The Sizewell C Project

SZC Co.'s Response to the Secretary of State's Request for Further Information dated 18 March 2022: Appendix 3 - The Drainage Strategy Part 2 of 12

Revision: 2.0

April 2022

SizewellC
Doing the power of good for Britain
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APPENDIX A SURFACE WATER DRAINAGE PLANS

Figure A.1 Existing Site Drainage Plan

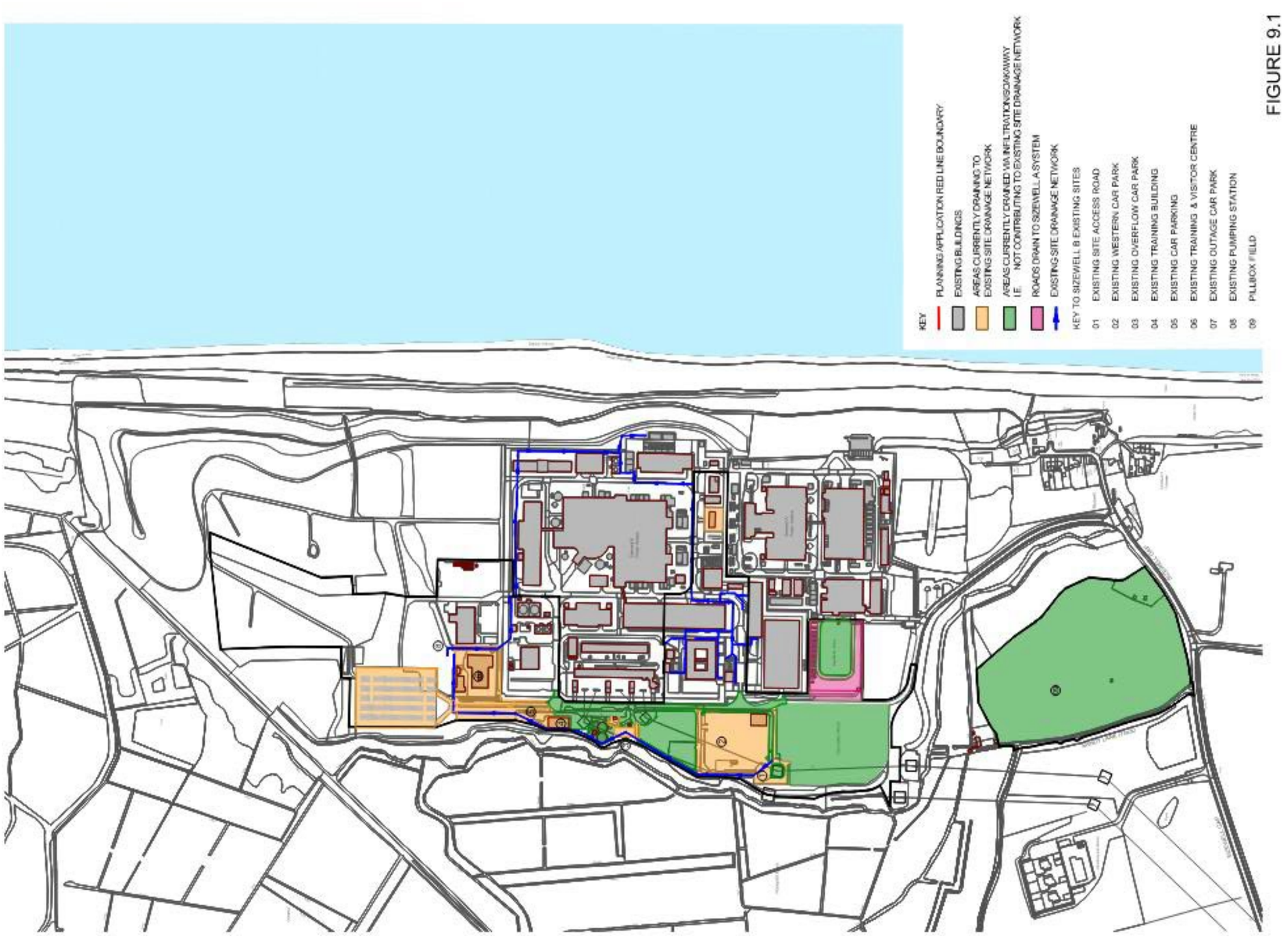
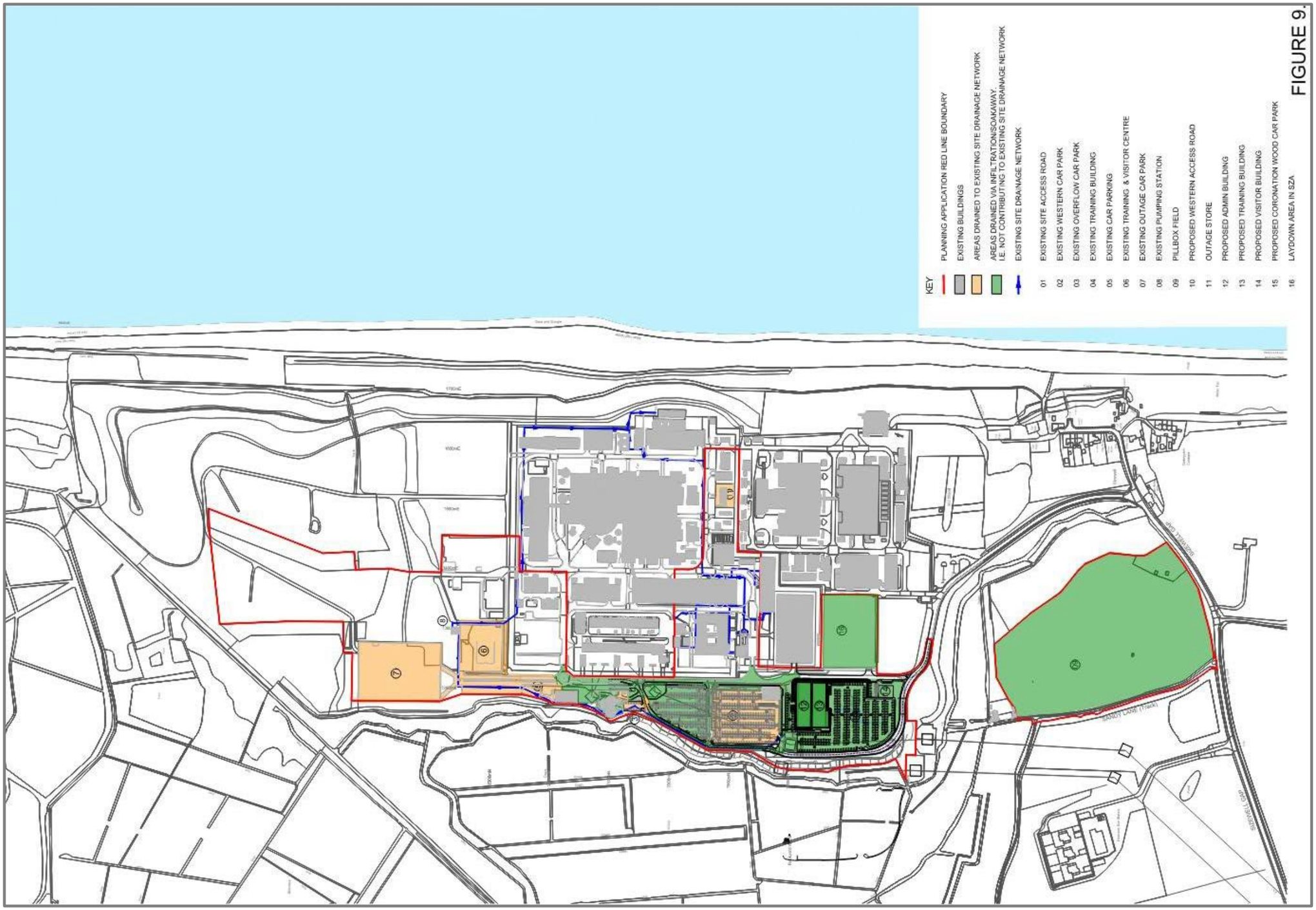


Figure A.2 Proposed Site Drainage Plan



APPENDIX B SURFACE WATER PUMPING AND STORAGE REQUIREMENT FOR DISCHARGE TO THE NORTHERN BRANCH OF DRAINAGE NETWORK

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.200	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	10.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.358	10.00	5.951	1200	647038.104	263361.118	1.701
2	0.299	10.00	5.897	1200	646996.808	263361.692	1.917
3	0.293	10.00	5.930	1200	647038.569	263394.615	1.880
4	0.272	10.00	5.909	1200	646997.273	263395.188	2.159
5	0.165	10.00	5.742	1200	646970.125	263346.519	1.897
6	0.040	10.00	5.684	1200	646970.709	263391.457	2.117
7	0.155	10.00	5.812	1200	646971.398	263441.546	2.512
8	0.073	10.00	5.000	1200	647004.484	263502.999	2.121
9	0.065	10.00	4.427	1200	647044.435	263536.245	1.217
10	0.075	10.00	4.424	1350	647041.642	263565.589	2.624
10_OUT			4.400	1350	647034.258	263583.241	2.630
11			4.400	1200	647028.852	263594.749	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	41.300	0.600	4.250	3.980	0.270	153.0	150	10.85	50.0
1.001	2	4	33.499	0.600	3.980	3.750	0.230	145.6	150	11.52	50.0
2.000	3	4	41.300	0.600	4.050	3.750	0.300	137.7	150	10.85	37.2
1.002	4	6	26.825	0.600	3.750	3.567	0.183	146.6	150	11.69	35.7
3.000	5	6	44.942	0.600	3.845	3.567	0.278	161.7	250	10.95	37.0
1.003	6	7	50.094	0.600	3.567	3.300	0.267	187.6	250	12.57	34.3
1.004	7	8	69.794	0.600	3.300	2.879	0.421	165.8	250	13.40	33.1
1.005	8	10	72.789	0.600	2.879	2.319	0.560	130.0	250	14.15	32.1
4.000	9	10	29.477	0.600	3.210	2.859	0.351	84.0	250	10.36	38.1
1.006	10	10_OUT	19.134	0.600	1.800	1.770	0.030	637.8	450	14.51	31.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.810	14.3	48.5	1.551	1.767	0.358	0.0	150	0.825
1.001	0.830	14.7	89.0	1.767	2.009	0.657	0.0	150	0.846
2.000	0.854	15.1	29.5	1.730	2.009	0.293	0.0	150	0.870
1.002	0.828	14.6	118.2	2.009	1.967	1.221	0.0	150	0.843
3.000	1.097	53.9	16.6	1.647	1.867	0.165	0.0	95	0.970
1.003	1.018	50.0	132.6	1.867	2.262	1.427	0.0	250	1.037
1.004	1.084	53.2	141.9	2.262	1.871	1.582	0.0	250	1.104
1.005	1.225	60.1	143.9	1.871	1.855	1.654	0.0	250	1.248
4.000	1.527	75.0	6.7	0.967	1.315	0.065	0.0	50	0.954
1.006	0.797	126.8	153.7	2.174	2.180	1.794	0.0	450	0.808

