262
MH004			4.770	1350	499313.550	102188.482	1.545
EX HEADWALL 2			4.500	1350	499298.297	102176.392	1.470

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)
1.000	SWALE	H	28.025	0.600	4.254	4.202	0.052	538.9	600	5.00	50.0
1.001	H3	HB3	5.126	0.600	4.120	4.103	0.017	301.5	450	5.00	50.0
1.002	HB3	H4	34.282	0.600	4.103	4.012	0.091	376.7	450	5.00	50.0
1.004	H5	HB4	4.659	0.600	3.760	3.727	0.033	141.2	225	5.00	50.0
1.005	HB4	S3	31.266	0.600	3.727	3.542	0.185	169.0	225	5.00	50.0
1.006	S3	MH004	15.738	0.600	3.542	3.450	0.092	171.1	225	5.00	50.0
1.007	MH004	EX HEADWALL 2	19.463	0.600	3.225	3.030	0.195	99.8	450	5.00	50.0

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)
1.000	1.042	294.5	0.0	1.348	1.118	0.000	0.0	0	0.000
1.001	1.165	185.3	0.0	1.350	1.367	0.000	0.0	0	0.000
1.002	1.041	165.6	0.0	1.367	0.798	0.000	0.0	0	0.000
1.004	1.098	43.7	0.0	1.275	1.308	0.000	0.0	0	0.000
1.005	1.003	39.9	0.0	1.308	1.097	0.000	0.0	0	0.000
1.006	0.996	39.6	0.0	1.097	1.095	0.000	0.0	0	0.000
1.007	2.035	323.6	0.0	1.095	1.020	0.000	0.0	0	0.000

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)
1.000	28.025	598.9	600	Circular	6.202	4.254	1.348	5.920	4.202	1.118
1.001	5.126	301.5	450	Circular	5.920	4.120	1.350	5.920	4.103	1.367
1.002	34.282	376.7	450	Circular	5.920	4.103	1.367	5.260	4.012	0.798
1.004	4.659	141.2	225	Circular	5.260	3.760	1.275	5.260	3.727	1.308
1.005	31.266	169.0	225	Circular	5.260	3.727	1.308	4.804	3.542	1.037
1.006	15.738	171.1	225	Circular	4.804	3.542	1.037	4.770	3.450	1.095
1.007	19.463	99.8	450	Circular	4.770	3.225	1.095	4.500	3.030	1.020

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	SWALE	1500	Manhole	Adoptable	H	1500	Manhole	Adoptable
1.001	H3	1350	Manhole	Adoptable	HB3	1350	Manhole	Adoptable
1.002	HB3	1350	Manhole	Adoptable	H4	1350	Manhole	Adoptable
1.004	H5	1350	Manhole	Adoptable	HB4	1350	Manhole	Adoptable
1.005	HB4	1350	Manhole	Adoptable	S3	1350	Manhole	Adoptable
1.006	S3	1350	Manhole	Adoptable	MH004	1350	Manhole	Adoptable
1.007	MH004	1350	Manhole	Adoptable	EX HEADWALL 2	1350	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
SWALE	499148.855	102475.804	6.202	1.948	1500				
H	499140.646	102449.008	5.920	1.723	1500		0 1.000	4.254	600
H3	499192.696	102378.630	5.920	1.800	1350		0 1.001	4.120	450
HB3	499196.436	102375.125	5.920	1.817	1350		1 1.001	4.103	450
H4	499221.445	102351.677	5.260	1.290	1350		0 1.002	4.103	450
H5	499316.257	102237.302	5.260	1.500	1350		1 1.002	4.012	450
HB4	499316.940	102232.693	5.260	1.533	1350		0 1.004	3.760	225
							1 1.004	3.727	225
							0 1.005	3.727	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)	
S3	499321.899	102201.823	4.804	1.262	1350	1 0	1	1.005	3.542	225
MH004	499313.550	102188.482	4.770	1.545	1350	1 0	0	1.006	3.542	225
						1 0	1	1.006	3.450	225
EX HEADWALL 2	499298.297	102176.392	4.500	1.470	1350	1 0	0	1.007	3.225	450
						1 0	1	1.007	3.030	450

