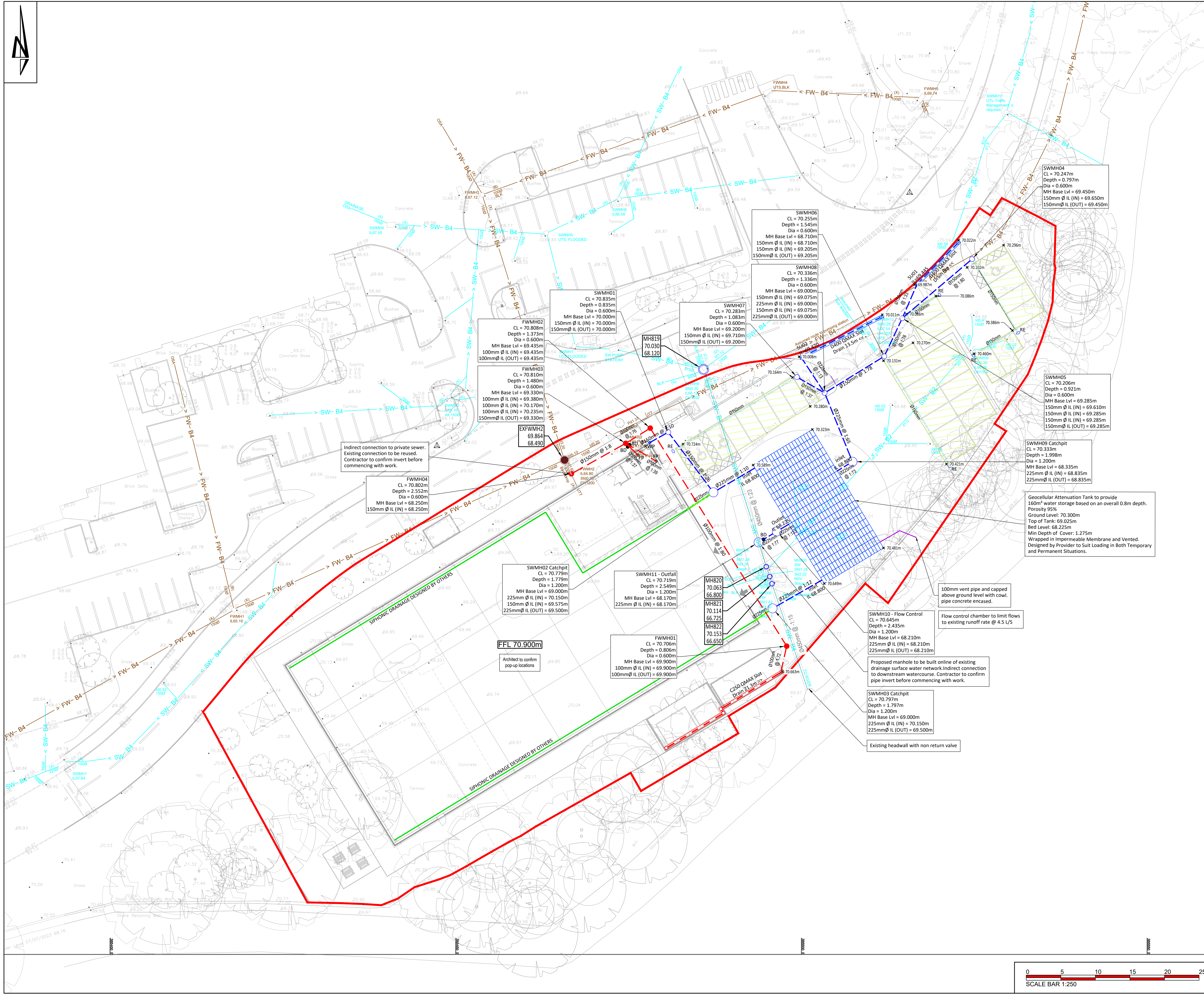
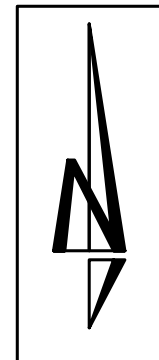




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CONSTRUCTION
MAINTENANCE
DEMOLITION
IT IS ASSUMED THAT ALL WORKS WILL BE CARRIED OUT BY A COMPETENT CONTRACTOR WORKING, WHERE APPROPRIATE, TO AN APPROVED METHOD STATEMENT

- GENERAL NOTES:
- THIS DRAWING SHALL BE READ IN CONJUNCTION WITH ALL THE RELEVANT ARCHITECTS, ENGINEERS' AND SERVICE ENGINEERS DRAWINGS & SPECIFICATIONS.
 - BASED ON "LANE AND FRANKHAM" TOPO SURVEY LF4945-LAF-XX-ST-DR-G-1001-R01 (28/07/23) AND "PHP ARCHITECTS" ARCHITECTS LAYOUT 4694-RBP-PHP-XX-XX-DR-A-101 PROPOSED SITE PLAN P06

- KEY:
- Site Boundary
 - F.F.L. 77.77m Proposed Building Level
 - SW00 Proposed Surface Water Pipe & Chamber
 - FW00 Proposed Foul Water Pipe & Chamber
 - SU Proposed Slot Drain & Sump Unit
 - SU = Sump Unit
 - AP = Access Point
 - Proposed Attenuation Tank
 - Porous Paving Block
 - Lined Permeable Paving (System C)
 - No Ground Infiltration with Sealed Outlet. Subbase To Be SHW Type 3
 - Material CL 805 With Perforated Pipe
 - Proposed Vent Pipe
 - Siphonic Drainage (Design By Others)
 - Perforated Pipe
 - RE Rodding Eye
 - FP₀ Foul Water Pops Up
 - BD₀ Backdrop
 - Existing Surface Water Pipe & Chamber
 - Existing Foul Water Pipe & Chamber
 - Existing Drainage To Be Removed

P01	10/10/23	SMB	First Issue	DV
REV	DATE	BY	DESCRIPTION	CHK'D

North Office:
5 Ambassador Place, Stockport Road,
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Tel: +44 (0)161 804 8046