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.007	10_OUT	11	12.715	0.600	4.250	3.050	1.200	10.6	150	14.58	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.007	3.113	55.0	243.1	0.000	1.200	1.794	0.0	150	3.171

Pipeline Schedule

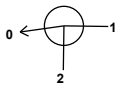
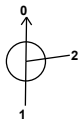
Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	41.300	153.0	150	Circular	5.951	4.250	1.551	5.897	3.980	1.767
1.001	33.499	145.6	150	Circular	5.897	3.980	1.767	5.909	3.750	2.009
2.000	41.300	137.7	150	Circular	5.930	4.050	1.730	5.909	3.750	2.009
1.002	26.825	146.6	150	Circular	5.909	3.750	2.009	5.684	3.567	1.967
3.000	44.942	161.7	250	Circular	5.742	3.845	1.647	5.684	3.567	1.867
1.003	50.094	187.6	250	Circular	5.684	3.567	1.867	5.812	3.300	2.262
1.004	69.794	165.8	250	Circular	5.812	3.300	2.262	5.000	2.879	1.871
1.005	72.789	130.0	250	Circular	5.000	2.879	1.871	4.424	2.319	1.855
4.000	29.477	84.0	250	Circular	4.427	3.210	0.967	4.424	2.859	1.315
1.006	19.134	637.8	450	Circular	4.424	1.800	2.174	4.400	1.770	2.180
1.007	12.715	10.6	150	Circular	4.400	4.250	0.000	4.400	3.050	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.000	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.002	4	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.003	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.004	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.005	8	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
4.000	9	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.006	10	1350	Manhole	Adoptable	10_OUT	1350	Manhole	Adoptable
1.007	10_OUT	1350	Manhole	Adoptable	11	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
1	647038.104	263361.118	5.951	1.701	1200	 0	1.000	4.250	150
2	646996.808	263361.692	5.897	1.917	1200	 1	1.000	3.980	150
						0	1.001	3.980	150
3	647038.569	263394.615	5.930	1.880	1200	 0	2.000	4.050	150

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections	Link	IL (m)	Dia (mm)
4	646997.273	263395.188	5.909	2.159	1200		1 2 0	2.000 1.001 1.002	3.750 3.750 3.750	150 150 150
5	646970.125	263346.519	5.742	1.897	1200		0	3.000	3.845	250
6	646970.709	263391.457	5.684	2.117	1200		1 2 0	3.000 1.002 1.003	3.567 3.567 3.567	250 150 250
7	646971.398	263441.546	5.812	2.512	1200		1 0	1.003 1.004	3.300 3.300	250 250
8	647004.484	263502.999	5.000	2.121	1200		1 0	1.004 1.005	2.879 2.879	250 250
9	647044.435	263536.245	4.427	1.217	1200		0	4.000	3.210	250
10	647041.642	263565.589	4.424	2.624	1350		1 2 0	4.000 1.005 1.006	2.859 2.319 1.800	250 250 450
10_OUT	647034.258	263583.241	4.400	2.630	1350		1 0	1.006 1.007	1.770 4.250	450 150
11	647028.852	263594.749	4.400	1.350	1200		1	1.007	3.050	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	18.200	Additional Storage (m³/ha)	0.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	25	0	0

Node 10_OUT Online Pump Control

Flap Valve	x	Invert Level (m)	0.770	Switch off depth (m)	0.850
Replaces Downstream Link	✓	Switch on depth (m)	0.900		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.800	30.000	5.000	30.000

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	225

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	240.0	0.0	1.500	240.0	0.0	1.501	0.0	0.0

Results for 100 year +25% CC Critical Storm Duration. Lowest mass balance: 99.82%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1	84	5.951	1.701	34.4	1.9238	107.8362	FLOOD
240 minute winter	2	84	5.897	1.917	34.7	2.1681	100.1531	FLOOD
240 minute winter	3	92	5.930	1.880	28.1	2.1263	63.1137	FLOOD
240 minute winter	4	132	5.883	2.133	42.7	2.4124	0.0000	FLOOD RISK
240 minute winter	5	132	4.724	0.879	15.9	0.9936	0.0000	SURCHARGED
240 minute winter	6	136	4.699	1.132	55.1	1.2799	0.0000	SURCHARGED
240 minute winter	7	136	4.354	1.054	69.9	1.1924	0.0000	SURCHARGED
600 minute winter	8	435	4.179	1.300	61.5	1.4704	0.0000	SURCHARGED
600 minute winter	9	435	4.049	0.839	3.0	0.9487	0.0000	SURCHARGED
600 minute winter	10	435	4.049	2.249	68.2	363.3381	0.0000	SURCHARGED
600 minute winter	10_OUT	435	4.046	2.276	30.7	3.2582	0.0000	OK
240 minute winter	11	4	3.050	0.000	30.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	1	1.000	2	11.2	0.639	0.786	0.7271	
240 minute winter	2	1.001	4	20.4	1.159	1.390	0.5897	
240 minute winter	3	2.000	4	13.5	0.766	0.893	0.7271	
240 minute winter	4	1.002	6	42.2	2.397	2.884	0.4722	
240 minute winter	5	3.000	6	15.7	0.322	0.292	2.1978	
240 minute winter	6	1.003	7	55.0	1.124	1.100	2.4497	
240 minute winter	7	1.004	8	69.7	1.426	1.311	3.4131	
600 minute winter	8	1.005	10	61.7	1.390	1.025	3.5595	
600 minute winter	9	4.000	10	3.0	0.749	0.040	1.4415	
600 minute winter	10	1.006	10_OUT	30.7	0.759	0.242	3.0317	
600 minute winter	10_OUT	Pump	11	30.0				1116.8

APPENDIX C SURFACE WATER INFILTRATION REQUIREMENT FOR CORONATION WOOD AREA

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	30	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.200	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	10.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.358	10.00	5.951	1200	647038.104	263361.118	1.701
2	0.299	10.00	5.897	1200	646996.808	263361.692	1.917
3	0.293	10.00	5.930	1200	647038.569	263394.615	1.880
4	0.272	10.00	5.909	1200	646997.273	263395.188	2.159
5	0.165	10.00	5.742	1200	646970.125	263346.519	1.897
6	0.040	10.00	5.684	1200	646970.709	263391.457	2.117
7	0.155	10.00	5.812	1200	646971.398	263441.546	2.512
8	0.073	10.00	5.000	1200	647004.484	263502.999	2.121
9	0.065	10.00	4.427	1200	647044.435	263536.245	1.217
10	0.075	10.00	4.424	1350	647041.642	263565.589	2.624
10_OUT			4.400	1350	647034.258	263583.241	2.630
11			4.400	1200	647028.852	263594.749	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	41.300	0.600	4.250	3.980	0.270	153.0	150	10.85	50.0
1.001	2	4	33.499	0.600	3.980	3.750	0.230	145.6	150	11.52	50.0
2.000	3	4	41.300	0.600	4.050	3.750	0.300	137.7	150	10.85	37.2
1.002	4	6	26.825	0.600	3.750	3.567	0.183	146.6	150	11.69	35.7
3.000	5	6	44.942	0.600	3.845	3.567	0.278	161.7	250	10.95	37.0
1.003	6	7	50.094	0.600	3.567	3.300	0.267	187.6	250	12.57	34.3
1.004	7	8	69.794	0.600	3.300	2.879	0.421	165.8	250	13.40	33.1
1.005	8	10	72.789	0.600	2.879	2.319	0.560	130.0	250	14.15	32.1
4.000	9	10	29.477	0.600	3.210	2.859	0.351	84.0	250	10.36	38.1
1.006	10	10_OUT	19.134	0.600	1.800	1.770	0.030	637.8	450	14.51	31.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.810	14.3	48.5	1.551	1.767	0.358	0.0	150	0.825
1.001	0.830	14.7	89.0	1.767	2.009	0.657	0.0	150	0.846
2.000	0.854	15.1	29.5	1.730	2.009	0.293	0.0	150	0.870
1.002	0.828	14.6	118.2	2.009	1.967	1.221	0.0	150	0.843
3.000	1.097	53.9	16.6	1.647	1.867	0.165	0.0	95	0.970
1.003	1.018	50.0	132.6	1.867	2.262	1.427	0.0	250	1.037
1.004	1.084	53.2	141.9	2.262	1.871	1.582	0.0	250	1.104
1.005	1.225	60.1	143.9	1.871	1.855	1.654	0.0	250	1.248
4.000	1.527	75.0	6.7	0.967	1.315	0.065	0.0	50	0.954
1.006	0.797	126.8	153.7	2.174	2.180	1.794	0.0	450	0.808

