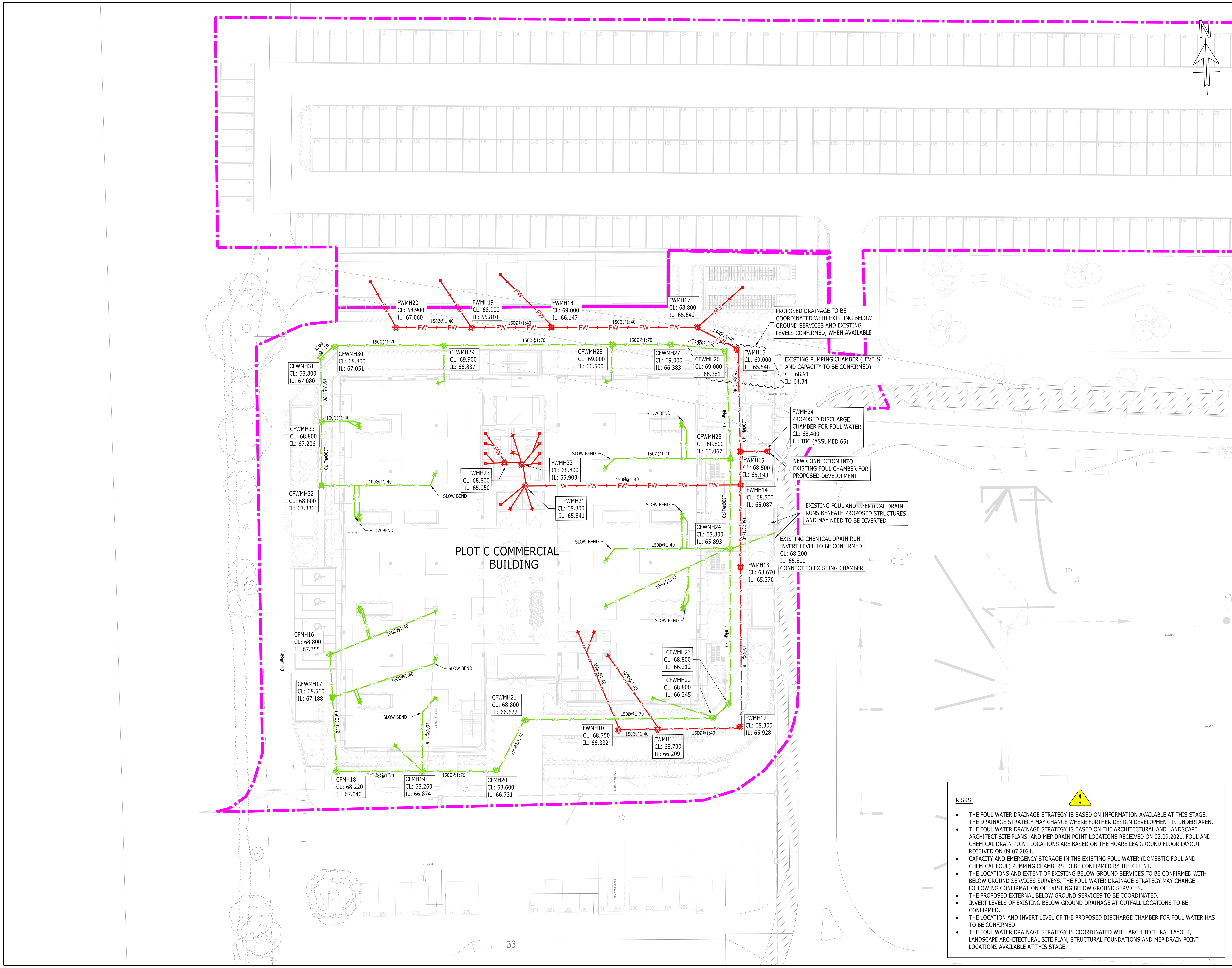

RISKS:

- THE FOUL WATER DRAINAGE STRATEGY IS BASED ON INFORMATION AVAILABLE AT THIS STAGE. THE DRAINAGE STRATEGY MAY CHANGE WHERE FURTHER DESIGN DEVELOPMENT IS UNDERTAKEN.
- THE FOUL WATER DRAINAGE STRATEGY IS BASED ON THE ARCHITECTURAL AND LANDSCAPE ARCHITECT SITE PLANS, AND MEP DRAIN POINT LOCATIONS RECEIVED ON 02.09.2021. FOUL AND CHEMICAL DRAIN POINT LOCATIONS ARE BASED ON THE HOARE LEA GROUND FLOOR LAYOUT RECEIVED ON 09.07.2021.
- CAPACITY AND EMERGENCY STORAGE IN THE EXISTING FOUL WATER (DOMESTIC FOUL AND CHEMICAL FOUL) PUMPING CHAMBERS TO BE CONFIRMED BY THE CLIENT.
- THE LOCATIONS AND EXTENT OF EXISTING BELOW GROUND SERVICES TO BE CONFIRMED WITH BELOW GROUND SERVICES SURVEYS. THE FOUL WATER DRAINAGE STRATEGY MAY CHANGE FOLLOWING CONFIRMATION OF EXISTING BELOW GROUND SERVICES.
- THE PROPOSED EXTERNAL BELOW GROUND SERVICES TO BE COORDINATED.
- INVERT LEVELS OF EXISTING BELOW GROUND DRAINAGE AT OUTFALL LOCATIONS TO BE CONFIRMED.
- THE LOCATION AND INVERT LEVEL OF THE PROPOSED DISCHARGE CHAMBER FOR FOUL WATER HAS TO BE CONFIRMED.
- THE FOUL WATER DRAINAGE STRATEGY IS COORDINATED WITH ARCHITECTURAL LAYOUT, LANDSCAPE ARCHITECTURAL SITE PLAN, STRUCTURAL FOUNDATIONS AND MEP DRAIN POINT LOCATIONS AVAILABLE AT THIS STAGE.

Notes

1. THIS DRAWING IS NOT TO BE SCALED.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND M&E DRAWINGS.
3. THIS IS NOT AN INSTALLATION DRAWING NOR A CO-ORDINATION DRAWING.
4. INDICATIVE BELOW GROUND DRAINAGE STRATEGY SUBJECT TO FURTHER DESIGN DEVELOPMENT AND COORDINATION.
5. THIS DRAWING IS BASED
   - NBBJ SITE LAYOUT RECEIVED ON ON 02.09.2021
   - HISTORIC SITE INFO RECEIVED ON 22.03.2021
   - LANDSCAPE DRAWING RECEIVED ON 25.08.2021
   - FIRA LP2264-FIRA-MP-ST-P-LA-WS
   - ARCHITECT DRAWING RECEIVED ON 02.09.2021

KEY:

- SITE BOUNDARY
- PROPOSED FOUL WATER DRAIN
- PROPOSED CHEMICAL FOUL WATER DRAIN
- PROPOSED CHEMICAL FOUL WATER MANHOLE
- PROPOSED FOUL WATER MANHOLE
- EXISTING UTILITIES ZONE
- EXISTING FOUL WATER DRAIN
- EXISTING CHEMICAL FOUL WATER DRAIN
- EXISTING FOUL WATER MANHOLE
- FLOOR GULLY
- DP

Rev	Description	Date	By / Chk	App
P02	STAGE 3 ISSUE	10.09 2021	BG LF	LS
P01	STAGE 2 ISSUE	28.05 2021	BG JS	MS

STAGE 3

BEGBROOKE SCIENCE PARK COMMERCIAL BUILDING

RAMBOLL

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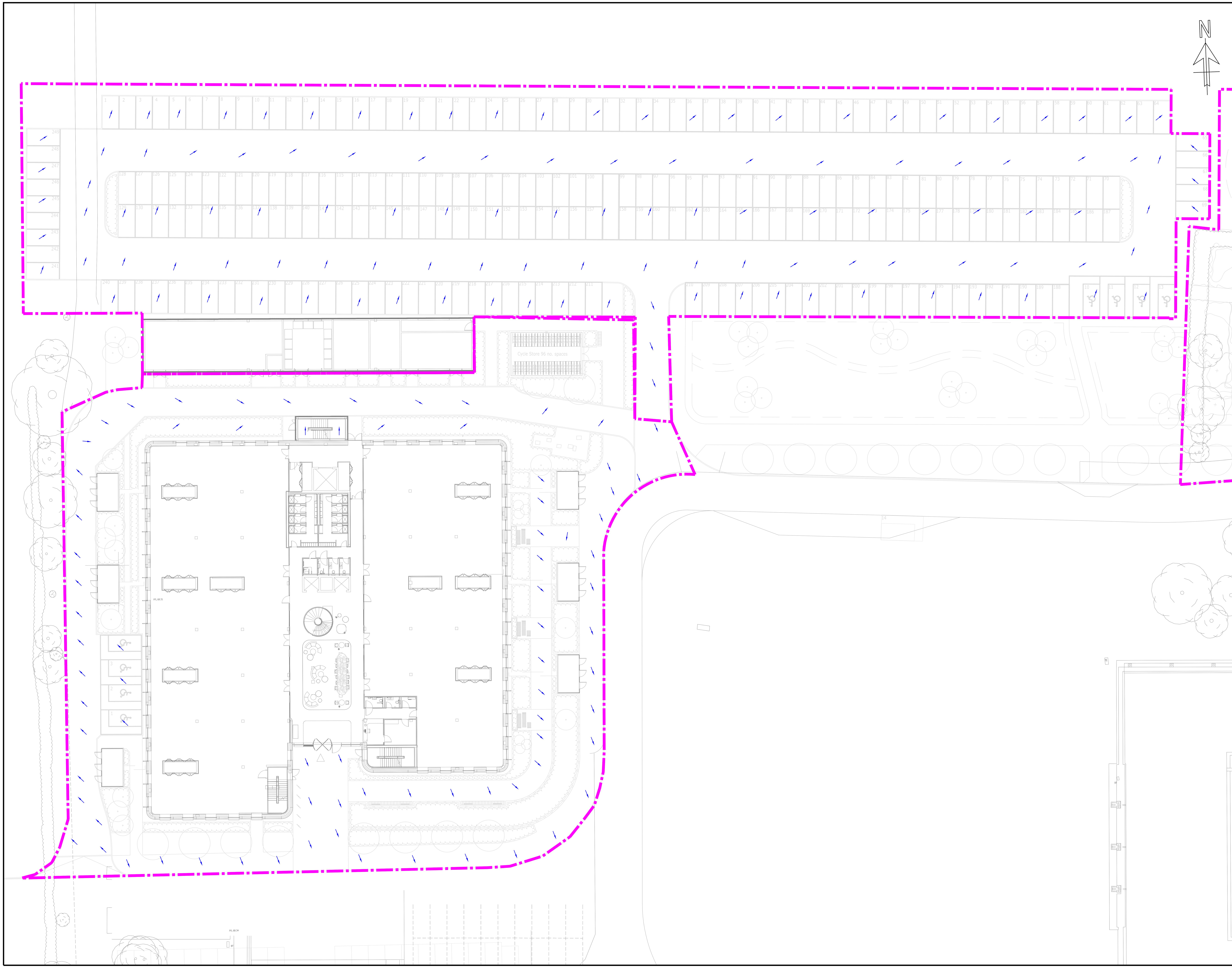
www.ramboll.co.uk

INDICATIVE FOUL WATER DRAINAGE LAYOUT ZONE C

Project No:	Scale (@A1):	Drawn:	Date:
1620011508	1:250	MES	MAY 2021

Drawing No: BBSP-RAMB-ZZ-XX-DR-C-000104 Rev: P02

13/09/2021 13:23:35



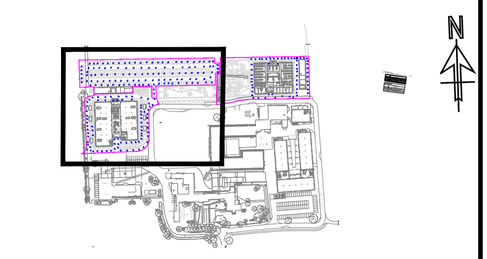
Notes

1. THIS DRAWING IS NOT TO BE SCALED.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND M&E DRAWINGS.
3. THIS IS NOT AN INSTALLATION DRAWING NOR A CO-ORDINATION DRAWING.
4. INDICATIVE BELOW GROUND DRAINAGE STRATEGY SUBJECT TO FURTHER DESIGN DEVELOPMENT AND COORDINATION.
5. THIS DRAWING IS BASED ON
   - LP2264-FIRA-MP-ST-P-LA-WS RECEIVED 02.09.2021.
   - LANDSCAPE DRAWING RECEIVED ON 25.08.2021.
   - BBSP-NBBJ-ZZ-XX-DR-A-511010-511011
   - BBSP-NBBJ-AB-00-DR-A-201010
   - BBSP-NBBJ-CB-00-DR-A-201000
     ARCHITECT DRAWINGS RECEIVED ON 02-09-2021.
   - HISTORIC SITE INFO RECEIVED ON 22.03.2021.

KEY:

SITE BOUNDARY

DIRECTION OF OVERLAND FLOWS



KEY PLAN

Rev	Description	Date	By / Chk	App
P01	STAGE 3 ISSUE	17.12 2021	AT LF	LS

STAGE 3

BEGBROOKE SCIENCE PARK COMMERCIAL BUILDING AND SURFACE CAR PARK

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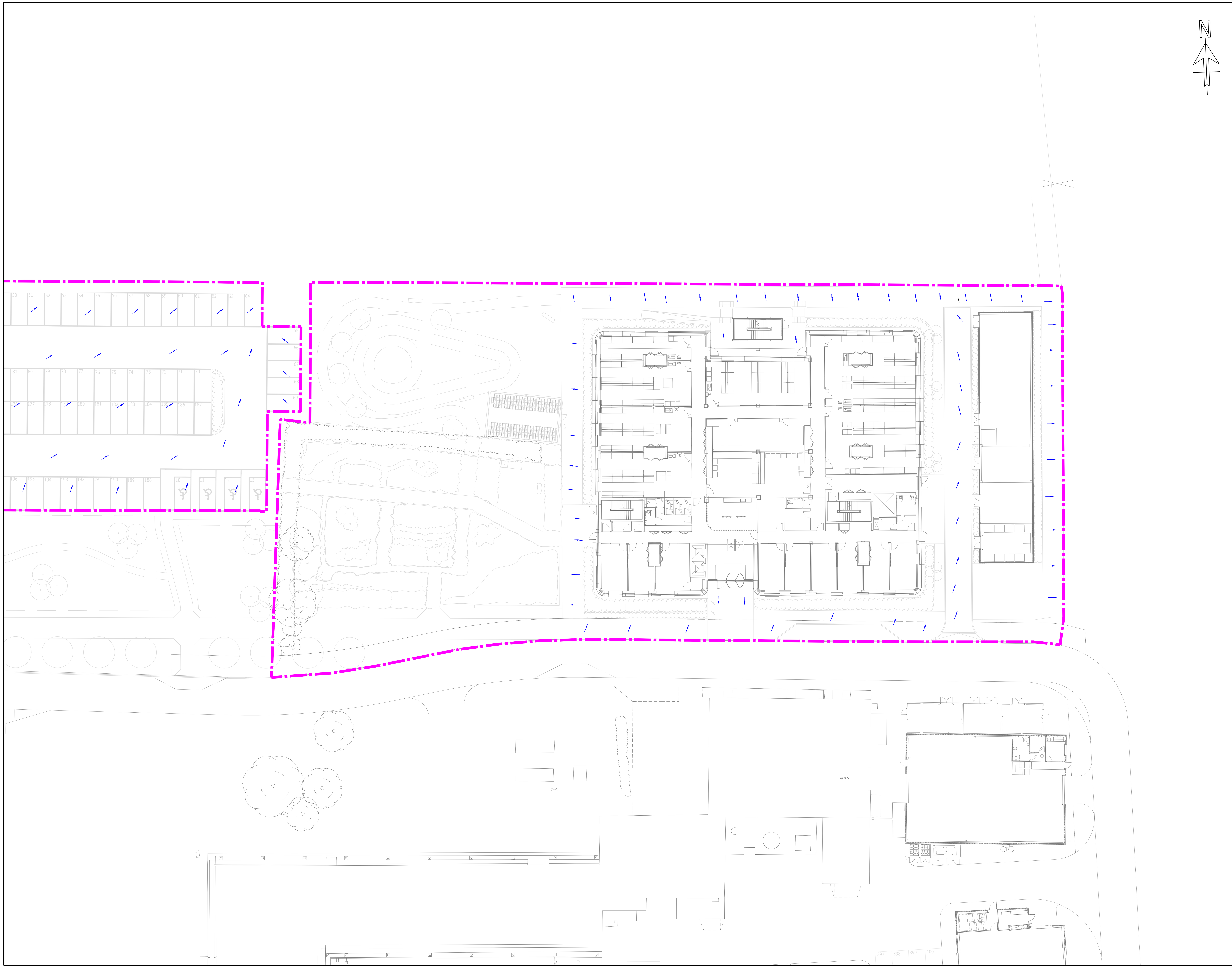
ZONE C
EXCEEDANCE FLOW PATH

Project No:	Scale (@A1):	Drawn:	Date:
1620011508	1:250	AT	DEC 2021

Drawing No:	Rev:
BBSP-RAMB-ZC-XX-DR-C-000105	P01

20/12/2021 16:26:00



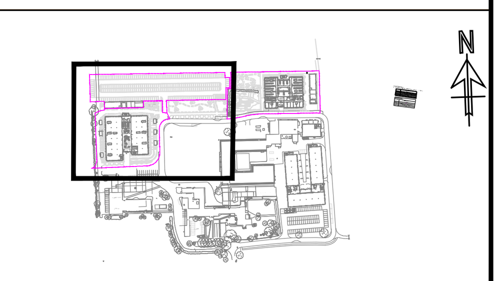
Notes

1. THIS DRAWING IS NOT TO BE SCALED.
2. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL RELEVANT ARCHITECTURAL, STRUCTURAL AND M&E DRAWINGS.
3. THIS IS NOT AN INSTALLATION DRAWING NOR A CO-ORDINATION DRAWING.
4. INDICATIVE BELOW GROUND DRAINAGE STRATEGY SUBJECT TO FURTHER DESIGN DEVELOPMENT AND COORDINATION.
5. THIS DRAWING IS BASED ON
   - LP2264-FIRA-MP-ST-P-LA-WS RECEIVED 02.09.2021.
   - LANDSCAPE DRAWING RECEIVED ON 25.08.2021.
   - BBSP-NBBJ-ZZ-XX-DR-A-511010-511011
   - BBSP-NBBJ-AB-00-DR-A-201010
   - BBSP-NBBJ-CB-00-DR-A-201000
     ARCHITECT DRAWINGS RECEIVED ON 02-09-2021.
   - HISTORIC SITE INFO RECEIVED ON 22.03.2021.

KEY:

SITE BOUNDARY

DIRECTION OF OVERLAND FLOWS



KEY PLAN

Rev	Description	Date	By / Chk	App
P01	STAGE 3 ISSUE	17.12 2021	AT / LF	LS

STAGE 3

BEGBROOKE SCIENCE PARK
ACADEMIC BUILDING

RAMBOLL

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ZONE B
EXCEEDANCE FLOW PATH

Project No:	Scale (@A1):	Drawn:	Date:
1620011508	1:250	AT	DEC 2021
Drawing No: BBSP-RAMB-ZC-XX-DR-C-000106			Rev: P01

20/12/2021 16:24:00

APPENDIX 3
MICRODRAINAGE (SURFACE WATER) RESULTS

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	Foul Sewage (l/s/ha)	0.000	Maximum Backdrop Height (m)	1.500
M5-60 (mm)	20.000	Volumetric Runoff Coeff.	0.750	Min Design Depth for Optimisation (m)	1.200
Ratio R	0.400	PIMP (%)	100	Min Vel for Auto Design only (m/s)	1.00
Maximum Rainfall (mm/hr)	50	Add Flow / Climate Change (%)	0	Min Slope for Optimisation (1:X)	500
Maximum Time of Concentration (mins)	30	Minimum Backdrop Height (m)	0.200		

Designed with Level Soffits

Time Area Diagram for Storm at outfall S (pipe S16.005)

Time (mins)	**Area (ha)**	**Time (mins)**	**Area (ha)**
0-4	0.184	4-8	0.060

Total Area Contributing (ha) = 0.244

Total Pipe Volume (m³) = 4.800

Time Area Diagram at outfall S (pipe S19.006)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.192	4-8	0.045

Total Area Contributing (ha) = 0.237

Total Pipe Volume (m³) = 2.698

Time Area Diagram at outfall S (pipe S23.009)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.235	4-8	0.102

Total Area Contributing (ha) = 0.338

Total Pipe Volume (m³) = 6.449

Network Design Table for Storm

- Indicates pipe length does not match coordinates

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S16.000	6.642	0.109	60.9	0.016	5.00	0.0	0.600	o	150	Pipe/Conduit	
S16.001	26.357	0.293	90.0	0.018	0.00	0.0	0.600	o	225	Pipe/Conduit	
S17.000	16.203	0.192	84.4	0.057	5.00	0.0	0.600	o	150	Pipe/Conduit	
S16.002	21.660	0.241	89.9	0.027	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.003	21.881	0.318	68.8	0.058	0.00	0.0	0.600	o	225	Pipe/Conduit	
S18.000	3.923	0.049	80.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S18.001	12.839	0.160	80.0	0.029	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S16.000	50.00	5.09	67.910	0.016	0.0	0.0	0.0	1.29	22.8	2.1
S16.001	50.00	5.40	67.726	0.034	0.0	0.0	0.0	1.38	54.8	4.6
S17.000	50.00	5.25	67.700	0.057	0.0	0.0	0.0	1.09	19.3	7.7
S16.002	50.00	5.67	67.433	0.117	0.0	0.0	0.0	1.38	54.9	15.9
S16.003	50.00	5.90	67.192	0.175	0.0	0.0	0.0	1.58	62.8	23.7
S18.000	50.00	5.06	67.540	0.010	0.0	0.0	0.0	1.12	19.9	1.3
S18.001	50.00	5.25	67.491	0.038	0.0	0.0	0.0	1.12	19.9	5.2

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S18.002	7.901	0.099	80.0	0.005	0.00	0.0	0.600	o	150	Pipe/Conduit	
S18.003	6.685	0.283	23.6	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S16.004	12.863	0.143	90.0	0.025	0.00	0.0	0.600	o	225	Pipe/Conduit	
S16.005	13.872	0.154	90.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.000	7.437	0.093	80.0	0.042	5.00	0.0	0.600	o	150	Pipe/Conduit	
S19.001	5.421	0.068	80.0	0.035	0.00	0.0	0.600	o	150	Pipe/Conduit	
S19.002	15.059	0.188	80.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S19.003	24.610	0.308	80.0	0.019	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S18.002	50.00	5.37	67.330	0.044	0.0	0.0	0.0	1.12	19.9	5.9
S18.003	50.00	5.42	67.232	0.044	0.0	0.0	0.0	2.08	36.8	5.9
S16.004	50.00	6.05	66.874	0.244	0.0	0.0	0.0	1.38	54.8	33.0
S16.005	49.51	6.22	66.731	0.244	0.0	0.0	0.0	1.38	54.8	33.0
S19.000	50.00	5.11	67.460	0.042	0.0	0.0	0.0	1.13	19.9	5.8
S19.001	50.00	5.19	67.367	0.077	0.0	0.0	0.0	1.12	19.9	10.5
S19.002	50.00	5.41	67.299	0.077	0.0	0.0	0.0	1.12	19.9	10.5
S19.003	50.00	5.78	67.111	0.097	0.0	0.0	0.0	1.12	19.9	13.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S19.004	3.419	0.043	80.0	0.041	0.00	0.0	0.600	o	150	Pipe/Conduit	
S19.005	5.000#	0.153	32.7	0.014	0.00	0.0	0.600	o	150	Pipe/Conduit	
S20.000	6.900	0.138	50.0	0.034	5.00	0.0	0.600	o	150	Pipe/Conduit	
S20.001	7.620	0.152	50.0	0.003	0.00	0.0	0.600	o	150	Pipe/Conduit	
S21.000	10.469	0.105	99.7	0.003	5.00	0.0	0.600	o	150	Pipe/Conduit	
S21.001	4.747	0.075	62.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S20.002	13.570	0.271	50.1	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S19.004	50.00	5.83	66.803	0.138	0.0	0.0	0.0	1.12	19.9	18.7
S19.005	50.00	5.88	66.761	0.152	0.0	0.0	0.0	1.77	31.2	20.6
S20.000	50.00	5.08	67.300	0.034	0.0	0.0	0.0	1.43	25.2	4.7
S20.001	50.00	5.17	67.162	0.037	0.0	0.0	0.0	1.43	25.2	5.0
S21.000	50.00	5.17	67.640	0.003	0.0	0.0	0.0	1.01	17.8	0.4
S21.001	50.00	5.24	67.535	0.003	0.0	0.0	0.0	1.27	22.4	0.4
S20.002	50.00	5.36	66.935	0.049	0.0	0.0	0.0	1.85	73.7	6.6

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S22.000	11.710	0.234	50.0	0.025	5.00	0.0	0.600	o	150	Pipe/Conduit	
S20.003	4.012	0.130	30.9	0.001	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.006	4.778	0.053	90.2	0.011	0.00	0.0	0.600	o	225	Pipe/Conduit	
S23.000	7.190	0.072	100.0	0.030	5.00	0.0	0.600	o	150	Pipe/Conduit	
S23.001	7.190	0.072	100.0	0.009	0.00	0.0	0.600	o	150	Pipe/Conduit	
S23.002	22.129	0.221	100.0	0.021	0.00	0.0	0.600	o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S22.000	50.00	5.14	67.400	0.025	0.0	0.0	0.0	1.43	25.2	3.3
S20.003	50.00	5.39	66.664	0.074	0.0	0.0	0.0	2.36	94.0	10.0
S19.006	50.00	5.93	66.533	0.237	0.0	0.0	0.0	1.38	54.8	32.1
S23.000	50.00	5.12	67.800	0.030	0.0	0.0	0.0	1.00	17.8	4.0
S23.001	50.00	5.24	67.728	0.039	0.0	0.0	0.0	1.00	17.8	5.2
S23.002	50.00	5.61	67.656	0.060	0.0	0.0	0.0	1.00	17.8	8.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S23.003	5.111	0.051	100.0	0.016	0.00	0.0	0.600	o	150	Pipe/Conduit	
S24.000	10.175	0.085	120.0	0.004	5.00	0.0	0.600	o	150	Pipe/Conduit	
S25.000	15.302	0.128	119.5	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
S25.001	10.243	0.085	120.0	0.029	0.00	0.0	0.600	o	150	Pipe/Conduit	
S25.002	6.460	0.054	120.0	0.029	0.00	0.0	0.600	o	150	Pipe/Conduit	
S23.004	27.015	0.246	110.0	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	
S23.005	21.026	0.191	110.0	0.013	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S23.003	50.00	5.69	67.435	0.076	0.0	0.0	0.0	1.00	17.8	10.3
S24.000	50.00	5.19	67.700	0.004	0.0	0.0	0.0	0.92	16.2	0.5
S25.000	50.00	5.28	68.000	0.023	0.0	0.0	0.0	0.92	16.2	3.2
S25.001	50.00	5.46	67.872	0.053	0.0	0.0	0.0	0.92	16.2	7.1
S25.002	50.00	5.58	67.787	0.081	0.0	0.0	0.0	0.92	16.2	11.0
S23.004	50.00	6.05	67.309	0.174	0.0	0.0	0.0	1.25	49.5	23.6
S23.005	49.09	6.33	67.063	0.187	0.0	0.0	0.0	1.25	49.5	24.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S23.006	7.759	0.071	110.0	0.008	0.00	0.0	0.600	o	225	Pipe/Conduit	
S23.007	9.315	0.085	110.0	0.028	0.00	0.0	0.600	o	225	Pipe/Conduit	
S26.000	19.914	0.199	100.0	0.034	5.00	0.0	0.600	o	150	Pipe/Conduit	
S26.001	16.739	0.167	100.0	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	
S26.002	9.976	0.100	100.0	0.030	0.00	0.0	0.600	o	225	Pipe/Conduit	
S26.003	9.297	0.093	100.0	0.038	0.00	0.0	0.600	o	225	Pipe/Conduit	
S23.008	16.074	0.146	110.0	0.003	0.00	0.0	0.600	o	225	Pipe/Conduit	
S23.009	8.191	0.246	33.3	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S23.006	48.70	6.44	66.872	0.195	0.0	0.0	0.0	1.25	49.5	25.7
S23.007	48.25	6.56	66.802	0.223	0.0	0.0	0.0	1.25	49.5	29.2
S26.000	50.00	5.33	67.911	0.034	0.0	0.0	0.0	1.00	17.8	4.5
S26.001	50.00	5.61	67.712	0.043	0.0	0.0	0.0	1.00	17.8	5.9
S26.002	50.00	5.74	67.469	0.073	0.0	0.0	0.0	1.31	52.0	9.9
S26.003	50.00	5.85	67.370	0.112	0.0	0.0	0.0	1.31	52.0	15.1
S23.008	47.50	6.78	66.717	0.338	0.0	0.0	0.0	1.25	49.5	43.5
S23.009	47.29	6.84	66.571	0.338	0.0	0.0	0.0	2.28	90.5	43.5