South Office:
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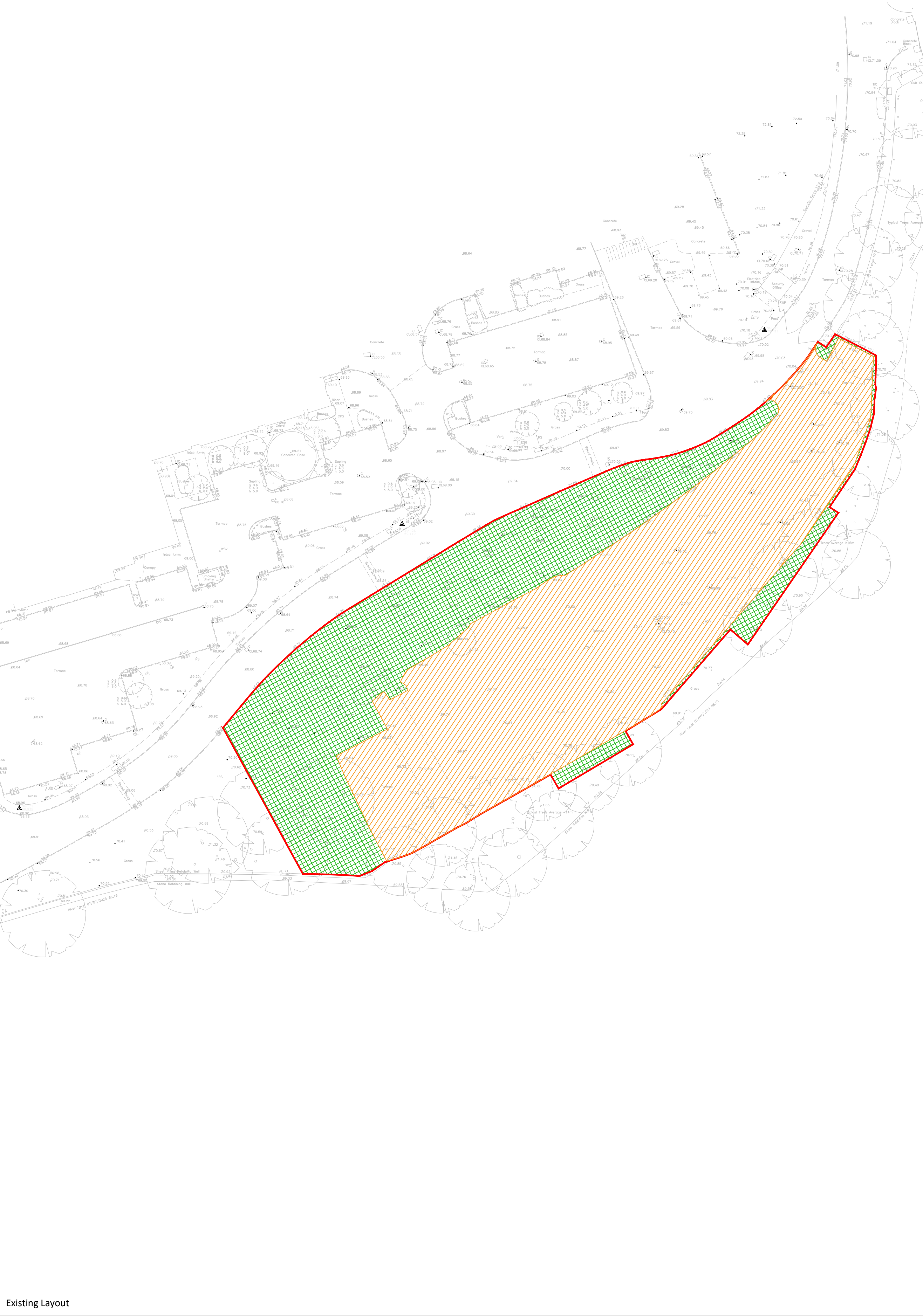
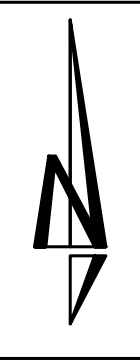
CLIENT
OXENWOOD REAL ESTATE

PROJECT
**RHODES BUSINESS PARK,
MIDDLETON, MANCHESTER**

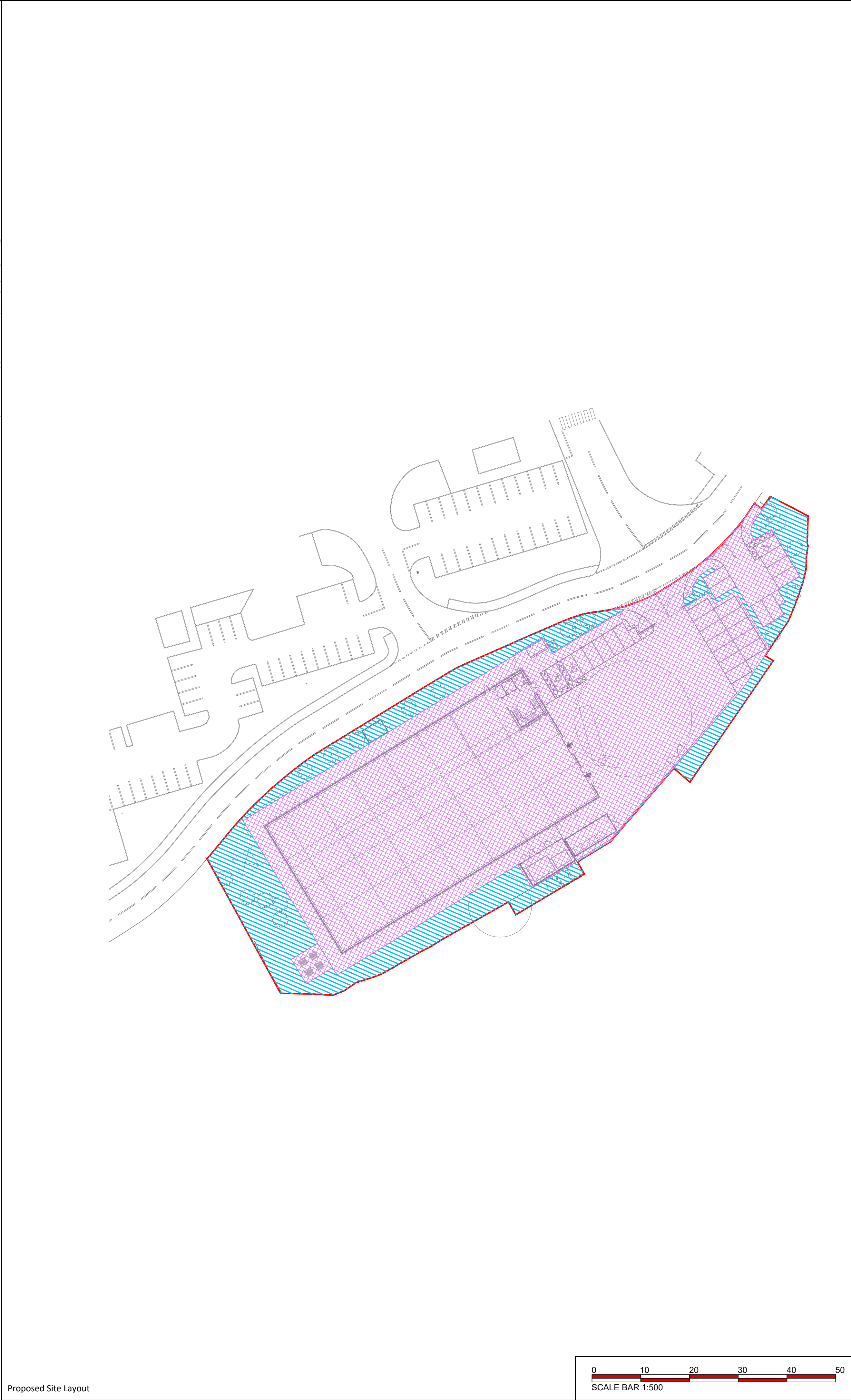
DRAWING TITLE
PROPOSED DRAINAGE

OUR PROJECT NUMBER 40055	DRAWING STATUS PRELIMINARY	OFFICE SOUTH	
SCALE @ A1 1:250	DATE 10/10/2023	DRAWN BY SMB	CHECKED BY DV