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.007	10_OUT	11	12.715	0.600	4.250	3.050	1.200	10.6	150	14.58	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.007	3.113	55.0	243.1	0.000	1.200	1.794	0.0	150	3.171

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	41.300	153.0	150	Circular	5.951	4.250	1.551	5.897	3.980	1.767
1.001	33.499	145.6	150	Circular	5.897	3.980	1.767	5.909	3.750	2.009
2.000	41.300	137.7	150	Circular	5.930	4.050	1.730	5.909	3.750	2.009
1.002	26.825	146.6	150	Circular	5.909	3.750	2.009	5.684	3.567	1.967
3.000	44.942	161.7	250	Circular	5.742	3.845	1.647	5.684	3.567	1.867
1.003	50.094	187.6	250	Circular	5.684	3.567	1.867	5.812	3.300	2.262
1.004	69.794	165.8	250	Circular	5.812	3.300	2.262	5.000	2.879	1.871
1.005	72.789	130.0	250	Circular	5.000	2.879	1.871	4.424	2.319	1.855
4.000	29.477	84.0	250	Circular	4.427	3.210	0.967	4.424	2.859	1.315
1.006	19.134	637.8	450	Circular	4.424	1.800	2.174	4.400	1.770	2.180
1.007	12.715	10.6	150	Circular	4.400	4.250	0.000	4.400	3.050	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.000	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.002	4	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.003	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.004	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.005	8	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
4.000	9	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.006	10	1350	Manhole	Adoptable	10_OUT	1350	Manhole	Adoptable
1.007	10_OUT	1350	Manhole	Adoptable	11	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	18.200	Additional Storage (m³/ha)	0.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

240 | 360 | 480 | 600 | 720 | 960 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	20	0	0

Node 10_OUT Online Pump Control

Flap Valve	x	Invert Level (m)	0.770	Switch off depth (m)	0.850
Replaces Downstream Link	✓	Switch on depth (m)	0.900		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.800	20.000	5.000	20.000

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	184

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	360.0	0.0	1.500	360.0	0.0	1.501	0.0	0.0

Node 11 Soakaway Storage Structure

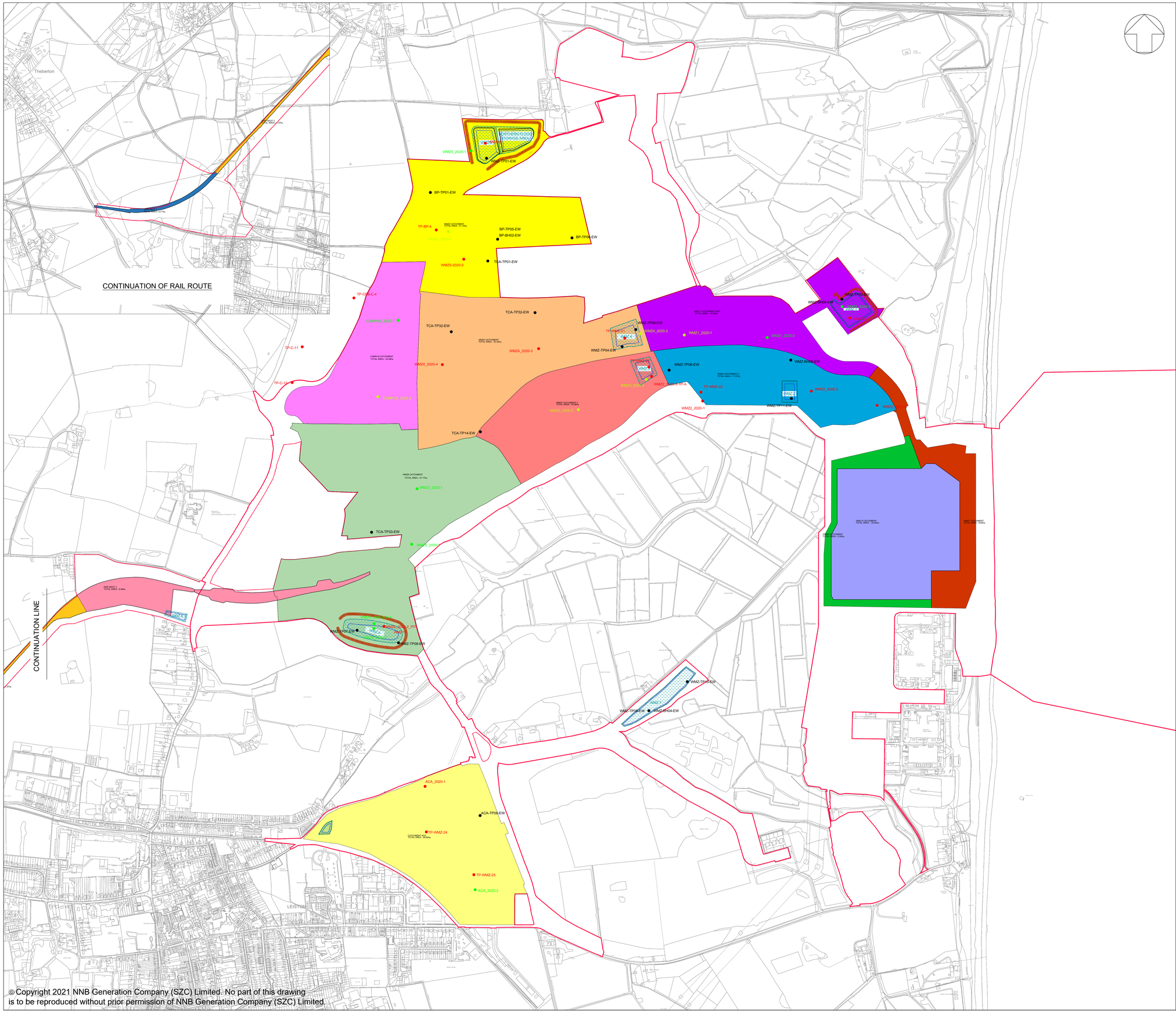
Base Inf Coefficient (m/hr)	0.04680	Invert Level (m)	3.050	Depth (m)	3.000
Side Inf Coefficient (m/hr)	0.04680	Time to half empty (mins)	928	Inf Depth (m)	2.000
Safety Factor	1.5	Pit Width (m)	20.000	Number Required	1
Porosity	1.00	Pit Length (m)	30.000		

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1	92	5.951	1.701	25.2	1.9238	63.4634	FLOOD
240 minute winter	2	96	5.897	1.917	27.0	2.1681	43.9896	FLOOD
240 minute winter	3	104	5.930	1.880	20.6	2.1263	21.1306	FLOOD
240 minute winter	4	128	5.782	2.032	42.4	2.2980	0.0000	FLOOD RISK
240 minute winter	5	128	4.299	0.454	11.6	0.5136	0.0000	SURCHARGED
240 minute winter	6	128	4.284	0.717	53.2	0.8112	0.0000	SURCHARGED
240 minute winter	7	128	3.938	0.638	64.0	0.7216	0.0000	SURCHARGED
240 minute winter	8	128	3.255	0.376	69.1	0.4254	0.0000	SURCHARGED
240 minute winter	9	128	3.252	0.042	4.5	0.0475	0.0000	OK
480 minute winter	10	368	2.897	1.097	65.0	396.4155	0.0000	SURCHARGED
480 minute winter	10_OUT	368	2.896	1.126	20.5	1.6115	0.0000	OK
960 minute winter	11	1050	4.159	1.109	20.0	666.4952	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute winter	1	1.000	2	11.0	0.624	0.767	0.7271
240 minute winter	2	1.001	4	20.2	1.150	1.379	0.5897
240 minute winter	3	2.000	4	13.7	0.776	0.905	0.7271
240 minute winter	4	1.002	6	41.9	2.380	2.865	0.4722
240 minute winter	5	3.000	6	11.6	0.259	0.215	2.1978
240 minute winter	6	1.003	7	53.1	1.095	1.063	2.4497
240 minute winter	7	1.004	8	64.0	1.309	1.203	3.4131
240 minute winter	8	1.005	10	69.1	1.422	1.148	3.5595
240 minute winter	9	4.000	10	4.5	0.842	0.060	0.1575
480 minute winter	10	1.006	10_OUT	20.5	0.687	0.162	3.0317
480 minute winter	10_OUT	Pump	11	20.0			
960 minute winter	11	Infiltration		6.2			

ANNEX 2A.2: LOCATION OF GEOTECHNICAL INVESTIGATIONS ON MDS AND INFILTRATION TESTING CONFIDENCE



NOTES:

KEY:

- PROPOSED INFILTRATION & PERMEABILITY TESTS IN UPCOMING TCA &ACA GI
- INFILTRATION TEST_CONFIDENCE CATEGORY 4
- INFILTRATION TEST_CONFIDENCE CATEGORY 3
- INFILTRATION TEST_CONFIDENCE CATEGORY 2
- INFILTRATION TEST_CONFIDENCE CATEGORY 1

NOT PROTECTIVELY MARKED

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EDF CGN

DOCUMENT:

Annex 2A.2: Location of Geotechnical Investigations on MDS and Infiltration Testing Confidence

DRAWING TITLE:

SIZEWELL C - GEOTECHNICAL INVESTIGATIONS - LOCATIONS

DRAWING NO:

SZC-EW0310-ATK-XX-000-XXXXXX-DRW-CIV-000018

DATE:	DRAWN:	SCALE:	REV:
OCT2021	BM	1:5000@A0	01

SCALE BAR:

100m 0m 100m 200m 300m
Scale 1:5000

ANNEX 2A.3: MAIN DEVELOPMENT SITE WATER MANAGEMENT ZONE SUMMARY

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1 INTRODUCTION

1.1.1 This document has been prepared to provide further background to the surface water management proposals for Sizewell C (SZC) nuclear power station basic design. The surface water proposals prioritise Sustainable Drainage Systems (SuDS) which are incorporated across the site in the forms of swales, infiltration trenches, permeable pavements and infiltration basins. These have been provisioned for early in the project. This document provides an overview about the Main Development Site water management zone (WMZ) infiltration basins, identifying design parameters and providing assurance that there is adequate storage on site for various storm events throughout the power station construction duration. Infiltration basins are proposed across the site in the Temporary Construction Area (TCA), Ancillary Construction Area (ACA), and the Green Rail route. The ACA is also known as the Land East of Eastlands Industrial Estate (LEEIE). In this document this will be referred to as the ACA.