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSWMH 42	69.110	1.200	Open Manhole	1200	S16.000	67.910	150				
SSWMH12	68.740	1.014	Open Manhole	1200	S16.001	67.726	225	S16.000	67.801	150	
SSWMH 43	68.865	1.165	Open Manhole	1200	S17.000	67.700	150				
SSWMH13	68.750	1.317	Open Manhole	1200	S16.002	67.433	225	S16.001	67.433	225	
								S17.000	67.508	150	
SSWMH14	69.000	1.808	Open Manhole	1200	S16.003	67.192	225	S16.002	67.192	225	
SCATCHPIT 20	68.740	1.200	Open Manhole	1200	S18.000	67.540	150				
SCATCHPIT 21	68.740	1.249	Open Manhole	1200	S18.001	67.491	150	S18.000	67.491	150	
SSWMH 40	68.900	1.570	Open Manhole	1200	S18.002	67.330	150	S18.001	67.330	150	
SSWMH 41	69.000	1.768	Open Manhole	1200	S18.003	67.232	150	S18.002	67.232	150	
SSWMH15	69.000	2.126	Open Manhole	1200	S16.004	66.874	225	S16.003	66.874	225	
								S18.003	66.949	150	
SSDS GEOLIGHT TANK	68.650	1.919	Open Manhole	1200	S16.005	66.731	225	S16.004	66.731	225	
S	68.600	2.023	Open Manhole	0		OUTFALL		S16.005	66.577	225	
SSWMH 34	68.770	1.310	Open Manhole	1200	S19.000	67.460	150				
SCATCHPIT 13	68.770	1.403	Open Manhole	1200	S19.001	67.367	150	S19.000	67.367	150	
SCATCHPIT 14	68.750	1.451	Open Manhole	1200	S19.002	67.299	150	S19.001	67.299	150	
SSWMH 35	68.800	1.689	Open Manhole	1200	S19.003	67.111	150	S19.002	67.111	150	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
SSWMH 36	68.650	1.847	Open Manhole	1200	S19.004	66.803	150	S19.003	66.803	150	
SCATCHPIT 15	68.650	1.889	Open Manhole	1200	S19.005	66.761	150	S19.004	66.761	150	
SSWMH 39	68.740	1.440	Open Manhole	900	S20.000	67.300	150				
S83	68.740	1.578	Open Manhole	1200	S20.001	67.162	150	S20.000	67.162	150	
SCATCHPIT 19	68.640	1.000	Open Manhole	600	S21.000	67.640	150				
SCATCHPIT 18	68.640	1.105	Open Manhole	600	S21.001	67.535	150	S21.000	67.535	150	
SCATCHPIT 17	68.410	1.475	Open Manhole	1200	S20.002	66.935	225	S20.001	67.010	150	
								S21.001	67.460	150	450
SSWMH 37	68.750	1.350	Open Manhole	1200	S22.000	67.400	150				
SCATCHPIT 16	68.750	2.086	Open Manhole	1200	S20.003	66.664	225	S20.002	66.664	225	
								S22.000	67.166	150	427
SSDS GEOLIGHT TANK	68.500	1.967	Open Manhole	1200	S19.006	66.533	225	S19.005	66.608	150	
								S20.003	66.534	225	1
S	68.500	2.020	Open Manhole	0		OUTFALL		S19.006	66.480	225	
SSWMH 20	69.000	1.200	Open Manhole	1200	S23.000	67.800	150				
SSWMH 21	69.000	1.272	Open Manhole	1200	S23.001	67.728	150	S23.000	67.728	150	
SSWMH 22	69.000	1.344	Open Manhole	1200	S23.002	67.656	150	S23.001	67.656	150	
SSWMH 26	68.700	1.265	Open Manhole	1200	S23.003	67.435	150	S23.002	67.435	150	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSWMH 27	68.500	0.800	Open Manhole	1200	S24.000	67.700	150				
SSWMH 23	69.000	1.000	Open Manhole	1200	S25.000	68.000	150				
SSWMH 24	69.000	1.128	Open Manhole	1200	S25.001	67.872	150	S25.000	67.872	150	
SSWMH 25	68.700	0.913	Open Manhole	1200	S25.002	67.787	150	S25.001	67.787	150	
SSWMH 28	68.600	1.291	Open Manhole	1200	S23.004	67.309	225	S23.003	67.384	150	
								S24.000	67.615	150	231
								S25.002	67.733	150	349
SCATCHPIT 08	68.600	1.537	Open Manhole	1200	S23.005	67.063	225	S23.004	67.063	225	
SCATCHPIT 09	68.600	1.728	Open Manhole	1200	S23.006	66.872	225	S23.005	66.872	225	
SCATCHPIT 10	68.610	1.808	Open Manhole	1200	S23.007	66.802	225	S23.006	66.802	225	
SSWMH 32	69.190	1.279	Open Manhole	1200	S26.000	67.911	150				
SSWMH 31	69.120	1.408	Open Manhole	1200	S26.001	67.712	150	S26.000	67.712	150	
SSWMH 29	69.020	1.551	Open Manhole	1200	S26.002	67.469	225	S26.001	67.544	150	
SCATCHPIT 12	69.010	1.640	Open Manhole	1200	S26.003	67.370	225	S26.002	67.370	225	
SCATCHPIT 11	69.010	2.293	Open Manhole	1200	S23.008	66.717	225	S23.007	66.717	225	
								S26.003	67.277	225	560
SSDS GEOLIGHT TANK	68.440	1.869	Open Manhole	1200	S23.009	66.571	225	S23.008	66.571	225	
S	68.440	2.115	Open Manhole	0		OUTFALL		S23.009	66.325	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

- Indicates pipe length does not match coordinates

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.000	o	150	SSWMH 42	69.110	67.910	1.050	Open Manhole	1200
S16.001	o	225	SSWMH12	68.740	67.726	0.789	Open Manhole	1200
S17.000	o	150	SSWMH 43	68.865	67.700	1.015	Open Manhole	1200
S16.002	o	225	SSWMH13	68.750	67.433	1.092	Open Manhole	1200
S16.003	o	225	SSWMH14	69.000	67.192	1.583	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S16.000	6.642	60.9	SSWMH12	68.740	67.801	0.789	Open Manhole	1200
S16.001	26.357	90.0	SSWMH13	68.750	67.433	1.092	Open Manhole	1200
S17.000	16.203	84.4	SSWMH13	68.750	67.508	1.092	Open Manhole	1200
S16.002	21.660	89.9	SSWMH14	69.000	67.192	1.583	Open Manhole	1200
S16.003	21.881	68.8	SSWMH15	69.000	66.874	1.901	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S18.000	o	150	SCATCHPIT 20	68.740	67.540	1.050	Open Manhole	1200
S18.001	o	150	SCATCHPIT 21	68.740	67.491	1.099	Open Manhole	1200
S18.002	o	150	SSWMH 40	68.900	67.330	1.420	Open Manhole	1200
S18.003	o	150	SSWMH 41	69.000	67.232	1.618	Open Manhole	1200
S16.004	o	225	SSWMH15	69.000	66.874	1.901	Open Manhole	1200
S16.005	o	225	SSDS GEOLIGHT TANK	68.650	66.731	1.694	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S18.000	3.923	80.0	SCATCHPIT 21	68.740	67.491	1.099	Open Manhole	1200
S18.001	12.839	80.0	SSWMH 40	68.900	67.330	1.420	Open Manhole	1200
S18.002	7.901	80.0	SSWMH 41	69.000	67.232	1.618	Open Manhole	1200
S18.003	6.685	23.6	SSWMH15	69.000	66.949	1.901	Open Manhole	1200
S16.004	12.863	90.0	SSDS GEOLIGHT TANK	68.650	66.731	1.694	Open Manhole	1200
S16.005	13.872	90.0	S	68.600	66.577	1.798	Open Manhole	0

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S19.000	o	150	SSWMH 34	68.770	67.460	1.160	Open Manhole	1200
S19.001	o	150	SCATCHPIT 13	68.770	67.367	1.253	Open Manhole	1200
S19.002	o	150	SCATCHPIT 14	68.750	67.299	1.301	Open Manhole	1200
S19.003	o	150	SSWMH 35	68.800	67.111	1.539	Open Manhole	1200
S19.004	o	150	SSWMH 36	68.650	66.803	1.697	Open Manhole	1200
S19.005	o	150	SCATCHPIT 15	68.650	66.761	1.739	Open Manhole	1200
S20.000	o	150	SSWMH 39	68.740	67.300	1.290	Open Manhole	900
S20.001	o	150	S83	68.740	67.162	1.428	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S19.000	7.437	80.0	SCATCHPIT 13	68.770	67.367	1.253	Open Manhole	1200
S19.001	5.421	80.0	SCATCHPIT 14	68.750	67.299	1.301	Open Manhole	1200
S19.002	15.059	80.0	SSWMH 35	68.800	67.111	1.539	Open Manhole	1200
S19.003	24.610	80.0	SSWMH 36	68.650	66.803	1.697	Open Manhole	1200
S19.004	3.419	80.0	SCATCHPIT 15	68.650	66.761	1.739	Open Manhole	1200
S19.005	5.000#	32.7	SSDS GEOLIGHT TANK	68.500	66.608	1.742	Open Manhole	1200
S20.000	6.900	50.0	S83	68.740	67.162	1.428	Open Manhole	1200
S20.001	7.620	50.0	SCATCHPIT 17	68.410	67.010	1.250	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S21.000	o	150	SCATCHPIT 19	68.640	67.640	0.850	Open Manhole	600
S21.001	o	150	SCATCHPIT 18	68.640	67.535	0.955	Open Manhole	600
S20.002	o	225	SCATCHPIT 17	68.410	66.935	1.250	Open Manhole	1200
S22.000	o	150	SSWMH 37	68.750	67.400	1.200	Open Manhole	1200
S20.003	o	225	SCATCHPIT 16	68.750	66.664	1.861	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S21.000	10.469	99.7	SCATCHPIT 18	68.640	67.535	0.955	Open Manhole	600
S21.001	4.747	62.9	SCATCHPIT 17	68.410	67.460	0.800	Open Manhole	1200
S20.002	13.570	50.1	SCATCHPIT 16	68.750	66.664	1.861	Open Manhole	1200
S22.000	11.710	50.0	SCATCHPIT 16	68.750	67.166	1.434	Open Manhole	1200
S20.003	4.012	30.9	SSDS GEOLIGHT TANK	68.500	66.534	1.741	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S19.006	o	225	SSDS GEOLIGHT TANK	68.500	66.533	1.742	Open Manhole	1200
S23.000	o	150	SSWMH 20	69.000	67.800	1.050	Open Manhole	1200
S23.001	o	150	SSWMH 21	69.000	67.728	1.122	Open Manhole	1200
S23.002	o	150	SSWMH 22	69.000	67.656	1.194	Open Manhole	1200
S23.003	o	150	SSWMH 26	68.700	67.435	1.115	Open Manhole	1200
S24.000	o	150	SSWMH 27	68.500	67.700	0.650	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S19.006	4.778	90.2	S	68.500	66.480	1.795	Open Manhole	0
S23.000	7.190	100.0	SSWMH 21	69.000	67.728	1.122	Open Manhole	1200
S23.001	7.190	100.0	SSWMH 22	69.000	67.656	1.194	Open Manhole	1200
S23.002	22.129	100.0	SSWMH 26	68.700	67.435	1.115	Open Manhole	1200
S23.003	5.111	100.0	SSWMH 28	68.600	67.384	1.066	Open Manhole	1200
S24.000	10.175	120.0	SSWMH 28	68.600	67.615	0.835	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S25.000	o	150	SSWMH 23	69.000	68.000	0.850	Open Manhole	1200
S25.001	o	150	SSWMH 24	69.000	67.872	0.978	Open Manhole	1200
S25.002	o	150	SSWMH 25	68.700	67.787	0.763	Open Manhole	1200
S23.004	o	225	SSWMH 28	68.600	67.309	1.066	Open Manhole	1200
S23.005	o	225	SCATCHPIT 08	68.600	67.063	1.312	Open Manhole	1200
S23.006	o	225	SCATCHPIT 09	68.600	66.872	1.503	Open Manhole	1200
S23.007	o	225	SCATCHPIT 10	68.610	66.802	1.583	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S25.000	15.302	119.5	SSWMH 24	69.000	67.872	0.978	Open Manhole	1200
S25.001	10.243	120.0	SSWMH 25	68.700	67.787	0.763	Open Manhole	1200
S25.002	6.460	120.0	SSWMH 28	68.600	67.733	0.717	Open Manhole	1200
S23.004	27.015	110.0	SCATCHPIT 08	68.600	67.063	1.312	Open Manhole	1200
S23.005	21.026	110.0	SCATCHPIT 09	68.600	66.872	1.503	Open Manhole	1200
S23.006	7.759	110.0	SCATCHPIT 10	68.610	66.802	1.583	Open Manhole	1200
S23.007	9.315	110.0	SCATCHPIT 11	69.010	66.717	2.068	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S26.000	o	150	SSWMH 32	69.190	67.911	1.129	Open Manhole	1200
S26.001	o	150	SSWMH 31	69.120	67.712	1.258	Open Manhole	1200
S26.002	o	225	SSWMH 29	69.020	67.469	1.326	Open Manhole	1200
S26.003	o	225	SCATCHPIT 12	69.010	67.370	1.415	Open Manhole	1200
S23.008	o	225	SCATCHPIT 11	69.010	66.717	2.068	Open Manhole	1200
S23.009	o	225	SSDS GEOLIGHT TANK	68.440	66.571	1.644	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S26.000	19.914	100.0	SSWMH 31	69.120	67.712	1.258	Open Manhole	1200
S26.001	16.739	100.0	SSWMH 29	69.020	67.544	1.326	Open Manhole	1200
S26.002	9.976	100.0	SCATCHPIT 12	69.010	67.370	1.415	Open Manhole	1200
S26.003	9.297	100.0	SCATCHPIT 11	69.010	67.277	1.508	Open Manhole	1200
S23.008	16.074	110.0	SSDS GEOLIGHT TANK	68.440	66.571	1.644	Open Manhole	1200
S23.009	8.191	33.3	S	68.440	66.325	1.890	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
16.000	User	-	100	0.002	0.002	0.002
	User	-	100	0.009	0.009	0.011
	User	-	46	0.010	0.005	0.016
16.001	User	-	97	0.010	0.010	0.010
	User	-	97	0.008	0.008	0.018
17.000	User	-	97	0.055	0.053	0.053
	User	-	46	0.008	0.004	0.057
16.002	User	-	97	0.013	0.013	0.013
	User	-	100	0.002	0.002	0.015
	User	-	97	0.012	0.012	0.027
16.003	User	-	97	0.010	0.010	0.010
	User	-	97	0.030	0.029	0.039
	User	-	97	0.008	0.007	0.046
	User	-	100	0.008	0.008	0.054
	User	-	97	0.004	0.004	0.058
18.000	User	-	100	0.007	0.007	0.007
	User	-	46	0.001	0.000	0.007
	User	-	100	0.003	0.003	0.010
18.001	User	-	100	0.002	0.002	0.002
	User	-	97	0.027	0.026	0.028
	User	-	100	0.001	0.001	0.029
18.002	User	-	100	0.002	0.002	0.002
	User	-	46	0.007	0.003	0.005
	User	-	46	0.001	0.000	0.005
18.003	-	-	100	0.000	0.000	0.000
16.004	User	-	100	0.008	0.008	0.008
	User	-	100	0.003	0.003	0.011

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
	User	-	97	0.007	0.007	0.017
	User	-	97	0.008	0.007	0.025
16.005	-	-	100	0.000	0.000	0.000
19.000	User	-	100	0.002	0.002	0.002
	User	-	97	0.019	0.018	0.020
	User	-	100	0.015	0.015	0.035
	User	-	100	0.005	0.005	0.041
	User	-	46	0.004	0.002	0.042
19.001	User	-	97	0.036	0.035	0.035
19.002	-	-	100	0.000	0.000	0.000
19.003	User	-	100	0.002	0.002	0.002
	User	-	100	0.009	0.009	0.011
	User	-	100	0.005	0.005	0.016
	User	-	100	0.003	0.003	0.019
19.004	User	-	100	0.008	0.008	0.008
	User	-	46	0.007	0.003	0.011
	User	-	97	0.031	0.030	0.041
	User	-	46	0.002	0.001	0.041
19.005	User	-	97	0.014	0.014	0.014
20.000	User	-	100	0.002	0.002	0.002
	User	-	97	0.022	0.021	0.023
	User	-	97	0.007	0.007	0.030
	User	-	46	0.004	0.002	0.031
	User	-	100	0.003	0.003	0.034
20.001	User	-	100	0.003	0.003	0.003
21.000	User	-	46	0.007	0.003	0.003
21.001	-	-	100	0.000	0.000	0.000

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
20.002	User	-	97	0.008	0.008	0.008
22.000	User	-	97	0.025	0.025	0.025
20.003	User	-	46	0.002	0.001	0.001
19.006	User	-	46	0.023	0.011	0.011
23.000	User	-	97	0.027	0.027	0.027
	User	-	46	0.006	0.003	0.030
23.001	User	-	100	0.009	0.009	0.009
23.002	User	-	100	0.012	0.012	0.012
	User	-	100	0.009	0.009	0.021
23.003	User	-	100	0.012	0.012	0.012
	User	-	100	0.004	0.004	0.016
24.000	User	-	100	0.004	0.004	0.004
25.000	User	-	100	0.023	0.023	0.023
25.001	User	-	100	0.029	0.029	0.029
25.002	User	-	100	0.022	0.022	0.022
	User	-	100	0.006	0.006	0.029
23.004	User	-	100	0.013	0.013	0.013
23.005	User	-	100	0.013	0.013	0.013
23.006	User	-	100	0.008	0.008	0.008
23.007	User	-	100	0.022	0.022	0.022
	User	-	100	0.001	0.001	0.023
	User	-	100	0.005	0.005	0.028
26.000	User	-	100	0.025	0.025	0.025
	User	-	97	0.006	0.005	0.030
	User	-	100	0.003	0.003	0.034
26.001	User	-	100	0.006	0.006	0.006
	User	-	100	0.004	0.004	0.010

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
26.002	User	-	100	0.024	0.024	0.024
	User	-	100	0.001	0.001	0.025
	User	-	100	0.005	0.005	0.030
26.003	User	-	100	0.025	0.025	0.025
	User	-	100	0.002	0.002	0.027
	User	-	100	0.004	0.004	0.031
	User	-	100	0.007	0.007	0.038
23.008	User	-	100	0.002	0.002	0.002
	User	-	100	0.001	0.001	0.003
23.009	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.874	0.819	0.819

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S16.000	SSWMH 42	150	0.789	1.050	Unclassified	1200	0	1.050	Unclassified
S16.001	SSWMH12	225	0.789	1.092	Unclassified	1200	0	0.789	Unclassified
S17.000	SSWMH 43	150	1.015	1.092	Unclassified	1200	0	1.015	Unclassified
S16.002	SSWMH13	225	1.092	1.583	Unclassified	1200	0	1.092	Unclassified
S16.003	SSWMH14	225	1.583	1.901	Unclassified	1200	0	1.583	Unclassified
S18.000	SCATCHPIT 20	150	1.050	1.099	Unclassified	1200	0	1.050	Unclassified
S18.001	SCATCHPIT 21	150	1.099	1.420	Unclassified	1200	0	1.099	Unclassified
S18.002	SSWMH 40	150	1.420	1.618	Unclassified	1200	0	1.420	Unclassified
S18.003	SSWMH 41	150	1.618	1.901	Unclassified	1200	0	1.618	Unclassified
S16.004	SSWMH15	225	1.694	1.901	Unclassified	1200	0	1.901	Unclassified
S16.005	SSDS GEOLIGHT TANK	225	1.694	1.798	Unclassified	1200	0	1.694	Unclassified
S19.000	SSWMH 34	150	1.160	1.253	Unclassified	1200	0	1.160	Unclassified
S19.001	SCATCHPIT 13	150	1.253	1.301	Unclassified	1200	0	1.253	Unclassified
S19.002	SCATCHPIT 14	150	1.301	1.539	Unclassified	1200	0	1.301	Unclassified
S19.003	SSWMH 35	150	1.539	1.697	Unclassified	1200	0	1.539	Unclassified
S19.004	SSWMH 36	150	1.697	1.739	Unclassified	1200	0	1.697	Unclassified
S19.005	SCATCHPIT 15	150	1.739	1.742	Unclassified	1200	0	1.739	Unclassified
S20.000	SSWMH 39	150	1.290	1.428	Unclassified	900	0	1.290	Unclassified
S20.001	S83	150	1.250	1.428	Unclassified	1200	0	1.428	Unclassified
S21.000	SCATCHPIT 19	150	0.850	0.955	Unclassified	600	0	0.850	Unclassified
S21.001	SCATCHPIT 18	150	0.800	0.955	Unclassified	600	0	0.955	Unclassified
S20.002	SCATCHPIT 17	225	1.250	1.861	Unclassified	1200	0	1.250	Unclassified
S22.000	SSWMH 37	150	1.200	1.434	Unclassified	1200	0	1.200	Unclassified
S20.003	SCATCHPIT 16	225	1.741	1.861	Unclassified	1200	0	1.861	Unclassified
S19.006	SSDS GEOLIGHT TANK	225	1.742	1.795	Unclassified	1200	0	1.742	Unclassified

Network Classifications for Storm

PN	USMH Name	Pipe Dia (mm)	Min Cover Depth (m)	Max Cover Depth (m)	Pipe Type	MH Dia (mm)	MH Width (mm)	MH Ring Depth (m)	MH Type
S23.000	SSWMH 20	150	1.050	1.122	Unclassified	1200	0	1.050	Unclassified
S23.001	SSWMH 21	150	1.122	1.194	Unclassified	1200	0	1.122	Unclassified
S23.002	SSWMH 22	150	1.115	1.194	Unclassified	1200	0	1.194	Unclassified
S23.003	SSWMH 26	150	1.066	1.115	Unclassified	1200	0	1.115	Unclassified
S24.000	SSWMH 27	150	0.650	0.835	Unclassified	1200	0	0.650	Unclassified
S25.000	SSWMH 23	150	0.850	0.978	Unclassified	1200	0	0.850	Unclassified
S25.001	SSWMH 24	150	0.763	0.978	Unclassified	1200	0	0.978	Unclassified
S25.002	SSWMH 25	150	0.717	0.763	Unclassified	1200	0	0.763	Unclassified
S23.004	SSWMH 28	225	1.066	1.312	Unclassified	1200	0	1.066	Unclassified
S23.005	SCATCHPIT 08	225	1.312	1.503	Unclassified	1200	0	1.312	Unclassified
S23.006	SCATCHPIT 09	225	1.503	1.583	Unclassified	1200	0	1.503	Unclassified
S23.007	SCATCHPIT 10	225	1.583	2.068	Unclassified	1200	0	1.583	Unclassified
S26.000	SSWMH 32	150	1.129	1.258	Unclassified	1200	0	1.129	Unclassified
S26.001	SSWMH 31	150	1.258	1.326	Unclassified	1200	0	1.258	Unclassified
S26.002	SSWMH 29	225	1.326	1.415	Unclassified	1200	0	1.326	Unclassified
S26.003	SCATCHPIT 12	225	1.415	1.508	Unclassified	1200	0	1.415	Unclassified
S23.008	SCATCHPIT 11	225	1.644	2.068	Unclassified	1200	0	2.068	Unclassified
S23.009	SSDS GEOLIGHT TANK	225	1.644	1.890	Unclassified	1200	0	1.644	Unclassified

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S16.005	S	68.600	66.577	0.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S19.006	S	68.500	66.480	0.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S23.009	S	68.440	66.325	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Manhole Headloss Coeff (Global)	0.500	Inlet Coeffiecient	0.800
Areal Reduction Factor	1.000	Foul Sewage per hectare (l/s)	0.000	Flow per Person per Day (l/per/day)	0.000
Hot Start (mins)	0	Additional Flow - % of Total Flow	0.000	Run Time (mins)	60
Hot Start Level (mm)	0	MADD Factor * 10m³/ha Storage	2.000	Output Interval (mins)	1

Number of Input Hydrographs	0	Number of Offline Controls	0	Number of Time/Area Diagrams	6
Number of Online Controls	3	Number of Storage Structures	8	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FSR	M5-60 (mm)	20.000	Cv (Summer)	0.750
Return Period (years)	1	Ratio R	0.400	Cv (Winter)	0.840
Region	England and Wales	Profile Type	Summer	Storm Duration (mins)	30

Online Controls for Storm

Pump Manhole: SSDS GEOLIGHT TANK, DS/PN: S16.005, Volume (m^3): 2.6

Invert Level (m) 66.731

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.0000	2.000	0.0000	3.000	0.0000

Pump Manhole: SSDS GEOLIGHT TANK, DS/PN: S19.006, Volume (m^3): 2.4

Invert Level (m) 66.533

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.0000	2.000	0.0000	2.500	0.0000	3.000	0.0000

Pump Manhole: SSDS GEOLIGHT TANK, DS/PN: S23.009, Volume (m^3): 2.7

Invert Level (m) 66.571

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.0000	2.000	0.0000	2.500	0.0000	3.000	0.0000

Storage Structures for Storm

Porous Car Park Manhole: SCATCHPIT 21, DS/PN: S18.001

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	100.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	67.491	Depression Storage (mm)	5
Max Percolation (l/s)	4.2	Width (m)	3.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	5.0	Cap Volume Depth (m)	0.400

Cellular Storage Manhole: SSDS GEOLIGHT TANK, DS/PN: S16.005

Invert Level (m) 66.730 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.12492 Safety Factor 2.0

Depth (m)	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**	**Depth (m)**	**Area (m²)**	**Inf. Area (m²)**
0.000	150.0	150.0	0.800	150.0	189.2	1.201	0.0	208.8
0.400	150.0	169.6	1.200	150.0	208.8			

Porous Car Park Manhole: SCATCHPIT 14, DS/PN: S19.002

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	100.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	67.249	Depression Storage (mm)	5
Max Percolation (l/s)	24.2	Width (m)	6.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	14.5	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SCATCHPIT 16, DS/PN: S20.003

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	100.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	66.688	Depression Storage (mm)	5
Max Percolation (l/s)	27.5	Width (m)	3.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	33.0	Cap Volume Depth (m)	0.400

Cellular Storage Manhole: SSDS GEOLIGHT TANK, DS/PN: S19.006

Invert Level (m)	66.533	Infiltration Coefficient Side (m/hr)	0.24480	Porosity	0.95
Infiltration Coefficient Base (m/hr)	0.24480	Safety Factor	2.0		

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	60.0	70.0	0.500	60.0	86.7	1.000	60.0	103.5	1.001	0.0	103.5

Porous Car Park Manhole: SCATCHPIT 10, DS/PN: S23.007

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	100.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	66.802	Depression Storage (mm)	5
Max Percolation (l/s)	56.7	Width (m)	3.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	68.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: SCATCHPIT 11, DS/PN: S23.008

Infiltration Coefficient Base (m/hr)	0.00000	Porosity	0.30	Slope (1:X)	100.0
Membrane Percolation (mm/hr)	1000	Invert Level (m)	66.717	Depression Storage (mm)	5
Max Percolation (l/s)	23.3	Width (m)	3.0	Evaporation (mm/day)	3
Safety Factor	2.0	Length (m)	28.0	Cap Volume Depth (m)	0.400

Cellular Storage Manhole: SSDS GEOLIGHT TANK, DS/PN: S23.009

Invert Level (m) 66.571 Infiltration Coefficient Side (m/hr) 0.05832 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.05832 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	160.0	212.0	0.800	160.0	258.6	1.201	0.0	281.9
0.400	160.0	235.3	1.200	160.0	281.9			

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 6
Number of Online Controls 3 Number of Storage Structures 8 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S16.000	SSWMH 42	60 Winter	1	+0%	100/15 Summer				67.913	-0.147	0.000	0.00		0.1
S16.001	SSWMH12	15 Winter	1	+0%	100/15 Summer				67.756	-0.195	0.000	0.04		2.1