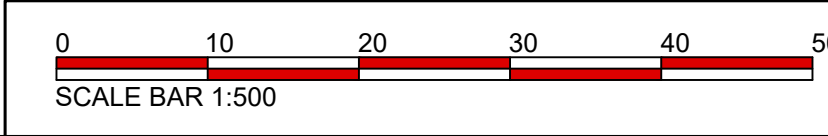
DRAWING NO	REV
40055-BGL-XX-XX-DR-C-00250	P01



Existing Layout



Proposed Site Layout



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KEY:

SITE BOUNDARY (Total area = 5,375m²)
EXISTING PERMEABLE AREA = 2,165m²
EXISTING IMPERMEABLE AREA = 3,210m²
PROPOSED PERMEABLE AREA = 4,190m²
PROPOSED IMPERMEABLE AREA = 1,185m²

P01	10/10/23	SMB	First Issue	DV
REV	DATE	BY	DESCRIPTION	CHK'D

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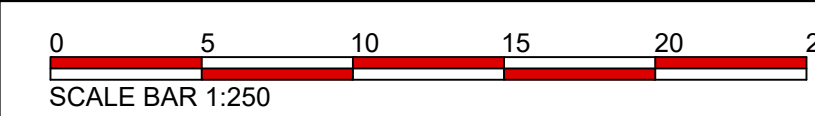
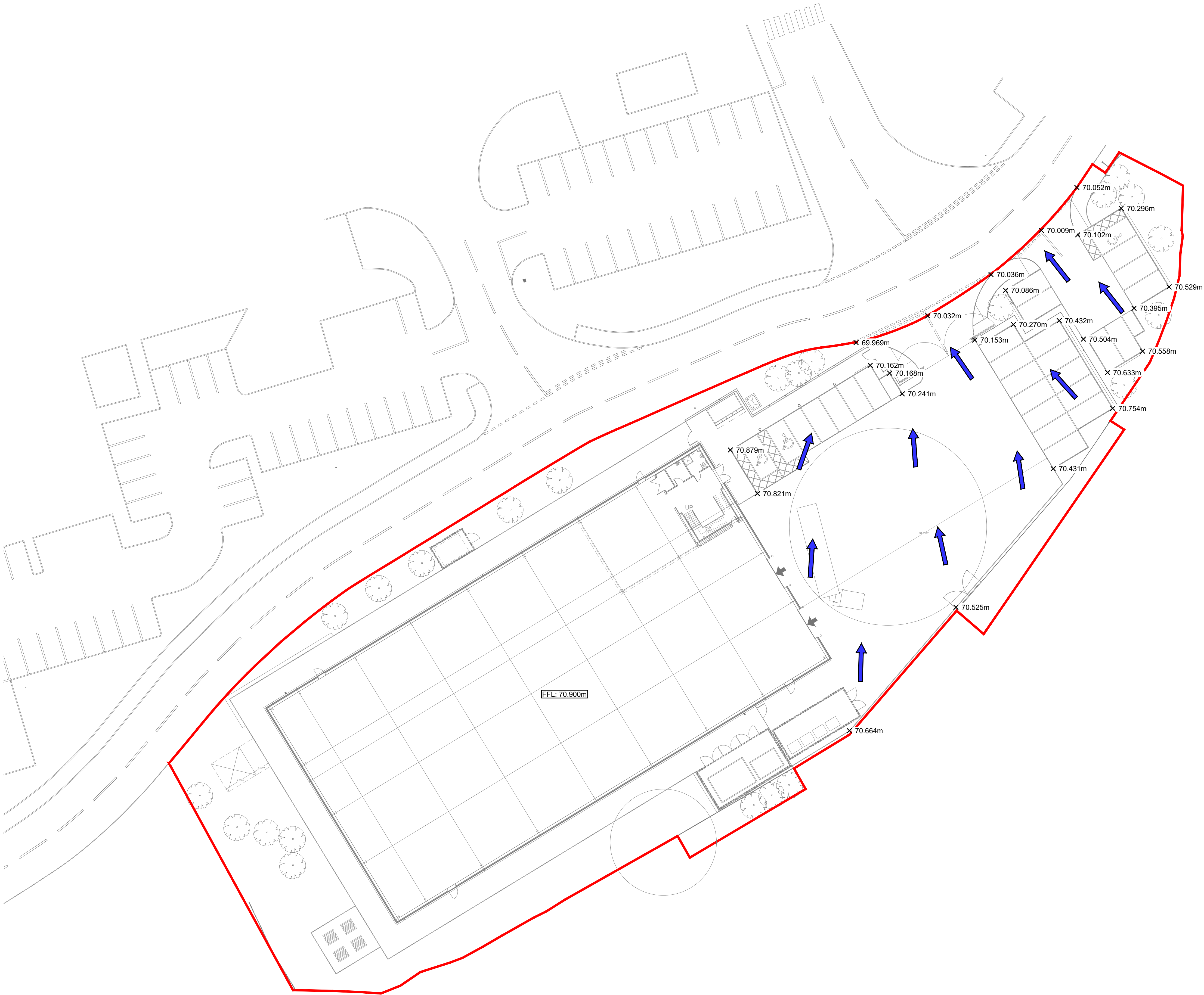
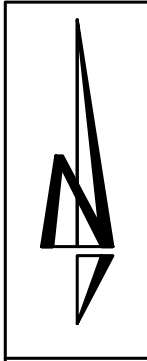
PROJECT
RHODES BUSINESS PARK,
MIDDLETON, MANCHESTER

DRAWING TITLE
EXISTING AND PROPOSED
IMPERMEABLE AREAS

OUR PROJECT NUMBER 40085	DRAWING STATUS PRELIMINARY	OFFICE SOUTH	
SCALE @ A1 1:500	DATE 10/10/2023	DRAWN BY SMB	CHECKED BY DV

DRAWING No
40055-BGL-XX-XX-DR-C-00255

REV
P01



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2. BASED ON "LANE AND FRANKHAM" TOPO SURVEY LF4945-LAF-XX-ST-DR-G-1001-R01 (28/07/23) AND "PHP ARCHITECTS" ARCHITECTS LAYOUT 4694-RBP-PHP-XX-XX-DR-A-101 PROPOSED SITE PLAN P06

KEY:

SITE BOUNDARY

100 YEAR + 40% CLIMATE CONTROL FLOW DIRECTION

X 32.900m

PROPOSED SPOT LEVEL

REV	DATE	BY	DESCRIPTION	CHK'D

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PROJECT
RHODES BUSINESS PARK,
MIDDLETON, MANCHESTER

DRAWING TITLE
PROPOSED DRAINAGE

OUR PROJECT NUMBER 40085	DRAWING STATUS PRELIMINARY	OFFICE SOUTH
SCALE @ A1 1:250	DATE 10/10/2023	DRAWN BY SMB
		CHECKED BY DV