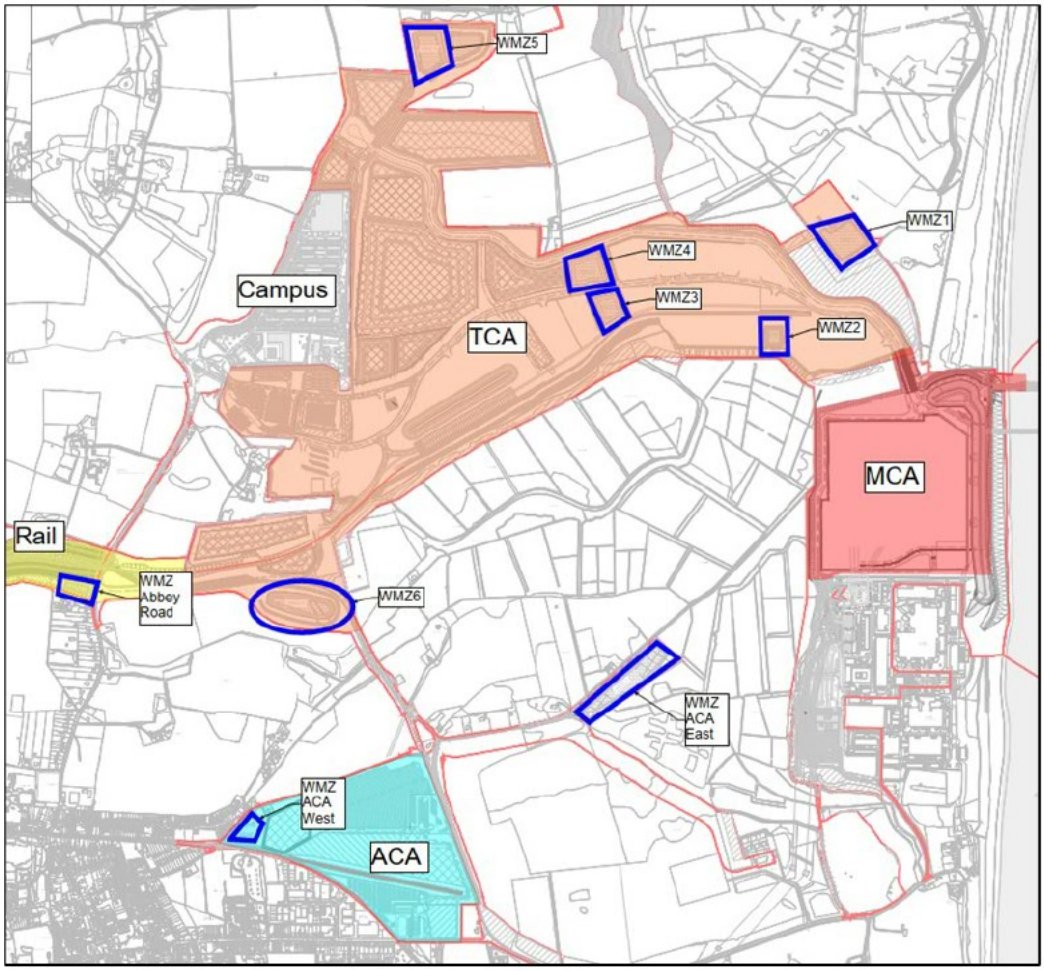
1.1.2 This note provides details of the WMZ infiltration basins for the established site. Temporary surface water control measures such as temporary sediment ponds will be required in areas prior to some of the WMZ infiltration basins are installed. The locations of the temporary surface water controls measures are to comply with the Code of Construction Practice (CoCP) and will be detailed alongside the construction sequencing with the Contractor.

1.1.3 The information presented in this report is in accordance with the overarching drainage principles that are documented in the SZC Development Consent Order (DCO) Outline Drainage Strategy at Volume 2, Chapter 2, Appendix 2A of the Environmental Statement [APP-181].

1.2 Background

1.2.1 The extent of the SZC Main Development Site (MDS) is set by the red line boundary shown in the Construction Site Plot Plan (CSPP). This incorporates the ACA, TCA, Main Construction Area (MCA), and Railway to the west. These areas are approximately outlined in Figure 1-1. Surface water drainage infrastructure will be required for all areas within the red line boundary and to ensure no surface water, other than at controlled greenfield runoff rates, will runoff the site up to a 1:100 year storm including climate change.

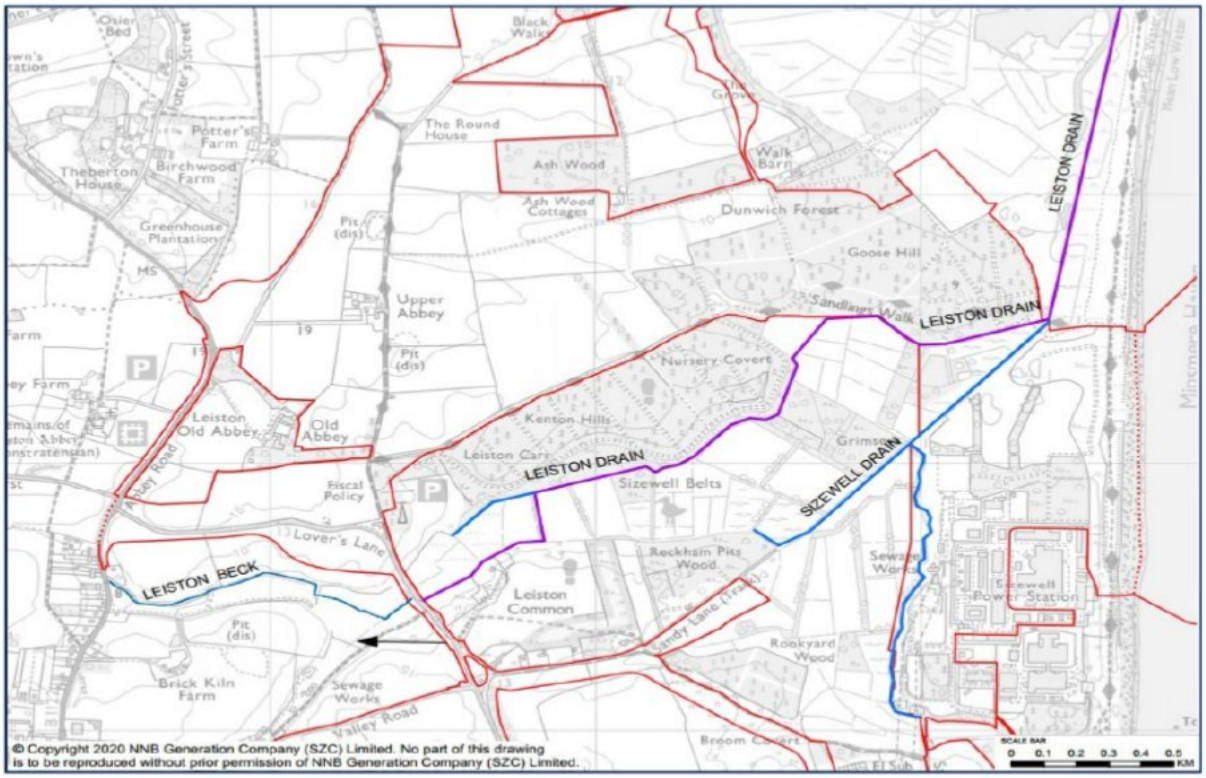
Figure 1-1 - Site plot plan with construction areas



1.2.2 Existing Site

1.2.3 The existing site is largely grassland across the TCA and the ACA. The MCA is also grassland with some ancillary Sizewell B buildings. The land to the south of the TCA is a Site of Special Scientific Interest (SSSI), which contains multiple watercourses, including two formal watercourses: the Leiston Drain and the Sizewell Drain. Surface water on the existing site currently infiltrates to ground and/or enters local watercourses which include the Leiston and Sizewell Drains and other minor tributaries – see Figure 1-2.

Figure 1-2 - Existing Surface Water Drains



1.2.4 Main Development Site Water Management Zones

1.2.5 The surface water drainage design is required to capture all surface water runoff from within the red line boundary, as defined in the Outline Drainage Strategy described in the Development Consent Order (DCO). To ensure that the construction site mimics the existing site surface water management, the runoff will be discharged through infiltration to ground where possible with some outfalls to existing watercourses or to the sea where necessary.

1.2.6 To manage the runoff across the MDS, catchments were identified across the TCA, ACA, MCA and Railway area. The following catchments were defined in the Outline Drainage Strategy:

- TCA – Catchments 1 to 6,
- ACA – Catchment ACA,
- MCA – Catchments 7 to 9,
- Railway

1.2.7 The surface water runoff within each catchment is proposed to infiltrate either directly through a permeable surface, or via a Sustainable Drainage System (SuDS) which will include:

- Swales;
- Infiltrations trenches; and,
- Infiltration basins (Water Management Zones).