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

PN	US/MH Name	Status	Level Exceeded
S16.000	SSWMH 42	OK	
S16.001	SSWMH12	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S17.000	SSWMH 43	15 Winter	1	+0%	30/15 Winter				67.770	-0.080	0.000	0.44	
S16.002	SSWMH13	15 Winter	1	+0%	100/15 Summer				67.512	-0.146	0.000	0.26	
S16.003	SSWMH14	15 Winter	1	+0%	30/15 Summer				67.284	-0.133	0.000	0.35	
S18.000	SCATCHPIT 20	15 Winter	1	+0%					67.571	-0.119	0.000	0.09	
S18.001	SCATCHPIT 21	15 Winter	1	+0%					67.517	-0.124	0.000	0.07	
S18.002	SSWMH 40	15 Winter	1	+0%	100/15 Summer				67.358	-0.123	0.000	0.07	
S18.003	SSWMH 41	15 Winter	1	+0%	100/15 Summer				67.251	-0.130	0.000	0.04	
S16.004	SSWMH15	15 Winter	1	+0%	30/15 Summer				66.988	-0.111	0.000	0.51	
S16.005	SSDS GEOLIGHT TANK	120 Winter	1	+0%	30/30 Winter				66.835	-0.121	0.000	0.00	
S19.000	SSWMH 34	60 Winter	1	+0%					67.463	-0.147	0.000	0.00	
S19.001	SCATCHPIT 13	15 Winter	1	+0%	100/15 Summer				67.418	-0.099	0.000	0.25	
S19.002	SCATCHPIT 14	15 Winter	1	+0%	100/15 Summer				67.342	-0.107	0.000	0.18	
S19.003	SSWMH 35	15 Winter	1	+0%	100/15 Summer				67.153	-0.108	0.000	0.18	
S19.004	SSWMH 36	15 Winter	1	+0%	30/15 Summer				66.885	-0.069	0.000	0.55	
S19.005	SCATCHPIT 15	15 Winter	1	+0%	30/15 Summer				66.822	-0.088	0.000	0.35	
S20.000	SSWMH 39	60 Winter	1	+0%					67.303	-0.147	0.000	0.00	
S20.001	S83	15 Winter	1	+0%	100/120 Winter				67.173	-0.139	0.000	0.02	
S21.000	SCATCHPIT 19	15 Winter	1	+0%					67.656	-0.134	0.000	0.03	
S21.001	SCATCHPIT 18	15 Winter	1	+0%					67.551	-0.134	0.000	0.02	
S20.002	SCATCHPIT 17	15 Winter	1	+0%	100/30 Winter				66.959	-0.200	0.000	0.03	
S22.000	SSWMH 37	15 Winter	1	+0%					67.439	-0.111	0.000	0.15	
S20.003	SCATCHPIT 16	15 Winter	1	+0%	30/30 Winter				66.712	-0.177	0.000	0.10	
S19.006	SSDS GEOLIGHT TANK	60 Winter	1	+0%	30/15 Summer				66.683	-0.075	0.000	0.00	
S23.000	SSWMH 20	15 Winter	1	+0%	30/15 Summer				67.853	-0.097	0.000	0.27	
S23.001	SSWMH 21	15 Winter	1	+0%	30/15 Summer				67.789	-0.089	0.000	0.34	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S17.000	SSWMH 43	7.8	OK	
S16.002	SSWMH13	13.1	OK	
S16.003	SSWMH14	20.0	OK	
S18.000	SCATCHPIT 20	1.3	OK	
S18.001	SCATCHPIT 21	1.3	OK	
S18.002	SSWMH 40	1.3	OK	
S18.003	SSWMH 41	1.3	OK	
S16.004	SSWMH15	24.0	OK	
S16.005	SSDS GEOLIGHT TANK	0.0	OK	
S19.000	SSWMH 34	0.1	OK	
S19.001	SCATCHPIT 13	4.1	OK	
S19.002	SCATCHPIT 14	3.4	OK	
S19.003	SSWMH 35	3.4	OK	
S19.004	SSWMH 36	7.2	OK	
S19.005	SCATCHPIT 15	8.6	OK	
S20.000	SSWMH 39	0.1	OK	
S20.001	S83	0.3	OK	
S21.000	SCATCHPIT 19	0.4	OK	
S21.001	SCATCHPIT 18	0.4	OK	
S20.002	SCATCHPIT 17	1.7	OK	
S22.000	SSWMH 37	3.4	OK	
S20.003	SCATCHPIT 16	5.2	OK	
S19.006	SSDS GEOLIGHT TANK	0.0	OK	
S23.000	SSWMH 20	4.1	OK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S23.001	SSWMH 21	5.1	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S23.002	SSWMH 22	15 Winter	1	+0%	30/15 Summer				67.727	-0.079	0.000	0.45	
S23.003	SSWMH 26	15 Winter	1	+0%	30/15 Summer				67.525	-0.060	0.000	0.67	
S24.000	SSWMH 27	15 Winter	1	+0%	100/15 Summer				67.719	-0.131	0.000	0.04	
S25.000	SSWMH 23	15 Winter	1	+0%	30/15 Summer				68.048	-0.102	0.000	0.21	
S25.001	SSWMH 24	15 Winter	1	+0%	30/15 Summer				67.944	-0.078	0.000	0.46	
S25.002	SSWMH 25	15 Winter	1	+0%	30/15 Summer				67.883	-0.054	0.000	0.74	
S23.004	SSWMH 28	15 Winter	1	+0%	30/15 Summer				67.417	-0.117	0.000	0.46	
S23.005	SCATCHPIT 08	15 Winter	1	+0%	30/15 Summer				67.177	-0.111	0.000	0.50	
S23.006	SCATCHPIT 09	15 Winter	1	+0%	30/15 Summer				67.002	-0.095	0.000	0.63	
S23.007	SCATCHPIT 10	15 Winter	1	+0%	30/15 Summer				66.931	-0.095	0.000	0.63	
S26.000	SSWMH 32	15 Winter	1	+0%	100/15 Summer				67.965	-0.096	0.000	0.27	
S26.001	SSWMH 31	15 Winter	1	+0%	100/15 Summer				67.773	-0.088	0.000	0.35	
S26.002	SSWMH 29	15 Winter	1	+0%	100/15 Summer				67.540	-0.154	0.000	0.21	
S26.003	SCATCHPIT 12	15 Winter	1	+0%	100/15 Summer				67.457	-0.137	0.000	0.32	
S23.008	SCATCHPIT 11	15 Winter	1	+0%	30/15 Summer				66.875	-0.066	0.000	0.83	
S23.009	SSDS GEOLIGHT TANK	240 Winter	1	+0%	30/15 Summer				66.796	0.000	0.000	0.00	

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S23.002	SSWMH 22	7.6	OK	
S23.003	SSWMH 26	9.5	OK	
S24.000	SSWMH 27	0.5	OK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S25.000	SSWMH 23	3.2	OK	
S25.001	SSWMH 24	6.7	OK	
S25.002	SSWMH 25	10.1	OK	
S23.004	SSWMH 28	21.2	OK	
S23.005	SCATCHPIT 08	22.7	OK	
S23.006	SCATCHPIT 09	23.6	OK	
S23.007	SCATCHPIT 10	25.7	OK	
S26.000	SSWMH 32	4.6	OK	
S26.001	SSWMH 31	5.8	OK	
S26.002	SSWMH 29	9.3	OK	
S26.003	SCATCHPIT 12	13.7	OK	
S23.008	SCATCHPIT 11	36.6	OK	
S23.009	SSDS GEOLIGHT TANK	0.0	OK	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 6
Number of Online Controls 3 Number of Storage Structures 8 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S16.000	SSWMH 42	30 Winter	30	+0%	100/15 Summer				67.918	-0.142	0.000	0.01		0.2
S16.001	SSWMH12	15 Winter	30	+0%	100/15 Summer				67.780	-0.171	0.000	0.13		6.7

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

PN	US/MH Name	Status	Level Exceeded
S16.000	SSWMH 42	OK	
S16.001	SSWMH12	OK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S17.000	SSWMH 43	15 Winter	30	+0%	30/15 Winter				67.866	0.016	0.000	1.05	
S16.002	SSWMH13	15 Winter	30	+0%	100/15 Summer				67.572	-0.086	0.000	0.68	
S16.003	SSWMH14	15 Winter	30	+0%	30/15 Summer				67.461	0.044	0.000	0.91	
S18.000	SCATCHPIT 20	15 Winter	30	+0%					67.589	-0.101	0.000	0.23	
S18.001	SCATCHPIT 21	15 Winter	30	+0%					67.533	-0.108	0.000	0.18	
S18.002	SSWMH 40	15 Winter	30	+0%	100/15 Summer				67.374	-0.107	0.000	0.18	
S18.003	SSWMH 41	15 Winter	30	+0%	100/15 Summer				67.264	-0.118	0.000	0.10	
S16.004	SSWMH15	15 Winter	30	+0%	30/15 Summer				67.200	0.101	0.000	1.32	
S16.005	SSDS GEOLIGHT TANK	120 Winter	30	+0%	30/30 Winter				67.053	0.097	0.000	0.00	
S19.000	SSWMH 34	30 Winter	30	+0%					67.470	-0.140	0.000	0.01	
S19.001	SCATCHPIT 13	15 Summer	30	+0%	100/15 Summer				67.468	-0.049	0.000	0.79	
S19.002	SCATCHPIT 14	15 Winter	30	+0%	100/15 Summer				67.383	-0.067	0.000	0.59	
S19.003	SSWMH 35	15 Winter	30	+0%	100/15 Summer				67.193	-0.068	0.000	0.57	
S19.004	SSWMH 36	15 Winter	30	+0%	30/15 Summer				67.071	0.118	0.000	1.73	
S19.005	SCATCHPIT 15	120 Winter	30	+0%	30/15 Summer				66.959	0.048	0.000	0.41	
S20.000	SSWMH 39	30 Winter	30	+0%					67.308	-0.142	0.000	0.01	
S20.001	S83	15 Summer	30	+0%	100/120 Winter				67.183	-0.129	0.000	0.05	
S21.000	SCATCHPIT 19	15 Winter	30	+0%					67.665	-0.125	0.000	0.07	
S21.001	SCATCHPIT 18	15 Winter	30	+0%					67.559	-0.126	0.000	0.06	
S20.002	SCATCHPIT 17	15 Winter	30	+0%	100/30 Winter				66.977	-0.183	0.000	0.08	
S22.000	SSWMH 37	15 Winter	30	+0%					67.463	-0.087	0.000	0.37	
S20.003	SCATCHPIT 16	120 Winter	30	+0%	30/30 Winter				66.956	0.067	0.000	0.07	
S19.006	SSDS GEOLIGHT TANK	120 Winter	30	+0%	30/15 Summer				66.955	0.197	0.000	0.00	
S23.000	SSWMH 20	15 Winter	30	+0%	30/15 Summer				68.011	0.061	0.000	0.57	
S23.001	SSWMH 21	15 Winter	30	+0%	30/15 Summer				67.990	0.112	0.000	0.67	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S17.000	SSWMH 43	18.8	SURCHARGED	
S16.002	SSWMH13	34.1	OK	
S16.003	SSWMH14	52.0	SURCHARGED	
S18.000	SCATCHPIT 20	3.2	OK	
S18.001	SCATCHPIT 21	3.2	OK	
S18.002	SSWMH 40	3.2	OK	
S18.003	SSWMH 41	3.2	OK	
S16.004	SSWMH15	62.3	SURCHARGED	
S16.005	SSDS GEOLIGHT TANK	0.0	SURCHARGED	
S19.000	SSWMH 34	0.2	OK	
S19.001	SCATCHPIT 13	12.8	OK	
S19.002	SCATCHPIT 14	10.8	OK	
S19.003	SSWMH 35	10.8	OK	
S19.004	SSWMH 36	22.5	SURCHARGED	
S19.005	SCATCHPIT 15	10.1	SURCHARGED	
S20.000	SSWMH 39	0.2	OK	
S20.001	S83	1.0	OK	
S21.000	SCATCHPIT 19	1.0	OK	
S21.001	SCATCHPIT 18	1.0	OK	
S20.002	SCATCHPIT 17	5.1	OK	
S22.000	SSWMH 37	8.4	OK	
S20.003	SCATCHPIT 16	3.6	SURCHARGED	
S19.006	SSDS GEOLIGHT TANK	0.0	SURCHARGED	
S23.000	SSWMH 20	8.7	SURCHARGED	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S23.001	SSWMH 21	10.2	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S23.002	SSWMH 22	15 Winter	30	+0%	30/15 Summer				67.960	0.154	0.000	0.96	
S23.003	SSWMH 26	15 Winter	30	+0%	30/15 Summer				67.795	0.211	0.000	1.37	
S24.000	SSWMH 27	15 Winter	30	+0%	100/15 Summer				67.731	-0.119	0.000	0.09	
S25.000	SSWMH 23	15 Winter	30	+0%	30/15 Summer				68.209	0.059	0.000	0.52	
S25.001	SSWMH 24	15 Winter	30	+0%	30/15 Summer				68.177	0.155	0.000	1.14	
S25.002	SSWMH 25	15 Winter	30	+0%	30/15 Summer				68.068	0.131	0.000	1.86	
S23.004	SSWMH 28	15 Winter	30	+0%	30/15 Summer				67.711	0.178	0.000	1.03	
S23.005	SCATCHPIT 08	15 Winter	30	+0%	30/15 Summer				67.476	0.188	0.000	1.05	
S23.006	SCATCHPIT 09	15 Winter	30	+0%	30/15 Summer				67.278	0.181	0.000	1.28	
S23.007	SCATCHPIT 10	15 Winter	30	+0%	30/15 Summer				67.178	0.151	0.000	1.11	
S26.000	SSWMH 32	15 Winter	30	+0%	100/15 Summer				68.003	-0.058	0.000	0.68	
S26.001	SSWMH 31	15 Winter	30	+0%	100/15 Summer				67.824	-0.038	0.000	0.89	
S26.002	SSWMH 29	15 Winter	30	+0%	100/15 Summer				67.595	-0.100	0.000	0.57	
S26.003	SCATCHPIT 12	15 Winter	30	+0%	100/15 Summer				67.539	-0.056	0.000	0.89	
S23.008	SCATCHPIT 11	360 Winter	30	+0%	30/15 Summer				67.134	0.193	0.000	0.31	
S23.009	SSDS GEOLIGHT TANK	360 Winter	30	+0%	30/15 Summer				67.131	0.335	0.000	0.00	

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S23.002	SSWMH 22	16.2	SURCHARGED	
S23.003	SSWMH 26	19.4	SURCHARGED	
S24.000	SSWMH 27	1.3	OK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S25.000	SSWMH 23	7.8	SURCHARGED	
S25.001	SSWMH 24	16.4	SURCHARGED	
S25.002	SSWMH 25	25.5	SURCHARGED	
S23.004	SSWMH 28	47.1	SURCHARGED	
S23.005	SCATCHPIT 08	47.2	SURCHARGED	
S23.006	SCATCHPIT 09	48.0	SURCHARGED	
S23.007	SCATCHPIT 10	45.4	SURCHARGED	
S26.000	SSWMH 32	11.3	OK	
S26.001	SSWMH 31	14.7	OK	
S26.002	SSWMH 29	24.9	OK	
S26.003	SCATCHPIT 12	38.3	OK	
S23.008	SCATCHPIT 11	13.8	SURCHARGED	
S23.009	SSDS GEOLIGHT TANK	0.0	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 6
Number of Online Controls 3 Number of Storage Structures 8 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.400 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status ON
Analysis Timestep 2.5 Second Increment (Extended) Inertia Status ON
DTS Status OFF

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)
S16.000	SSWMH 42	15 Winter	100	+40%	100/15 Summer				68.251	0.191	0.000	0.18		3.5
S16.001	SSWMH12	15 Winter	100	+40%	100/15 Summer				68.265	0.314	0.000	0.23		11.9

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

PN	US/MH Name	Status	Level Exceeded
S16.000	SSWMH 42	SURCHARGED	
S16.001	SSWMH12	SURCHARGED	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S17.000	SSWMH 43	15 Winter	100	+40%	30/15 Winter				68.737	0.887	0.000	1.60	
S16.002	SSWMH13	15 Winter	100	+40%	100/15 Summer				68.251	0.593	0.000	1.00	
S16.003	SSWMH14	15 Winter	100	+40%	30/15 Summer				68.042	0.625	0.000	1.30	
S18.000	SCATCHPIT 20	15 Winter	100	+40%					67.609	-0.081	0.000	0.42	
S18.001	SCATCHPIT 21	15 Winter	100	+40%					67.550	-0.091	0.000	0.32	
S18.002	SSWMH 40	15 Winter	100	+40%	100/15 Summer				67.518	0.037	0.000	0.41	
S18.003	SSWMH 41	15 Winter	100	+40%	100/15 Summer				67.502	0.121	0.000	0.25	
S16.004	SSWMH15	15 Winter	100	+40%	30/15 Summer				67.491	0.392	0.000	1.93	
S16.005	SSDS GEOLIGHT TANK	240 Winter	100	+40%	30/30 Winter				67.419	0.463	0.000	0.00	
S19.000	SSWMH 34	15 Winter	100	+40%					67.564	-0.046	0.000	0.05	
S19.001	SCATCHPIT 13	15 Winter	100	+40%	100/15 Summer				67.574	0.057	0.000	1.38	
S19.002	SCATCHPIT 14	15 Winter	100	+40%	100/15 Summer				67.495	0.046	0.000	0.73	
S19.003	SSWMH 35	15 Winter	100	+40%	100/15 Summer				67.432	0.171	0.000	0.76	
S19.004	SSWMH 36	15 Winter	100	+40%	30/15 Summer				67.416	0.463	0.000	2.36	
S19.005	SCATCHPIT 15	120 Winter	100	+40%	30/15 Summer				67.348	0.437	0.000	0.71	
S20.000	SSWMH 39	120 Winter	100	+40%					67.345	-0.105	0.000	0.01	
S20.001	S83	120 Winter	100	+40%	100/120 Winter				67.345	0.033	0.000	0.04	
S21.000	SCATCHPIT 19	15 Winter	100	+40%					67.674	-0.116	0.000	0.12	
S21.001	SCATCHPIT 18	15 Winter	100	+40%					67.568	-0.117	0.000	0.11	
S20.002	SCATCHPIT 17	120 Winter	100	+40%	100/30 Winter				67.344	0.185	0.000	0.05	
S22.000	SSWMH 37	15 Winter	100	+40%					67.491	-0.059	0.000	0.67	
S20.003	SCATCHPIT 16	120 Winter	100	+40%	30/30 Winter				67.344	0.455	0.000	0.07	
S19.006	SSDS GEOLIGHT TANK	120 Winter	100	+40%	30/15 Summer				67.343	0.585	0.000	0.00	
S23.000	SSWMH 20	15 Winter	100	+40%	30/15 Summer				68.966	1.016	0.000	0.76	
S23.001	SSWMH 21	15 Winter	100	+40%	30/15 Summer				68.923	1.045	0.000	0.90	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S17.000	SSWMH 43	28.7	FLOOD RISK	
S16.002	SSWMH13	49.8	SURCHARGED	
S16.003	SSWMH14	74.4	SURCHARGED	
S18.000	SCATCHPIT 20	5.9	OK	
S18.001	SCATCHPIT 21	5.8	OK	
S18.002	SSWMH 40	7.0	SURCHARGED	
S18.003	SSWMH 41	7.9	SURCHARGED	
S16.004	SSWMH15	91.2	SURCHARGED	
S16.005	SSDS GEOLIGHT TANK	0.0	SURCHARGED	
S19.000	SSWMH 34	0.8	OK	
S19.001	SCATCHPIT 13	22.5	SURCHARGED	
S19.002	SCATCHPIT 14	13.5	SURCHARGED	
S19.003	SSWMH 35	14.4	SURCHARGED	
S19.004	SSWMH 36	30.6	SURCHARGED	
S19.005	SCATCHPIT 15	17.3	SURCHARGED	
S20.000	SSWMH 39	0.3	OK	
S20.001	S83	0.9	SURCHARGED	
S21.000	SCATCHPIT 19	1.9	OK	
S21.001	SCATCHPIT 18	1.9	OK	
S20.002	SCATCHPIT 17	3.0	SURCHARGED	
S22.000	SSWMH 37	15.3	OK	
S20.003	SCATCHPIT 16	3.8	SURCHARGED	
S19.006	SSDS GEOLIGHT TANK	0.0	SURCHARGED	
S23.000	SSWMH 20	11.6	FLOOD RISK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S23.001	SSWMH 21	13.7	FLOOD RISK	

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

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)
S23.002	SSWMH 22	15 Winter	100	+40%	30/15 Summer				68.867	1.060	0.000	1.17	
S23.003	SSWMH 26	15 Winter	100	+40%	30/15 Summer				68.562	0.977	0.000	1.72	
S24.000	SSWMH 27	15 Winter	100	+40%	100/15 Summer				68.413	0.563	0.000	0.19	
S25.000	SSWMH 23	15 Winter	100	+40%	30/15 Summer				68.953	0.803	0.000	0.72	
S25.001	SSWMH 24	15 Winter	100	+40%	30/15 Summer				68.889	0.867	0.000	1.54	
S25.002	SSWMH 25	15 Winter	100	+40%	30/15 Summer				68.697	0.760	0.000	2.54	
S23.004	SSWMH 28	15 Winter	100	+40%	30/15 Summer				68.409	0.875	0.000	1.32	
S23.005	SCATCHPIT 08	15 Winter	100	+40%	30/15 Summer				68.001	0.712	0.000	1.43	
S23.006	SCATCHPIT 09	480 Winter	100	+40%	30/15 Summer				67.673	0.576	0.000	0.34	
S23.007	SCATCHPIT 10	480 Winter	100	+40%	30/15 Summer				67.671	0.645	0.000	0.29	
S26.000	SSWMH 32	15 Winter	100	+40%	100/15 Summer				68.383	0.322	0.000	1.11	
S26.001	SSWMH 31	15 Winter	100	+40%	100/15 Summer				68.129	0.268	0.000	1.43	
S26.002	SSWMH 29	15 Winter	100	+40%	100/15 Summer				67.814	0.120	0.000	0.93	
S26.003	SCATCHPIT 12	15 Winter	100	+40%	100/15 Summer				67.706	0.111	0.000	1.47	
S23.008	SCATCHPIT 11	480 Winter	100	+40%	30/15 Summer				67.669	0.727	0.000	0.39	
S23.009	SSDS GEOLIGHT TANK	480 Winter	100	+40%	30/15 Summer				67.665	0.869	0.000	0.00	

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S23.002	SSWMH 22	19.6	FLOOD RISK	
S23.003	SSWMH 26	24.3	FLOOD RISK	
S24.000	SSWMH 27	2.8	FLOOD RISK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
S25.000	SSWMH 23	10.7	FLOOD RISK	
S25.001	SSWMH 24	22.2	FLOOD RISK	
S25.002	SSWMH 25	34.7	FLOOD RISK	
S23.004	SSWMH 28	60.8	FLOOD RISK	
S23.005	SCATCHPIT 08	64.4	SURCHARGED	
S23.006	SCATCHPIT 09	12.7	SURCHARGED	
S23.007	SCATCHPIT 10	11.9	SURCHARGED	
S26.000	SSWMH 32	18.6	SURCHARGED	
S26.001	SSWMH 31	23.6	SURCHARGED	
S26.002	SSWMH 29	40.1	SURCHARGED	
S26.003	SCATCHPIT 12	62.8	SURCHARGED	
S23.008	SCATCHPIT 11	17.0	SURCHARGED	
S23.009	SSDS GEOLIGHT TANK	0.0	SURCHARGED	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	1	Maximum Time of Concentration (mins)	30	Add Flow / Climate Change (%)	0	Min Vel for Auto Design only (m/s)	1.00
M5-60 (mm)	20.000	Foul Sewage (l/s/ha)	0.000	Minimum Backdrop Height (m)	0.200	Min Slope for Optimisation (1:X)	500
Ratio R	0.400	Volumetric Runoff Coeff.	0.750	Maximum Backdrop Height (m)	1.500		
Maximum Rainfall (mm/hr)	50	PIMP (%)	100	Min Design Depth for Optimisation (m)	1.200		

Designed with Level Soffits

Time Area Diagram for Storm at outfall S (pipe S1.007)

Time (mins)	Area (ha)	Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.183	4-8	0.307	8-12	0.017

Total Area Contributing (ha) = 0.508

Total Pipe Volume (m³) = 30.720

Time Area Diagram at outfall S (pipe S23.004)

Time (mins)	Area (ha)	Time (mins)	Area (ha)
0-4	0.023	4-8	0.010

Total Area Contributing (ha) = 0.033

Total Pipe Volume (m³) = 2.298

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S1.000	52.344	0.349	150.0	0.000	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S1.001	3.147	0.021	149.2	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S2.000	47.231	0.236	200.1	0.023	5.00	0.0	0.600	o	150	Pipe/Conduit	
S2.001	7.208	0.048	149.4	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S1.002	30.927	0.189	164.1	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S3.000	66.079	0.330	200.0	0.043	5.00	0.0	0.600	o	150	Pipe/Conduit	
S3.001	11.558	0.152	75.9	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S4.000	43.200	0.288	150.0	0.000	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S4.001	9.840	0.066	150.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S1.003	26.065	0.189	138.3	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S5.000	55.265	0.366	151.0	0.000	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S5.001	3.358	0.022	150.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S6.000	55.416	0.277	200.0	0.029	5.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S1.000	50.00	5.85	68.050	0.000	0.0	0.0	0.0	1.03	32.9	0.0
S1.001	50.00	5.90	67.701	0.000	0.0	0.0	0.0	1.03	33.0	0.0
S2.000	49.92	6.11	67.550	0.023	0.0	0.0	0.0	0.71	12.5	3.1
S2.001	49.36	6.26	67.314	0.023	0.0	0.0	0.0	0.82	14.5	3.1
S1.002	47.01	6.92	67.266	0.023	0.0	0.0	0.0	0.78	13.8	3.1
S3.000	48.27	6.56	67.560	0.043	0.0	0.0	0.0	0.71	12.5	5.7
S3.001	47.68	6.72	67.230	0.043	0.0	0.0	0.0	1.16	20.4	5.7
S4.000	50.00	5.70	68.060	0.000	0.0	0.0	0.0	1.03	32.9	0.0
S4.001	50.00	5.86	67.772	0.000	0.0	0.0	0.0	1.03	32.9	0.0
S1.003	45.35	7.43	67.077	0.066	0.0	0.0	0.0	0.85	15.1	8.2
S5.000	50.00	5.90	67.990	0.000	0.0	0.0	0.0	1.02	32.8	0.0
S5.001	50.00	5.95	67.624	0.000	0.0	0.0	0.0	1.03	32.9	0.0
S6.000	47.73	6.71	67.510	0.029	0.0	0.0	0.0	0.54	4.2	3.7

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S6.001	6.623	0.044	150.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S7.000	11.669	0.077	151.0	0.013	5.00	0.0	0.600	o	100	Pipe/Conduit	
S7.001	17.315	0.115	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.004	45.021	0.298	151.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S8.000	44.870	0.297	151.0	0.024	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S8.001	3.667	0.024	150.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S9.000	43.537	0.218	200.0	0.022	5.00	0.0	0.600	o	100	Pipe/Conduit	
S9.001	7.249	0.048	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S1.005	7.737	0.208	37.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S10.000	11.499	0.076	151.0	0.006	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S10.001	6.829	0.045	151.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S11.000	9.767	0.049	200.0	0.006	5.00	0.0	0.600	o	100	Pipe/Conduit	
S11.001	8.956	0.059	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S6.001	47.12	6.89	67.233	0.029	0.0	0.0	0.0	0.63	4.9	3.7
S7.000	50.00	5.31	67.520	0.013	0.0	0.0	0.0	0.62	4.9	1.7
S7.001	50.00	5.77	67.443	0.013	0.0	0.0	0.0	0.62	4.9	1.7
S1.004	43.27	8.14	66.814	0.108	0.0	0.0	0.0	1.06	42.2	12.6
S8.000	50.00	5.73	68.010	0.024	0.0	0.0	0.0	1.02	32.8	3.2
S8.001	50.00	5.79	67.713	0.024	0.0	0.0	0.0	1.03	32.9	3.2
S9.000	49.05	6.34	67.530	0.022	0.0	0.0	0.0	0.54	4.2	2.9
S9.001	48.34	6.54	67.312	0.022	0.0	0.0	0.0	0.62	4.9	2.9
S1.005	43.10	8.20	66.516	0.154	0.0	0.0	0.0	2.15	85.6	17.9
S10.000	50.00	5.19	68.070	0.006	0.0	0.0	0.0	1.02	32.8	0.8
S10.001	50.00	5.30	67.994	0.006	0.0	0.0	0.0	1.02	32.8	0.8
S11.000	50.00	5.30	67.600	0.006	0.0	0.0	0.0	0.54	4.2	0.8
S11.001	50.00	5.54	67.551	0.006	0.0	0.0	0.0	0.62	4.9	0.8

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S10.002	35.528	0.235	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S12.000	27.459	0.183	150.0	0.033	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S12.001	7.739	0.051	151.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S13.000	23.705	0.119	200.0	0.013	5.00	0.0	0.600	o	100	Pipe/Conduit	
S13.001	6.898	0.046	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S10.003	36.746	0.243	151.2	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S14.000	20.269	0.134	151.0	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
S15.000	69.596	0.461	151.0	0.051	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S15.001	6.576	0.044	151.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S16.000	34.948	0.175	199.7	0.021	5.00	0.0	0.600	o	150	Pipe/Conduit	
S16.001	4.829	0.032	150.0	0.000	0.00	0.0	0.600	o	150	Pipe/Conduit	
S10.004	25.946	0.052	499.0	0.033	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S10.002	48.51	6.49	67.492	0.012	0.0	0.0	0.0	0.62	4.9	1.6
S12.000	50.00	5.45	68.100	0.033	0.0	0.0	0.0	1.03	32.9	4.5
S12.001	50.00	5.57	67.917	0.033	0.0	0.0	0.0	1.02	32.8	4.5
S13.000	50.00	5.73	67.640	0.013	0.0	0.0	0.0	0.54	4.2	1.7
S13.001	50.00	5.92	67.521	0.013	0.0	0.0	0.0	0.62	4.9	1.7
S10.003	45.95	7.24	67.207	0.058	0.0	0.0	0.0	0.81	14.4	7.2
S14.000	50.00	5.54	68.000	0.000	0.0	0.0	0.0	0.62	4.9	0.0
S15.000	49.85	6.13	68.130	0.051	0.0	0.0	0.0	1.02	32.8	6.9
S15.001	49.44	6.24	67.669	0.051	0.0	0.0	0.0	1.02	32.8	6.9
S16.000	50.00	5.82	67.610	0.021	0.0	0.0	0.0	0.71	12.5	2.8
S16.001	50.00	5.92	67.435	0.021	0.0	0.0	0.0	0.82	14.5	2.8
S10.004	43.69	7.99	66.889	0.163	0.0	0.0	0.0	0.58	23.0	19.3

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S17.000	15.521	0.103	150.0	0.009	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S17.001	7.856	0.052	151.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S18.000	11.928	0.204	58.5	0.009	5.00	0.0	0.600	o	100	Pipe/Conduit	
S18.001	7.508	0.050	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S10.005	55.107	0.365	151.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S19.000	72.060	0.360	200.0	0.047	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S19.001	4.281	0.028	152.9	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S20.000	67.429	0.337	200.1	0.034	5.00	0.0	0.600	o	100	Pipe/Conduit	
S20.001	8.119	0.054	151.0	0.000	0.00	0.0	0.600	o	100	Pipe/Conduit	
S10.006	6.720	0.164	40.9	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S21.000	9.600	0.064	151.0	0.016	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S21.001	3.774	0.025	151.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S17.000	50.00	5.25	68.000	0.009	0.0	0.0	0.0	1.03	32.9	1.2
S17.001	50.00	5.38	67.897	0.009	0.0	0.0	0.0	1.02	32.8	1.2
S18.000	50.00	5.20	67.520	0.009	0.0	0.0	0.0	1.01	7.9	1.2
S18.001	50.00	5.40	67.316	0.009	0.0	0.0	0.0	0.62	4.9	1.2
S10.005	41.37	8.85	66.837	0.182	0.0	0.0	0.0	1.06	42.2	20.3
S19.000	49.01	6.35	68.150	0.047	0.0	0.0	0.0	0.89	28.4	6.2
S19.001	48.75	6.42	67.790	0.047	0.0	0.0	0.0	1.02	32.5	6.2
S20.000	46.47	7.08	67.630	0.034	0.0	0.0	0.0	0.54	4.2	4.2
S20.001	45.77	7.30	67.293	0.034	0.0	0.0	0.0	0.62	4.9	4.2
S10.006	41.24	8.91	66.472	0.262	0.0	0.0	0.0	2.05	81.5	29.3
S21.000	50.00	5.16	68.480	0.016	0.0	0.0	0.0	1.02	32.8	2.1
S21.001	50.00	5.22	68.416	0.016	0.0	0.0	0.0	1.02	32.8	2.1