DRAWING No
40055-BGL-XX-XX-DR-C-00250

REV
P01

APPENDIX B – HYDRAULIC CALCULATIONS

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)	17.000	Minimum Backdrop Height (m)	0.200
Ratio-R	0.300	Preferred Cover Depth (m)	1.200
CV	0.850	Include Intermediate Ground	✓
Time of Entry (mins)	5.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Width (mm)	Easting (m)	Northing (m)	Depth (m)
SWMH01	0.018	5.00	70.781	600		385480.741	405209.742	0.531
SWMH02	0.078	5.00	70.800	1200		385487.266	405201.041	1.300
Tank			70.300	1200		385498.156	405196.415	2.075
SWMH03	0.096	5.00	70.827	1200		385495.824	405184.242	1.327
Dummy	0.003	5.00	70.380	450	450	385531.047	405224.590	0.730
SWMH04	0.006	5.00	70.247	600		385524.687	405234.795	0.797
SU01	0.010	5.00	69.985	450	450	385516.694	405231.086	0.540
SWMH05	0.003	5.00	70.240	600		385514.583	405226.230	0.965
SWMH06	0.015	5.00	70.255	600		385511.983	405220.722	1.049
SWMH07	0.025	5.00	70.283	600		385499.352	405217.722	1.083
SU02	0.082	5.00	70.010	450	450	385500.022	405220.592	0.540
SWMH08			70.322	600		385503.361	405215.422	1.322
SWMH09			70.402	600		385510.281	405203.715	1.567
SWMH10 - Control			70.732	1200		385496.442	405195.385	2.522
SWMH11 - Outfall			70.772	1200		385493.806	405193.803	3.587

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)
1.001	SWMH01	SWMH02	10.876	0.600	70.250	69.575	0.675	16.1	150	5.07	40.1
1.002	SWMH02	Tank	11.832	0.600	69.500	68.800	0.700	16.9	225	5.13	39.9
2.001	SWMH03	Tank	12.394	0.600	69.500	68.800	0.700	17.7	225	5.07	40.1
3.001	Dummy	SWMH04	12.025	0.600	69.650	69.500	0.150	80.2	100	5.23	39.6
3.002	SWMH04	SWMH05	13.246	0.600	69.450	69.275	0.175	75.7	150	5.42	39.1
3.003	SU01	SWMH05	5.295	0.600	69.445	69.285	0.160	33.1	150	5.05	40.2
3.004	SWMH05	SWMH08	15.580	0.600	69.285	69.075	0.210	74.2	150	5.65	38.4
3.005	SWMH06	SWMH08	10.121	0.600	69.206	69.075	0.131	77.3	150	5.15	39.9

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)
1.001	2.522	44.6	2.2	0.381	1.075	0.018	0.0	23	1.310
1.002	3.198	127.1	11.8	1.075	1.275	0.096	0.0	46	2.022
2.001	3.124	124.2	11.8	1.102	1.275	0.096	0.0	47	1.997
3.001	0.860	6.8	0.4	0.630	0.647	0.003	0.0	16	0.456
3.002	1.157	20.4	1.1	0.647	0.815	0.009	0.0	24	0.617
3.003	1.756	31.0	1.2	0.390	0.805	0.010	0.0	20	0.849
3.004	1.168	20.6	2.6	0.805	1.097	0.022	0.0	36	0.802
3.005	1.145	20.2	1.8	0.899	1.097	0.015	0.0	31	0.716

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)
4.001	SU02	SWMH08	6.154	0.600	69.470	69.000	0.470	13.1	225	5.03	40.3
4.002	SWMH07	SWMH08	4.622	0.600	69.200	69.075	0.125	37.0	150	5.05	40.2
4.003	SWMH08	SWMH09	13.599	0.600	69.000	68.835	0.165	82.4	225	5.80	38.0
4.004	SWMH09	Tank	14.153	0.600	68.835	68.800	0.035	404.4	225	6.17	37.0
5.001	Tank	SWMH10 - Control	2.000	0.600	68.225	68.210	0.015	133.3	225	6.20	37.0
5.002	SWMH10 - Control	SWMH11 - Outfall	3.074	0.600	68.210	67.185	1.025	3.0	225	6.21	36.9

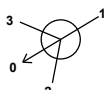
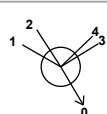
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
4.001	3.635	144.5	10.1	0.315	1.097	0.082	0.0	40	2.112
4.002	1.660	29.3	3.1	0.933	1.097	0.025	0.0	33	1.075
4.003	1.441	57.3	16.8	1.097	1.342	0.144	0.0	83	1.254
4.004	0.644	25.6	16.4	1.342	1.275	0.144	0.0	131	0.681
5.001	1.130	44.9	38.1	1.850	2.297	0.336	0.0	160	1.264
5.002	7.610	302.6	38.1	2.297	3.362	0.336	0.0	53	5.226

Pipeline Schedule

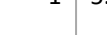
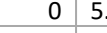
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.001	10.876	16.1	150	Circular	70.781	70.250	0.381	70.800	69.575	1.075
1.002	11.832	16.9	225	Circular	70.800	69.500	1.075	70.300	68.800	1.275
2.001	12.394	17.7	225	Circular	70.827	69.500	1.102	70.300	68.800	1.275
3.001	12.025	80.2	100	Circular	70.380	69.650	0.630	70.247	69.500	0.647
3.002	13.246	75.7	150	Circular	70.247	69.450	0.647	70.240	69.275	0.815
3.003	5.295	33.1	150	Circular	69.985	69.445	0.390	70.240	69.285	0.805
3.004	15.580	74.2	150	Circular	70.240	69.285	0.805	70.322	69.075	1.097
3.005	10.121	77.3	150	Circular	70.255	69.206	0.899	70.322	69.075	1.097
4.001	6.154	13.1	225	Circular	70.010	69.470	0.315	70.322	69.000	1.097
4.002	4.622	37.0	150	Circular	70.283	69.200	0.933	70.322	69.075	1.097
4.003	13.599	82.4	225	Circular	70.322	69.000	1.097	70.402	68.835	1.342
4.004	14.153	404.4	225	Circular	70.402	68.835	1.342	70.300	68.800	1.275
5.001	2.000	133.3	225	Circular	70.300	68.225	1.850	70.732	68.210	2.297
5.002	3.074	3.0	225	Circular	70.732	68.210	2.297	70.772	67.185	3.362