Simulation Settings

Rainfall Methodology	FEH-22	Analysis Speed	Normal	Additional Storage (m ³ /ha)	20.0
Summer CV	0.750	Skip Steady State	x	Check Discharge Rate(s)	x
Winter CV	0.840	Drain Down Time (mins)	1440	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 %)
100	40	0	0

Node HB4 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	3.727	Product Number	CTL-SHE-0132-8500-1233-8500
Design Depth (m)	1.233	Min Outlet Diameter (m)	0.150
Design Flow (l/s)	8.5	Min Node Diameter (mm)	1200

Node H3 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	77.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	4.120	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)	31	Main Channel n	0.020

Inlets

H

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	1519.0	0.0	1.500	2601.0	0.0	1.501	0.0	0.0

Node H5 Flow through Pond Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Main Channel Length (m)	210.000
Side Inf Coefficient (m/hr)	0.00000	Invert Level (m)	3.760	Main Channel Slope (1:X)	1000.0
Safety Factor	2.0	Time to half empty (mins)		Main Channel n	0.020

Inlets

H4

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	6174.0	0.0	1.500	11154.0	0.0	1.501	0.0	0.0

Rainfall

Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)	Event	Peak Intensity (mm/hr)	Average Intensity (mm/hr)
100 year +40% CC 15 minute summer	512.714	145.080	100 year +40% CC 360 minute summer	61.770	15.895
100 year +40% CC 15 minute winter	359.799	145.080	100 year +40% CC 360 minute winter	40.152	15.895
100 year +40% CC 30 minute summer	343.435	97.180	100 year +40% CC 480 minute summer	47.739	12.616
100 year +40% CC 30 minute winter	241.007	97.180	100 year +40% CC 480 minute winter	31.717	12.616
100 year +40% CC 60 minute summer	235.659	62.278	100 year +40% CC 600 minute summer	38.469	10.522
100 year +40% CC 60 minute winter	156.566	62.278	100 year +40% CC 600 minute winter	26.284	10.522
100 year +40% CC 120 minute summer	140.692	37.181	100 year +40% CC 720 minute summer	33.800	9.059
100 year +40% CC 120 minute winter	93.473	37.181	100 year +40% CC 720 minute winter	22.716	9.059
100 year +40% CC 180 minute summer	106.232	27.337	100 year +40% CC 960 minute summer	27.075	7.130
100 year +40% CC 180 minute winter	69.053	27.337	100 year +40% CC 960 minute winter	17.935	7.130
100 year +40% CC 240 minute summer	82.847	21.894	100 year +40% CC 1440 minute summer	19.000	5.092
100 year +40% CC 240 minute winter	55.042	21.894	100 year +40% CC 1440 minute winter	12.769	5.092

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.55%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
60 minute winter	SWALE	51	5.209	0.955	9.3	1.6879	0.0000	SURCHARGED
60 minute winter	H	51	5.209	1.012	1921.5	65.1003	0.0000	OK
60 minute winter	H3	52	5.209	1.089	1100.9	1.5585	0.0000	SURCHARGED
60 minute winter	HB3	52	5.002	0.899	369.8	1.2866	0.0000	SURCHARGED
1440 minute winter	H4	1440	4.962	0.992	260.4	79.5146	0.0000	OK
1440 minute winter	H5	1440	4.962	1.202	131.4	1.7205	0.0000	FLOOD RISK
1440 minute winter	HB4	1440	4.960	1.233	8.5	1.7643	0.0000	SURCHARGED
720 minute winter	S3	690	4.506	0.964	8.5	1.3792	0.0000	FLOOD RISK
720 minute winter	MH004	660	4.500	1.275	8.5	1.8248	0.0000	FLOOD RISK
15 minute summer	EX HEADWALL 2	1	4.500	1.470	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
60 minute winter	SWALE	1.000	H	-9.3	-0.143	-0.032	7.8940	
60 minute winter	H	Flow through pond	H3	1100.9	0.264	0.025	1994.4905	
60 minute winter	H3	1.001	HB3	369.8	2.334	1.995	0.8122	
60 minute winter	HB3	1.002	H4	369.8	2.335	2.233	5.4318	
1440 minute winter	H4	Flow through pond	H5	131.4	0.067	0.001	8798.7432	
1440 minute winter	H5	1.004	HB4	8.5	0.286	0.195	0.1853	
1440 minute winter	HB4	Hydro-Brake®	S3	8.5				
720 minute winter	S3	1.006	MH004	8.5	0.424	0.215	0.6259	
720 minute winter	MH004	1.007	EX HEADWALL 2	8.5	0.054	0.026	3.0838	880.2