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
S22.000	10.744	0.071	151.0	0.020	5.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S22.001	4.117	0.027	151.0	0.000	0.00	0.0	0.600	MD7	-16	Pipe/Conduit	
S1.006	8.392	0.361	23.2	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S1.007	32.155	0.291	110.4	0.056	0.00	0.0	0.600	o	300	Pipe/Conduit	
S23.000	26.371	0.293	90.0	0.010	5.00	0.0	0.600	o	150	Pipe/Conduit	
S23.001	21.649	0.241	90.0	0.013	0.00	0.0	0.600	o	150	Pipe/Conduit	
S23.002	21.881	0.243	90.0	0.010	0.00	0.0	0.600	o	150	Pipe/Conduit	
S23.003	12.863	0.143	90.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	
S23.004	13.872	0.154	90.0	0.000	0.00	0.0	0.600	o	225	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
S22.000	50.00	5.17	68.210	0.020	0.0	0.0	0.0	1.02	32.8	2.8
S22.001	50.00	5.24	68.139	0.020	0.0	0.0	0.0	1.02	32.8	2.8
S1.006	41.12	8.96	66.308	0.452	0.0	0.0	0.0	2.73	108.4	50.3
S1.007	40.30	9.32	65.871	0.508	0.0	0.0	0.0	1.50	105.7	55.4
S23.000	50.00	5.41	67.800	0.010	0.0	0.0	0.0	1.06	18.7	1.4
S23.001	50.00	5.76	67.507	0.023	0.0	0.0	0.0	1.06	18.7	3.1
S23.002	49.98	6.10	67.266	0.033	0.0	0.0	0.0	1.06	18.7	4.4
S23.003	49.38	6.25	67.023	0.033	0.0	0.0	0.0	1.38	54.8	4.4
S23.004	48.76	6.42	66.805	0.033	0.0	0.0	0.0	1.38	54.8	4.4

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S1	68.370	0.320	Junction		S1.000	68.050	-16				
S2	68.320	0.619	Junction		S1.001	67.701	-16	S1.000	67.701	-16	
S3	68.350	0.800	Junction		S2.000	67.550	150				
S4	68.320	1.006	Junction		S2.001	67.314	150	S2.000	67.314	150	
SSWMH01	68.320	1.054	Open Manhole	1200	S1.002	67.266	150	S1.001	67.680	-16	549
								S2.001	67.266	150	
S26	68.360	0.800	Junction		S3.000	67.560	150				
S28	68.350	1.120	Open Manhole	1200	S3.001	67.230	150	S3.000	67.230	150	
S16	68.380	0.320	Junction		S4.000	68.060	-16				
S17	68.330	0.558	Junction		S4.001	67.772	-16	S4.000	67.772	-16	
SSWMH06	68.390	1.313	Open Manhole	1200	S1.003	67.077	150	S1.002	67.077	150	
								S3.001	67.077	150	
								S4.001	67.706	-16	764
S4	68.310	0.320	Junction		S5.000	67.990	-16				
S5	68.330	0.706	Junction		S5.001	67.624	-16	S5.000	67.624	-16	
S8	68.310	0.800	Junction		S6.000	67.510	100				
S9	68.330	1.097	Junction		S6.001	67.233	100	S6.000	67.233	100	
S10	68.320	0.800	Junction		S7.000	67.520	100				
S11	68.320	0.877	Junction		S7.001	67.443	100	S7.000	67.443	100	
SSWMH02	68.460	1.646	Open Manhole	1200	S1.004	66.814	225	S1.003	66.889	150	
								S5.001	67.602	-16	848
								S6.001	67.189	100	250
								S7.001	67.328	100	389
S7	68.330	0.320	Junction		S8.000	68.010	-16				
S8	68.470	0.757	Junction		S8.001	67.713	-16	S8.000	67.713	-16	
S15	68.330	0.800	Junction		S9.000	67.530	100				
S16	68.470	1.158	Junction		S9.001	67.312	100	S9.000	67.312	100	
SSWMH03	68.620	2.104	Open Manhole	1200	S1.005	66.516	225	S1.004	66.516	225	
								S8.001	67.688	-16	1233
								S9.001	67.264	100	624
S6	68.390	0.320	Junction		S10.000	68.070	-16				
S7	68.420	0.426	Junction		S10.001	67.994	-16	S10.000	67.994	-16	
S20	68.400	0.800	Junction		S11.000	67.600	100				
S21	68.480	0.929	Junction		S11.001	67.551	100	S11.000	67.551	100	
SSWMH11	68.430	0.938	Open Manhole	1200	S10.002	67.492	100	S10.001	67.949	-16	642
								S11.001	67.492	100	
S13	68.420	0.320	Junction		S12.000	68.100	-16				
S14	68.420	0.503	Junction		S12.001	67.917	-16	S12.000	67.917	-16	
S19	68.440	0.800	Junction		S13.000	67.640	100				
S20	68.410	0.889	Junction		S13.001	67.521	100	S13.000	67.521	100	
SSWMH10	68.470	1.263	Open Manhole	1200	S10.003	67.207	150	S10.002	67.257	100	
								S12.001	67.866	-16	794
								S13.001	67.476	100	219
SSWMH09	68.900	0.900	Open Manhole	1200	S14.000	68.000	100				
S18	68.450	0.320	Junction		S15.000	68.130	-16				
S19	68.320	0.651	Junction		S15.001	67.669	-16	S15.000	67.669	-16	
S25	68.410	0.800	Junction		S16.000	67.610	150				
S26	68.320	0.885	Junction		S16.001	67.435	150	S16.000	67.435	150	
SSWMH08	68.330	1.441	Open Manhole	1200	S10.004	66.889	225	S10.003	66.964	150	
								S14.000	67.866	100	852
								S15.001	67.626	-16	797
								S16.001	67.403	150	439
S19	68.320	0.320	Junction		S17.000	68.000	-16				
S20	68.330	0.433	Junction		S17.001	67.897	-16	S17.000	67.897	-16	
S36	68.320	0.800	Junction		S18.000	67.520	100				
S37	68.350	1.034	Junction		S18.001	67.316	100	S18.000	67.316	100	
Sdummy	68.300	1.463	Junction		S10.005	66.837	225	S10.004	66.837	225	
								S17.001	67.845	-16	1068
								S18.001	67.266	100	305
S24	68.470	0.320	Junction		S19.000	68.150	-16				
S25	68.860	1.070	Junction		S19.001	67.790	-16	S19.000	67.790	-16	
S45	68.430	0.800	Junction		S20.000	67.630	100				
S46	68.890	1.597	Junction		S20.001	67.293	100	S20.000	67.293	100	
SSWMH05	68.700	2.228	Open Manhole	1200	S10.006	66.472	225	S10.005	66.472	225	
								S19.001	67.762	-16	1350
								S20.001	67.239	100	643
S47	68.800	0.320	Junction		S21.000	68.480	-16				
S48	68.600	0.184	Junction		S21.001	68.416	-16	S21.000	68.416	-16	

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
S49	68.530	0.320	Junction		S22.000	68.210	-16				
S50	68.600	0.461	Junction		S22.001	68.139	-16	S22.000	68.139	-16	
SSWMH04	68.670	2.362	Open Manhole	1200	S1.006	66.308	225	S1.005	66.308	225	
								S10.006	66.308	225	
								S21.001	68.391	-16	2143
								S22.001	68.112	-16	1864
S7	68.320	2.449	Open Manhole	450	S1.007	65.871	300	S1.006	65.946	225	
S	68.320	2.740	Open Manhole	0		OUTFALL		S1.007	65.580	300	

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	PN	Pipe Out Invert Level (m)	Diameter (mm)	PN	Pipes In Invert Level (m)	Diameter (mm)	Backdrop (mm)
SSWMH12	68.740	0.940	Open Manhole	1200	S23.000	67.800	150				
SSWMH13	69.020	1.513	Open Manhole	1200	S23.001	67.507	150	S23.000	67.507	150	
SSWMH14	69.000	1.734	Open Manhole	1200	S23.002	67.266	150	S23.001	67.266	150	
SSWMH15	69.000	1.977	Open Manhole	1200	S23.003	67.023	225	S23.002	67.023	150	
S66	68.650	1.845	Open Manhole	1200	S23.004	66.805	225	S23.003	66.880	225	
S	68.600	1.949	Open Manhole	0		OUTFALL		S23.004	66.651	225	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	MD7	-16	S1	68.370	68.050	0.035	Junction	
S1.001	MD7	-16	S2	68.320	67.701	0.334	Junction	
S2.000	o	150	S3	68.350	67.550	0.650	Junction	
S2.001	o	150	S4	68.320	67.314	0.856	Junction	
S1.002	o	150	SSWMH01	68.320	67.266	0.904	Open Manhole	1200
S3.000	o	150	S26	68.360	67.560	0.650	Junction	
S3.001	o	150	S28	68.350	67.230	0.970	Open Manhole	1200
S4.000	MD7	-16	S16	68.380	68.060	0.035	Junction	
S4.001	MD7	-16	S17	68.330	67.772	0.273	Junction	
S1.003	o	150	SSWMH06	68.390	67.077	1.163	Open Manhole	1200
S5.000	MD7	-16	S4	68.310	67.990	0.035	Junction	
S5.001	MD7	-16	S5	68.330	67.624	0.421	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S1.000	52.344	150.0	S2	68.320	67.701	0.334	Junction	
S1.001	3.147	149.2	SSWMH01	68.320	67.680	0.355	Open Manhole	1200
S2.000	47.231	200.1	S4	68.320	67.314	0.856	Junction	
S2.001	7.208	149.4	SSWMH01	68.320	67.266	0.904	Open Manhole	1200
S1.002	30.927	164.1	SSWMH06	68.390	67.077	1.163	Open Manhole	1200
S3.000	66.079	200.0	S28	68.350	67.230	0.970	Open Manhole	1200
S3.001	11.558	75.9	SSWMH06	68.390	67.077	1.163	Open Manhole	1200
S4.000	43.200	150.0	S17	68.330	67.772	0.273	Junction	
S4.001	9.840	150.0	SSWMH06	68.390	67.706	0.399	Open Manhole	1200
S1.003	26.065	138.3	SSWMH02	68.460	66.889	1.421	Open Manhole	1200
S5.000	55.265	151.0	S5	68.330	67.624	0.421	Junction	
S5.001	3.358	150.0	SSWMH02	68.460	67.602	0.573	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	o	100	S8	68.310	67.510	0.700	Junction	
S6.001	o	100	S9	68.330	67.233	0.997	Junction	
S7.000	o	100	S10	68.320	67.520	0.700	Junction	
S7.001	o	100	S11	68.320	67.443	0.777	Junction	
S1.004	o	225	SSWMH02	68.460	66.814	1.421	Open Manhole	1200
S8.000	MD7	-16	S7	68.330	68.010	0.035	Junction	
S8.001	MD7	-16	S8	68.470	67.713	0.472	Junction	
S9.000	o	100	S15	68.330	67.530	0.700	Junction	
S9.001	o	100	S16	68.470	67.312	1.058	Junction	
S1.005	o	225	SSWMH03	68.620	66.516	1.879	Open Manhole	1200
S10.000	MD7	-16	S6	68.390	68.070	0.035	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S6.000	55.416	200.0	S9	68.330	67.233	0.997	Junction	
S6.001	6.623	150.0	SSWMH02	68.460	67.189	1.171	Open Manhole	1200
S7.000	11.669	151.0	S11	68.320	67.443	0.777	Junction	
S7.001	17.315	151.0	SSWMH02	68.460	67.328	1.032	Open Manhole	1200
S1.004	45.021	151.0	SSWMH03	68.620	66.516	1.879	Open Manhole	1200
S8.000	44.870	151.0	S8	68.470	67.713	0.472	Junction	
S8.001	3.667	150.0	SSWMH03	68.620	67.688	0.647	Open Manhole	1200
S9.000	43.537	200.0	S16	68.470	67.312	1.058	Junction	
S9.001	7.249	151.0	SSWMH03	68.620	67.264	1.256	Open Manhole	1200
S1.005	7.737	37.2	SSWMH04	68.670	66.308	2.137	Open Manhole	1200
S10.000	11.499	151.0	S7	68.420	67.994	0.141	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.001	MD7	-16	S7	68.420	67.994	0.141	Junction	
S11.000	o	100	S20	68.400	67.600	0.700	Junction	
S11.001	o	100	S21	68.480	67.551	0.829	Junction	
S10.002	o	100	SSWMH11	68.430	67.492	0.838	Open Manhole	1200
S12.000	MD7	-16	S13	68.420	68.100	0.035	Junction	
S12.001	MD7	-16	S14	68.420	67.917	0.218	Junction	
S13.000	o	100	S19	68.440	67.640	0.700	Junction	
S13.001	o	100	S20	68.410	67.521	0.789	Junction	
S10.003	o	150	SSWMH10	68.470	67.207	1.113	Open Manhole	1200
S14.000	o	100	SSWMH09	68.900	68.000	0.800	Open Manhole	1200
S15.000	MD7	-16	S18	68.450	68.130	0.035	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S10.001	6.829	151.0	SSWMH11	68.430	67.949	0.196	Open Manhole	1200
S11.000	9.767	200.0	S21	68.480	67.551	0.829	Junction	
S11.001	8.956	151.0	SSWMH11	68.430	67.492	0.838	Open Manhole	1200
S10.002	35.528	151.0	SSWMH10	68.470	67.257	1.113	Open Manhole	1200
S12.000	27.459	150.0	S14	68.420	67.917	0.218	Junction	
S12.001	7.739	151.0	SSWMH10	68.470	67.866	0.319	Open Manhole	1200
S13.000	23.705	200.0	S20	68.410	67.521	0.789	Junction	
S13.001	6.898	151.0	SSWMH10	68.470	67.476	0.894	Open Manhole	1200
S10.003	36.746	151.2	SSWMH08	68.330	66.964	1.216	Open Manhole	1200
S14.000	20.269	151.0	SSWMH08	68.330	67.866	0.364	Open Manhole	1200
S15.000	69.596	151.0	S19	68.320	67.669	0.366	Junction	

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.001	MD7	-16	S19	68.320	67.669	0.366	Junction	
S16.000	o	150	S25	68.410	67.610	0.650	Junction	
S16.001	o	150	S26	68.320	67.435	0.735	Junction	
S10.004	o	225	SSWMH08	68.330	66.889	1.216	Open Manhole	1200
S17.000	MD7	-16	S19	68.320	68.000	0.035	Junction	
S17.001	MD7	-16	S20	68.330	67.897	0.148	Junction	
S18.000	o	100	S36	68.320	67.520	0.700	Junction	
S18.001	o	100	S37	68.350	67.316	0.934	Junction	
S10.005	o	225	Sdummy	68.300	66.837	1.238	Junction	
S19.000	MD7	-16	S24	68.470	68.150	0.035	Junction	
S19.001	MD7	-16	S25	68.860	67.790	0.785	Junction	

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S15.001	6.576	151.0	SSWMH08	68.330	67.626	0.419	Open Manhole	1200
S16.000	34.948	199.7	S26	68.320	67.435	0.735	Junction	
S16.001	4.829	150.0	SSWMH08	68.330	67.403	0.777	Open Manhole	1200
S10.004	25.946	499.0	Sdummy	68.300	66.837	1.238	Junction	
S17.000	15.521	150.0	S20	68.330	67.897	0.148	Junction	
S17.001	7.856	151.0	Sdummy	68.300	67.845	0.170	Junction	
S18.000	11.928	58.5	S37	68.350	67.316	0.934	Junction	
S18.001	7.508	151.0	Sdummy	68.300	67.266	0.934	Junction	
S10.005	55.107	151.0	SSWMH05	68.700	66.472	2.003	Open Manhole	1200
S19.000	72.060	200.0	S25	68.860	67.790	0.785	Junction	
S19.001	4.281	152.9	SSWMH05	68.700	67.762	0.653	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S20.000	o	100	S45	68.430	67.630	0.700	Junction	
S20.001	o	100	S46	68.890	67.293	1.497	Junction	
S10.006	o	225	SSWMH05	68.700	66.472	2.003	Open Manhole	1200
S21.000	MD7	-16	S47	68.800	68.480	0.035	Junction	
S21.001	MD7	-16	S48	68.600	68.416	-0.101	Junction	
S22.000	MD7	-16	S49	68.530	68.210	0.035	Junction	
S22.001	MD7	-16	S50	68.600	68.139	0.176	Junction	
S1.006	o	225	SSWMH04	68.670	66.308	2.137	Open Manhole	1200
S1.007	o	300	S7	68.320	65.871	2.149	Open Manhole	450
S23.000	o	150	SSWMH12	68.740	67.800	0.790	Open Manhole	1200
S23.001	o	150	SSWMH13	69.020	67.507	1.363	Open Manhole	1200
S23.002	o	150	SSWMH14	69.000	67.266	1.584	Open Manhole	1200
S23.003	o	225	SSWMH15	69.000	67.023	1.827	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S20.000	67.429	200.1	S46	68.890	67.293	1.497	Junction	
S20.001	8.119	151.0	SSWMH05	68.700	67.239	1.361	Open Manhole	1200
S10.006	6.720	40.9	SSWMH04	68.670	66.308	2.137	Open Manhole	1200
S21.000	9.600	151.0	S48	68.600	68.416	-0.101	Junction	
S21.001	3.774	151.0	SSWMH04	68.670	68.391	-0.006	Open Manhole	1200
S22.000	10.744	151.0	S50	68.600	68.139	0.176	Junction	
S22.001	4.117	151.0	SSWMH04	68.670	68.112	0.273	Open Manhole	1200
S1.006	8.392	23.2	S7	68.320	65.946	2.149	Open Manhole	450
S1.007	32.155	110.4	S	68.320	65.580	2.440	Open Manhole	0
S23.000	26.371	90.0	SSWMH13	69.020	67.507	1.363	Open Manhole	1200
S23.001	21.649	90.0	SSWMH14	69.000	67.266	1.584	Open Manhole	1200
S23.002	21.881	90.0	SSWMH15	69.000	67.023	1.827	Open Manhole	1200
S23.003	12.863	90.0	S66	68.650	66.880	1.620	Open Manhole	1200

PIPELINE SCHEDULES for Storm

Upstream Manhole

PN	Hyd Sect	Diam (mm)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S23.004	o	225	S66	68.650	66.805	1.620	Open Manhole	1200

Downstream Manhole

PN	Length (m)	Slope (1:X)	MH Name	C.Level (m)	I.Level (m)	D.Depth (m)	MH Connection	MH DIAM., L*W (mm)
S23.004	13.872	90.0	S	68.600	66.651	1.724	Open Manhole	0

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.000	0.000	0.000
1.001	-	-	100	0.000	0.000	0.000
2.000	User	-	100	0.023	0.023	0.023
2.001	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
3.000	User	-	97	0.045	0.043	0.043
3.001	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.000	0.000	0.000
4.001	-	-	100	0.000	0.000	0.000
1.003	-	-	100	0.000	0.000	0.000
5.000	-	-	100	0.000	0.000	0.000
5.001	-	-	100	0.000	0.000	0.000
6.000	User	-	100	0.029	0.029	0.029
6.001	-	-	100	0.000	0.000	0.000
7.000	User	-	97	0.013	0.013	0.013
7.001	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.000	0.000	0.000
8.000	User	-	97	0.025	0.024	0.024
8.001	-	-	100	0.000	0.000	0.000
9.000	User	-	100	0.022	0.022	0.022
9.001	-	-	100	0.000	0.000	0.000
1.005	-	-	100	0.000	0.000	0.000
10.000	User	-	100	0.006	0.006	0.006
10.001	-	-	100	0.000	0.000	0.000
11.000	User	-	100	0.006	0.006	0.006
11.001	-	-	100	0.000	0.000	0.000
10.002	-	-	100	0.000	0.000	0.000
12.000	User	-	97	0.034	0.033	0.033
12.001	-	-	100	0.000	0.000	0.000
13.000	User	-	100	0.013	0.013	0.013
13.001	-	-	100	0.000	0.000	0.000
10.003	-	-	100	0.000	0.000	0.000
14.000	-	-	100	0.000	0.000	0.000
15.000	User	-	100	0.040	0.040	0.040
	User	-	100	0.012	0.012	0.051
15.001	-	-	100	0.000	0.000	0.000
16.000	User	-	97	0.021	0.021	0.021
16.001	-	-	100	0.000	0.000	0.000
10.004	User	-	100	0.008	0.008	0.008
	User	-	100	0.025	0.025	0.033
17.000	User	-	100	0.009	0.009	0.009
17.001	-	-	100	0.000	0.000	0.000
18.000	User	-	100	0.009	0.009	0.009
18.001	-	-	100	0.000	0.000	0.000
10.005	-	-	100	0.000	0.000	0.000
19.000	User	-	100	0.047	0.047	0.047

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
19.001	-	-	100	0.000	0.000	0.000
20.000	User	-	100	0.034	0.034	0.034
20.001	-	-	100	0.000	0.000	0.000
10.006	-	-	100	0.000	0.000	0.000
21.000	User	-	100	0.006	0.006	0.006
	User	-	100	0.005	0.005	0.012
	User	-	100	0.004	0.004	0.016
21.001	-	-	100	0.000	0.000	0.000
22.000	User	-	100	0.009	0.009	0.009
	User	-	100	0.006	0.006	0.014
	User	-	100	0.006	0.006	0.020
22.001	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
1.007	User	-	100	0.056	0.056	0.056
23.000	User	-	97	0.010	0.010	0.010
23.001	User	-	97	0.013	0.013	0.013
23.002	User	-	97	0.010	0.010	0.010
23.003	-	-	100	0.000	0.000	0.000
23.004	-	-	100	0.000	0.000	0.000
				Total	Total	Total
				0.545	0.540	0.540

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S1.007	S	68.320	65.580	0.000	0	0

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
S23.004	S	68.600	66.651	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Hot Start Level (mm)	0	Additional Flow - % of Total Flow	0.000	Flow per Person per Day (l/per/day)	0.000
Areal Reduction Factor	1.000	Manhole Headloss Coeff (Global)	0.500	MADD Factor * 10m³/ha Storage	2.000	Run Time (mins)	60
Hot Start (mins)	0	Foul Sewage per hectare (l/s)	0.000	Inlet Coeffiecient	0.800	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 10 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Region	England and Wales	Ratio R	0.400	Cv (Summer)	0.750
Storm Duration (mins)	30						
Return Period (years)	1	M5-60 (mm)	20.000	Profile Type	Summer	Cv (Winter)	0.840

Online Controls for Storm

Pump Manhole: S7, DS/PN: S1.007, Volume (m³): 0.7

Invert Level (m) 65.871

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.0000	2.000	0.0000	3.000	0.0000

Pump Manhole: S66, DS/PN: S23.004, Volume (m³): 2.6

Invert Level (m) 66.805

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
1.000	0.0000	2.000	0.0000	3.000	0.0000

Storage Structures for Storm

Porous Car Park Manhole: S4, DS/PN: S2.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.7	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	48.0	Evaporation (mm/day)	3
Max Percolation (l/s)	62.7	Invert Level (m)	67.314	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S9, DS/PN: S6.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.6	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	60.0	Evaporation (mm/day)	3
Max Percolation (l/s)	76.7	Invert Level (m)	67.233	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S11, DS/PN: S7.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.6	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	14.4	Evaporation (mm/day)	3
Max Percolation (l/s)	18.4	Invert Level (m)	67.443	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S16, DS/PN: S9.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.6	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	45.5	Evaporation (mm/day)	3
Max Percolation (l/s)	58.1	Invert Level (m)	67.312	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S20, DS/PN: S13.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.6	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	26.4	Evaporation (mm/day)	3
Max Percolation (l/s)	33.7	Invert Level (m)	67.521	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S26, DS/PN: S16.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.6	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	45.7	Evaporation (mm/day)	3
Max Percolation (l/s)	58.4	Invert Level (m)	67.435	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S37, DS/PN: S18.001

Infiltration Coefficient Base (m/hr)	0.12492	Safety Factor	2.0	Width (m)	4.6	Depression Storage (mm)	5
Membrane Percolation (mm/hr)	1000	Porosity	0.30	Length (m)	14.4	Evaporation (mm/day)	3
Max Percolation (l/s)	18.4	Invert Level (m)	67.316	Slope (1:X)	200.0	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: S46, DS/PN: S20.001

Infiltration Coefficient Base (m/hr) 0.00000 Safety Factor 2.0 Width (m) 4.6 Depression Storage (mm) 5
Membrane Percolation (mm/hr) 1000 Porosity 0.30 Length (m) 72.0 Evaporation (mm/day) 3
Max Percolation (l/s) 92.0 Invert Level (m) 67.293 Slope (1:X) 200.0 Cap Volume Depth (m) 0.400

Cellular Storage Manhole: S7, DS/PN: S1.007

Invert Level (m) 65.900 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.12492 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	195.0	190.0	0.400	195.0	212.1	0.800	195.0	234.1	1.200	195.0	256.2	1.201	0.0	256.2

Cellular Storage Manhole: S66, DS/PN: S23.004

Invert Level (m) 66.650 Infiltration Coefficient Side (m/hr) 0.00000 Porosity 0.95
Infiltration Coefficient Base (m/hr) 0.12492 Safety Factor 2.0

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	40.0	0.0	0.400	40.0	0.0	0.800	40.0	0.0	1.200	40.0	0.0	1.201	0.0	0.0

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 10 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 20.000 Ratio R 0.400 Cv (Summer) 0.750 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DTS Status OFF Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	60 minute 1 year Winter I+0%	68.370	68.050	-0.285	0.000	0.00		0.0	OK
S1.001	S2	60 minute 1 year Winter I+0%	68.320	67.701	-0.285	0.000	0.00		0.0	OK
S2.000	S3	15 minute 1 year Winter I+0%	68.350	67.602	-0.098	0.000	0.24		3.0	OK*
S2.001	S4	15 minute 1 year Winter I+0%	68.320	67.354	-0.110	0.000	0.16		2.2	OK*
S1.002	SSWMH01	15 minute 1 year Winter I+0%	68.320	67.307	-0.109	0.000	0.16		2.2	OK
S3.000	S26	15 minute 1 year Winter I+0%	68.360	67.634	-0.076	0.000	0.44		5.5	OK*
S3.001	S28	15 minute 1 year Winter I+0%	68.350	67.286	-0.094	0.000	0.30		5.5	OK
S4.000	S16	60 minute 1 year Winter I+0%	68.380	68.060	-0.285	0.000	0.00		0.0	OK
S4.001	S17	60 minute 1 year Winter I+0%	68.330	67.772	-0.285	0.000	0.00		0.0	OK
S1.003	SSWMH06	15 minute 1 year Winter I+0%	68.390	67.154	-0.073	0.000	0.52		7.5	OK
S5.000	S4	60 minute 1 year Winter I+0%	68.310	67.990	-0.285	0.000	0.00		0.0	OK
S5.001	S5	60 minute 1 year Winter I+0%	68.330	67.624	-0.285	0.000	0.00		0.0	OK
S6.000	S8	15 minute 1 year Winter I+0%	68.310	67.587	-0.023	0.000	0.87		3.7	OK*
S6.001	S9	15 minute 1 year Winter I+0%	68.330	67.283	-0.050	0.000	0.49		2.4	OK*
S7.000	S10	15 minute 1 year Winter I+0%	68.320	67.562	-0.058	0.000	0.35		1.7	OK*
S7.001	S11	15 minute 1 year Winter I+0%	68.320	67.476	-0.067	0.000	0.24		1.2	OK*
S1.004	SSWMH02	15 minute 1 year Winter I+0%	68.460	66.893	-0.145	0.000	0.27		10.8	OK
S8.000	S7	15 minute 1 year Winter I+0%	68.330	68.066	-0.229	0.000	0.10		3.2	FLOOD RISK*
S8.001	S8	15 minute 1 year Winter I+0%	68.470	67.767	-0.230	0.000	0.14		3.2	OK
S9.000	S15	15 minute 1 year Winter I+0%	68.330	67.593	-0.037	0.000	0.68		2.9	OK*
S9.001	S16	15 minute 1 year Winter I+0%	68.470	67.356	-0.057	0.000	0.39		1.9	OK*
S1.005	SSWMH03	15 minute 1 year Winter I+0%	68.620	66.590	-0.151	0.000	0.24		15.2	OK
S10.000	S6	15 minute 1 year Winter I+0%	68.390	68.096	-0.259	0.000	0.03		0.8	FLOOD RISK*
S10.001	S7	15 minute 1 year Winter I+0%	68.420	68.019	-0.260	0.000	0.03		0.8	FLOOD RISK*
S11.000	S20	15 minute 1 year Winter I+0%	68.400	67.629	-0.071	0.000	0.18		0.8	OK*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S11.001	S21	15 minute 1 year Winter I+0%	68.480	67.578	-0.074	0.000	0.16		0.8	OK*
S10.002	SSWMH11	15 minute 1 year Winter I+0%	68.430	67.531	-0.061	0.000	0.32		1.5	OK
S12.000	S13	15 minute 1 year Winter I+0%	68.420	68.168	-0.217	0.000	0.14		4.5	FLOOD RISK*
S12.001	S14	15 minute 1 year Winter I+0%	68.420	67.985	-0.217	0.000	0.17		4.4	FLOOD RISK*
S13.000	S19	15 minute 1 year Winter I+0%	68.440	67.685	-0.055	0.000	0.41		1.7	OK*
S13.001	S20	15 minute 1 year Winter I+0%	68.410	67.554	-0.067	0.000	0.23		1.1	OK*
S10.003	SSWMH10	15 minute 1 year Winter I+0%	68.470	67.282	-0.075	0.000	0.49		6.8	OK
S14.000	SSWMH09	60 minute 1 year Winter I+0%	68.900	68.000	-0.100	0.000	0.00		0.0	OK
S15.000	S18	15 minute 1 year Winter I+0%	68.450	68.221	-0.194	0.000	0.20		6.5	FLOOD RISK*
S15.001	S19	15 minute 1 year Winter I+0%	68.320	67.757	-0.198	0.000	0.28		6.6	OK
S16.000	S25	15 minute 1 year Winter I+0%	68.410	67.659	-0.101	0.000	0.22		2.8	OK*
S16.001	S26	15 minute 1 year Winter I+0%	68.320	67.476	-0.109	0.000	0.17		1.9	OK*
S10.004	SSWMH08	15 minute 1 year Winter I+0%	68.330	67.052	-0.061	0.000	0.86		18.3	OK
S17.000	S19	15 minute 1 year Winter I+0%	68.320	68.033	-0.252	0.000	0.04		1.3	FLOOD RISK*
S17.001	S20	15 minute 1 year Winter I+0%	68.330	67.930	-0.252	0.000	0.05		1.3	FLOOD RISK*
S18.000	S36	15 minute 1 year Winter I+0%	68.320	67.547	-0.073	0.000	0.16		1.3	OK*
S18.001	S37	15 minute 1 year Winter I+0%	68.350	67.344	-0.072	0.000	0.18		0.9	OK*
S10.005	Sdummy	15 minute 1 year Winter I+0%	68.300	66.946	-0.116	0.000	0.47		19.7	OK*
S19.000	S24	15 minute 1 year Winter I+0%	68.470	68.244	-0.191	0.000	0.21		5.9	FLOOD RISK*
S19.001	S25	15 minute 1 year Winter I+0%	68.860	67.871	-0.203	0.000	0.25		5.8	OK
S20.000	S45	15 minute 1 year Winter I+0%	68.430	67.730	0.000	0.000	0.96		4.1	SURCHARGED*
S20.001	S46	15 minute 1 year Winter I+0%	68.890	67.354	-0.039	0.000	0.68		3.3	OK*
S10.006	SSWMH05	15 minute 1 year Winter I+0%	68.700	66.583	-0.113	0.000	0.50		28.3	OK
S21.000	S47	15 minute 1 year Winter I+0%	68.800	68.524	-0.241	0.000	0.08		2.2	FLOOD RISK*
S21.001	S48	15 minute 1 year Winter I+0%	68.600	68.460	-0.241	0.000	0.09		2.2	FLOOD RISK*
S22.000	S49	15 minute 1 year Winter I+0%	68.530	68.261	-0.234	0.000	0.09		2.8	FLOOD RISK*
S22.001	S50	15 minute 1 year Winter I+0%	68.600	68.189	-0.235	0.000	0.12		2.8	FLOOD RISK*
S1.006	SSWMH04	15 minute 1 year Winter I+0%	68.670	66.427	-0.105	0.000	0.55		46.7	OK
S1.007	S7	120 minute 1 year Winter I+0%	68.320	66.146	-0.025	0.000	0.00		0.0	OK
S23.000	SSWMH12	15 minute 1 year Winter I+0%	68.740	67.828	-0.122	0.000	0.08		1.4	OK
S23.001	SSWMH13	15 minute 1 year Winter I+0%	69.020	67.547	-0.110	0.000	0.16		2.8	OK
S23.002	SSWMH14	15 minute 1 year Winter I+0%	69.000	67.314	-0.102	0.000	0.22		4.0	OK
S23.003	SSWMH15	15 minute 1 year Winter I+0%	69.000	67.067	-0.181	0.000	0.08		4.0	OK
S23.004	S66	1440 minute 1 year Winter I+0%	68.650	66.872	-0.158	0.000	0.00		0.0	OK