Link	US Node	Dia (mm)	Width (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.001	SWMH01	600		Manhole	Adoptable	SWMH02	1200	Manhole	Adoptable
1.002	SWMH02	1200		Manhole	Adoptable	Tank	1200	Manhole	Adoptable
2.001	SWMH03	1200		Manhole	Adoptable	Tank	1200	Manhole	Adoptable
3.001	Dummy	450	450	Manhole	Adoptable	SWMH04	600	Manhole	Adoptable
3.002	SWMH04	600		Manhole	Adoptable	SWMH05	600	Manhole	Adoptable
3.003	SU01	450	450	Manhole	Adoptable	SWMH05	600	Manhole	Adoptable
3.004	SWMH05	600		Manhole	Adoptable	SWMH08	600	Manhole	Adoptable
3.005	SWMH06	600		Manhole	Adoptable	SWMH08	600	Manhole	Adoptable
4.001	SU02	450	450	Manhole	Adoptable	SWMH08	600	Manhole	Adoptable
4.002	SWMH07	600		Manhole	Adoptable	SWMH08	600	Manhole	Adoptable
4.003	SWMH08	600		Manhole	Adoptable	SWMH09	600	Manhole	Adoptable
4.004	SWMH09	600		Manhole	Adoptable	Tank	1200	Manhole	Adoptable
5.001	Tank	1200		Manhole	Adoptable	SWMH10 - Control	1200	Manhole	Adoptable
5.002	SWMH10 - Control	1200		Manhole	Adoptable	SWMH11 - Outfall	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)	
SWMH01	385480.741	405209.742	70.781	0.531	600			0	1.001	70.250	150
SWMH02	385487.266	405201.041	70.800	1.300	1200			1	1.001	69.575	150
								0	1.002	69.500	225
Tank	385498.156	405196.415	70.300	2.075	1200			1	4.004	68.800	225
								2	2.001	68.800	225
								3	1.002	68.800	225
								0	5.001	68.225	225
SWMH03	385495.824	405184.242	70.827	1.327	1200						
								0	2.001	69.500	225
Dummy	385531.047	405224.590	70.380	0.730	450	450					
								0	3.001	69.650	100
SWMH04	385524.687	405234.795	70.247	0.797	600			1	3.001	69.500	100
								0	3.002	69.450	150
SU01	385516.694	405231.086	69.985	0.540	450	450					
								0	3.003	69.445	150
SWMH05	385514.583	405226.230	70.240	0.965	600			1	3.003	69.285	150
								2	3.002	69.275	150
								0	3.004	69.285	150
SWMH06	385511.983	405220.722	70.255	1.049	600						
								0	3.005	69.206	150
SWMH07	385499.352	405217.722	70.283	1.083	600						
								0	4.002	69.200	150
SU02	385500.022	405220.592	70.010	0.540	450	450					
								0	4.001	69.470	225
SWMH08	385503.361	405215.422	70.322	1.322	600			1	4.002	69.075	150
								2	4.001	69.000	225
								3	3.005	69.075	150
								4	3.004	69.075	150
								0	4.003	69.000	225
SWMH09	385510.281	405203.715	70.402	1.567	600			1	4.003	68.835	225
								0	4.004	68.835	225

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Width (mm)	Connections	Link	IL (m)	Dia (mm)	
SWMH10 - Control	385496.442	405195.385	70.732	2.522	1200		 01	1	5.001	68.210	225
								0	5.002	68.210	225
SWMH11 - Outfall	385493.806	405193.803	70.772	3.587	1200		 1	1	5.002	67.185	225

Simulation Settings

Rainfall Methodology	FSR	Analysis Speed	Normal
FSR Region	England and Wales	Skip Steady State	x
M5-60 (mm)	20.000	Drain Down Time (mins)	240
Ratio-R	0.400	Additional Storage (m³/ha)	20.0
Summer CV	0.800	Check Discharge Rate(s)	x
Winter CV	0.900	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 %)
1	0	0	0
30	35	0	0
100	40	0	0

Node SWMH10 - Control Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	✓	Sump Available	✓
Invert Level (m)	68.210	Product Number	CTL-SHE-0087-4500-2000-4500
Design Depth (m)	2.000	Min Outlet Diameter (m)	0.100
Design Flow (l/s)	4.5	Min Node Diameter (mm)	1200

Node Tank Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	68.225
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	200.0	0.0	0.800	200.0	0.0	0.801	0.0	0.0

Node Dummy Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	69.650
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	24

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	29.5	0.0	0.300	29.5	0.0	0.301	0.0	0.0

Node SWMH04 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	69.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	104

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	56.0	0.0	0.300	56.0	0.0	0.301	0.0	0.0

Node SWMH05 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	69.275
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	200

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	24.8	0.0	0.300	24.8	0.0	0.301	0.0	0.0

Node SWMH06 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	69.206
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	232

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	150.0	0.0	0.300	150.0	0.0	0.301	0.0	0.0

Node SWMH07 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	69.200
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.30	Time to half empty (mins)	240

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	103.5	0.0	0.300	103.5	0.0	0.301	0.0	0.0

Results for 1 year Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH01	10	70.276	0.026	2.7	0.0246	0.0000	OK
15 minute winter	SWMH02	10	69.554	0.054	14.5	0.1247	0.0000	OK
180 minute winter	Tank	140	68.398	0.173	12.4	32.9826	0.0000	OK
15 minute winter	SWMH03	10	69.554	0.054	14.5	0.1394	0.0000	OK
15 minute winter	Dummy	13	69.664	0.014	0.5	0.1240	0.0000	OK
30 minute winter	SWMH04	22	69.468	0.018	0.9	0.3136	0.0000	OK
15 minute winter	SU01	10	69.468	0.023	1.5	0.0130	0.0000	OK
15 minute winter	SWMH05	12	69.317	0.042	2.2	0.3266	0.0000	OK
60 minute winter	SWMH06	41	69.226	0.020	1.2	0.8964	0.0000	OK
15 minute winter	SWMH07	13	69.230	0.030	3.8	0.9470	0.0000	OK
15 minute winter	SU02	10	69.514	0.044	12.4	0.1436	0.0000	OK
15 minute winter	SWMH08	11	69.084	0.084	15.7	0.0237	0.0000	OK
15 minute winter	SWMH09	11	68.963	0.128	15.7	0.0361	0.0000	OK
180 minute winter	SWMH10 - Control	140	68.397	0.187	3.4	0.2118	0.0000	OK
15 minute summer	SWMH11 - Outfall	1	67.185	0.000	2.7	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH01	1.001	SWMH02	2.7	1.370	0.060	0.0213	
15 minute winter	SWMH02	1.002	Tank	14.4	2.063	0.113	0.0824	
180 minute winter	Tank	5.001	SWMH10 - Control	3.4	0.215	0.075	0.0680	
15 minute winter	SWMH03	2.001	Tank	14.4	2.032	0.116	0.0877	
15 minute winter	Dummy	3.001	SWMH04	0.3	0.414	0.039	0.0076	
30 minute winter	SWMH04	3.002	SWMH05	0.6	0.273	0.031	0.0335	
15 minute winter	SU01	3.003	SWMH05	1.5	0.859	0.048	0.0110	
15 minute winter	SWMH05	3.004	SWMH08	2.0	0.733	0.096	0.0420	
60 minute winter	SWMH06	3.005	SWMH08	0.7	0.536	0.035	0.0136	
15 minute winter	SWMH07	4.002	SWMH08	2.3	0.950	0.077	0.0110	
15 minute winter	SU02	4.001	SWMH08	12.3	1.377	0.085	0.0577	
15 minute winter	SWMH08	4.003	SWMH09	15.7	0.860	0.274	0.2492	
15 minute winter	SWMH09	4.004	Tank	15.5	0.761	0.606	0.2892	
180 minute winter	SWMH10 - Control	Hydro-Brake®	SWMH11 - Outfall	3.4				49.9