1.2.8 Where suitable, the surfaces of the catchments are proposed to be permeable, so surface water will infiltrate to ground in the first instance. Any runoff that does not infiltrate directly will be captured through swales that border each catchment. The swales provide local source control to ensure the management of water returning to the ground to mimic the existing condition. The swales contain an infiltration trench beneath them which will encourage further infiltration, as well as provide additional storage. Any water that does not infiltrate through the infiltration trench into the surrounding ground will be captured by a perforated pipe within the trench, which will convey the flow to a Water Management Zone (WMZ) infiltration basin. This concept is shown in Figure 1-3 below. More frequent storm events will not need to overflow into the WMZ infiltration basins and surface water will be primarily discharged through infiltration at source. In less frequent storm events, the WMZ infiltration basins will be used to attenuate and infiltrate surface water and as such have been sized so they have capacity for a 1:100-year storm event including climate change.

1.2.9 Infiltration basins in catchments 1, 2, 3, and 6 have an outlet to nearby watercourses, restricted to greenfield runoff rates, and to be agreed with external stakeholders Suffolk County Council (SCC), Environment Agency (EA) and/or Internal Drainage Board (IDB) where applicable. As an additional backup measure, the WMZ infiltration basins for catchments 1-4 have an allowance for an overflow into a conventional drainage system (spine network) discharging to the combined drainage outfall (CDO) which discharges to the sea. Hydraulic modelling shows this network is not required; this spine network has only been included at this stage as a precaution.

Figure 1-3 - Surface water runoff capture and discharge process

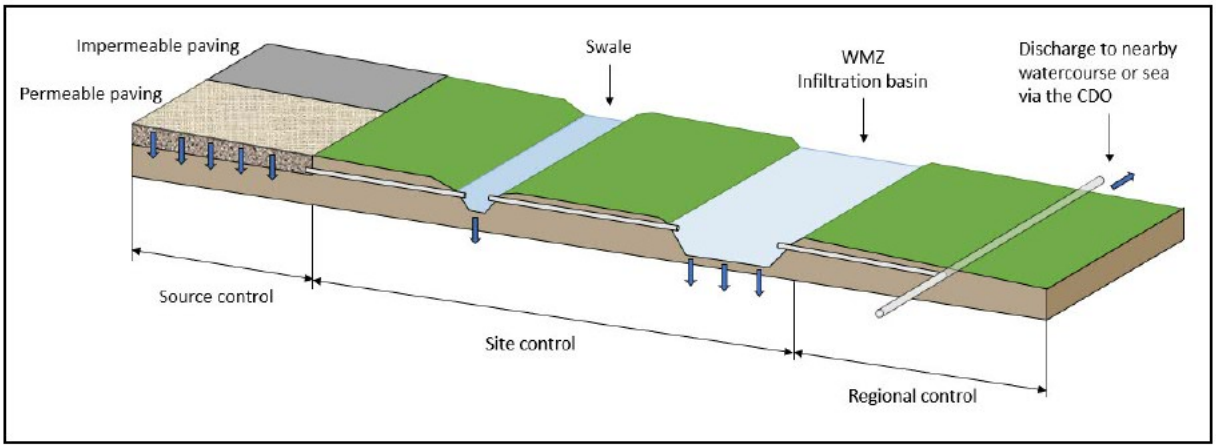
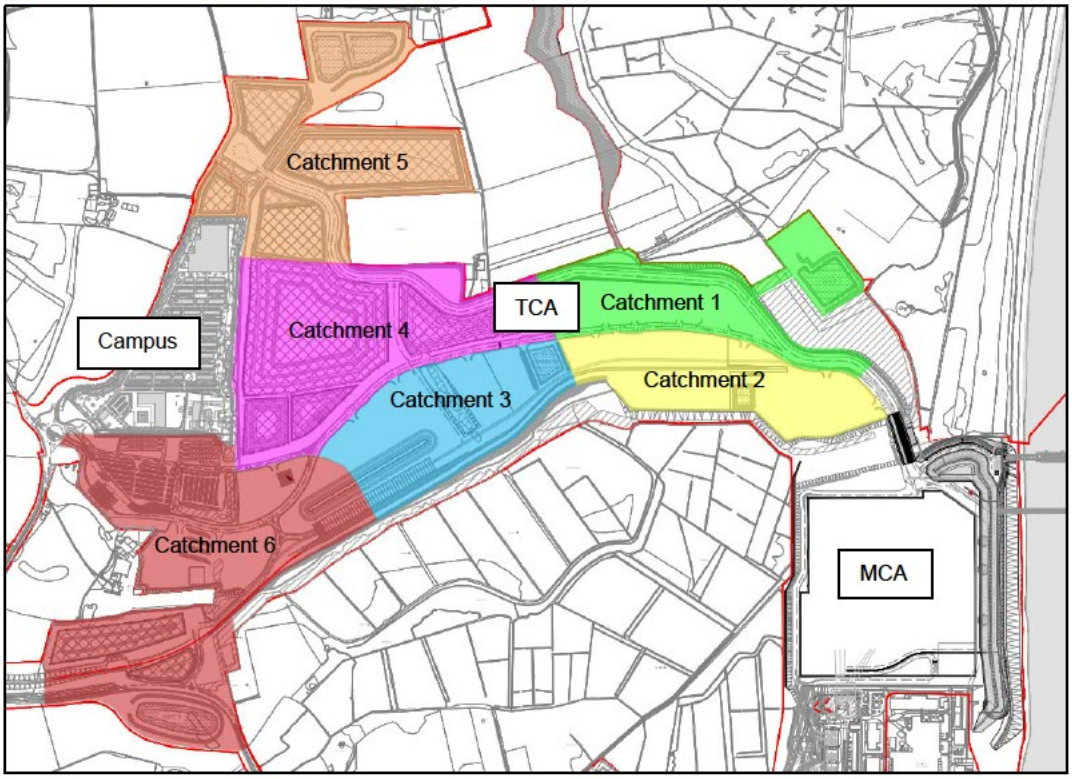


Figure 1-4 - TCA Enabling Works surface water drainage catchments



1.3 Scope

1.3.1 This document provides a summary of infiltration basins that are required to manage surface water runoff during the enabling works, in line with the Enabling Works surface water drainage strategy. The document presents the hydraulic assessment of the WMZs across the TCA, ACA and Railway area.

1.3.2 This document does not address the design of other minor SuDS features such as swales, infiltration trenches, and permeable paving. These features will be further detailed in future proposals, in conjunction with Contractor involvement.

2 DESIGN REQUIREMENTS

2.1.1 In accordance with the Outline Drainage Strategy, all infiltration basins within the MDS are designed to cater for a 100-year flood event plus a 20% allowance for climate change. This section summarises the design parameters used in the hydraulic assessment to determine the size of the WMZ infiltration basins. The volume assessment was conducted using MicroDrainage Source Control using the parameters and assumptions in the following sections. By sizing the infiltration basins using Source Control and not considering additional storage in the upstream network, the storage volumes calculated are conservative and will be able to be reduced in the next design phase.

2.2 General Parameters

2.2.1 The parameters in Table 2-1 were used to determine approximate storage volumes required for critical storm events for 100-year return period for a storm duration of up to 24 hours, including a 20% allowance for climate change in accordance with the Outline Drainage Strategy.

Table 2-1 - Input parameters for MicroDrainage Source Control storage volumes

	Parameter	Notes
Rainfall-Runoff method	Flood Studies Report (FSR), Flood Estimation Handbook (FEH) 1999 and 2013	Sensitivity check using FEH 1999 and 2013
Return Period (years)	100	As per DCO Outline Drainage Strategy [1]
Storm duration (minutes)	15 – 1440	As per DCO Outline Drainage Strategy [1]
Climate Change (%)	20	As per DCO Outline Drainage Strategy [1] and EA guidance [2]
Volumetric Runoff Coefficient	Varies per catchment	Wallingford Procedure Vol 1 Equation 7.3
Freeboard (mm)	300	CIRIA C753 – The SuDS Manual
Factor of Safety	1.5	[3]

[1] Environmental Statement – 6.3 Volume 2 Main Development Site, Chapter 2 Description of the Permanent Development, Appendix 2A Outline Drainage Strategy (EN010012-001802-SZC_Bk6_ES_V2_Ch2_Appx2A)

[2] Environment Agency – Flood risk assessment: climate change allowances - Table 2: peak rainfall intensity allowance in small catchments (less than 5 km^2) or urban drainage catchments (based on a 1961 to 1990 baseline)

[3] Table 25.2 in the CIRIA SuDS manual provides guidance on which Factor of Safety (FoS) to use given a range of areas and consequences of failure. Given this area is a temporary construction site for 10 years with infiltration basins designed for a 1:100 year return period, assuming only infiltration through the sides of the basin, and the selected infiltration rates are the worst case rates from a series of GI campaigns, it is proposed to use a FoS of 1.5 as opposed to 5 or 10. Use of a FoS of 5 or 10 would require even greater oversized infiltration basins which is not deemed necessary, especially where the basins have an overflow to the spine network.

2.2.2 All three rainfall-runoff methods were used to undertake sensitivity checks on the design volumes. It was noted that the FEH 2013 rainfall-runoff method generally provided more conservative values for greater return periods in comparison to FEH 1999 and FSR.

2.2.3 As the Sizewell development site is extensive, two FEH data sets were necessary to undertake the hydraulic modelling and are shown in Table 2-2 below. The rainfall data set used in the ACA drainage modelling was 'GB 647050, 262950', whereas all other areas used data set 'GB 647450, 264900'.