Appendix F

VISTRY HOMES LIMITED

THE LANDINGS, LAND AT FORD AIRFIELD, FORD

SuDS Management & Maintenance Plan

**REPORT REF.
2205771**

August 2024

Contents

	Page
1. Introduction	1
2. Management & Maintenance Plan.....	2
3.0. Operation and Maintenance Requirements	7
3.1. Below Ground Drainage Network	7
Table 3: maintenance schedule for a below ground pipe network	7
3.2. Road Gullies	7
Table 4: maintenance schedule for road gullies	7
3.3. Manholes, Silt Traps and Catchpits	8
Table 5: maintenance schedule for manholes, silt traps	8
3.4. Headwalls.....	8
Table 6: maintenance schedule for inlets/outfalls	9
3.5. Swales.....	9
Table 7: maintenance schedule for swales	10
3.6. Detention Basins	10
Table 8: maintenance schedule for detention basins.....	11

Document Control Sheet

REV	ISSUE PURPOSE	AUTHOR	CHECKED	APPROVED	DATE
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1. Introduction

This report details the management and maintenance requirements of the surface water sustainable drainage system (SuDS) for the Reserved Matters applications for a residential-led mixed-use development on Land at Ford Airfield, Ford.

- 1.1. Outline (all matters reserved except access) permission (ref F/4/20/OUT) was granted in July 2023 for:
- 1.2. *"...the development of up to 1,500 dwellings (Use Class C3), 60-bed care home (Use Class C2), up to 9,000 sqm of employment floorspace (Use Classes B1), local centre of up to 2,350 sqm including up to 900 sqm retail / commercial (Use Classes A1-A5) and 1,450 sqm community / leisure floorspace (Use Classes D1-D2), land for a two-form entry primary school (Use Class D1), public open space, allotments, new sports pitches and associated facilities, drainage, parking and associated access, infrastructure, landscape, ancillary and site preparation works, including demolition of existing buildings and part removal of existing runway hardstanding..."*
- 1.3. The development will be brought forward via a number of reserved matters applications. This report is to be submitted to the Local Planning Authority in support of all Reserved Matters applications relating to drainage infrastructure. This report is to be read in conjunction with the Drainage Technical Note (Ref: 2205771-R16).

2. Management & Maintenance Plan

The Sitewide Indicative Surface Water Drainage Strategy is shown on Ardent drawing **2205771-D020 F**.

2.1. This plan defines the management and maintenance responsibilities for all proposed SuDS components to ensure their effective operation for the lifetime of the development.

2.2. Following construction of the proposed SuDS components and connection of drained surfaces to these components, the drainage system will enter the operational phase of its design life. Periodic monitoring and maintenance will be required during the
2.3. operational phase as described within this document.

2.4. Maintenance requirements for the drainage system will be summarised in handover documentation provided to the operator(s) on completion of the development in the form of Health & Safety files and Operation and Maintenance (O&M) manuals.

2.5. As indicated on the Sitewide Indicative Surface Water Drainage Strategy drawing, the drainage system comprises of various SuDS components for the effective interception, treatment, attenuation and conveyance of surface water runoff.

2.6. Management responsibilities for SuDS components will belong to the landowner or to the asset owner in instances where components are dedicated to a Highway
2.7. Authority or Independent Adoption Company by statutory or private agreement.

For the purposes of this document the maintenance responsibilities for each SuDS component are defined by the following criteria:

- Regular Maintenance
- Occasional Maintenance
- Remedial Maintenance

Ownership and Management

For the lifetime of the development the responsibility for ongoing management and maintenance of SuDS components will belong to the landowner or asset owner where ownership is transferred.

- 2.8. The following table summarises the SuDS components incorporated within the development and identifies their general location, ownership, and the maintenance duty holder.

2.9.