Results for 30 year +35% CC Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH01	10	70.298	0.048	9.0	0.0459	0.0000	OK
15 minute winter	SWMH02	10	69.605	0.105	47.9	0.2452	0.0000	OK
240 minute winter	Tank	236	68.948	0.723	31.2	138.2045	0.0000	SURCHARGED
15 minute winter	SWMH03	10	69.606	0.106	48.0	0.2740	0.0000	OK
15 minute winter	Dummy	12	69.679	0.029	1.5	0.2627	0.0000	OK
15 minute winter	SWMH04	13	69.490	0.040	3.9	0.6825	0.0000	OK
15 minute winter	SU01	10	69.487	0.042	5.0	0.0239	0.0000	OK
15 minute winter	SWMH05	12	69.352	0.077	8.9	0.6003	0.0000	OK
15 minute winter	SWMH06	13	69.282	0.076	11.6	3.4620	0.0000	OK
15 minute winter	SWMH07	12	69.293	0.093	12.5	2.9410	0.0000	OK
15 minute winter	SU02	10	69.558	0.088	41.0	0.2862	0.0000	OK
15 minute winter	SWMH08	12	69.282	0.282	51.4	0.0798	0.0000	SURCHARGED
15 minute winter	SWMH09	12	69.134	0.299	46.4	0.0845	0.0000	SURCHARGED
240 minute winter	SWMH10 - Control	240	68.948	0.738	3.8	0.8347	0.0000	SURCHARGED
15 minute summer	SWMH11 - Outfall	1	67.185	0.000	3.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH01	1.001	SWMH02	8.9	1.914	0.201	0.0508	
15 minute winter	SWMH02	1.002	Tank	47.6	2.795	0.375	0.2017	
15 minute winter	Tank	5.001	SWMH10 - Control	4.3	0.436	0.096	0.0795	
15 minute winter	SWMH03	2.001	Tank	47.7	2.754	0.384	0.2145	
15 minute winter	Dummy	3.001	SWMH04	1.2	0.638	0.173	0.0220	
15 minute winter	SWMH04	3.002	SWMH05	3.1	0.515	0.153	0.0850	
15 minute winter	SU01	3.003	SWMH05	5.0	1.018	0.160	0.0300	
15 minute winter	SWMH05	3.004	SWMH08	8.5	0.904	0.414	0.1965	
15 minute winter	SWMH06	3.005	SWMH08	8.5	0.973	0.419	0.1344	
15 minute winter	SWMH07	4.002	SWMH08	11.6	1.284	0.397	0.0670	
15 minute winter	SU02	4.001	SWMH08	40.4	1.618	0.280	0.1668	
15 minute winter	SWMH08	4.003	SWMH09	46.4	1.168	0.811	0.5408	
15 minute winter	SWMH09	4.004	Tank	46.5	1.191	1.815	0.5224	
15 minute winter	SWMH10 - Control	Hydro-Brake®	SWMH11 - Outfall	3.6				52.2

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.96%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute winter	SWMH01	10	70.306	0.056	12.1	0.0541	0.0000	OK
360 minute winter	SWMH02	344	69.882	0.382	8.9	0.8912	0.0000	SURCHARGED
360 minute winter	Tank	344	69.883	1.658	30.8	153.9697	0.0000	SURCHARGED
360 minute winter	SWMH03	344	69.882	0.382	8.8	0.9857	0.0000	SURCHARGED
360 minute winter	Dummy	344	69.883	0.233	0.8	2.1284	0.0000	SURCHARGED
360 minute winter	SWMH04	344	69.883	0.433	3.1	5.2358	0.0000	SURCHARGED
360 minute winter	SU01	344	69.883	0.438	0.9	0.2510	0.0000	FLOOD RISK
360 minute winter	SWMH05	344	69.883	0.608	4.1	2.4454	0.0000	SURCHARGED
360 minute winter	SWMH06	344	69.883	0.677	8.4	13.9076	0.0000	SURCHARGED
360 minute winter	SWMH07	344	69.882	0.682	9.8	9.8383	0.0000	SURCHARGED
360 minute winter	SU02	344	69.883	0.413	7.6	1.3374	0.0000	FLOOD RISK
360 minute winter	SWMH08	344	69.883	0.883	15.1	0.2500	0.0000	SURCHARGED
360 minute winter	SWMH09	344	69.882	1.047	13.2	0.2964	0.0000	SURCHARGED
360 minute winter	SWMH10 - Control	344	69.882	1.672	6.0	1.8909	0.0000	SURCHARGED
15 minute summer	SWMH11 - Outfall	1	67.185	0.000	3.6	0.0000	0.0000	OK

Link Event (Outflow)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute winter	SWMH01	1.001	SWMH02	12.0	2.067	0.270	0.0633	
15 minute winter	SWMH02	1.002	Tank	64.1	2.982	0.504	0.2543	
600 minute winter	Tank	5.001	SWMH10 - Control	8.1	0.211	0.179	0.0795	
15 minute winter	SWMH03	2.001	Tank	64.2	2.939	0.517	0.2709	
15 minute winter	Dummy	3.001	SWMH04	1.6	0.701	0.244	0.0282	
15 minute winter	SWMH04	3.002	SWMH05	4.6	0.501	0.225	0.1378	
15 minute winter	SU01	3.003	SWMH05	6.7	1.038	0.215	0.0492	
15 minute summer	SWMH05	3.004	SWMH08	11.4	0.820	0.551	0.2299	
15 minute winter	SWMH06	3.005	SWMH08	14.1	1.103	0.695	0.1752	
15 minute winter	SWMH07	4.002	SWMH08	17.0	1.359	0.579	0.0814	
15 minute winter	SU02	4.001	SWMH08	54.6	1.644	0.377	0.1880	
15 minute winter	SWMH08	4.003	SWMH09	51.7	1.300	0.902	0.5408	
15 minute winter	SWMH09	4.004	Tank	51.7	1.312	2.021	0.5334	
360 minute winter	SWMH10 - Control	Hydro-Brake®	SWMH11 - Outfall	4.2				115.0

Calculated by: Steven Bowron

Site name: Rhodes Business Park

Site location: Rhodes, Manchester

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude: 53.54319° N

Longitude: 2.22038° W

Reference: 3211860077

Date: Oct 09 2023 12:29

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): .64

Methodology

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

SPR estimation method: Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	4	4
HOST class:	N/A	N/A
SPR/SPRHOST:	0.47	0.47

Hydrological characteristics

	Default	Edited
SAAR (mm):	1003	1003
Hydrological region:	10	10
Growth curve factor 1 year:	0.87	0.87
Growth curve factor 30 years:	1.7	1.7
Growth curve factor 100 years:	2.08	2.08
Growth curve factor 200 years:	2.37	2.37