Table 2-2 - FEH 1999 rainfall parameters

FEH Site	C (1km)	D1 (1km)	D2 (1km)	D3 (1km)	E (1km)	F (1km)
GB 647050 262950	-0.019	0.298	0.279	0.207	0.309	2.506
GB 647450 264900	-0.02	0.299	0.272	0.215	0.311	2.506

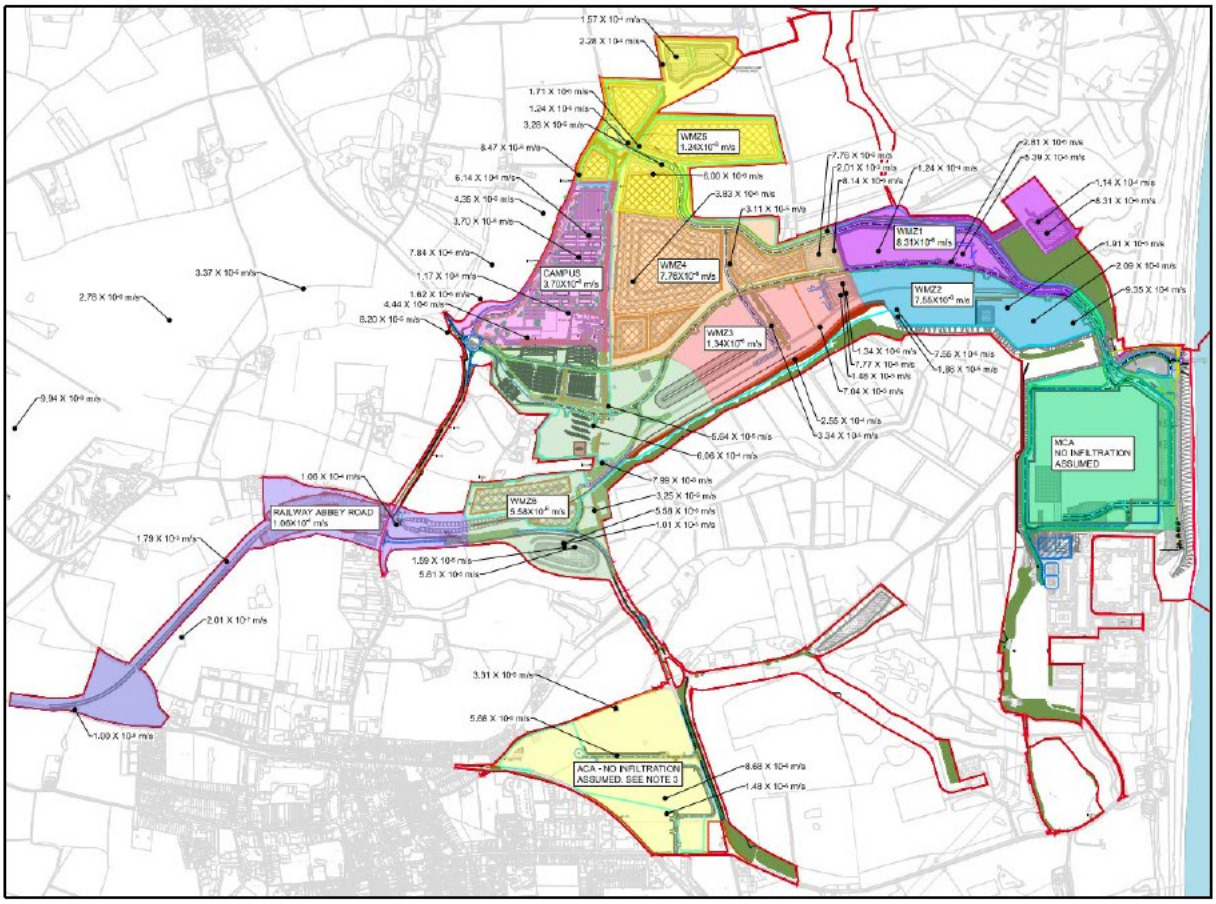
2.2.4 Using FSR, Sizewell, Suffolk was used as the location with M5-60 and 'r' ratio of 18.2 mm and 0.4 taken respectively. Storage estimates using all rainfall-runoff methods are included in this document.

2.2.5 Attenuation structures are modelled in Source Control to have side slopes of 1:3. The infiltration rate has been applied to the side walls of the attenuation structure only. No infiltration is applied to the base of the structure to account for any loss of efficiency over the design life.

2.3 Infiltration rates

2.3.1 Several ground investigation (GI) campaigns have been undertaken across the site to determine the infiltration potential across various catchment areas. The figure below summarises the range of infiltration rates recorded in four separate campaigns in 2014, 2015, 2017 and 2020. The lowest (worst-case) rate for each catchment has been used at this design stage for surface water calculations, specifically to calculate the storage volume required in infiltration basins. Further GI campaigns are planned, and results will be included during the next design stage. The geology across the site is largely sandy which provides confidence that the infiltration rates used in the surface water design are conservative.

Figure 2-1 - Infiltration rates (refer to drawing SZC-EW0320-ATK-XX-000-XXXXXX-DRW-CCD-000001 in Annex A)



2.3.2 In order to calculate the contributing areas to each of the water management zones, they have been assessed based on their land use with their appropriate percentage impermeable (PIMP) value for each area type:

- Roofed buildings: 100%
- Asphalt roads/pavements: 90%
- Gravel areas: 50%
- Road verges: 50%
- Stockpile area: 30%
- Grassed areas: 30%

2.3.3 Using the above PIMP values and known areas within each catchment, a source control model has been run to provide assurance that the design storage is able to be catered for within the WMZ infiltration basins.

2.4 Water Quality

2.4.1 The purpose of this document is to provide clarity around sizing of WMZ infiltration basins, however quality of surface water runoff from the site is also important and therefore is summarised in this section. Surface water discharges to, in order of preference, the ground, nearby watercourses, or the sea.

2.4.2 Discharges to nearby watercourses and the sea will be controlled through permit applications and ongoing monitoring to ensure the quality of the water meets the Environment Agency's (EA) criteria prior to discharge.

2.4.3 There are possible contaminants that need to be considered in surface water treatment design across the site. These are divided into:

- Sediment runoff
- Chemical spills, including concrete batching plant, waste consolidation centre and fuel farm.

2.4.4 Treatment of sediment runoff will be managed through the implementation of SuDS features on site, including:

- Swales
- Infiltration trenches
- Hay bales (around stockpiles)
- Silt fences (where suitable)
- WMZ infiltration basins

2.4.5 The positioning and location of these features will be further defined in the following design phases and will follow overarching principles in the CIRIA SuDS Manual (C753) as well as the Outline Drainage Strategy document.

2.4.6 Treatment of chemical spills will be required at source, by specific treatment systems. For example, around the fuel storage area the pavement will be impermeable to prevent fuel seeping into the groundwater. Any potential oil spills will be captured and treated via an oil interceptor sized and designed suitably for the potentially contaminated spill volumes.

2.4.7 The assessment of water quality risk management for each WMZ will be provided through the simple index approach as outlined in Section 26.7.1 of the CIRIA SuDS Manual (C753). This method will ultimately determine

what SuDS measures are required to treat different types of developments across the MDS. The steps are set out as:

Step 1 – Allocate suitable pollution hazard indices for the proposed land use
Step 2 – Select SuDS with a total pollution mitigation index that equals or exceeds the pollution hazard index
Step 3 – Where the discharge is to protected surface waters or groundwater, consider the need for a more precautionary approach

2.4.8 Proposed SuDS features within each catchment will be used to determine a total pollution mitigation index (Table 26.3 CIRIA SuDS Manual). Where additional SuDS features are not considered appropriate at this design stage, proprietary, non-SuDS treatment may be proposed. This assessment will be carried out for each WMZ in the next design phase.

2.5 Discharge Rates

2.5.1 Proposed discharge rates from infiltration basins to nearby watercourses have been defined following the Environment Agency guidance (Report SC030219 – Rainfall runoff management for developments). A Q_{bar} (peak rate of flow from a catchment for the mean annual flood - return period of approximately 1:2.3 years) greenfield runoff rate has been calculated for each catchment using UK SuDS guidance. In some cases (the ACA), this is the proposed restricting flow rate. Across the TCA however, it is noted that Q_{bar} is extremely small, and therefore the Environment Agency guidance is followed, whereby if Q_{bar} is less than 1 l/s/ha, the latter can be proposed as a limiting discharge rate. Where an outfall is proposed from an infiltration basin to nearby watercourses in the TCA and rail catchments, this is the proposed approach.

2.5.2 It is important that the SSSI is neither overwhelmed with additional surface water runoff, nor starved of surface water during the construction and operation of SZC. Maintaining the status quo of how the existing site drains is required to ensure the SSSI retains its current ecological and hydrological features. This has been reinforced by conversations with the EA and other stakeholders and is represented in both the groundwater/surface water modelling and flood risk modelling.

3 WATER MANAGEMENT ZONES

3.1.1 Generally, the surfaces of the catchments are largely permeable, so surface water will infiltrate to ground in the first instance. Any runoff that does not infiltrate directly or captured through swales with infiltration trenches will be captured by a perforated pipe within the trench, that will convey the flow to a Water Management Zone (WMZ) infiltration basin. The WMZs are

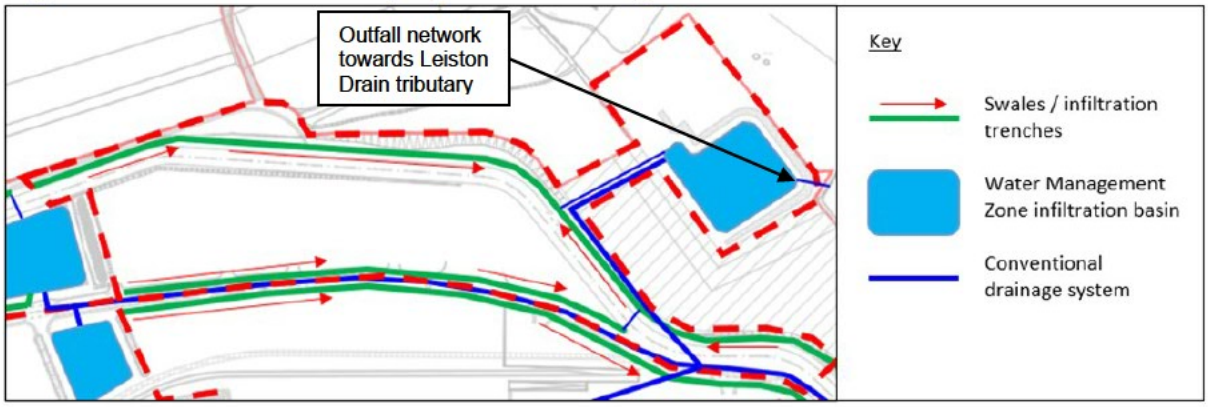
designed for 100-year return period rainfall events including climate change. In extreme rainfall events the WMZs for catchments 1-4 will overflow into a conventional drainage system (spine network) discharging to the CDO which outflows to the sea.