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 10 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 20.000 Ratio R 0.400 Cv (Summer) 0.750 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DTS Status OFF Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 1, 30, 100
Climate Change (%) 0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	60 minute 30 year Winter I+0%	68.370	68.050	-0.285	0.000	0.00		0.0	OK
S1.001	S2	60 minute 30 year Winter I+0%	68.320	67.701	-0.285	0.000	0.00		0.0	OK
S2.000	S3	15 minute 30 year Winter I+0%	68.350	67.637	-0.063	0.000	0.60		7.5	OK*
S2.001	S4	15 minute 30 year Winter I+0%	68.320	67.380	-0.084	0.000	0.40		5.6	OK*
S1.002	SSWMH01	15 minute 30 year Winter I+0%	68.320	67.333	-0.083	0.000	0.41		5.4	OK
S3.000	S26	15 minute 30 year Winter I+0%	68.360	67.710	0.000	0.000	1.04		13.0	SURCHARGED*
S3.001	S28	15 minute 30 year Winter I+0%	68.350	67.335	-0.045	0.000	0.70		12.9	OK
S4.000	S16	60 minute 30 year Winter I+0%	68.380	68.060	-0.285	0.000	0.00		0.0	OK
S4.001	S17	60 minute 30 year Winter I+0%	68.330	67.772	-0.285	0.000	0.00		0.0	OK
S1.003	SSWMH06	15 minute 30 year Winter I+0%	68.390	67.281	0.054	0.000	1.14		16.4	SURCHARGED
S5.000	S4	60 minute 30 year Winter I+0%	68.310	67.990	-0.285	0.000	0.00		0.0	OK
S5.001	S5	60 minute 30 year Winter I+0%	68.330	67.624	-0.285	0.000	0.00		0.0	OK
S6.000	S8	60 minute 30 year Winter I+0%	68.310	67.610	0.000	0.000	1.11		4.7	SURCHARGED*
S6.001	S9	15 minute 30 year Winter I+0%	68.330	67.311	-0.022	0.000	0.96		4.7	OK*
S7.000	S10	15 minute 30 year Winter I+0%	68.320	67.593	-0.027	0.000	0.87		4.2	OK*
S7.001	S11	15 minute 30 year Winter I+0%	68.320	67.496	-0.046	0.000	0.56		2.7	OK*
S1.004	SSWMH02	15 minute 30 year Winter I+0%	68.460	66.936	-0.102	0.000	0.57		23.0	OK
S8.000	S7	15 minute 30 year Winter I+0%	68.330	68.110	-0.185	0.000	0.24		7.9	FLOOD RISK*
S8.001	S8	15 minute 30 year Winter I+0%	68.470	67.810	-0.188	0.000	0.33		7.8	OK
S9.000	S15	30 minute 30 year Winter I+0%	68.330	67.630	0.000	0.000	1.22		5.2	SURCHARGED*
S9.001	S16	15 minute 30 year Winter I+0%	68.470	67.382	-0.030	0.000	0.83		4.1	OK*
S1.005	SSWMH03	15 minute 30 year Winter I+0%	68.620	66.668	-0.073	0.000	0.50		32.0	OK
S10.000	S6	15 minute 30 year Winter I+0%	68.390	68.113	-0.242	0.000	0.07		2.1	FLOOD RISK*
S10.001	S7	15 minute 30 year Winter I+0%	68.420	68.037	-0.242	0.000	0.09		2.1	FLOOD RISK*
S11.000	S20	15 minute 30 year Winter I+0%	68.400	67.648	-0.052	0.000	0.45		1.9	OK*

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

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S11.001	S21	15 minute 30 year Winter I+0%	68.480	67.629	-0.022	0.000	0.38		1.9	OK*
S10.002	SSWMH11	15 minute 30 year Winter I+0%	68.430	67.621	0.029	0.000	0.71		3.4	SURCHARGED
S12.000	S13	15 minute 30 year Winter I+0%	68.420	68.222	-0.163	0.000	0.34		11.1	FLOOD RISK*
S12.001	S14	15 minute 30 year Winter I+0%	68.420	68.037	-0.165	0.000	0.43		11.0	FLOOD RISK*
S13.000	S19	15 minute 30 year Winter I+0%	68.440	67.725	-0.015	0.000	0.99		4.2	OK*
S13.001	S20	15 minute 30 year Winter I+0%	68.410	67.575	-0.046	0.000	0.54		2.7	OK*
S10.003	SSWMH10	15 minute 30 year Winter I+0%	68.470	67.555	0.198	0.000	1.05		14.7	SURCHARGED
S14.000	SSWMH09	60 minute 30 year Winter I+0%	68.900	68.000	-0.100	0.000	0.00		0.0	OK
S15.000	S18	15 minute 30 year Winter I+0%	68.450	68.294	-0.121	0.000	0.49		16.2	FLOOD RISK*
S15.001	S19	15 minute 30 year Winter I+0%	68.320	67.825	-0.129	0.000	0.69		16.3	OK
S16.000	S25	15 minute 30 year Winter I+0%	68.410	67.691	-0.069	0.000	0.55		6.9	OK*
S16.001	S26	15 minute 30 year Winter I+0%	68.320	67.503	-0.082	0.000	0.42		4.8	OK*
S10.004	SSWMH08	15 minute 30 year Winter I+0%	68.330	67.306	0.192	0.000	1.92		40.9	SURCHARGED
S17.000	S19	15 minute 30 year Winter I+0%	68.320	68.054	-0.231	0.000	0.09		3.1	FLOOD RISK*
S17.001	S20	15 minute 30 year Winter I+0%	68.330	67.951	-0.231	0.000	0.12		3.1	FLOOD RISK*
S18.000	S36	15 minute 30 year Winter I+0%	68.320	67.564	-0.056	0.000	0.40		3.1	OK*
S18.001	S37	15 minute 30 year Winter I+0%	68.350	67.361	-0.055	0.000	0.43		2.1	OK*
S10.005	Sdummy	15 minute 30 year Winter I+0%	68.300	67.135	0.073	0.000	0.99		41.7	SURCHARGED*
S19.000	S24	15 minute 30 year Winter I+0%	68.470	68.320	-0.115	0.000	0.51		14.6	FLOOD RISK*
S19.001	S25	15 minute 30 year Winter I+0%	68.860	67.935	-0.140	0.000	0.62		14.4	OK
S20.000	S45	60 minute 30 year Winter I+0%	68.430	67.730	0.000	0.000	1.23		5.2	SURCHARGED*
S20.001	S46	15 minute 30 year Winter I+0%	68.890	67.394	0.001	0.000	1.05		5.1	SURCHARGED*
S10.006	SSWMH05	15 minute 30 year Winter I+0%	68.700	66.788	0.092	0.000	1.02		58.1	SURCHARGED
S21.000	S47	15 minute 30 year Winter I+0%	68.800	68.557	-0.208	0.000	0.19		5.3	FLOOD RISK*
S21.001	S48	15 minute 30 year Winter I+0%	68.600	68.493	-0.208	0.000	0.23		5.4	FLOOD RISK*
S22.000	S49	15 minute 30 year Winter I+0%	68.530	68.301	-0.194	0.000	0.23		6.8	FLOOD RISK*
S22.001	S50	15 minute 30 year Winter I+0%	68.600	68.230	-0.194	0.000	0.30		6.9	FLOOD RISK*
S1.006	SSWMH04	240 minute 30 year Winter I+0%	68.670	66.624	0.091	0.000	0.32		27.3	SURCHARGED
S1.007	S7	240 minute 30 year Winter I+0%	68.320	66.620	0.448	0.000	0.00		0.0	SURCHARGED
S23.000	SSWMH12	15 minute 30 year Winter I+0%	68.740	67.845	-0.105	0.000	0.19		3.4	OK
S23.001	SSWMH13	15 minute 30 year Winter I+0%	69.020	67.578	-0.079	0.000	0.44		7.7	OK
S23.002	SSWMH14	15 minute 30 year Winter I+0%	69.000	67.355	-0.062	0.000	0.63		11.1	OK
S23.003	SSWMH15	15 minute 30 year Winter I+0%	69.000	67.098	-0.151	0.000	0.24		11.2	OK
S23.004	S66	1440 minute 30 year Winter I+0%	68.650	67.097	0.066	0.000	0.00		0.0	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Online Controls 2 Number of Offline Controls 0 Number of Storage Structures 10 Number of Time/Area Diagrams 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR Region England and Wales M5-60 (mm) 20.000 Ratio R 0.400 Cv (Summer) 0.750 Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 450.0 DTS Status OFF Inertia Status ON
Analysis Timestep 2.5 Second Increment (Extended) DVD Status ON

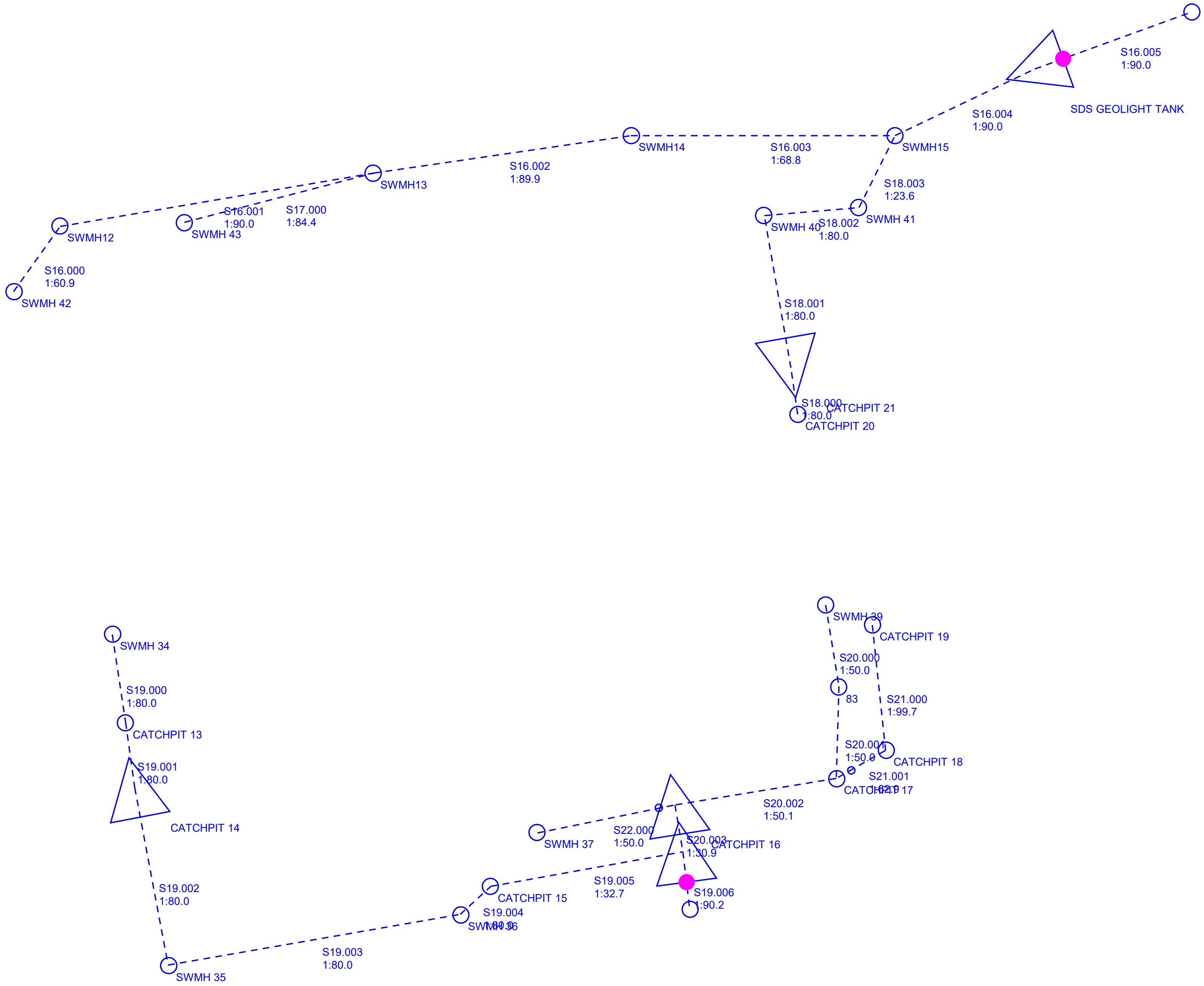
Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S1.000	S1	60 minute 100 year Winter I+40%	68.370	68.050	-0.285	0.000	0.00		0.0	OK
S1.001	S2	60 minute 100 year Winter I+40%	68.320	67.701	-0.285	0.000	0.00		0.0	OK
S2.000	S3	15 minute 100 year Winter I+40%	68.350	67.700	0.000	0.000	1.06		13.3	SURCHARGED*
S2.001	S4	15 minute 100 year Winter I+40%	68.320	67.454	-0.010	0.000	0.66		9.1	OK*
S1.002	SSWMH01	15 minute 100 year Winter I+40%	68.320	67.460	0.044	0.000	0.70		9.3	SURCHARGED
S3.000	S26	15 minute 100 year Winter I+40%	68.360	67.710	0.000	0.000	1.63		20.3	SURCHARGED*
S3.001	S28	15 minute 100 year Winter I+40%	68.350	67.608	0.229	0.000	0.97		17.8	SURCHARGED
S4.000	S16	60 minute 100 year Winter I+40%	68.380	68.060	-0.285	0.000	0.00		0.0	OK
S4.001	S17	60 minute 100 year Winter I+40%	68.330	67.772	-0.285	0.000	0.00		0.0	OK
S1.003	SSWMH06	15 minute 100 year Winter I+40%	68.390	67.466	0.238	0.000	1.28		18.5	SURCHARGED
S5.000	S4	60 minute 100 year Winter I+40%	68.310	67.990	-0.285	0.000	0.00		0.0	OK
S5.001	S5	60 minute 100 year Winter I+40%	68.330	67.624	-0.285	0.000	0.00		0.0	OK
S6.000	S8	15 minute 100 year Winter I+40%	68.310	67.610	0.000	0.000	2.41		10.2	SURCHARGED*
S6.001	S9	360 minute 100 year Winter I+40%	68.330	67.408	0.075	0.000	0.38		1.9	SURCHARGED*
S7.000	S10	15 minute 100 year Winter I+40%	68.320	67.620	0.000	0.000	1.54		7.5	SURCHARGED*
S7.001	S11	15 minute 100 year Winter I+40%	68.320	67.522	-0.021	0.000	0.98		4.8	OK*
S1.004	SSWMH02	360 minute 100 year Winter I+40%	68.460	67.444	0.405	0.000	0.20		8.1	SURCHARGED
S8.000	S7	15 minute 100 year Winter I+40%	68.330	68.157	-0.138	0.000	0.44		14.4	FLOOD RISK*
S8.001	S8	15 minute 100 year Winter I+40%	68.470	67.856	-0.142	0.000	0.61		14.2	OK
S9.000	S15	15 minute 100 year Winter I+40%	68.330	67.630	0.000	0.000	2.19		9.3	SURCHARGED*
S9.001	S16	360 minute 100 year Winter I+40%	68.470	67.432	0.020	0.000	0.29		1.4	SURCHARGED*
S1.005	SSWMH03	360 minute 100 year Winter I+40%	68.620	67.456	0.715	0.000	0.17		10.6	SURCHARGED
S10.000	S6	15 minute 100 year Winter I+40%	68.390	68.132	-0.223	0.000	0.12		3.8	FLOOD RISK*
S10.001	S7	15 minute 100 year Winter I+40%	68.420	68.055	-0.224	0.000	0.16		3.8	FLOOD RISK*
S11.000	S20	15 minute 100 year Winter I+40%	68.400	67.700	0.000	0.000	0.72		3.1	SURCHARGED*

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

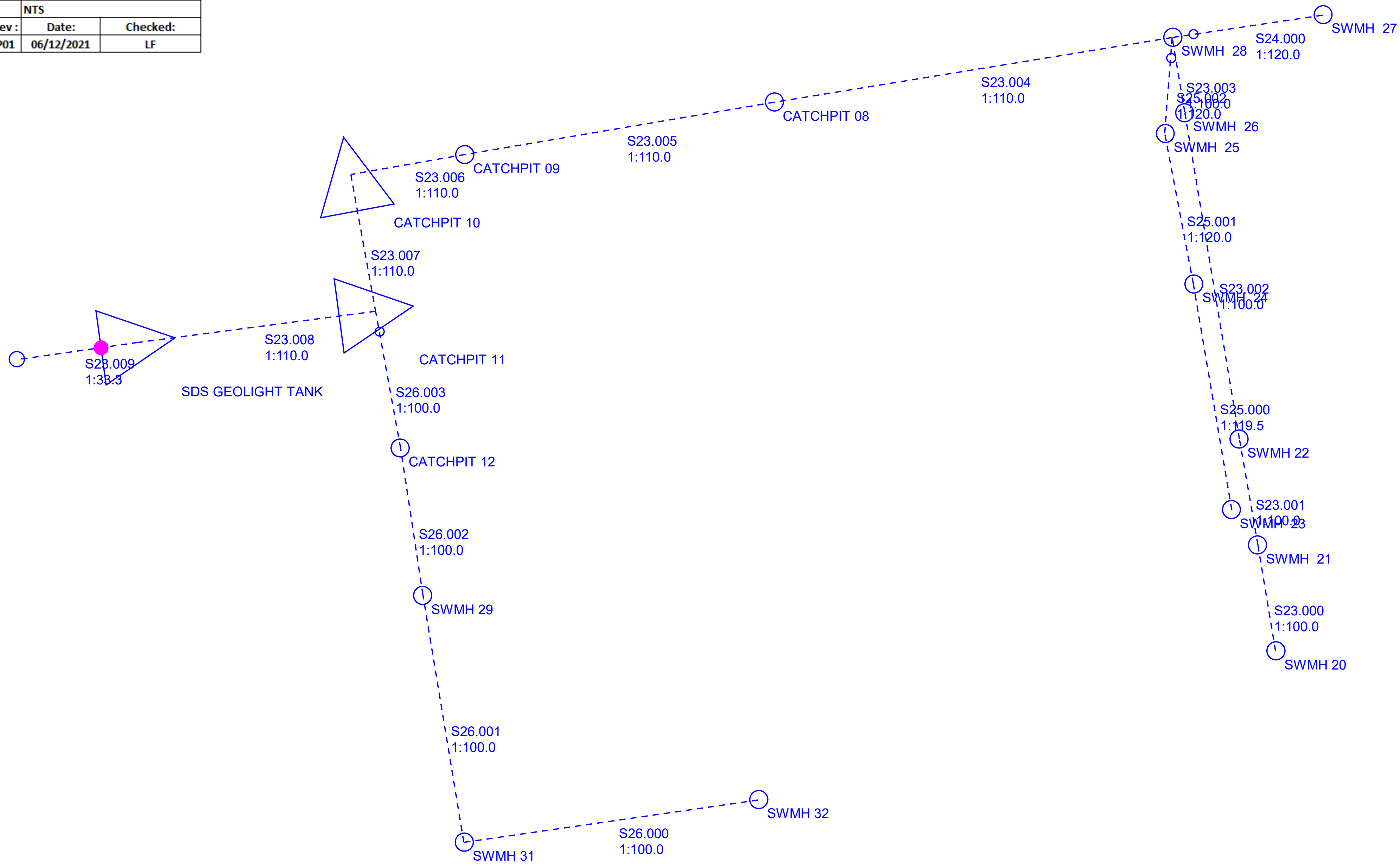
PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status
S11.001	S21	15 minute 100 year Winter I+40%	68.480	67.651	0.000	0.000	0.46		2.3	SURCHARGED*
S10.002	SSWMH11	15 minute 100 year Winter I+40%	68.430	67.965	0.373	0.000	0.87		4.2	SURCHARGED
S12.000	S13	15 minute 100 year Winter I+40%	68.420	68.286	-0.099	0.000	0.61		20.2	FLOOD RISK*
S12.001	S14	15 minute 100 year Winter I+40%	68.420	68.099	-0.103	0.000	0.78		20.0	FLOOD RISK*
S13.000	S19	15 minute 100 year Winter I+40%	68.440	67.740	0.000	0.000	1.60		6.8	SURCHARGED*
S13.001	S20	15 minute 100 year Winter I+40%	68.410	67.712	0.091	0.000	1.50		7.3	SURCHARGED*
S10.003	SSWMH10	15 minute 100 year Winter I+40%	68.470	67.840	0.484	0.000	0.99		13.7	SURCHARGED
S14.000	SSWMH09	60 minute 100 year Winter I+40%	68.900	68.000	-0.100	0.000	0.00		0.0	OK
S15.000	S18	15 minute 100 year Winter I+40%	68.450	68.390	-0.025	0.000	0.90		29.4	FLOOD RISK*
S15.001	S19	15 minute 100 year Winter I+40%	68.320	67.946	-0.008	0.000	1.15		27.3	FLOOD RISK*
S16.000	S25	15 minute 100 year Winter I+40%	68.410	67.747	-0.013	0.000	0.98		12.3	OK*
S16.001	S26	15 minute 100 year Winter I+40%	68.320	67.639	0.054	0.000	1.36		15.3	SURCHARGED*
S10.004	SSWMH08	15 minute 100 year Winter I+40%	68.330	67.665	0.551	0.000	2.31		49.3	SURCHARGED
S17.000	S19	15 minute 100 year Winter I+40%	68.320	68.080	-0.205	0.000	0.17		5.7	FLOOD RISK*
S17.001	S20	15 minute 100 year Winter I+40%	68.330	67.977	-0.205	0.000	0.22		5.7	FLOOD RISK*
S18.000	S36	15 minute 100 year Winter I+40%	68.320	67.584	-0.036	0.000	0.72		5.7	OK*
S18.001	S37	360 minute 100 year Winter I+40%	68.350	67.460	0.044	0.000	0.13		0.6	SURCHARGED*
S10.005	Sdummy	15 minute 100 year Winter I+40%	68.300	67.489	0.428	0.000	1.17		49.2	SURCHARGED*
S19.000	S24	15 minute 100 year Winter I+40%	68.470	68.427	-0.008	0.000	0.93		26.6	FLOOD RISK*
S19.001	S25	15 minute 100 year Winter I+40%	68.860	68.058	-0.016	0.000	1.00		23.4	OK
S20.000	S45	15 minute 100 year Winter I+40%	68.430	67.730	0.000	0.000	2.46		10.4	SURCHARGED*
S20.001	S46	360 minute 100 year Winter I+40%	68.890	67.472	0.079	0.000	0.59		2.9	SURCHARGED*
S10.006	SSWMH05	360 minute 100 year Winter I+40%	68.700	67.468	0.771	0.000	0.36		20.6	SURCHARGED
S21.000	S47	15 minute 100 year Winter I+40%	68.800	68.592	-0.173	0.000	0.34		9.7	FLOOD RISK*
S21.001	S48	15 minute 100 year Winter I+40%	68.600	68.528	-0.173	0.000	0.42		9.8	FLOOD RISK*
S22.000	S49	15 minute 100 year Winter I+40%	68.530	68.342	-0.153	0.000	0.41		12.4	FLOOD RISK*
S22.001	S50	15 minute 100 year Winter I+40%	68.600	68.271	-0.153	0.000	0.54		12.6	FLOOD RISK*
S1.006	SSWMH04	360 minute 100 year Winter I+40%	68.670	67.464	0.931	0.000	0.40		33.6	SURCHARGED
S1.007	S7	360 minute 100 year Winter I+40%	68.320	67.462	1.290	0.000	0.00		0.0	SURCHARGED
S23.000	SSWMH12	15 minute 100 year Winter I+40%	68.740	67.861	-0.089	0.000	0.34		6.1	OK
S23.001	SSWMH13	15 minute 100 year Winter I+40%	69.020	67.613	-0.044	0.000	0.80		14.1	OK
S23.002	SSWMH14	15 minute 100 year Winter I+40%	69.000	67.460	0.044	0.000	1.09		19.4	SURCHARGED
S23.003	SSWMH15	1440 minute 100 year Winter I+40%	69.000	67.421	0.173	0.000	0.02		0.9	SURCHARGED
S23.004	S66	1440 minute 100 year Winter I+40%	68.650	67.421	0.391	0.000	0.00		0.0	SURCHARGED

Project Title	BEGBROKE SCIENCE PARK COMMERCIAL BUILDING		
Project No	1620011508		
Title	MICRODRAINAGE SURFACE WATER DRAINAGE LAYOUT		
Scale	NTS		
Eng :	Rev :	Date:	Checked:
AT	P01	06/12/2021	LF

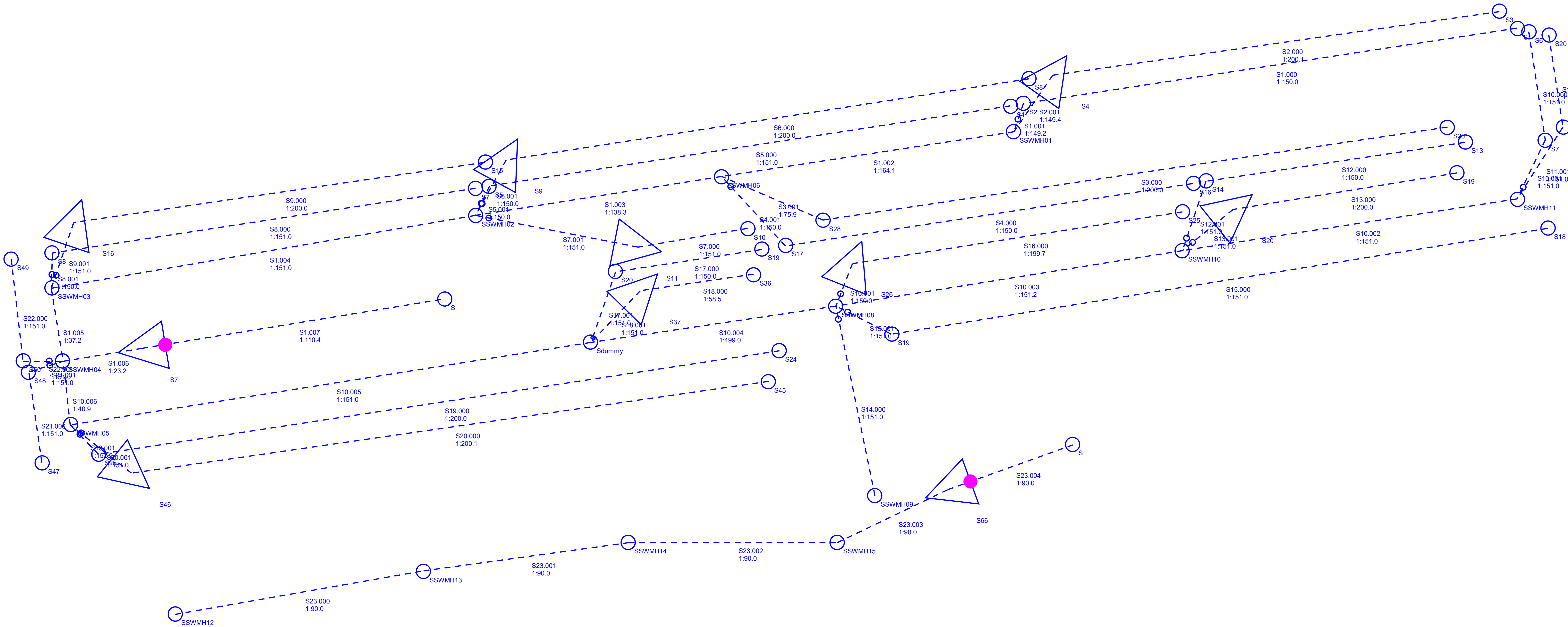


Project Title	BEGBROKE SCIENCE PARK ACADEMIC BUILDING
Project No	1620011508
Title	MICRODRAINAGE SURFACE WATER DRAINAGE LAYOUT
Scale	NTS

Eng :	Rev :	Date:	Checked:
AT	P01	06/12/2021	LF



Project Title	BEGBROKE SCIENCE PARK SURFACE CARPARK BUILDING		
Project No	1620011508		
Title	MICRODRAINAGE SURFACE WATER DRAINAGE LAYOUT		
Scale	NTS		
Eng :	Rev :	Date:	Checked:
AT	P01	06/12/2021	LF



APPENDIX 4
GROUND INVESTIGATION RESULTS

GROUND ENGINEERING LIMITED

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PHASE 2 SITE INVESTIGATION REPORT
ZONES B & C
BEGBROKE SCIENCE PARK
BEGBROKE HILL
WOODSTOCK ROAD
KIDLINGTON

Report Reference No. C15387

On behalf of:-

Oxford University Development
University Offices
Wellington Square
Oxford
OX1 2JD

August 2021

CONTENTS

OXFORD UNIVERSITY DEVELOPMENT LIMITED

BURO FOUR

RAMBOLL UK LIMITED

PHASE 2 SITE INVESTIGATION REPORT
BEGBROKE SCIENCE PARK
BEGBROKE HILL
WOODSTOCK ROAD
KIDLINGTON

Report Reference No. C15387 **August 2021**

INTRODUCTION

Oxford University Development Limited, the client, intends to extend their existing research laboratories and engineering facilities at Begbroke Science Park, Begbroke Hill, Woodstock Road, Kidlington, Oxfordshire. The new structures are proposed on two sites, in north-eastern and north-western parts of the science park, referenced as Zones B and C, respectively. Details of the proposed structures were not available at the time of reporting.