SuDS Component	Location	Owner	Maintenance Duty Holder
Below ground drainage (Private) • Pipes • Access & inspection chambers • Manholes • Silt traps/catchpits • Headwalls	Private land	Landowner	Landowner
Below ground drainage (Adoptable) • Pipes • Manholes • Headwalls • Foul Pumping Station	Public highway, public open space, private land	Independent Adoption Company	Independent Adoption Company
Below ground drainage (Highway) • Pipes • Manholes • Silt traps/Catchpits • Headwalls	Public highway, public open space, private land	Highway Authority	Highway Authority
Road Gully (Highway)	Public highway	Highway Authority	Highway Authority
Flow control device • Orifice plate • Vortex flow control	Public highway, public open space, private land	Highway Authority, Independent Adoption Company, Landowner	Highway Authority, Independent Adoption Company, Landowner
Swales	Public highway, public open space, private land	Highway Authority, Independent Adoption Company, Landowner	Highway Authority, Independent Adoption Company, Landowner
Detention Basin	Public open space, private land	Highway Authority, Independent Adoption Company, Landowner	Highway Authority, Independent Adoption Company, Landowner

2.10.

Table1: Ownership and maintenance matrix

- 2.11. Where SuDS components are not to be adopted by the dedicated to the Highway Authority, it is anticipated that an appropriate organisation (an independent adoption company) will be appointed the responsibility for the monitoring and maintenance of the surface water drainage system during the operational phase.

The maintenance regimes developed by this organisation will incorporate the requirements of this document together with the specific/further requirements detailed within handover documentation.

Health & Safety Requirements

The design of the surface water drainage system shall comply with the Construction (Design and management) (CDM) Regulations 2015 in order that designers assess foreseeable risks during construction and maintenance and design to minimise them by the following (in order of preference):

2.12.

- Avoid
- Reduce
- Identify and mitigate residual risks

2.13.

Designer's risk assessments and maintenance statements will be contained with the handover information to make the contractors and others aware of risks associated with the management and maintenance of the system.

2.14.

The Health and Safety at Work Act and Regulations under it apply to the maintenance and monitoring works required for the surface water drainage. These operations will be always subject to risk assessment.

2.15.

The organisation responsible for maintenance and monitoring requirements outlined in this document shall take appropriate health and safety precautions in accordance with 2.3.2 and 2.3.3.

Suds Component Overview

The following tables provides an overview of maintenance requirements for different SuDS components.

2.16.

Operation and maintenance activity	SuDS Component				
	Below ground drainage	Road gullies	Flow control devices	Swales	Detention basins
Monitoring					
Inspection					
Regular maintenance					
Litter & debris removal					
Grass cutting					
Weed & invasive vegetation control					
Tree & shrub management					
Shoreline vegetation management					
Aquatic vegetation management					

	Below ground drainage	Road gullies	Flow control devices	Swales	Detention basins

Occasional maintenance					
Sediment management ¹					
Vegetation replacement					
Vacuum sweeping & brushing					
Remedial maintenance					
Structure rehabilitation/repair					
Infiltration surface reconditioning					

Table 2: SuDS Component Overview

Key	
	will be required
	may be required
	not required
1	Sediment should be collected and managed in pre-treatment systems, upstream of the main SuDS component.

3.0. Operation and Maintenance Requirements

3.1. Below Ground Drainage Network

Maintenance Schedule	Required Action	Required Frequency
Monitoring	Visually inspect manholes, silt traps, vortex separator inlet/outlet headwalls and attenuation basin for evidence of siltation, damage or blockage	Every 2 months first 12 months, then every 6 months
Occasional Maintenance	CCTV survey pipes to periodically record structural pipe condition. Undertake survey recommendations as required	Every 5 years; or as required by monitoring
Remedial Maintenance	Trimming of any roots that may be causing blockages	As required
	Removal of blockage by rodding, jetting, hydraulic rams, suction tanker etc.	As required
	Replacement of structurally damaged pipe sections	As required