3.2 Catchment 1

3.2.1 Catchment 1 is located in the north eastern area of proposed TCA. This catchment houses plant and workshops such as joinery/metal workshops, a formwork factory and slurry treatment plants. It also houses the fire and rescue centre, Emergency response facility and fuel farm. The catchment encompasses sections of the site access road to the south, haul roads to north and east, and one of the Contractor's working compounds. Catchment 1 has a total area of 19.4 ha and will drain via combined swale and infiltration trenches with perforated pipes. Two main runs are proposed, north and south of the catchment, both running from the west to WMZ1 which is proposed in the east. An outfall from WMZ1 is proposed to discharge surface water to the Leiston Drain tributary east of WMZ1, at 19.4 l/s (equivalent to 1 l/s/ha). An overflow connection is also proposed from WMZ1 to the Construction Drainage Outfall (CDO).

3.2.2 Due to the nature of the use for this catchment and the risk of potential contamination, most of this area will require control and treatment of surface water runoff prior to discharge. For example, the fuel farm will be concreted, and other areas in the Contractor's compound will be hard standing if there is potential for chemical spills. A 90% PIMP factor is assumed for this catchment. The area of hardstanding may decrease in the future, however for this stage of design, a more conservative value is considered more suitable to space proof the infiltration basin.

Figure 3-1 - Catchment 1 proposed drainage



3.2.3 WMZ1

3.2.4 Alongside the general parameters stated in Section 2.2, the parameters in Table 3-1 were used to determine a conservative estimate for the required storage volume for WMZ1. The volume allocated for WMZ1 in the Civil 3D model exceeds this.

3.2.5 WMZ1 is proposed at a low point east of the TCA where the ground levels range between 2 and 3 mAOD. The groundwater contours from Winter 2018 included in the Environmental Statement showed the groundwater level is approximately 0.9 mAOD at the location of WMZ1 (see Annex B). Given the proximity to the groundwater table, infiltration from the basin is not considered feasible and the basin is assumed to be lined.

3.2.6 A more detailed figure showing the proposed arrangement of the WMZ1 basin is provided in Annex C.

Table 3-1 - Water Management Zone 1 - Infiltration Basin Summary

Design Input		**Comment**
Total catchment area	19.430 ha	
Percentage of runoff	90%	To be revised as design progresses
Volumetric runoff coefficient (Cv)	0.684, 0.746	Summer, winter respectively
Infiltration rate	0 m/s	
Overflow allowance to nearby watercourse	19.43 l/s	Assumed at 1 l/s/ha [1]
Overflow to spine network	Yes	Allowance for 200 l/s, not included in model
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	0.900 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	10770.1 m^3	1:100 year return period, 1440 winter storm
FEH 1999	13946.6 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**14690.4 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	1.200 mAOD	
Bottom of basin area	10579.2 m^2	

Top of basin area (excluding freeboard)	12618.8 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**17328 m^3**	(excluding 300mm freeboard)

[1] Based on Environment Agency guidance - Rainfall runoff management for developments ref. SC030219. Limiting discharge rates for sites should be set to Qbar or 1 l/s/ha, whichever is greater.

3.3 Catchment 2

3.3.1 Catchment 2 is south of catchment 1 and encompasses sections of the site access and haul roads at the point they converge and then cross the SSSI. It will contain Contractor compounds, including concrete batching plant, the railhead, a waste consolidation area, and several laydown areas. The catchment has a total area of approximately 17.4 ha. The majority of this area will be hardstanding and therefore a 90% PIMP factor has been assumed. The area of hardstanding may decrease in the future, however for this stage of design, a more conservative value is considered more suitable to space proof the infiltration basin.

3.3.2 The drainage in this catchment includes road edge swales to the south of the main access road collecting road runoff and runoff from the compound area north of the railhead. A separate network made up of filter drains is proposed at the compound perimeter to cater for the runoff immediately south of the railhead. The network discharges into WMZ2 to the south. An outfall from WMZ2 is proposed to discharge surface water to the Leiston Drain south of WMZ2, at 17.4 l/s (equivalent to 1 l/s/ha). An overflow connection is also proposed from WMZ2 to the Construction Drainage Outfall (CDO) via a spine network as a precaution.

Figure 3-2 - Catchment 2 proposed drainage

3.3.3 WMZ2

3.3.4 The parameters in Table 3-2 were used to determine a conservative estimate of the attenuation volume required to serve TCA Catchment 2.

Table 3-2 - Water Management Zone 2 - Infiltration Basin Summary

Design Input		**Comment**
Total catchment area	17.370 ha	
Percentage of runoff	90%	To be revised as design progresses
Volumetric runoff coefficient (Cv)	0.684, 0.746	Summer, winter respectively
Infiltration rate	7.55E-06 m/s	
Overflow allowance to nearby watercourse	17.37 l/s	Assumed at 1 l/s/ha [1]
Overflow to spine network	Yes	Allowance for 200 l/s, not included in model
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	0.800 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	9211.2 m^3	1:100 year return period, 1440 winter storm
FEH 1999	12005.4 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**12663.5 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	3.200 mAOD	
Bottom of basin area	3290.1 m^2	
Top of basin area (excluding freeboard)	6274.5 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**17694.5 m^3**	(excluding 300mm freeboard)

[1] Based on Environment Agency guidance - Rainfall runoff management for developments ref. SC030219. Limiting discharge rates for sites should be set to Qbar or 1 l/s/ha, whichever is greater.

3.4 Catchment 3

3.4.1 Catchment 3 is to the west of catchment 2 and is enclosed by roads on three sides and the rail to the south. It encompasses part of the combined site access road, a section of the railway and two Contractor's compounds. The catchment has a total area of approximately 21.0 ha. A 90% percentage of impermeable area has been allowed for in these areas conservatively, should the use of the Contractor compounds require hardstanding surfaces. This will likely be reduced in the future. A 50% PIMP has been applied to the railway sections.

3.4.2 The runoff is divided to drain into the road drainage swales proposed along the roads forming the perimeter drainage. A separate network has been designed to cater for the runoff from the unloading area platform and railway drainage. The perimeter drainage discharges to WMZ3 to the east of the catchment. An outfall from WMZ2 is proposed to discharge surface water to the Leiston Drain south of WMZ3, at 21.0 l/s (equivalent to 1 l/s/ha). An overflow connection is also proposed from WMZ3 to the Construction Drainage Outfall (CDO) via a spine network.

Figure 3-3 - Catchment 3 proposed drainage

3.4.3 **WMZ3**

3.4.4 Table 3-3 summarises the parameters used to determine a conservative estimate of the attenuation volume required and the volume space-proofed for WMZ3.

3.4.5 A more detailed figure showing the proposed arrangement of the WMZ3 basin is provided in Annex C.

Table 3-3 - Water Management Zone 3 - Infiltration Basin Summary

Design Input		Comment
Total catchment area	20.960 ha	
Percentage of runoff	90%	
Volumetric runoff coefficient (Cv)	0.684, 0.746	Summer, winter respectively
Infiltration rate	1.34E-06 m/s	
Overflow allowance to nearby watercourse	20.96 l/s	Assumed at 1 l/s/ha [1]
Overflow to spine network	Yes	Allowance for 200 l/s, not included in model
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	1.200 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	11458.8 m^3	1:100 year return period, 1440 winter storm
FEH 1999	14887.7 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**15685.8 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	5.000 mAOD	
Bottom of basin area	3346.8 m^2	
Top of basin area (excluding freeboard)	7162.9 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**17341.0 m^3**	(excluding 300mm freeboard)

[1] Based on Environment Agency guidance - Rainfall runoff management for developments ref. SC030219. Limiting discharge rates for sites should be set to Qbar or 1 l/s/ha, whichever is greater.

3.5 Catchment 4

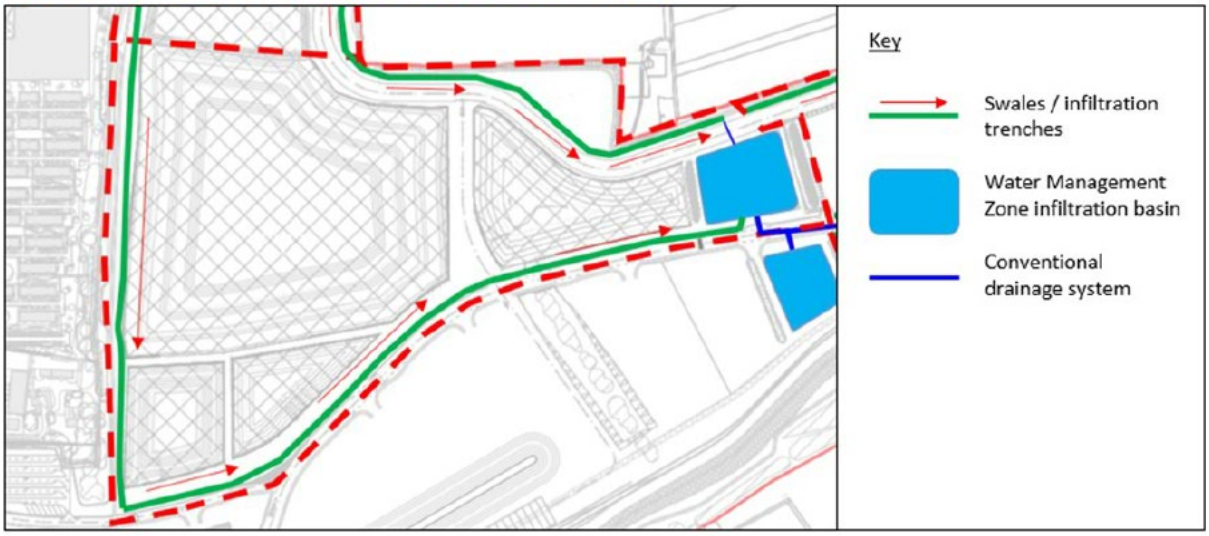
3.5.1 Catchment 4 is to the west of catchment 1. It encompasses part of the access and haul road but is predominantly material storage and stockpile area. The catchment has a total area of approximately 33.3 ha. This results

in a conservative percentage of impermeable area (PIMP) for the catchment to be 50%. As stockpiles are assigned a 30% PIMP, this figure may be reduced in the future, but for this design phase is considered conservative.