A Phase 1 desk study was previously undertaken for the entire science park by Jubb Consulting Engineers Limited (ref: 18143-DTS-03, May 2018). Ground Engineering Limited was instructed by the client, under the direction of project managers Buro Four, to carry out a Phase 2 intrusive geotechnical site investigation, specified by consultants Ramboll UK Limited. The scope of which was to provide parameters for foundation/pile design and construction. Chemical testing on recovered soil and groundwater samples, and a contamination assessment, were also included within the scope of this investigation.

LOCATION, TOPOGRAPHY, GEOLOGY AND HYDROGEOLOGY OF THE SITE

The University of Oxford Begbroke Science Park is located on the crest of Begbroke Hill, off the eastern side of Woodstock Road (A44), on the western outskirts of Kidlington, Oxfordshire. The science park is positioned approximately 1.2km south of Oxford International Airport and is centred at approximate National Grid Reference SP 47878 13547. A site plan is presented in Appendix 1, together with a site location plan.

The two proposed development sites are positioned in north-eastern and north-western parts of the science park, comprising Zone B and Zone C, respectively. Zone B is a near rectangular site, approximately 105m long and up to 50m wide and Zone C is a near square shaped site, some 75m wide.

At the time of the investigation both sites comprised overflow car parks, generally surfaced with gravel and patches of asphalt, together with peripheral soft landscaping and grass verges. The north-western corner of Zone B contained several stockpiles of building materials, including timber, wooden pallets, bricks and some plastic pipework. It was understood that the science park was a former farm, Begbroke Hill Farm, and Zone B had recently contained an irrigation reservoir that had been backfilled. Zone C had recently been cleared of former buildings. The remaining science park, to the south of Zone B and east of Zone C, contained modern blocks of laboratories, offices and engineering facilities, one to three storeys high, further car parks and landscaping. An original three-storey, Grade II Listed, 17th Century, masonry-built farmhouse (restored and converted to offices and conference facilities), with walled garden and some remnant former farm buildings was also in the southern half of the science park. The wider surroundings comprised arable fields.

A belt of trees surrounded the science park, bordering the northern edge of Zone B and western edge of Zone C. Various trees were also positioned in the grass verges within each site. These trees included Field Maple, Oak, Pine and Poplar.

The sites of Zone B and C, and remaining science park, are generally level and on the crest of Begbroke Hill at an approximate elevation of 68.5mOD. The immediate surroundings to the north of Zones B & C slope down to the north, towards the eastward flowing Rowel Brook that is some 200m north of the site.

The 1982 geological map for the area at 1:50,000 scale, Sheet 236, shows the sites to be covered by superficial Second Terrace Deposits (Summertown-Radley Sand and Gravel Member) and underlain by the solid geology Oxford Clay Formation that covers the Kellaways Sand Member. A subcrop of the latter is indicated to the immediate north of the site. The outline of geology reported on this map indicates that the Kellaways Sand is locally 3m to 5m thick, and covers a sequence of Kellaways Clay Member, typically 2m to 5m thick, over the Cornbrash Formation (limestone) up to 5m thick, over the Forest Marble Formation (clays with beds of limestone that increase in frequency and thickness with depth) that is up to 15m thick.

The site is designated by the Environment Agency (EA) as being underlain by a Secondary (A) Aquifer of the Summertown-Radley Sand and Gravel Member, over the Unproductive solid geology Oxford Clay, an aquiclude, which is practically impervious. Near surface groundwater may be expected óperchedô within the superficial deposits that cover the solid geology clay.

Based on the topography of the site areas (Zones B & C) and geology, the direction of near surface groundwater and surface water flow would be to the north, downhill towards Rowel Brook. The latter flows eastwards some 200m north of the site.

PREVIOUS WORK AND SUPPLEMENTARY DESK STUDY INFORMATION

A Phase 1 desk study was previously undertaken by Jubb Consulting Engineers Limited (ref: 18143-DTS-03, May 2018) for the entire plot of Begbroke Science Park, including Zone B and Zone C. This comprised a review of historical Ordnance Survey (OS) maps and environmental database research. The previous Phase 1 report and supplementary information may be summarised as follows:

Site History – Internet research indicates that Begbroke Hill was occupied in the Iron Age and contained an Anglo-Saxon settlement as mentioned in the Domesday Book of 1086. The present-day farmhouse was constructed circa 1625. The earliest OS map reviewed, dated 1876, showed the farmhouse, together with orchards and ancillary farm buildings on Begbroke Hill, surrounded by farmland. An access track trended southwards from the farm to join Sandy Lane. Other than some extensions to the farm buildings, the site was ostensibly unchanged until the 1970s and 1980s when multiple new structures were built, including two blocks in the south-east corner of Zone C, and a rectangular reservoir occupied much of Zone B. A pair of semi-detached houses (Nos.3& 4) were also built within Zone B, close to the west of the reservoir. A pond was indicated in the gardens of the farmhouse, close to the south-east of Zone C.

Internet research indicates that Begbroke Hill Farm was the headquarters of the Weed Research Organisation from 1960. In the 1980s, the Cookson Group bought the site for its Technology Centre and in 1998 it was acquired by Oxford University. The Oxford University Begbroke Science Park was officially launched in 2000. The science park was expanded with various new structures between 2004 and 2006, the reservoir in Zone B was backfilled, and the pair of semi-detached were demolished. In 2012 further structures were added to the science park and the two buildings in the south-west corner of Zone C were removed to make way for a new roadway, providing access from the west, off Woodstock Road. Zones B and C have since largely remained unaltered to the present day and are now used as overflow car parks and for the storage of building materials.

Contaminant Sources – Zone B is likely to be underlain by a significant thickness of made ground associated with the infilled former reservoir and demolished semi-detached houses. Made ground should also be anticipated in Zone C including demolition rubble and perhaps remnant foundations, associated with the demolished buildings. Leaks of fuels and lubricants from recent parked vehicles and historical farm machinery are potential sources of petrochemical contamination within the sites. Stored building materials may also include potential contaminants. Although the current science park may contain chemical stores with range of contaminants, these are likely to be professionally managed within the laboratory research facilities and are not anticipated to present a significant potential source of contamination.

Off-site potential sources of contamination identified by the Phase 1 report comprised fertilisers/pesticide usage in surrounding fields and potential ground gasses from backfilled gravel pits. It is noted that the surrounding fields are down hydraulic gradient from the hilltop Zone B & C sites and the nearest recorded gravel/sand pit is located approximately 315m south-west of the site. There are no abstraction consents, discharge consents, pollution incidents, fuel stations or contemporary trade entries listed within 250m of the science park. A single landfill site is recorded within 250m of the science park, named Sandy Lane East and positioned 246m south-east, which accepted inert and industrial waste. This was presumably at the historical sand pit that was recorded to be 315m south-west of the site.

Sensitivity Pathways & Receptors **-** The site is designated by the EA as being underlain by a Secondary (A) Aquifer of superficial Summertown-Radley Sand and Gravel Member over the Unproductive solid geology Oxford Clay Formation. The hilltop site is not within an area at risk from flooding from rivers or the sea. The nearest natural surface water feature is Rowel Brook that flows eastwards some 200m north of the site. The site lies within an area where no radon protection measures are necessary for new dwellings or extensions in accordance with Building Research Establishment report BR211 (2007).

***Ground Stability Hazards* -** According to the British Geological Survey, within the site there is: a óModerateô hazard potential for Shrinking or Swelling Clay; a óVery Lowô hazard potential for Collapsible Ground, Landslides and Running Sands; and a óNegligibleó/No hazard potential for Soluble Rocks and Compressible Ground. The site is not within an area affected by coal mining and is not within an area affected by brine extraction.

PRELIMINARY RISK ASSESSMENT

In order to assess the risks associated with the presence of ground contamination the linkages between the sources and potential receptors to contamination need to be established and evaluated. This is in accordance with the Environmental Protection Act 1990, which provides a statutory definition of Contaminated Land. To fall within this definition it is necessary that, as a result of the condition of the land, substances may be present on or under the land such that

- *Significant harm is being caused or there is a significant possibility of such harm being caused; or*
- *Pollution of controlled waters is being, or is likely to be, caused*

There are three principal factors that are assessed whilst undertaking a qualitative risk assessment for any site. These are the presence of a contamination source, the existence of migration pathways and the presence of a sensitive target(s). It should be noted that it is necessary for each element of source, pathway and target to be present in order for exposure of a human or environmental receptor to occur.

UK Government guidance on the assessment of contaminated land, requires risk to human health and the environment to be reviewed using source ï pathway ï target relationships. If each of these elements is present, the linkage provides a potential risk to the identified targets. ***Contaminants or potential pollutants*** identified as ***sources*** in relation to the identified previous uses are listed below in Table 1.

Table 1: Identified Potential Contaminant Sources

Contaminant Source	***Comments***
Stockpiled Building Materials	Building materials may include asbestos containing materials (ACMs).
Drainage	Effluent from existing drains could provide a contaminant source.
Soil & Groundwater	A significant thickness of made ground may be present, including a backfilled reservoir in Zone B and demolition rubble of former buildings in both Zone B and Zone C. Contamination may be present due to leakages of petrochemicals from former farm machinery and recent parked vehicles.
Soil Gas	Potential soil gas generated from made ground or underlying natural strata.
Ground Contamination Outside Site Boundary	Ground contamination migrating from adjoining sites.

A ***Pathway*** is defined as one or more routes through which a receptor is being, or could be, exposed to, or affected by, a given contaminant.

Potential ***Target or Receptors*** fall within the categories of Human Health, Water Environment, Flora and Fauna, and Building Materials.

There are a number of possible pathways for the contaminants identified on the site to impact human and/or environmental receptors and these are summarised in Tables 2 and 3.

Table 2: Human Receptors and Pathways

Human Receptor-Mechanism	***Typical Exposure Pathway***
Human Inhalation	Breathing Dust and Fumes Breathing Gas emissions
Human Ingestion	Eating -contaminated soil, for example by small children -plants grown on contaminated soil Ingesting dust or soil on fruit or vegetables Drinking contaminated water
Human Contact	Direct skin contact with contamination Direct skin contact with contaminated liquids

Table 3: Water Receptors and Pathways

Receptor-Water Environment	***Typical Exposure Pathway***
Groundwater The site is recorded as being underlain by the Secondary (A) Aquifer Summertown-Radley Sand and Gravel Member over the Unproductive Oxford Clay Formation.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and migrate to underlying groundwater. Contamination leads to restriction/prevention of use as a resource, for example, drinking water, and can have secondary impacts on other resources, which depend on it.
Surface Water/River Networks The nearest natural surface water feature is Rowel Brook, located 200m north of the site.	Surface infiltration of atmospheric waters into the soils beneath the site could wash or dissolve potential contaminants and laterally migrate. Contamination leads to a restriction/prevention of use: -as drinking water resource -for amenity use Effects on aquatic life

Preliminary Conceptual Model

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research documented in the preceding sections of this report.

A generalised preliminary conceptual model relative to the construction phase and completed development is presented below in Table 4.

Table 4: Preliminary Conceptual Model Relative to Proposed Development

Receptors	Pathway	Estimated Potential for Linkage with Contaminant Sources				
		Stockpiled Building Materials	**Drainage**	**Soil & Groundwater**	**Soil Gas**	**Ground Contamination Outside Site Boundary**
Human Health ï site and ground workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	High	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Human Health ï users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	NA (to be removed as part of redevelopment)	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Water Environment	Migration through ground into surface water or surrounding groundwater	NA (to be removed as part of redevelopment)	Low likelihood	Low likelihood	Low likelihood	Low likelihood
Flora	Vegetation on site growing on contaminated soil	NA (to be removed as part of redevelopment)	Unlikely	Low likelihood	Unlikely	Unlikely
Building Materials	Contact with contaminated soil	NA (to be removed as part of redevelopment)	Unlikely	Low likelihood	Unlikely	Unlikely

Key to Table 4 **Estimated Potential for Linkage with Contaminant Source**	**Definition**
High likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such an event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.
NA	Not Applicable

SITE WORK

The intrusive work was undertaken from 14th to 18th June 2021 and comprised four rotary cored boreholes to depths between 10.00m and 20.20m (BH1 to BH4); seven machine excavated trial pits to a maximum of 4.00m depth (TP1 to TP7); including three 2.00m deep soakaway test pits (TP3, TP4 & TP7); and four 1.00m deep hand excavated California Bearing Ratio test pits (CBR1 to CBR4) with CBR determinations calculated from Dynamic Cone Penetrometer tests (DCPs). The exploratory hole locations are shown on the site plan presented in Appendix 1. The exploratory hole locations were proposed by the Engineer and were agreed or amended on site based on the site constraints and following a review of the desk study information.

Prior to undertaking the intrusive works, statutory service plans were sourced by Ground Engineering Limited and consulted in addition to a ground penetrating radar (GPR) utilities survey plan provided by the client. A service scan of the exploratory hole positions was made using a CAT (Cable Avoidance Tool) to check for the absence of buried services that may otherwise have been damaged by the investigation.

The site work was undertaken under the supervision of a Geo-environmental Engineer from Ground Engineering Limited. The works were carried out making due reference to generic and site-specific risk assessments, and method statements. The working areas were delineated by Heras fencing and Chapter 8 barriers where appropriate.

The investigation was undertaken following the protocols detailed in British Standards (BS) óCode of Practice for Site Investigationsô (BS5930:2015+A1:2020), óMethods of test for soils for engineering purposesô (BS1377:1990 & 2006) and óInvestigation of potentially contaminated sitesô (BS10175:2011+A2:2017). Detailed records of the exploratory holes have been produced in accordance with British Standard BS5930:2015+A1:2020 óCode of Practice for Site Investigationsö. The exploratory hole records, presented in Appendix 2, give the descriptions and depths of the various strata encountered, details of all samples taken, results of the in-situ tests and groundwater conditions observed throughout drilling/excavation, on completion and subsequently in standpipe installations. The elevations (mOD) of the ground level at each position are presented on the exploratory hole records and were interpolated from a topographical site survey plan provided by the client.

Rotary Cored Boreholes

A Comacchio 205-type, track-mounted, rig was employed to undertake the rotary drilled boreholes (BH1 to BH4) to depths between 10.00m and 20.20m. Prior to drilling, starter pits were pre-excavated to 1.20m depth using hand digging tools in order to ensure the absence of buried services.

From the base of the starter pits, continuous soil core samples were initially recovered in plastic tube liners. The rig used equipment comprising 1.00m long drive-in samplers of specially constructed and strengthened steel tubes of initially 117mm diameter, reducing in diameter with depth. The samplers were driven into the ground by an automatic trip hammer weighing 63.50kg falling freely through 750mm. The ends of the samples were capped and sealed to maintain them in as representative condition as possible during transit to the laboratory. Where the drive-in samplers met refusal within very dense sand and gravel, open hole drilling was undertaken (from 1.60m to 4.20m in BH1, 3.20m to 4.20m in BH2, and 2.20m to 4.20m in BH3 and BH4), then drive-in sampling was resumed with casing was installed to maintain hole stability to rock head.

Upon encountering rockhead, a tricone roller bit within 120mm diameter casing was used to over-ream the holes and a PWF-type core barrel with polycrystalline diamond (PCD) cutting shoe was used, which took 92mm diameter cores using a mist flush. The core runs were retrieved in 1.50m long plastic liners. The samples were sealed and placed sequentially into wooden core boxes.

Standard penetration tests were undertaken in order to give an indication of the in-situ relative density/shear strength of the soils at 1.00m intervals to rockhead. The test was made by driving a 50mm diameter split spoon sampler (S) into the soil at the base of the borehole by means of an automatic trip hammer weighing 63.50kg falling freely through 760mm. The penetration resistance was determined as the number of blows (N) required to drive the tool the final 300mm of a total penetration of 450mm into the soil ahead of the borehole. Where the full test depth was not achieved, the depth driven for 50 blows was recorded. The SPT ó*N’* values are presented on the rotary hole records and the óNô values are plotted against depth in Figure 1, Appendix 3.

On completion of BH1 and BH3, 50mm diameter standpipes were installed to 5.00m depth with a pea gravel surround to within 1.00m of ground level. Above this a top seal of bentonite was placed to near surface. A gas tap was installed in the top of each standpipe and a protective stopcock cover was concreted into the ground flush with the surface over each installation. Below the installations, the boreholes were infilled with bentonite, as were BH2 and BH4.

<u>Machine Excavated Trial Pits, Plate Loads and Soakaway Testing</u>

The trial pits were undertaken by a JCB 3CX-type excavator to depths of 2.00m (TP3, TP4 & TP7) or 4.00m (TP1, TP5 & TP8). Disturbed samples of soil were taken at regular intervals throughout each pit and placed in polycarbonate pots (D samples). Bulk disturbed samples (B) of soil were sealed in large plastic bags. Near surface environmental samples (ES) of soil were also sealed in amber glass jars and vials. A single sample of apparent asbestos containing material (ACM1) was taken in TP5, double bagged and was labelled as ópotential asbestosô pending subsequent identification by laboratory microscopy.

A Mackintosh Probe (MP) was used to ascertain the in-situ relative density of granular soil in selected trial pits (TP5 & TP6). The 25mm diameter solid cone point of the probe was screwed onto the rods and driven into the ground by repeated blows of a 4.5kg slide hammer with a fall of 0.3m. The depth driven for 100 blows was recorded.

In TP3, TP4 and TP7, soakaway tests were undertaken in accordance with BRE Digest 365. Water was delivered to the site in a 10,000 litre lorry tanker, added to the excavations and the fall in water level was measured relative to a datum over a period of up to 165 minutes. Three test fillings were undertaken in each pit. The soil infiltration rate results follow the respective trial pit records. On completion the trial pits were backfilled with the spoil that was placed in compacted layers.

Dynamic Cone Penetrometer Tests

Dynamic Cone Penetrometer (DCP) tests were performed from near ground level to a maximum of 1.00m depth to give an indication of the California Bearing Ratio (CBR) of the near surface soils at four positions (CBR1 to CBR4). Each test consisted of driving a 60° solid cone point, 20mm diameter, into the soil by means of an 8kg hammer falling freely through 575mm. The CBR value was then determined using the distance driven per number of blows, based on Transport Research Laboratory (TRL) research. The DCP results are presented to the rear of the exploratory hole records.

Trial pits were then excavated at each position using hand digging tools to 1.00m depth. Disturbed samples of soil were taken at regular intervals throughout the pits and placed in polycarbonate pots (D samples). Bulk disturbed samples of near surface soils were also sealed in large plastic bags (B).

On completion the trial pits were backfilled with arisings.

Monitoring

Three return visits were made on 30th June, 7th and 14th July 2021, to monitor methane, carbon dioxide and oxygen gas levels in the standpipes using a GasData GA5000 gas monitor. Ambient pressures and flow rates were also recorded. The groundwater levels in the standpipes were also recorded.

Groundwater samples were obtained from the 50mm diameter standpipes (BH1, & BH3), using nominated bailers during the first return visit, and were sealed within 1 litre glass bottles, plastic bottles and small glass vials.

The results of the monitoring visits are presented to the rear of Appendix 2.

LABORATORY TESTING

The samples were inspected in the laboratory and assessments of the soil and rock characteristics have been taken into account during preparation of the exploratory hole records. The soil and rock sample descriptions are in accordance with BS5930:2015+A1:2020.

Geotechnical tests were conducted to BS1377:1990 & 2016, and other industry standards, and the results are presented in Appendix 3, whilst the results of the chemical tests are presented in Appendix 4.

Geotechnical Testing

The moisture content and index properties of selected soil samples were determined as a guide to soil classification and behaviour. The liquid limit was determined by the cone penetrometer method.

The particle size distributions of selected samples were obtained by sieve analysis. Results of these tests are given as particle size distribution curves.

Immediate undrained triaxial compression tests were made on selected undisturbed samples of clay soil (sub-sampled from the recovered plastic sample tube liners and core samples) under a single cell pressure equivalent to the overburden pressure at each sampleôs depth. The moisture content and bulk density of the specimens were also determined. The triaxial test results are plotted against depth in Figure 2, Appendix 3.

During the sub-sampling, hand shear vane tests (V) were also undertaken at regular intervals in the sample liners to provide an indication of the apparent cohesion of clay soil, and the results (kPa) are presented on the borehole records.

The rock cores were inspected, and measurements taken of the total core recovery (TCR), solid core recovery (SCR), and the rock quality designation (RQD). The TCR is the total length of core, the SCR is the total length of core still at full diameter excluding any fragmented core, whilst the RQD is the core lengths of more than 100mm. All three lengths are expressed as a percentage of the total core run and are presented on the rotary hole records. The fracture index (FI, number of fractures per metre) was also determined for each core run. Where the number of fractures is greater than 20, the specific number is not significant for rock classification and the FI numbers, 0 to 20 and >20, are presented on the rotary hole records.

Photographs of the rock cores are presented with the respective borehole records. Additional close-up photographs of features of note are also presented to the rear of the core photographs for BH1 to BH4.

Selected core sticks were cut to provide test specimens with a height/diameter ratio of about 2:1. The rock cores were crushed unconfined, and the compressive strengths calculated.

Franklin Point Load tests were performed on selected samples of rock to give an estimation of rock strength and classification. Ten specimens were tested per sample. The test was performed using a Point Load apparatus consisting of a loading frame, pump, ram and platens fitted with a system of measuring the pressure applied and a device for measuring the distance between the platens. Each specimen was inserted into the apparatus, crushed and a Point Load Index calculated (Is). The Point Load Index was then corrected to the reference core diameter of 50mm using a factor (k) of 15. This value was used to estimate the equivalent uniaxial compressive strength (UCS). The results follow the laboratory test summary sheets.

Selected samples of soil were analysed to determine the concentration of soluble sulphates. The pH values were also determined using an electrometric method.

<u>Chemical Testing</u>

Chemical analysis of selected soil samples recovered from the exploratory holes was undertaken by an independent laboratory, primarily for characterisation purposes. The samples were tested for a suite encompassing a wide range of potential contaminants outlined by the Environment Agency (EA) and National House Building Council (NHBC) document R&D 66; 2008 óGuidance for the Safe Development of Housing on Land Affected by Contaminationô.

Fifteen soil samples recovered from the exploratory holes and the two water samples obtained during the first return visit were tested for total concentrations of arsenic, cadmium, chromium, lead, mercury, selenium, nickel and benzo[a]pyrene (the CLEA suite), together with speciated polyaromatic hydrocarbons (PAH), boron, copper and zinc, phenols, total cyanide, hexavalent chromium, sulphate, sulphide, pH and Total Petroleum Hydrocarbons (TPH). The soil samples were also tested for organic content.

Three selected soil samples and the two water samples were also tested for speciated TPH Criteria Working Croup (CWG). Ten soil samples were screened for the presence/absence of asbestos.

A single sample of apparent asbestos containing material (TP5, 0.20m to 0.40m depth, ACM1) was scheduled for identification by laboratory microscopy.

GROUND CONDITIONS

The ground conditions revealed by the investigation initially comprised a surface layer of made ground 0.25m to 2.30m thick, with the thickest comprising reservoir infill in Zone B. The made ground mantled the superficial river terrace deposit of Summertown-Radley Sand and Gravel Member, which was underlain by the solid geology Kellaways Clay Member at depths between 4.30m and 4.40m. The Oxford Clay over Kellaways Sand Member succession (anticipated from BGS mapping to cover the Kellaways Clay Member) was absent, having been fluvially eroded and replaced by the superficial river terrace deposit. The Kellaways Clay Member was in turn underlain by a 2.70m or 2.80m thick layer of Cornbrash Formation, met at depths between 7.50m and 7.90m, which in turn was underlain by the Forest Marble Formation. The deepest boreholes were completed within the latter at 20.20m depth. Separate soil profiles of the ground conditions encountered across Zone B (Figure 3) and Zone C (Figure 3.1), from south-west to north-east, are presented in Appendix 3.

Made Ground

Localised patches of surface asphalt were proved to be 0.15m thick in TP1 and 0.10m in TP2, positioned in Zone B. The remaining exploratory holes across Zones B & C encountered surface and near surface layers of hardcore/coarse-grained made ground, which were generally grey, slightly sandy gravel or light brown, silty, gravelly to very gravelly sand with rare to occasional cobbles of brick, concrete, asphalt and limestone. The gravel fraction of the hardcore layers comprised granite, concrete, brick, asphalt, limestone, flint, ironstone, ash and localised fragments of glass and string (CBR4).

A fragment of suspected asbestos sheeting was encountered at 0.20m to 0.40m depth in TP5 (located at the western end of Zone C) and was subsequently confirmed to comprise cement-bound chrysotile-type asbestos, by laboratory microscopy.

In TP1, TP2 and BH2, positioned in the backfilled reservoir in Zone B, the coarse-grained made ground was rubbly, with abundant cobbles. A layer of clay fill, 0.10m to 0.40m thick, was met at the base of this rubbly fill at depths of 1.90m to 2.00m. This clay fill comprised soft or firm, orange brown or grey and brown mottled, slightly gravelly, silty clay with a gravel fraction of angular to rounded limestone, ironstone, brick and ash. A geotextile layer was noted at the base of this clay in TP1 and TP2, presumably the remnant liner of the infilled former reservoir. The base of the made ground was proved at depths between 0.25m and 2.30m (66.15mOD to 68.10mOD), with the thickest including the localised reservoir infill in BH2, Zone B.

Summertown-Radley Sand and Gravel Member

The superficial Summertown-Radley Sand and Gravel Member was met below the made ground in all of the exploratory holes at depths between 0.25m and 2.30m. In BH3 and TP6, located in the eastern half of Zone B, below a 0.30m thick surface layer of made ground, this river terrace deposit was initially a firm, friable brown and orange brown mottled slightly gravelly, sandy, silty clay.

Below this clay layer at depths of 1.65m in BH3 and 0.80m in TP6, and below the made ground in the remaining exploratory holes, the Summertown-Radley Sand and Gravel Member was a loose to dense, orange brown and light brown or yellow brown, slightly silty, gravelly sand, becoming very dense sandy gravel with occasional limestone cobbles with increasing depth. The gravel fraction comprised angular to rounded limestone, ironstone, flint, quartz and quartzite. Fragments of belemnite fossils were also locally noted, which had been fluvially eroded from the solid geology (Oxford Clay Formation or Kellaway Sand Member) and incorporated into this river terrace deposit. The shallow exploratory holes were completed within the Summertown-Radley Sand and Gravel Member at depths between 1.00m and 4.00m. The base of this deposit was proved at depths between 4.30m to 4.40m in BH1 to BH4 (63.80mOD to 64.05mOD).