Notes

(1) Is $Q_{BAR} < 2.0$ l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

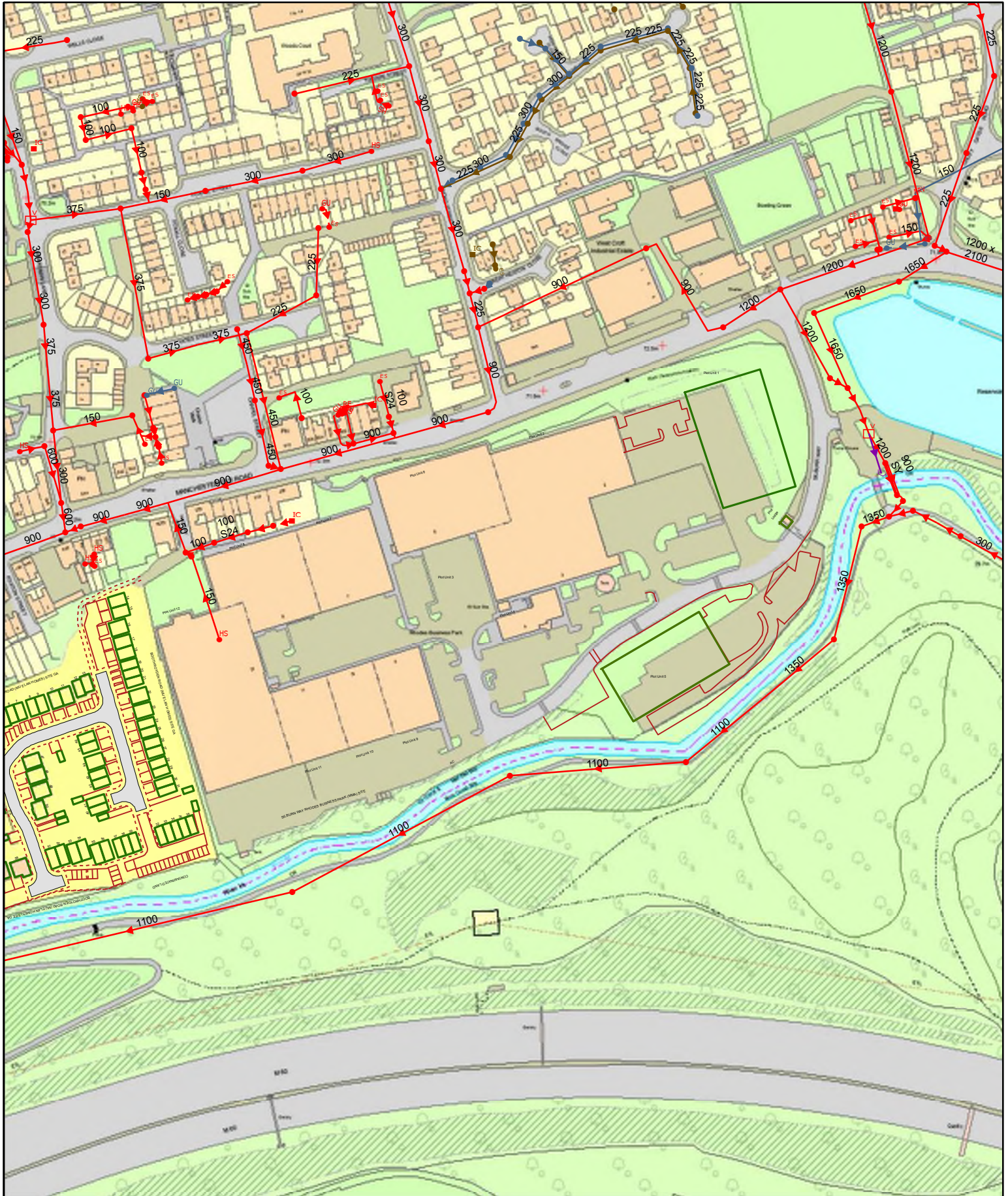
(3) Is $SPR/SPRHOST \leq 0.3$?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Q_{BAR} (l/s):	4.71	4.71
1 in 1 year (l/s):	4.09	4.09
1 in 30 years (l/s):	8	8
1 in 100 year (l/s):	9.79	9.79
1 in 200 years (l/s):	11.15	11.15

This report was produced using the greenfield runoff tool developed by HR Wallingford and available at www.uksuds.com. The use of this tool is subject to the UK SuDS terms and conditions and licence agreement , which can both be found at www.uksuds.com/terms-and-conditions.htm. The outputs from this tool are estimates of greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, CEH, Hydrosolutions or any other organisation for the use of this data in the design or operational characteristics of any drainage scheme.

APPENDIX C – UNITED UTILITIES SEWER MAPS



Date: 08/10/2021

Printed By:
Property Searches

Extract from Map of Public Sewers

Unit 4, Rhodes Business Park Silburn Way, Middleton,
MANCHESTER, M24 4NE



The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available. The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded. United Utilities Water PLC will not accept any liability for any damage caused by the actual positions being different from those shown.

Wastewater Symbolology

Abandoned	Foul	Surface Water	Combined	
				Public Sewer
				Private Sewer
				Section 104
				Rising Main
				Sludge Main
				Overflow
				Water Course
				Highway Drain

All point assets follow the standard colour convention: **red** – combined **brown** - foul
blue – surface water **purple** - overflow

Manhole	Side Entry Manhole
Head of System	Outfall
Extent of Survey	Screen Chamber
Rodding Eye	Inspection Chamber
Inlet	Bifurcation Chamber
Discharge Point	Lamp Hole
Vortex	T Junction / Saddle
Penstock	Catchpit
Washout Chamber	Valve Chamber
Valve	Vent Column
Air Valve	Vortex Chamber
Non Return Valve	Penstock Chamber
Soakaway	Network Storage Tank
Gully	Sewer Overflow
Cascade	Ww Treatment Works
Flow Meter	Ww Pumping Station
Hatch Box	Septic Tank
Oil Interceptor	Control Kiosk
Summit	
Drop Shaft	Change of Characteristic
Orifice Plate	

APPENDIX D – LLFA AND EA CORRESPONDENCE

Awaiting response

APPENDIX E – MAINTENANCE MANUAL

RHODES BUSINESS PARK, MIDDLETON

TECHNICAL NOTE

DRAINAGE MAINTENANCE PLAN

DOCUMENT CONTROL SHEET

Issued by: Burrows Graham Limited
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Tel: 01442 508402

Client: Oxenwood LLP

Project: Rhodes Business Park, Silburn Way, Middleton, Manchester, M24 4NE

Title: Maintenance Plan

Status : Planning

Date : 09.10.2023

Prepared By: DV

Checked By: DB

Document Revision Record

Version Number	Date	Revision Details
1	09/10/2023	First Issue

Burrows Graham Limited has prepared this report in accordance with the instructions of the above-named Client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk.

1 INTRODUCTION

The long-term maintenance of the new drainage infrastructure will be with the owner of the proposed commercial unit, or professional maintenance company appointed by the owner, in line with best practice guidance. Periodic inspections will need to be carried out and clearing of drainage channels, gullies, catchpits and petrol interceptors undertaken. A record of inspections should be kept, an inspection checklist template is available within the CIRIA SuDS Manual (C753) which can be used to support an inspection record.