Table 3: maintenance schedule for a below ground pipe network

3.2. Road Gullies

Maintenance Schedule	Required Action	Required Frequency
Monitoring	Inspection of silt accumulation rates and establish appropriate removal frequencies	Monthly during first year of operation, then every 6 months thereafter
	Structural inspection of gully covers, frames and bedding for defects or damage	Every 6 months
Regular Maintenance	Remove litter and debris	Every 6 months; or as required by monitoring
Occasional Maintenance	Emptying of gullies and accumulated deposits by suction tanker	Yearly, or as required by monitoring
Remedial Maintenance	Replacement of damaged gully tops	As required

Table 4: maintenance schedule for road gullies

3.3. Manholes, Silt Traps, Catchpits and Foul Pumping Station

Maintenance Schedule	Required Action	Required Frequency
Monitoring	General inspection of chamber covers for signs of damage, wear and rocking covers	Every 6 months
	Structural inspection of chamber cover surrounds	Every 6 months
	Inspection of manhole chamber internals for evidence of pipe surcharging	Every 6 months
	Inspection of silt accumulation rates and establish appropriate removal frequencies	Monthly during first year of operation, then every 6 months thereafter
Regular Maintenance	Removal of accumulated deposits by suction tanker	Every 6 months; or as required by monitoring
Occasional Maintenance	Sides, benching and channels washed down with clean water jetting	Every 6 months; or as required by monitoring
	Removal of accumulated deposits by suction tanker following high return period storm or period of poor performance	As required
Remedial Maintenance	Replacement of damaged chamber covers and chamber cover bedding	As required
	Sealing repair of cracked/spalled concrete and benching	As required

Table 5: maintenance schedule for manholes, silt traps

3.4. Headwalls

Maintenance Schedule	Required Action	Required Frequency
Monitoring	Inspect apron for debris or signs of blockage	Every 6 months
	Inspect condition of security grille	Every 6 months
	Inspect condition of inlet/outfall structure	Every 6 months
Regular Maintenance	Remove accumulated litter, debris or vegetation from headwall and grille	Every 6 months
Occasional Maintenance	Remove accumulated litter, debris or vegetation following high return period storm	As required

Maintenance Schedule	Required Action	Required Frequency
Remedial Maintenance	Sealing repair of cracked/spalled concrete	As required
	Repair or replacement of security grille components	As required

Table 6: maintenance schedule for inlets/outfalls

3.3. Swales

Maintenance Schedule	Required Action	Required Frequency
Monitoring	Inspect filter strip surface to identify evidence of erosion, poor vegetation growth, compaction, ponding, sedimentation and contamination (e.g. oils)	Monthly (at start, then half yearly)
	Check flow spreader and filter strip surface for even gradients	Monthly (at start, then half yearly)
	Inspect gravel flow spreader upstream of filter strip for clogging	Monthly (at start, then half yearly)
	Inspect silt accumulation rates and establish appropriate removal frequencies	Monthly (at start, then half yearly)
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut grass – to retain grass height within specified design range (e.g. 75-150mm)	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
Occasional Maintenance	Reseed areas of poor vegetation growth; alter plant types to better suit conditions, if required	As required or if bare soil is exposed over >10% of the filter strip area
Remedial Maintenance	Repair erosion or other damage by re-turfing or reseedling	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench,	As required

	flow spreader, or at top of filter strip	
	Remove and dispose of oils or petrol residues using safe standard practises, undertake waste classification testing prior to disposa	As required

Table 7: maintenance schedule for swales

3.6. Detention Basins

Maintenance Schedule	Required Action	Required Frequency
Monitoring	Inspect/check all inlets, outlets and overflows to ensure that they are in good condition and free from blockages	Monthly
	Inspect banksides, structures, pipework etc. for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies	Monthly (for first year), then annually or as required
	Check any mechanical devices, e.g. penstocks	Every 6 months
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut grass – for spillways and access routes	Monthly (during growing season), or as required
	Cut grass – meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Tidy all dead growth before start of growing season	Annually
	Manage wetland plants in outlet pool – where provided	Annually (see Wetlands)
Occasional Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required by monitoring	Every 2 to 5 years, or as required (likely to be minimal requirement where treatment is provided upstream)
Remedial Maintenance	Repair erosion or other damage by reseedling or turfing	As required

Maintenance Schedule	Required Action	Required Frequency
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table 8: maintenance schedule for detention basins