Kellaways Clay Member

The solid geology Kellaways Clay Member was met below the Summertown-Radley Sand and Gravel Member at depths between 4.30m and 4.40m in BH1 to BH4. This was initially reworked, comprising stiff, orange brown, grey and dark grey mottled, slightly gravelly clay. The gravel fraction comprised angular to sub-rounded limestone, flint and quartzite.

Below this 0.20m or 0.25m thick reworked layer, the Kellaways Clay Member was stiff, becoming very stiff, closely fissured, dark blue grey clay with occasional gravel size pyrite nodules. Rare grey silt partings and fossil traces were also noted. The base of the Kellaways Clay Member was proved at depths between 7.50m and 7.90m (60.40mOD to 60.70mOD), confirming a thickness of 3.15m to 3.50m.

Cornbrash Formation

The Cornbrash Formation was met beneath the Kellaways Clay Member at depths of between 7.50m and 7.90m. This a comprised weak to strong, thinly to medium bedded, grey, argillaceous, shelly limestone with occasional very thin to thin beds of very stiff, dark grey clay. The fossils included *cardiid* bivalves, oysters and razor clams. Some calcite-filled bivalves and fossil burrows were also locally noted. Boreholes BH2 and BH4 were completed within this bedded rock at depths of 10.20m and 10.00m, respectively (58.25mOD and 58.00mOD), proving this stratum to be greater than 2.30m thick. The Cornbrash Formation was confirmed to be 2.80m thick in BH1 and 2.70m thick in BH3 where the base of this stratum was penetrated at depths of 10.60m and 10.20m, respectively (57.60mOD and 58.00mOD).

Forest Marble Formation

The Forest Marble Formation was met below the Cornbrash Formation at depths of 10.60m in BH1 and 10.20m in BH3. This was initially a stiff, laminated, light green grey to green grey, silty clay with occasional thin laminae and ripples of light grey and white silt and rare black carbonaceous specks. This laminated clay was very stiff below 13.50m depth, often calcareous and cemented, locally varying with depth to an extremely weak mudstone. Medium to thick beds of oolitic limestone were met within this initially clay dominated stratum at depths of 11.75m (56.45mOD) in BH1 and 11.10m (57.10mOD) and 14.60m (53.60mOD) in BH3. These subordinate rock beds were generally medium strong, very thinly to thinly bedded, green grey or grey, oolitic limestone with occasional very thin beds and thick laminae of very stiff, green grey, silty clay.

The Forest Marble Formation was predominantly a bedded limestone below depths of 17.80m (50.40mOD) in BH1 and 16.95m (51.25mOD) in BH3. This rock was moderately weak to strong, thin to medium bedded, light grey and white, oolitic limestone that was cross bedded up to 25º from horizontal. Calcite veins and fossil bivalves were locally noted in BH1 that was completed within this rock horizon at 20.20m depth. A 15mm thick layer of white sand was noted at 18.70m depth in BH3, below which this bedded limestone was grey and argillaceous. A 0.85m thick layer of very stiff, fissured, dark green grey clay was met at 19.05m depth in BH3 and was locally ógrittyô with sand and fine gravel size fossil fragments to 19.60m depth. Below 19.90m depth in BH3, the bedded rock resumed as a moderately strong, medium bedded, grey and dark grey, oolitic limestone with occasional fossil burrows and shell fragments. Borehole BH3 was completed within this bedded rock at 20.20m depth (48.00mOD).

Groundwater and Stability

Groundwater was struck during excavation at depths of 3.90m in TP5 and 3.60m in TP6, with standing water levels on completion at depths of 3.40m and 3.60m, respectively. The remaining exploratory holes were recorded as dry during and on completion of drilling/excavation. The use of water flush and installation of casing to depths of 7.20m in BH1, BH2 and BH3, and 6.00m in BH4 prevented the detection of groundwater during drilling.

The subsequent standpipe groundwater levels in BH1 and BH3 were recorded at depths between 3.27m and 3.70m, during the three return visits undertaken during June and July 2021.

Live Roots

Live roots were encountered in about half of the exploratory holes, with the deepest noted at 3.20m depth in TP6, located near several trees in Zone C. No live roots were met in BH1, BH2, BH4, TP1, TP2, CBR1 and CBR2.

Evidence of Contamination

The made ground contained fragments of brick, concrete, glass, string, asphalt and ash.

No visual or olfactory evidence of hydrocarbon contamination was detected.

A fragment of suspected asbestos sheeting was encountered at 0.20m to 0.40m depth in TP5 (located at the western end of Zone C) and was subsequently confirmed, by laboratory microscopy, to comprise cement-bound chrysotile-type asbestos. No further apparent asbestos containing materials were observed within the remaining exploratory holes.

COMMENTS ON THE GROUND CONDITIONS

IN RELATION TO FOUNDATION DESIGN & CONSTRUCTION

The investigation found a 0.25m to 2.30m thick surface layer of made ground, mantling the superficial Summertown-Radley Sand and Gravel Member, which was underlain by the solid geology succession of Kellaways Clay Member over the Cornbrash Formation over the Forest Marble Formation.

The coarse-grained Summertown-Radley Sand and Gravel Member is a suitable founding stratum for locally deepened mass concrete footings. Due to the thickness of made ground and depending on the proposed building loads, a piled foundation solution may be preferred, extending foundation loads into the underlying solid geology clays and limestones.

Mass Concrete Foundations

The made ground was 0.25m to 2.30m thick, with the deepest associated with the infilled former reservoir. Large scale processes of natural sedimentation allow a certain degree of confidence to be placed in the absence of important variation of the engineering properties of natural soils across sites. By contrast, made ground, whose history is not completely known, must, despite any amount of investigation, inevitably present the possibility of conditions existing which could not be accepted when considering the material as a bearing stratum. Foundations for the new buildings should therefore be extended through the made ground and into the underlying naturally deposited soils.

The localised initial clay layer of the Summertown-Radley Sand and Gravel Member (BH3 and TP6) had a modified plasticity index of 30% and is rated as having a medium volume change potential. The underlying coarse-grained Summertown-Radley Sand and Gravel Member may be regarded as non-shrinkable, and where proved was 2.10m to 3.90m thick. The thickness and depth of the sand and gravel is sufficient to satisfy Section 4.2.9 of the National House Building Council (NHBC) Standards Chapter 4.2 ñBuilding near treesò (2021), as the underlying medium volume change Kellaways Clay Member (modified plasticity indices of 37% and 38%) is too deep to be affected by the root influence of trees. Indeed, the deepest live roots were encountered to 3.20m depth within TP6, within the water-bearing, coarse-grained Summertown-Radley Sand and Gravel Member and did not extend into the Kellaways Clay Member, which is present from depths between 4.30m and 4.40m. No evidence of desiccation was encountered in the Kellaways Clay Member. The Section 4.2.9 rule that the distance between the base of foundation and top of the underlying clay must be greater than the footing width; does not therefore apply in this instance, as the underlying clay is not affected by tree roots and is beneath the water-bearing gravel where root penetration is highly unlikely.

It is considered that foundations should be deepened into the underlying non-shrinkable sand and gravel as the clay layer was not laterally persistent, was only present to depths of 1.35m (BH3) and 0.80m (TP6), contained live roots, and has significantly inferior bearing properties to the underlying non-shrinkable sand and gravel.

The coarse-grained Summertown-Radley Sand and Gravel has an allowable bearing pressure in the order of 300kN/m^2 for footings up to 1.20m wide and immediate settlement within 25mm. A 1.20m wide square pad, based within the naturally deposited sand and gravel, could therefore support a column load of 430kN. Higher column loads could be supported on wider foundations that would require reduced allowable bearing pressures to keep immediate settlement within 25mm. For example, a column load of 2100kN (including permanent and variable loads, with no partial factors applied to loads) may be supported on a 2.90m wide square pad, with a reduced allowable bearing pressure of 250kN/m^2, for immediate settlement within 25mm. Similarly a column load of 2800kN (including permanent and variable loads, with no partial factors applied to loads) may be supported on a 3.50m wide square pad, with a reduced allowable bearing pressure of 230kN/m^2, for immediate settlement within 25mm. Such foundations, deepened through the made ground and into the Summertown-Radley Sand and Gravel, would not overstress the underlying Kellaways Clay Member that was present at its shallowest at 4.30m depth. This has been assessed assuming a 45 degree stress distribution from the base of the pad foundation, and that underlying Kellaways Clay Member has a safe bearing capacity of 195kN/m^2 beneath such pad foundations, with a factor of safety of 3.0 applied against shear failure.

Due to the thickness of made ground, a piled foundation solution may be preferred, particularly in Zone B.

Piled Foundations

The solid geology clays and limestones clays are suitable strata into which piles can be installed. The ground conditions favour the adoption of CFA or bored piles. The advice of a specialist piling contractor should be sought prior to design, with particular regard to piling through obstructions such as remnant foundations/floor slabs within the made ground, buried rubble and chiselling (to form a rock socket) into the limestone layers of the Cornbrash Formation or Forest Marble Formation.

For the purposes of preliminary pile design, the pile bearing coefficients given overleaf, which are based on the following assumptions, may be used to assess working loads for a bored pile.

1) Ultimate shaft friction/adhesion within the made ground and the near surface localised clay layer of the Summertown-Radley Sand and Gravel Member is ignored.

2) The ultimate load on a pile would be the sum of the side friction/adhesion acting on the pile shaft together with the end bearing load.

3) In coarse-grained strata, the shaft friction would be a function of the in-situ standard penetration test results (plotted in Figure 1) and effective overburden pressure. The groundwater level is assumed at approximately 3.30m below ground level, based on the conditions at the time of the return monitoring visits.

4) In clay strata the shaft adhesion and end bearing would be a function of the apparent shear strength values obtained from the triaxial compression tests as plotted in Figure 2 and SPT N values plotted in Figure 1.

5) In bedded rock, the skin friction and end bearing values would be a function of the unconfined compressive strength of the rock into which the pile is embedded and at the pile base respectively.

6) A conservative end bearing value has been provided for the Cornbrash limestone, due to layers of clay up to 100mm thick within this stratum, and to prevent ópunching failureô into the underlying clay of the Forest Marble Formation.

7) The design of piles end bearing within the limestone layers of the Forest Marble Formation would also need to take into account the presence of clay layers.

8) Where piles are installed in groups it will be necessary to position them at least 2.5 diameters apart, otherwise a reduction in individual working load will need to be taken into account.

9) A factor of safety (F) of at least 2.5 would be used to assess pile working loads, unless test loading is undertaken. Where piles are to be largely end-bearing an increased factor of safety of 3.0 would be appropriate.

Item	**Ultimate Pile Bearing Value kN/m^2**
Shaft friction/adhesion in made ground and localised tree root infested clay	Nil
Average shaft friction in Summertown Radley Sand and Gravel	15
Average shaft adhesion in Kellaways Clay Member	45
Average shaft friction in Cornbrash Formation	100
Average shaft friction/adhesion in Forest Marble Formation to 14.00m depth	65
Average shaft friction/adhesion in Forest Marble Formation below 14.00m depth	100
End bearing in in Kellaways Clay Member	800
End bearing in Cornbrash Formation	1100
End bearing in Forest Marble Formation to 14.00m depth	1300
End bearing in Forest Marble Formation below 14.00m depth	2600

Using these coefficients, the following table provides ultimate pile bearing values for a range of single pile diameters, located in Zone B (with made ground up to 2.30m thick) and Zone C.

Pile Diameter (mm)	**Pile Depth (m)**	**Factor of Safety (F)**	**Estimated Working Load (kN)**	
			Zone B	**Zone C**
300	9.00	2.5	145	155
300	12.00	2.5	245	250
300	15.00	2.5	370	375
450	9.00	2.5	240	255
450	12.00	2.5	395	410
450	15.00	2.5	610	620
600	9.00	2.5	355	370
600	12.00	2.5	565	580
600	15.00	2.5	885	900

Table 5

Different pile lengths, or diameters, from those detailed would give different available working loads, which could be tailored to suit the working loads required, when available. A piling specialist should undertake final design of piles.

Floor Slab

In areas of thick made ground, such as the infilled former reservoir in Zone B, the floor slab of the proposed building should be suspended on the piled foundations or deepened mass concrete footings. This would avoid any potential differential settlement between them.

In areas of thinner made ground in western parts of Zone B and in Zone C, lightly loaded floor slabs could be ground bearing following removal of the surface layer of made ground and root infested clay, replacement with well graded and compacted stone, careful inspection and preparation using a vibratory roller. The performance of a ground bearing floor slab greatly depends on the careful and correctly supervised placement of such fill. Differential settlement could take place where former foundations and floors remain in the ground, as these would form ôhard spotsö. These should be removed and replaced with compacted coarse-grained fill material prior to floor slab construction.

Excavations

The groundwater level was recorded at depths between 3.27m and 3.70m during the return visits, near the base of the Summertown-Radley Sand and Gravel Member. Shallow excavations would therefore be expected to remain dry. Shallower groundwater may be anticipated óperchedô within the made ground and superficial strata during wetter seasons. Such inflows would likely be accompanied with órunning sandô conditions within the coarse-grained soils beneath this site. Screened sump pump techniques should be sufficient to keep shallow excavations dry. If deep excavations are proposed, such as for deep pad foundations, it is recommended that further groundwater level monitoring is undertaken (in the existing standpipes) to confirm if dewatering is required, particularly if construction is to be undertaken during wetter months.

Excavations on this site within the coarse-grained soils including rubbly made ground are likely to be unstable and collapse. Statutory safety precautions should not be neglected and excavations especially those where personnel are to enter, will need to be supported, or have battered sides where space permits. All excavations should be undertaken in accordance with CIRIA Report 97 ó*Trenching Practice*ô.

Re-Use of Site-Won Soils

If earthworks are proposed, the site-won soils may be re-used, if they are correctly selected and placed. The hardcore and the underlying coarse-grained made ground were highly variable, locally silty, often rubbly, and would need to be screened (by sifting, riddling and sorting) to enable re-use as an engineered fill. In light of the fragment of chrysotile-type asbestos identified within the made ground in TP5, it is recommended that the earthworks contractor should visually screen the made ground soils for re-use and hand pick any suspected asbestos containing materials for separate disposal as special waste. Care should be taken to ensure that asbestos containing material is handled properly, not crushed or broken, kept wet and that special precautions are adopted, and appropriate PPE used to prevent the spread and inhalation of asbestos fibres.

The likely Specification for Highway Works (SHW) classification for the localised clay of the Summertown-Radley Sand and Gravel would be 2C, óStony Cohesiveô fill, and 1A for the otherwise coarse-grained Summertown-Radley Sand and Gravel (well graded with generally <15% fines). Such soils would require compaction óMethod 2ô according to SHW Table 6/1 amended 2016, with plant and methods detailed in SHW Table 6/4, amended 2016.

Typically when undertaking earthworks, the fill should be carefully selected. If topsoil, peaty or organic materials and root invaded clay are found during such works, they should not be incorporated since it may not compact well.

A range of geosynthetic materials (geotextiles and geogrids) for reinforcement, erosion protection and stabilisation may be considered. The advice of a specialist contractor in the field of soil stabilisation should be sought as to the efficacy of such methods.

Pavement/Hardstanding Design

The pavement formation across this site will be within the near surface made ground and, perhaps at a reduced level, within the localised clay layer and underlying coarse-grained soil of the Summertown-Radley Sand and Gravel, where present away from areas of deep made ground. The CBR values derived from the Dynamic Cone Penetrometer testing (CBR1 to CBR4) were between 10% and 131% for the variable hardcore and coarse-grained fill, and between 7.4% and 28% in the underlying coarse-grained Summertown-Radley Sand and Gravel Member. A design CBR value of 10% is therefore considered to be appropriate for these coarse-grained soils.

The localised near surface clay layer of the Summertown-Radley Sand and Gravel Member (met in BH3 and TP6, within Zone C) had a plasticity index of 43%. IAN 73/06 (2009) Design Guidance for Road Pavements recommends a design CBR value of 2.5%, for a thin pavement on clay with a plasticity index of 40%, a low water table and average construction conditions. Based on this, a CBR design value of 2.5% is therefore considered appropriate for this localised clay within Zone C.

Proof rolling of the formation layer should be carried out prior to construction and any topsoil, soft or loosely compacted material should be removed and replaced with a well graded hardcore or lean mix concrete.

Drainage

The soil infiltration rates determined from the three sets of three BRE 365 soakaway tests undertaken in TP3, TP4 and TP7 at 2.00m depth within the coarse-grained Summertown-Radley Sand and Gravel Member were between $1.16x10^{-4}$m/s and $1.62x10^{-5}$m/s. The quickest infiltration rate was determined from the first filling in TP7 (Zone C) and the slowest rate was determined from the third test filling in TP3 (Zone B). The infiltration rates are considered to be representative of the coarse-grained Summertown-Radley Sand and Gravel Member and consistent with the sieve test results obtained, and indicate a good drainage potential based on Figure 6 of BS8004:1986.

Based on these findings it is considered that traditional soakaways may be installed. For any proposed soakaway drainage, chambers should be designed with sufficient storage capacity and surface area to cope with storm events. The groundwater level, measured at approximately 3.30m depth during the return visits, would limit the depth of soakaways. The underlying Kellaways Clay Member, met at its shallowest at 4.30m depth, is typically practically impervious.

Any proposed soakaway chambers should incorporate silt and leaf traps to ensure the infiltration rates do not deteriorate with time. Soakaways should be positioned at least 5m distance from buildings due to the potential for removal of fines and undermining foundations within the coarse-grained soils, particularly within the deep, rubbly made ground (met in the infilled former reservoir in Zone B). Drainage design should be undertaken by a specialist.

It is recommended that unless already completed, a CCTV survey of the existing drainage system, including any sewers, should be undertaken to determine their locations, depths, state of repair and as to whether they can be used or augmented for the proposed redevelopment.

Buried Concrete

Sulphate analysis of the soil and water samples tested (undertaken as part of both geotechnical and chemical laboratory testing) gave results in Design Sulphate Classes DS-1 and DS-2 of the BRE Special Digest 1, Table C2 (2005) presented in Appendix 5. The DS-2 results were obtained from samples of Kellaways Clay and Forest Marble Formation clay. The pH results were between 6.8 and 10.2, and so acidic to alkaline.

The Kellaways Clay contained rare gravel size pyrite nodules/pyritised fossil wood. It should be noted that the use of piled foundations would minimise disturbance of the ground and consequently reduce the potential for the oxidation of any pyritic clay, but re-use of pile arisings could enhance the potential for oxidation of any disturbed pyritic clay. Pile arisings should therefore not be re-used for fill in contact with buried concrete.

Using the sulphate and pH results obtained within the made ground and Summertown-Radley Sand and Gravel Member, an Aggressive Chemical Environment for Concrete (ACEC) Class of AC-1 would be considered appropriate for buried concrete/mass footings in contact with these soils.

An ACEC class of AC-2 would be required for concrete in deepened/piled foundations, where in contact with the underlying solid geology clays.

COMMENTS ON CHEMICAL TESTING

The results of the laboratory chemical testing on near surface soil samples have primarily been compared to soil screening values (SSVs) produced by Land Quality Management Limited (LQM) and the Chartered Institute for Environmental Health (CIEH) presented in their document óThe LQM/CIEH S4ULs for Human Health Risk Assessment: 2015 (Publication Number S4UL3608)ö. The LQM/CIEH S4ULs are intended for use in assessing the potential risks posed to human health by contaminants in soil and are transparently-derived and cautious ótrigger valuesô above which further assessment of the risks or remedial action may be needed. The S4ULs (Suitable for Use Levels) have been derived, in accordance with UK legislation and Environment Agency policy, using a modified version of the Environment Agency CLEA 1.06 software.

Reference has also been given to ATRISKsoil soil screening values produced by Atkins Limited and provided under licence to Ground Engineering Limited. Atkins SSVs have been derived in line with the Environment Agency 2009 guidance using the CLEA 1.071 software. With the absence of a S4UL for cyanide the ATRISKsoil SSV has been used as the soil screening criteria within this report.

In 2014 the Department for Environment Food and Rural Affairs (DEFRA) published, in their document SP1010, Category 4 Screening Levels (C4SL) for several contaminants including lead. The C4SL represent screening levels below which the land could be considered suitable for a specified use and definitely not contaminated land in respect of those determinands. With the absence of S4UL for lead the C4SL has been used as the soil screening criteria within this report.

For each contaminant the adopted soil screening criteria have been calculated for the following land uses:

- Residential use with home grown produce
- Residential use without home grown produce
- Commercial and industrial usage

The intended purpose of the SSVs are as ñintervention valuesò in the regulatory framework for assessment of human health risks in relation to land use. These values are not binding standards, but are intended to inform judgements about the need for action to ensure that a new use of land does not pose any unacceptable risks to the health of the intended users.

Tables 6 compares the test results for the made ground with the SSVs in relation to the specified uses. The number of test results, which exceed these values, are also provided.

Table 6: Comparison of Chemical Test Results for Made Ground with SSVs

Determinand	Number of Samples	Min Value (mg/kg)	Max Value (mg/kg)	Number of Samples Exceeding SSVs for:			Measured 95th Percentile (mg/kg)	Soil Screening Values (SSVs) (1% SOM)			
				Residential with home grown produce	Residential without home grown produce	Commercial / Industrial		Assessment Method	Residential with home grown produce (mg/kg)	Residential without home grown produce (mg/kg)	Commercial/ Industrial (mg/kg)
Organic matter	15	<0.4%	7.8%	-	-	-	-	-	-	-	-
Arsenic	15	15	52	3	2	0	33.00	S4UL	37	40	640
Cadmium	15	<0.10	1.4	0	0	0	0.51	S4UL	11	85	190
Trivalent* Chromium	15	3.4	40	0	0	0	25.55	S4UL	910	910	8600
Hexavalent Chromium	15	<0.50	<0.50	0	0	0	<0.50	S4UL	6	6	33
Lead	15	6.1	39	0	0	0	20.80	C4SL	200	310	2330
Mercury	15	<0.10	0.21	0	0	0	0.12	S4UL	11	15	320
Selenium	15	<0.20	0.36	0	0	0	0.29	S4UL	250	430	12,000
Nickel	15	4.7	33	0	0	0	19.53	S4UL	130	180	980
Phenols	15	<0.10	<0.10	0	0	0	<0.10	S4UL	120	440	440
Benzo[a]pyrene	15	<0.1	10	3	3	0	2.74	S4UL	0.79	1.2	15
Copper	15	2.8	16	0	0	0	9.84	S4UL	2400	7100	68,000
Zinc	15	17	210	0	0	0	74.36	S4UL	3700	40,000	730,000
Free Cyanide	15	<0.50	<0.50	0	0	0	<0.50	S4UL	34	34	34

Notes
S4UL and C4SL for metals were derived using 6% SOM. These values are not sensitive to SOM and would also be applicable for 1% SOM and 2.5% SOM.
LQM/CIEH S4ULs óCopyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3608. All rights reservedâ
ATRISKsoil SSVs produced by Atkins Limited and provided under licence to Ground Engineering Limited.

Discussion of Results and Statistics

The results of the laboratory analysis (Table 6) indicate that three of the fifteen samples of near surface soils tested contained concentrations of arsenic and benzo[a]pyrene that exceeded the respective soil screening values (SSVs) for a residential with home grown produce end use. The three elevated benzo[a]pyrene concentrations and two of the elevated arsenic concentrations also exceeded the respective SSVs for a residential without home grown produce end use. None of the recorded concentrations exceeded the respective soil screening values for a commercial/industrial end use, which is considered to be representative of the science park usage. Statistical analysis, based on the mean value test, indicates that the US95 value for the benzo[a]pyrene concentrations exceeds the respective residential SSVs. All the remaining US95 values, including arsenic, fall below the respective screening values for the specified end uses. The maximum value test indicates that the highest values obtained for arsenic and benzo[a]pyrene are representative of their sample populations.

In summary, the statistical analysis of the results indicates that the made ground across the site would be suitable for retention or re-use at the surface in the proposed commercial setting. Owing to the statistically elevated concentrations of benzo[a]pyrene, the soils tested would not be considered suitable for retention or re-use at the surface within a residential setting, in the unlikely event that residential gardens are proposed within the science park site.

Asbestos

A single fragment of apparent asbestos containing material (ACM) was encountered during the investigation at 0.20m to 0.40m in TP5. This fragment was sampled, double bagged, sealed, and scheduled for laboratory identification by microscopy that confirmed this ACM to comprise cement-bound chrysotile. No visual evidence of ACM was noted in the remaining exploratory holes during the investigation. Ten samples of made ground soil from across Zones B & C were screened in the laboratory for the presence/absence of asbestos and no ACM was identified within the soils tested.

Hydrocarbon Pollution

Fifteen samples of soil were tested for total petroleum hydrocarbons (TPH). The TPH results were generally very low, between <10mg/kg and 51mg/kg. The exceptions were three samples obtained within Zone B: BH2, 0.10m depth; TP1, 0.40m depth; and TP2, 0.60m depth; which contained TPH concentrations of 2700mg/kg, 260mg/kg and 850mg/kg, respectively. These three samples were re-tested for speciated TPH Criteria Working Group (CWG), and the results are summarised in Table 7.

Table 7: Comparison of Speciated TPH CWG results with Soil Screening Values (SSVs)

Determinand	Sample Tested			Number of Samples Exceeding SSVs for:			Soil Screening Values (SSVs) (1% SOM)		
	BH2, 0.10m depth (mg/kg)	TP1, 0.40m depth (mg/kg)	TP2, 0.60m depth (mg/kg)	Residential with home grown produce	Residential without home grown produce	Commercial/ Industrial	Residential with home grown produce (mg/kg)	Residential without home grown produce (mg/kg)	Commercial/ Industrial (mg/kg)
TPH Aliphatic >C5-C6	<1.0	<1.0	<1.0	0	0	0	42	42	3200
TPH Aliphatic >C6-C8	<1.0	<1.0	<1.0	0	0	0	100	100	7800
TPH Aliphatic >C8-C10	<1.0	<1.0	<1.0	0	0	0	27	27	2000
TPH Aliphatic >C10-C12	<1.0	<1.0	<1.0	0	0	0	130	130	9700
TPH Aliphatic >C12-C16	<1.0	<1.0	<1.0	0	0	0	1100	1100	59,000
TPH Aliphatic >C16-C21	<1.0	<1.0	<1.0	0	0	0	65,000	65,000	1,600,000
TPH Aliphatic >C21-C35	41	20	20						
TPH Aliphatic >C35-C44	<1.0	<1.0	<5.0				65,000	65,000	1,600,000
TPH Aliphatic >C5-C35	<5.0	<5.0	<5.0	-	-	-	-	-	-
TPH Aromatic >C5-C7	<1.0	<1.0	<1.0	0	0	0	70	270	26,000
TPH Aromatic >C7-C8	<1.0	<1.0	<1.0	0	0	0	130	860	56,000
TPH Aromatic >C8-C10	<1.0	<1.0	<1.0	0	0	0	34	47	3500
TPH Aromatic >C10-C12	<1.0	<1.0	<1.0	0	0	0	74	250	16,000
TPH Aromatic >C12-C16	<1.0	<1.0	<1.0	0	0	0	140	1800	36,000
TPH Aromatic >C16-C21	99	39	9.9	0	0	0	260	1900	28,000
TPH Aromatic >C21-C35	2000	510	220	1	1	0	1100	1900	28,000
TPH Aromatic >C35-C44	<1.0	<1.0	<1.0	0	0	0	1100	1900	28,000
TPH Aromatic >C5-C35	2100	550	230	0	0	0	-	-	-

The sample of hardcore from BH2 at 0.10m depth contained a concentration of hydrocarbons in the aromatic fraction >C21-C35 that exceeded the respective residential SSVs but fell below the commercial SSV that is considered to be representative of the proposed science park use. None of the remaining concentrations of hydrocarbons in the fractions tested exceeded the respective residential or commercial/industrial SSVs.

In the absence of visual or olfactory evidence of petrochemical contamination observed at shallow depths during the site work, it was considered that the low concentrations of total TPH, where detected, were generally due to fragments of asphalt scalpings and ash in the samples tested. Notably, the sample at 0.10m depth in BH2, with the highest total TPH concentration 2700mg/kg, contained predominantly óoil rangeô organics, and largely comprised fragments of asphalt (bitumen).

<u>Comparison of Water Analysis with Drinking Water Standards</u>

The two samples of groundwater recovered from the BH1 and BH3 standpipes were analysed in the laboratory for a suite of common inorganic and organic potential contaminants primarily for characterisation purposes.

The primary assessment tool employed for the generic screening of samples for the protection of óControlled Watersô consists of the Statutory Instrument 2000 No. 3184 óThe Water Supply (Water Quality) Regulations 2000ô that amends the 1991 version, which provided a standard threshold for TPH of 10μg/l. In the absence of an amended TPH threshold in the updated version, we defer to the 1991 standard, which is generally accepted within the industry.

The fraction of test results that exceed these levels are summarised in Table 8.