Typically, the maintenance regime will be in line with the Management and Maintenance Plan as set out below and in line with CIRIA C753 guidance.

Should exceedance flooding occur, access and egress to the development shall be from the main site access off Mauretania Road. Refer to Appendix A for Flow exceedance plan.

The maintenance of SuDS appurtenances will help to minimise the flood risk impact to the development and the surrounding sewer network.

Flood risk to people and property can be managed but it can never be completely removed; a residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified.

Maintenance schedule has been prepared to provide methodology for the surface water drainage elements proposed for this development. If any discrepancies from manufacturers guidance are encountered, the proprietary system guidance should be adopted.

The surface water drainage works are composed of the following:

- Permeable paving
- Linear drainage channels, connecting pipe network, manholes & inspection chambers.
- Permeable paving.
- Geocellular attenuation tanks.
- Oil separators.
- Flow control device.

Any man-entry into the system and silt removal should be carried out by trained personnel with adequate personal protective equipment. Approved safety procedures must be followed in accordance with the Health and Safety Act.

This drainage system's maintenance will be the responsibility of the project developer or by an appointed maintenance company, and as such an appropriated maintenance regime should be implemented.

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

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

Sediment/material removal should be undertaken in consultation with the environmental regulator to confirm appropriate protocols; especially where run-off is taken from potentially contaminated areas such as the filter drains and the upstream/downstream chambers.

2 MAINTENANCE STRATEGY

2.1 INSPECTION, MANHOLE AND CATCHPIT CHAMBERS

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

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

2.2 PIPES

Pipes are proprietary products and the materials can vary across the site and as such where used the manufacture's recommendations should be followed. Regardless of the product used, the pipes will be fully compliant with National and local certification.

Pipes are intended to be the main conveyance across the development and where oversized they form the attenuation volume required by the limitation of the discharge rate. They are intended to be dry except for during rainfall events. These have been designed to be self-cleaning where possible for smaller diameter pipes, and for larger diameters the risk is reduced due to the overall pipe size.

Access for maintenance is provided through access chambers and manholes.

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

2.3 FLOW CONTROL DEVICES

Regular inspection and maintenance are important to identify any obstructions to flow control devices. Complex control systems, such as Hydrobrake (or similar), are to be maintained in accordance with the manufacturers recommendations. Orifice plates and manholes are to be kept clear of all debris, and the protection grating cleaned thoroughly.

2.4 CHANNELS & GULLIES

Channels and gullies should be inspected and cleaned in accordance with the manufacturer's details. Channel units can be cleaned through the use of a high-pressure hose; this can be fed into the channel system through access units strategically placed along the channel run. The throat section of channel units should be kept clear at all times to ensure uninterrupted flow of surface water into the drainage channel and any debris within the throat should be removed.

Locking bolts should be replaced and sufficiently tightened, taking care that the bolt heads do not stand above the top surface of the cover or grate. If covers are allowed to move within their frame, this may cause damage to the frame or seating

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove manhole and chamber covers to sewers and flow control on network– inspect to ensure water is flowing freely and that the water flow route is unobstructed. Remove debris and silt as required.	Half Yearly Undertake one of these inspections after leaf fall in autumn
Occasional Maintenance	None required	
Remedial Actions	Re-line or replace pipework if unable to clear blockages by jetting.	As required
Monitoring	Inspect chambers for build-up of silt and debris	Half yearly

Table 5 – Operation & maintenance requirements for pipe network, manholes & inspection chambers, drainage channels & gullies.

2.5 ATTENUATION TANKS

Geocellular attenuation tanks are modular storage systems made with plastic units. These units can be assembled to achieved re required volume and usually on multiple layers. Generally, the units have 95% of voids content and are used to create an efficient below ground structure to store surface water.

The geocellular units and geotextile membrane are proprietary products and therefore manufacturer's recommendations should also be taken into consideration.

Access for maintenance should be provided by an access shaft located on the tank and from the manhole chambers downstream of the tank.

Regular inspection and maintenance are important for the effective operation of attenuation tanks as designed. As the feature is buried, a regular inspection regime is very important to ensure the correction functionality of the surface water drainage network.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action.	Monthly for 3 months, then annually.
	Remove debris form the catchment surface (where it may cause risks to performance).	Monthly.
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockages by sediment, algae or other matter; remove and replace surface infiltration medium as required.	Annually.
	Remove sediments from pre-treatment structures and/or internal forebays.	Annually, or as required.
Remedial Actions	Repair/rehabilitate inlets, outlets, overflows and vents.	As required.
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed.	Annually
	Survey inside of tank for sediment build-up and remove if necessary.	Every 5 years or as required.

Table 6 – Operation & maintenance requirements for attenuation storage tanks - Based on CIRIA SuDS Manual 2015

2.6 POROUS PAVED AREA

Permeable surfacing enables any water landing on the surface to infiltrate directly to ground at source, thus acting close to a permeable surface. Regular inspection and maintenance are important for the effective operation of the permeable surfacing to allow it to work efficiently through its design life.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surfaces from adjacent impermeable areas as this is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements.
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50mm of the level of the surface.	As required
	Remedial works to any depressions, rutting and cracked considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Inspect for evidence of poor operation and/or weed growth -if required, take remedial action	Three-monthly, 48 hours after large storms in the first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers	Annually

Table 7 – Operation & Maintenance requirements for Porous Paved Area – CIRIA SuDS Manual 2015

2.7 PROPRIETARY SURFACE WATER TREATMENT SYSTEMS

These are manufactured products to provide a treatment to the surface water by removing specific pollutant, such as petrol interceptors.

Table 8 sets out the recommended maintenance actions and frequency. Manufacture guidance / recommendations should always be used when available.

Maintenance schedule	Required action	Typical frequency
Regular Maintenance	Remove litter and debris and inspect for sediment, oil and grease accumulation.	Monthly for 3 months, then annually.
	Change the filter media.	As recommended by manufacturer.
	Remove sediment, oil grease and floatables.	As necessary – indicated by system inspections or immediately following significant spill.
Remedial Actions	Replace malfunctioning parts or structures.	As required.
Monitoring	Inspect for evidence of poor operation.	Biannually
	Inspect filter media and establish appropriate replacement frequencies.	Biannually
	Inspect sediment accumulation rates and establish removal frequencies.	Monthly during first half year of operation, then every six months.

Table 8 – Operation & maintenance requirements for proprietary surface water treatment systems - CIRIA SuDS Manual 2015

2.8 SPILLAGES – EMERGENCY ACTION

Most spillages on development sites are of compounds that do not pose a serious risk to the environment if they enter the drainage network at a slow and controlled manner allowing time for natural breakdown in the treatment system. The Environment Agency recommends that small spillages should be removed, when possible, using soak mats and residual spillage can be allowed to bio-remediate within the drainage system.

Should a serious spillage occur, either by volume or of unknown/toxic compound, isolate the spillage with soil, turn or fabric and block outlet pipes from chamber(s) downstream of the spillage with bung(s).

The Environment Agency must be contacted immediately.

The owner of the development should be contacted in the event of a concern or failure of a SuDS design Feature.