Table 8 Comparison of Chemical Test Results with Water Supply Regulations

Determinand	Value detected		The Water Supply (Water Quality) Regulations 1989-2000 Maximum Concentration/Value for Consumers Taps	Fraction of samples Exceeding Water Supply Regulation
	BH1 3.61m	**BH3 3.27m**		
Arsenic (total) µg/l	100	0.66	10 µg/l	1/2
Boron (Water Soluble) µg/l	2100	950	1000 µg/l	1/2
Cadmium (total) µg/l	5.4	< 0.11	5.0 µg/l	1/2
Chromium (total) µg/l	200	< 0.50	50 µg/l	1/2
Copper (total) µg/l	560	0.89	2000µg/l	0/2
Cyanide (total) mg/l	<0.050	<0.050	50 mg/l	0/2
Lead (total) µg/l	410	< 0.50	10 µg/l	1/2
Mercury (total) µg/l	0.12	< 0.05	1.0 µg/l	0/2
Nickel (total) µg/l	320	0.92	20 µg/l	1/2
pH value	7.6	7.7	6.5 minimum 10.0 maximum	0/2
Phenols mg/l	<0.030	<0.030	0.0005 mg/l	-/2
Selenium (total) µg/l	180	3	10 µg/l	1/2
Sulphate (soluble) mg/l	160	160	250mg/l	0/2
Zinc (total) µg/l	820	< 2.5	5000 µg/l	0/2
Benzo[a]pyrene µg/l	< 0.010	< 0.010	1.0 µg/l	0/2
Total of 16 PAHs µg/l	<0.20	<0.20	0.10 µg/l	-/2
Total TPH µg/l	<10	<10	10 µg/l	0/2

For the water sample taken from BH1 (located in Zone B that contains the infilled reservoir), the recorded concentrations of arsenic, boron, cadmium, chromium, nickel and selenium exceeded the respective drinking water samples. None of the concentrations of contaminants tested for the sample obtained from BH3 (Zone C) exceeded the respective drinking water standards. The lack of contaminants detected in the sample from BH3 indicates that the elevated concentrations of contaminants in BH1 may be a localised source in Zone B. The elevated concentrations of groundwater contaminants do not directly correspond with the soil test results obtained for the reservoir infill, and could be due to another localised source on this former farm/science park, within or close to Zone B.

All of the speciated TPH CWG results in both water samples were below the respective detection limits of the analysing laboratory, confirming the absence of petrochemical contamination in the water samples tested.

SOIL GAS MONITORING RESULTS

Three return visits to monitor gas levels at this site were made during June and July 2021 in the standpipes installed within BH1 and BH3. The results are presented to the rear of the exploratory hole records. The recorded concentration of methane was <0.1%, and the carbon dioxide levels were between 1.5% and 3.0%. Oxygen concentrations were depleted, between 0.2% and 10.7%. The in-situ measurement confirmed a gas emission flow rate of <0.1l/hr.

Assuming a positive flow rate of 0.1l/hr, the results give a Gas Screening Value (GSV) of 0.00031l/hr. The GSV falls into Characteristic Situation 1 as defined by BS8485:2015+A1:2019 óCode of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildingsô.

UPDATED CONCEPTUAL MODEL

Assessment of the potential linkage between ground contamination sources, human and environmental receptors have been assessed based on the desk study research and the intrusive ground investigation documented in the preceding sections of this report.

A generalised conceptual model, updated following the intrusive works, monitoring and testing, and targeted to provide coverage across the site, relative to the construction phase and completed development, is presented below in Table 9.

Table 9: Updated Conceptual Model Relative to Construction and Future Development

Receptors	**Pathway**	**Estimated Potential for Linkage with Contaminant Sources**				
		Stockpiled Building Materials	**Drainage**	**Soil & Groundwater**	**Soil Gas**	**Ground Contamination Outside Site Boundary**
Human Health ï construction workers	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	High (if asbestos present)	Moderate	Moderate	Very Low	Very Low
Human Health ï users of completed development	Ingestion and Inhalation of contaminated Soil, Dust and Vapour	N/A	N/A	Low to Very Low	Very Low	Very Low
Water Environment	Migration through ground into surface water or groundwater	N/A	N/A	Low	Very Low	Very Low
Flora	Vegetation on site growing on contaminated soil	N/A	N/A	Very Low	Very Low	Very Low
Building Materials	Contact with contaminated soil	N/A	N/A	Very Low	Very Low	Very Low

Key to Table 7

RISK	**Definition**
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, or, there is evidence that severe harm to a designated receptor is currently happening. The risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) and remedial works may be necessary in the short term and likely over the long term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild.
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.
N/A	Not Applicable because the proposed development will remove the source.

COMMENTS ON GROUND CONTAMINATION IN RELATION TO PROPOSED DEVELOPMENT

The proposals include new commercial/research buildings within the existing science park. Some new areas of soft landscaping may also be included in the proposals.

Anticipated exposure scenarios relating to the site and future development works including remediation options as applicable, in the context of the conceptual model, are discussed as follows. This investigation may not have revealed the full extent of contamination on the site and appropriate professional advice should be sought if subsequent site works reveal materials that may appear to be contaminated.

Existing Drainage & Stored Materials

Redundant foul or surface water drain runs, should be removed from beneath the site and precautions should ensure that any remaining effluent is directly disposed off-site. The integrity of existing drainage should be checked, and where they are to be retained, any damaged sections should be replaced prior to development. The latter measures should remove any future risk to human health and to the water environment.

No asbestos containing materials were observed within the stored materials at the time of the investigation. Zones B and C have been used for stockpiling of various materials associated with ongoing renovations and alterations to the science park buildings and infrastructure. Suitable precautions, in line with current best practice, should be put in place to protect workers from the effects of asbestos material during the redevelopment. The stored materials will be removed for the proposed redevelopment and this will remove the potential source for the end users.

Contaminated Soil & Groundwater

The site is underlain by made ground, between 0.25m and 2.30m thick, including reservoir infill, which contained statistically elevated concentrations of benzo[a]pyrene that exceeded residential soil screening values, but fell below the respective soil screening value for a commercial/industrial end use that is representative of the ongoing science park use.

Significant TPH contamination was not encountered by the investigation and the low concentrations of óoil rangeô organics, where detected, were attributed to fragments of asphalt (bitumen) in the near surface hardcore/made ground and not due to petrochemical spillages.

A single fragment of suspected ACM, at 0.20m to 0.40m in TP5 was sampled, double bagged and scheduled for laboratory identification by microscopy, and was confirmed to comprise cement-bound chrysotile. No visual evidence of ACM was noted in the remaining exploratory holes during the investigation, and no ACM was detected in the ten samples of made ground soil across Zones B & C that were scheduled for laboratory screening.

The groundwater locally, in BH1, Zone B, contained concentrations of arsenic, boron, cadmium, chromium, nickel and selenium that exceeded the respective drinking water standards.

<u>Human Health - Construction Workers</u>

The recorded arsenic and benzo[a]pyrene concentrations and the single identified fragment of chrysotile-type asbestos in the soils tested indicates that there is a moderate risk that a pathway could develop affecting workers during the construction phase of development.

It is considered that special precautions should be adopted for suspected asbestos across the site and should not be limited to the areas of made ground in the northern corner of the site where asbestos was identified. If asbestos is encountered during construction works, including excavating or piling within made ground across the site, suitable precautions should be taken to prevent inhalation of asbestos fibres such as appropriate PPE (dust masks and disposable suits) and dust suppression or ódamping downô.

No further special precautions would be required during the development of the site by workers who may come into contact with the soil during groundworks, providing standard precautions are adopted which should generally include the procedures given by the Health and Safety Executive (The Blue Book) HS(G)66.

For the protection of workers the following is recommended:

a) Limit repeated or prolonged skin contact with soils by wearing gloves with sleeves rolled down.

b) Washing facilities should be made available to workers, so as to minimise the potential for inadvertent ingestion of soil.

c) If any soils are revealed which are different to those encountered by this ground investigation, the advice of a specialist should be sought in view of classifying the material and ascertaining its risk to groundworkers.

d) Care should be taken to ensure that asbestos containing material is handled properly, not crushed or broken, kept wet and that special precautions are adopted and appropriate PPE used to prevent the spread and inhalation of asbestos fibres.

e) Consideration should be given to gas monitoring within deep or confined spaces to ensure safety of personnel entering them, in light of the potential for depleted oxygen, within service chambers or sub-structures.

Human Health - Users of Completed Development

The risk of the encountered ground contamination affecting the site users when present beneath buildings and areas of permanent hardstanding would be considered to be low. This is because it would be highly unlikely that the general site users would normally be able to penetrate the building floors and hardstanding, which would be necessary for them to uncover any contaminated soils beneath the site.

The identified chrysotile-type asbestos was present within the rubbly made ground at 0.20m to 0.40m depth in TP5 (western end of Zone C) and was capped by a 0.20m thick layer of hardcore. The rubbly made ground, locally containing ACM, is therefore considered to present a very low risk to end users of the commercial development, where present beneath such capping layers.

The presence of localised cement-bound chrysotile-type asbestos within the rubbly made ground means that such soils should not be retained or re-used at the surface within areas of new landscaping, if proposed, within the science park. The rubbly made ground, locally containing ACM, will need to be removed from such areas and either disposed of off-site, covered with an adequate capping layer, or placed beneath areas of permanent hardstanding, if geotechnically suitable.

Soil Gas

According to database information, there are no active landfills within influencing distance of the site. The made ground across the site was 0.25m to 2.30m thick but contained no significant quantities of putrescible/peaty material. The soil gas monitoring results fall into Characteristic Situation 1 (very low risk) as defined by BS8485:2015+A1:2019 óCode of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildingsô.

In conclusion, gas protection measures are not considered necessary in relation to methane and carbon dioxide soil gases.

The site lies within an area where radon protection measures are not required for new dwellings in accordance with BR211.

Water Environment

Based on the topography of the site area the likely direction of near surface groundwater and surface water flow would be northwards, towards Rowel Brook that flows eastwards some 200m north of the site. The Summertown-Radley Sand and Gravel Member is a Secondary (A) Aquifer over the Unproductive Kellaways Clay.

The desk study research identified that the off-site historical potential sources of contamination (including a landfill located 246m south-east) were down hydraulic gradient from this hilltop site. There are no abstraction consents, discharge consents, pollution incidents, fuel stations or contemporary trade entries listed within 250m of the science park.

Groundwater was recorded during the return visits at depths between 3.27m and 3.70m in the borehole standpipes. The groundwater locally, in BH1, Zone B, contained concentrations of arsenic, boron, cadmium, chromium, nickel and selenium that exceeded the respective drinking water standards.

Provided that any redundant foul or surface water drain runs are removed/replaced and any remaining effluent is directly disposed off-site, the risk of the proposed development, including the installation of piled foundations, to impact the end users and quality of the water environment is considered to be low.

Effects on Services

Consideration should be given to upgrading service materials, particularly for water supply pipes, where they will be in contact with made ground containing arsenic and benzo[a]pyrene contamination, or ensure that the made ground is not used as a backfill around such water supply pipes. Further guidance on the selection of materials for use as water supply pipes should be sought from the local water supplier.

Off-Site Disposal of Soil Arisings

The results of chemical analysis (solid soil testing) are provided in Appendix 4 and can be used for the basic characterisation of the soil destined for landfill. The Environment Agency publication Hazardous Waste, Technical Guidance WM3 outlines the methodology for classifying wastes and should be referenced for guidance. The test results should be compared to the relevant thresholds to determine whether they fall into the primary categories of non-hazardous waste or hazardous waste and will help indicate the likely European Waste Catalogue (EWC) code, which is determined by the waste type.

If categorised as non-hazardous waste, the WAC test results should be used to determine if waste soils could be disposed of at an inert waste landfill; or if categorised as hazardous waste whether it could qualify as stable non-reactive hazardous waste for disposal in non-hazardous landfill.

Excavated material and excess spoil should always be classified prior to removal from site as required by óDuty of Careô (Environmental Protection Act, 1990) legislation. This means that material must be given a proper description and waste classification prior to removal. Basic characterisation is the responsibility of the waste producer and compliance checking and on-site verification are generally the responsibility of the landfill operator. The landfill operator will need to liaise with the waste producer as the approach relies on the information from basic characterisation.

It is expected that clean arisings from natural soils across this site would fall into the inert category under the European Waste Catalogue description óSoil and Stonesô, EWC code 17 05 04 with restrictions excluding topsoil and peat.

Asbestos containing soils would be considered óspecial wasteô and will need to be dealt with accordingly. The single recorded occurrence suggest that this may not be a significant problem across the site, but it is recommended that the earthworks contractor visually screen the made ground for off-site disposal and hand pick any suspected asbestos containing materials for separate disposal. Care should be taken to ensure that asbestos containing material is handled properly, not crushed or broken, kept wet and that special precautions are adopted and appropriate PPE used to prevent the spread and inhalation of asbestos fibres.

CONTAMINATION ASSESSMENT CONCLUSIONS

The proposals include new science park buildings. The proposed final site layout will need to be finalised by the client in due course. This plan will need to clearly identify areas new soft landscaping, if proposed.

Appropriate professional advice should be sought if subsequent site works reveal materials that may appear to be contaminated.

Remediation

Remediation of the soils, in respect of the proposed redevelopment, is only considered necessary in relation to the creation of new soft landscaping as any new and existing hardstanding and building floors, will prevent contact between any contaminated ground and the site end users.

For areas of soft landscaping, tended by professional groundworkers, a capping thickness of 0.30m of clean imported topsoil would be sufficient to break the pathway between soil contaminants and end users in this commercial/science park setting.

Topsoil

Imported topsoil should have appropriate certificates confirming its suitability prior to placement.

Remediation Plan

This outline remediation strategy should be used with the proposed development plan to derive a remediation plan, clearly labelled to show the different land uses (for example - hardstanding, buildings, new soft landscaping), which should be submitted to satisfy planning conditions.

Validation

The implementation of the remediation strategy should be checked during construction and on completion, and appropriate records kept so that a Validation Report can be compiled and subsequently submitted to the local authority.

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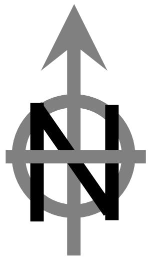
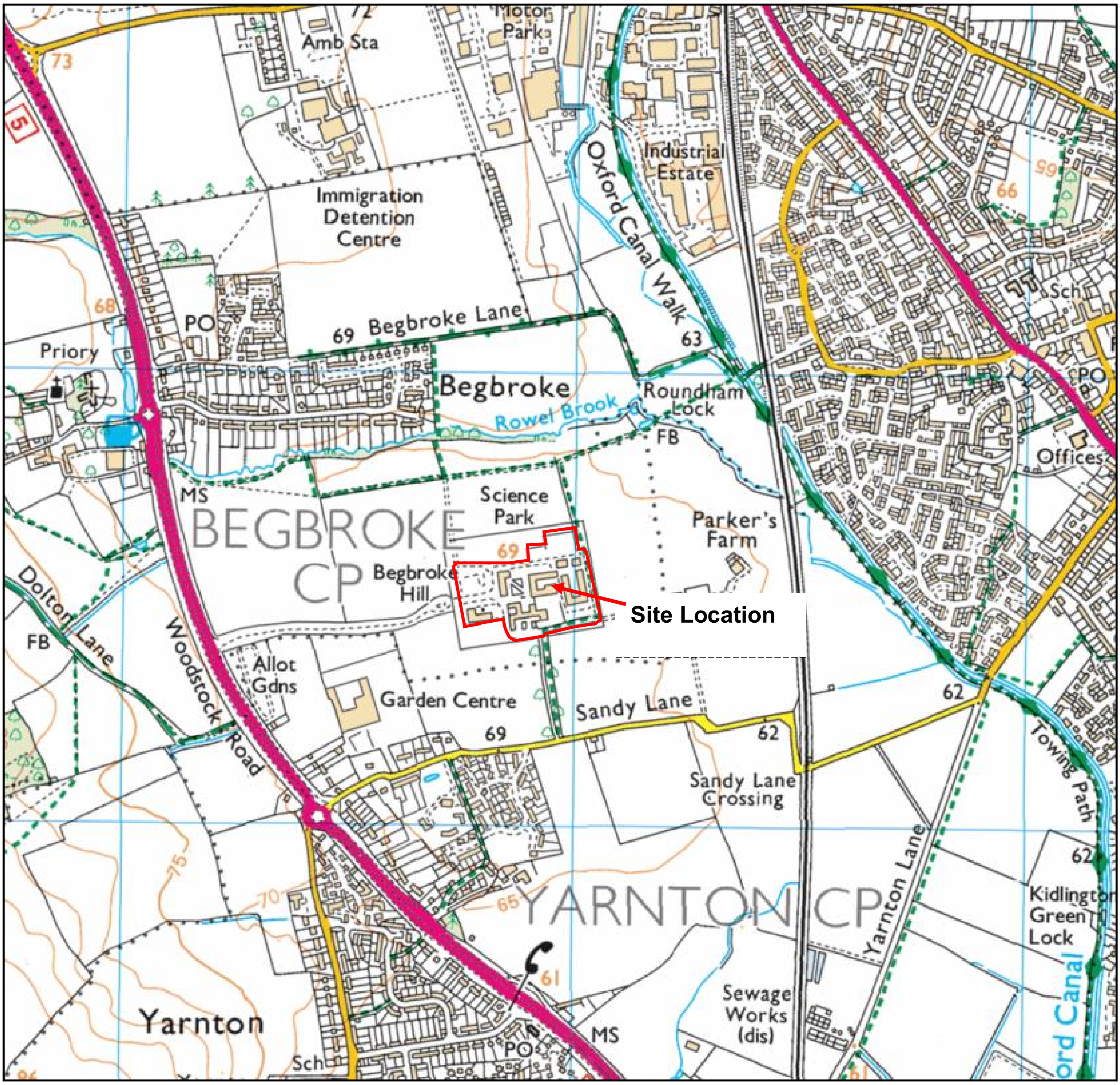
Appendix 1

Site Location Plan

Exploratory Hole Location Plan

Site Location Plan



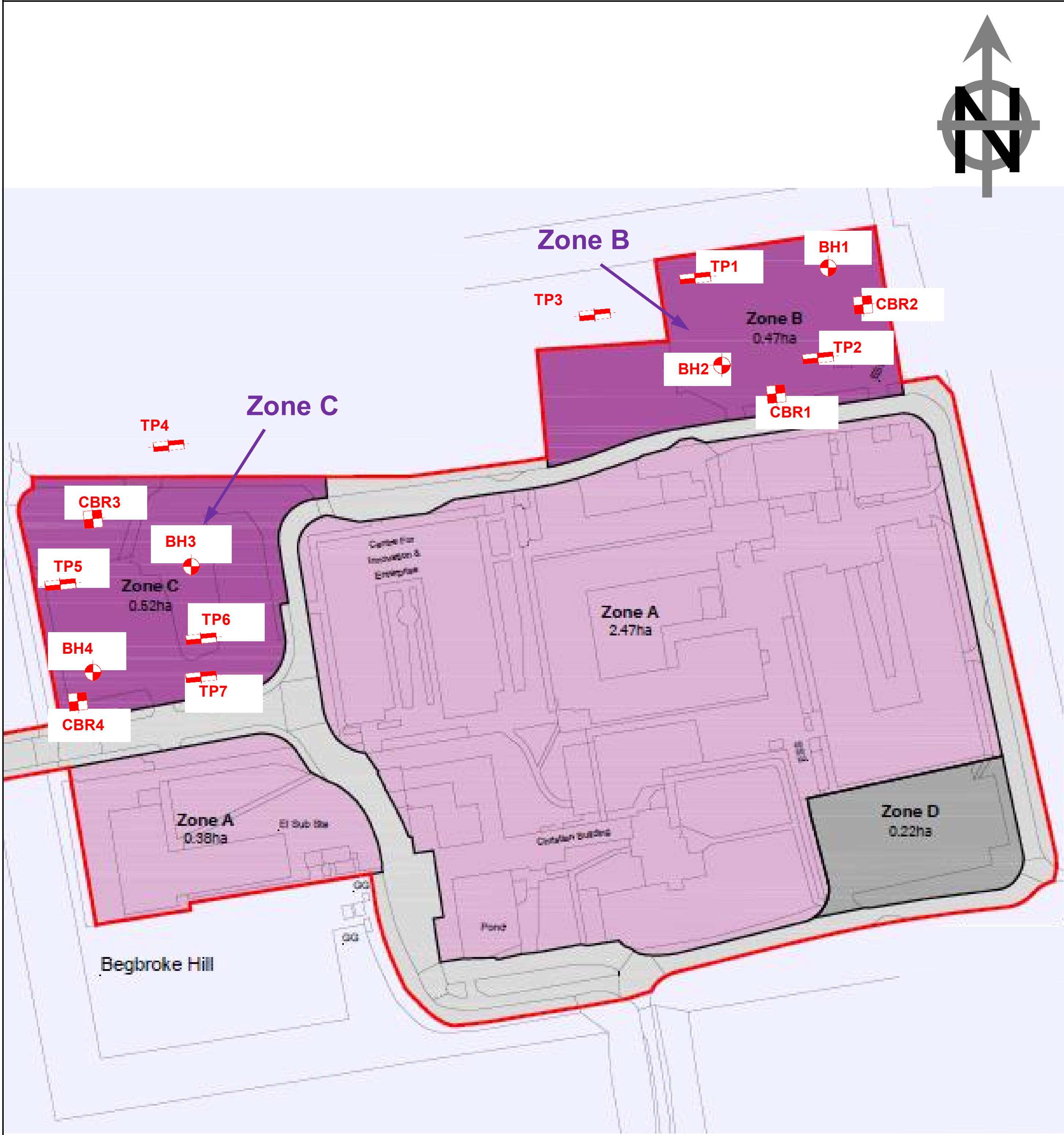


Scale=1km Grid

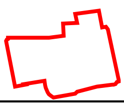
Project: Begbroke Science Park, Kidlington **Client:** Oxford University Development	**GROUND ENGINEERING LIMITED** Peterborough Tel : 01733 566566	**Project No.** **C15387**

Exploratory Hole Location Plan

(Taken from a plan provided by the Engineer, Not to Scale)



Key

Rotary Cored Boreholes	
Trial Pits	
CBR Determinations	
Site Area	

Project: Begbroke Science Park, Kidlington

Client: Oxford University Development

GROUND ENGINEERING LIMITED
Peterborough Tel : 01733 566566

Project No. C15387

Appendix 2

Exploratory Hole Records

Tabulated SPT Results

Liner Sample/Core Photographs

Trial Pit Photographs

Soakaway Test Results

DCP Results with CBR Determinations

Gas & Groundwater Monitoring Results

GROUND ENGiNEERiNG LIMITED

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Site: BEGBROKE SCIENCE PARK, KIDLINGTON

BOREHOLE BH1

Date: 14/06/21 to 15/06/21

Hole Size: 150mm dia to 7.20m
120mm dia to 20.20m

447984 mE 213641 mN
Ground Level: 68.65m. O.D.

Samples/Tests Depth m	Type	TCR	SCR	RQD	FI
0.10	D1				
0.10	D2				
0.35	D3				
0.60	D4				
0.90	D5				
1.20	D6				
1.20-1.60	U1				
1.35-1.58	S			53*	
2.20	D7				
2.35-2.44	S			50*	
3.20	D8				
3.35-3.58	S			50*	
4.20	D9				
4.20-5.20	U2				
4.35-4.65	S			N16	
4.80	V1			(118)	
5.20-6.20	U3				
5.35-5.65	S			N33	
5.70	V2			(111)	
6.15	V3			(140+)	
6.20-7.20	U4				
6.35-6.65	S			N22	
6.70	V4			(86)	
7.15					
7.20	V5			(115)	
7.35-7.55	S			50*	
		87	65	61	7
8.70					
		91	77	58	16
9.70					
		52	48	48	4

(Date) Water: standpipe level (▼s) shown at approx. 3.6m

Description of Strata	Depth m	O.D. Level m
MADE GROUND - Grey, slightly sandy GRAVEL. Gravel of angular granite, brick, concrete, asphalt and flint. Geotextile at base.	0.15	68.50
MADE GROUND - Brown, grey and red brown, silty, very gravelly SAND with rare cobbles of brick. Gravel of brick, concrete, limestone, flint, quartz, quartzite, ironstone and ash.	1.00	67.65
Very dense, orange brown, silty SAND AND GRAVEL with rare cobbles of limestone. Gravel of angular to rounded limestone, flint, quartz, quartzite and ironstone. (SUMMERTOWN - RADLEY SAND AND GRAVEL MEMBER)	3.20	65.45
Medium dense, yellow brown and orange brown, slightly silty, very sandy GRAVEL with occasional cobbles of limestone. Gravel of angular to rounded limestone, flint, quartz, quartzite and ironstone. Occasional fossil belemnite fragments. (SUMMERTOWN - RADLEY SAND AND GRAVEL MEMBER)	4.40	64.25
Stiff, orange brown and grey mottled, slightly gravelly CLAY. Gravel of angular limestone and flint. (REWORKED KELLAWAYS CLAY MEMBER)	4.60	64.05
Stiff, closely fissured, dark blue grey CLAY with occasional gravel size pyrite nodules. Rare grey silt partings and fossil traces. (KELLAWAYS CLAY MEMBER) ...Very stiff below 7.40m depth.	7.80	60.85
Weak to medium strong, thinly to medium bedded, grey, argillaceous, shelly LIMESTONE with abundant fossil bivalves. Horizontal beds of very stiff, dark grey clay; 100mm thick at 7.90m, 15mm thick at 8.12m, 50mm thick at 8.70m and 30mm thick at 9.63m. (CORNBRASH FORMATION) ...Abundant calcite-filled fossil bivalves below 9.70m depth.	10.00	58.65

REMARKS
1. Starter pit excavated to 1.20m depth
2. No live roots observed
3. Window sampled 117mm dia to 1.60m, open hole to 4.20m, 107mm dia to 5.20m, 97mm dia to 6.20m, reamed out with roller bit and cored 92mm dia to 20.20m depth
4. Casing installed to 7.20m depth
5. Gas monitoring standpipe installed to 5.00m depth

Project No 15387 | Scale 1:50 | Page 1/3

KEY
TCR - Total Core Recovery % (of core run)
SCR - Solid Core Recovery % (of core run)
RQD - Rock Quality Designation % (of core run)
FI - Fracture Index
▽ Water Strike ▼c Level on completion
▼ Water Rise c▼w Level Casing Withdrawn
▼s Standpipe Level

Groundwater Strikes

No	Struck (Depth m)	Rose to (Depth m)	Rate	Cased	Sealed

Groundwater Observations

Date	Hole (Depth m)	Casing (Depth m)	Water (Depth m)
14/06/21	17.20	7.20	NA
15/06/21	17.20	7.20	NA
15/06/21	20.20	7.20	NA
30/06/21	5.00	1.00	3.61
07/07/21	5.00	1.00	3.67

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Site: BEGBROKE SCIENCE PARK, KIDLINGTON

BOREHOLE BH1

Date: 14/06/21 to 15/06/21

Hole Size: 150mm dia to 7.20m; 120mm dia to 20.20m

447984 mE 213641 mN
Ground Level: 68.65m. O.D.

Samples/Tests Depth m	TCR	SCR	RQD	FI	(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
	52	48	48	4			Weak to medium strong, thinly to medium bedded, grey, argillaceous, shelly LIMESTONE. Horizontal bed of very stiff, dark grey clay, 40mm thick at 10.05m. (CORNBRASH FORMATION)		10.00 10.60	58.65 58.05
11.20							Stiff, laminated, light green grey, silty CLAY with occasional thin laminae of light grey silt. Rare black carbonaceous specks. (FOREST MARBLE FORMATION)		11.75	56.90
	100	94	91	4			Strong, very thinly to thinly bedded, green grey, oolitic LIMESTONE with occasional very thin beds and thick laminae of very stiff, green grey, silty clay. (FOREST MARBLE FORMATION)		12.35	56.30
12.70							Stiff, becoming very stiff, laminated, green grey, silty CLAY with occasional thin laminae and ripples of light grey and white silt. Rare black carbonceous specks. ...Locally calcareous and cemented to an extremely weak mudstone below 12.60m depth.			
	62	55	42	10						
14.20							(FOREST MARBLE FORMATION)			
	94	81	81	9						
15.70										
	89	80	54	>20			...Occasional very thin beds of weak, oolitic limestone below 16.60m depth.			
17.20									17.80	50.85
	100	82	82	6			Medium strong to strong, thinly to medium bedded, light grey and white, oolitic LIMESTONE with cross bedding of ooids up to 25 degrees from horizontal. Calcite veins, 5mm wide, 30 degrees from horizontal at 17.95m depth and 65 degrees from horizontal, curving to near vertical at 17.95m to 18.30m depth. ...Occasional bivalve shells below 18.70m depth.			
18.70										
	100	97	86	4			(FOREST MARBLE FORMATION)		20.00	48.65

REMARKS

Project No 15387

Scale 1:50 | Page 2/3

KEY
TCR - Total Core Recovery % (of core run)
SCR - Solid Core Recovery % (of core run)
RQD - Rock Quality Designation % (of core run)
FI - Fracture Index
▽ Water Strike ▼c Level on completion
▼ Water Rise c▼w Level Casing Withdrawn
▼s Standpipe Level

Groundwater Strikes						Groundwater Observations			
No	Struck	Rose to	Rate	Cased	Sealed	Date	Hole	Casing	Water
						14/07/21	5.00	1.00	3.70

GROUND ENGiNEERiNG LIMITED Tel: 01733-566566 www.groundengineering.co.uk	Site: BEGBROKE SCIENCE PARK, KIDLINGTON	BOREHOLE BH1
Date: 14/06/21 to 15/06/21	Hole Size: 150mm dia to 7.20m 120mm dia to 20.20m	447984 mE 213641 mN Ground Level: 68.65m. O.D.

Samples/Tests Depth m	TCR	SCR	RQD	FI	(Date) Water	Inst.	Description of Strata	Legend	Depth m	O.D. Level m
20.20	100	97	86	4			"See previous page"		20.00	48.65
							Borehole completed at 20.20m depth		20.20	48.45

REMARKS

Project No	
15387	
Scale	Page
1:50	3/3

KEY

TCR - Total Core Recovery % (of core run)
SCR - Solid Core Recovery % (of core run)
RQD - Rock Quality Designation % (of core run)
FI - Fracture Index
∇ Water Strike
▼ Water Rise
▼s Standpipe Level
▼c Level on completion
c▼w Level Casing Withdrawn

Groundwater Strikes					
No	Struck (Depth m)	Rose to (Depth m)	Rate	Cased	Sealed

Groundwater Observations			
Date	Hole (Depth m)	Casing (Depth m)	Water (Depth m)

Sample Photographs BH1, 1.20m to 5.20m Depth

Project: Begbroke Science Park, Kidlington **Client:** Oxford University Development	**GROUND ENGINEERING LTD** Peterborough Tel : 01733 566566	**Project No.** **C15387**