3.5.2 Perimeter road swales have been proposed along the roads to drain the runoff from the catchment. Two such networks, one from the north and the other from the south, discharge to WMZ4 located to the east of the catchment. An overflow connection is also proposed from WMZ4 to the Construction Drainage Outfall (CDO) via a spine network as a precaution.

3.5.3 A more detailed figure showing the proposed arrangement of the WMZ4 basin is provided in Annex C.

Figure 3-4 - Catchment 4 proposed drainage



3.5.4 **WMZ4**

3.5.5 Table 3-4 summarises the parameters used to determine a conservative estimate of the attenuation volume required and the volume space-proofed for WMZ4.

Table 3-4 - Water Management Zone 4 - Infiltration Basin Summary

Design Input		Comment
Total catchment area	33.320 ha	
Percentage of runoff	50%	
Volumetric runoff coefficient (Cv)	0.568, 0.680	Summer, winter respectively
Infiltration rate	7.76E-06 m/s	

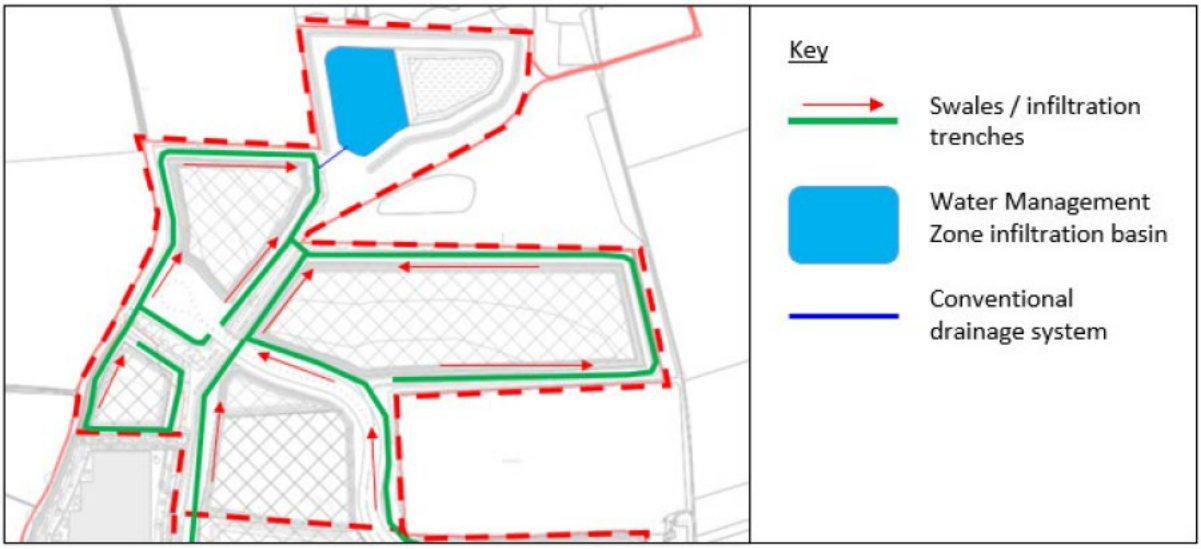
Overflow allowance to nearby watercourse	No	
Overflow to spine network	Yes	Allowance for 200 l/s, not included in model
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	1.200 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	10080.8 m^3	1:100 year return period, 1440 winter storm
FEH 1999	12795.4 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**13422.3 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	5.200 mAOD	
Bottom of basin area	4916.6 m^2	
Top of basin area (excluding freeboard)	9759.7 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**25688.8 m^3**	(excluding 300mm freeboard)

3.6 Catchment 5

3.6.1 Catchment 5 is to be north of catchment 4. It encompasses part of the haul road and is predominantly made up of proposed borrow pits and stockpile areas. The catchment has a total area of approximately 31.2 ha. A 50% PIMP factor has been applied to this area. As with catchment 4, this may be reduced in the future.

3.6.2 Two drainage networks along the site boundary have been designed as perimeter swales/infiltration trenches with perforated pipes, as well as a network surrounding the storage area. These networks discharge to WMZ5 located to the north of the catchment. No outfalls are proposed from WMZ5 at this stage.

Figure 3-5 - Catchment 5 proposed drainage



3.6.3 WMZ5

3.6.4 Table 3-5 summarises the parameters used to determine a conservative estimate of the attenuation volume required and the volume space-proofed for WMZ5.

Table 3-5 - Water Management Zone 5 - Infiltration Basin Summary

Design Input		Comment
Total catchment area	31.195 ha	
Percentage of runoff	50%	
Volumetric runoff coefficient (Cv)	0.568, 0.680	Summer, winter respectively
Infiltration rate	1.24E-06 m/s	
Overflow allowance to nearby watercourse	No	
Overflow to spine network	No	
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	1.400 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	9715.2 m^3	1:100 year return period, 1440 winter storm
FEH 1999	12296.3 m^3	1:100 year return period, 1440 winter storm

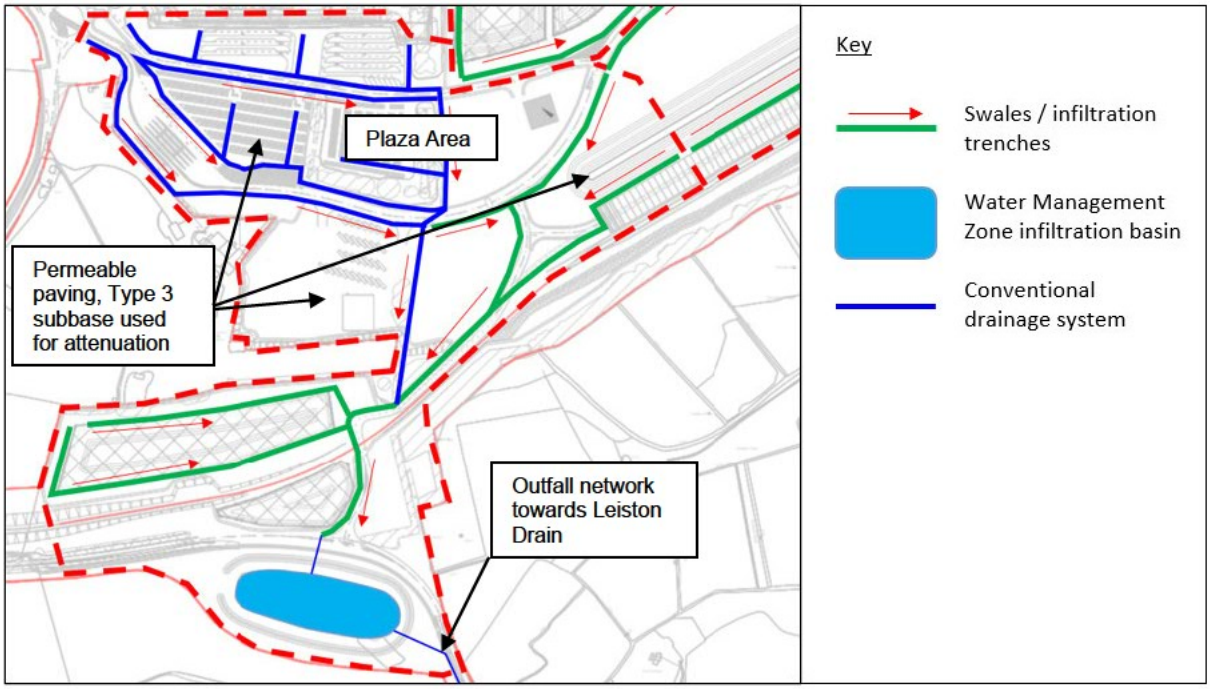
FEH 2013	12891.1 m^3	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	6.000 mAOD	
Bottom of basin area	7658.1 m^2	
Top of basin area (excluding freeboard)	9615.7 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**17223.8 m^3**	(excluding 300mm freeboard)

3.7 Catchment 6 & Plaza

3.7.1 Catchment 6 is located to the south-west of catchment 3 and encompasses site access roads, part of the railway, numerous site facilities, including rail and freight security buildings, vehicle inspection cabins, and the main TCA site offices. Catchment 6 also encompasses a sewage treatment plant, potable water storage facility and the Plaza area. The catchment has a total area of approximately 47.8 ha. A 58% PIMP has been applied to this catchment to account for stockpiles, soft landscaping and where TruckPave is proposed as hardstanding.

3.7.2 The rail drainage consists of filter drains adjacent to the track, cut off drains at the top of the cutting, and toe ditches at the bottom of the embankment. The Plaza drainage consists of filter drains along the road verges. Perimeter swales are proposed around the storage areas and adjacent to the access roads. All drainage networks discharge to WMZ6 located to the south of the catchment. An overflow is proposed to discharge runoff to the Leiston Drain near Lover's Lane.

Figure 3-6 - Catchment 6 proposed drainage



3.7.3 WMZ6

3.7.4 Table 3-6 summarises the parameters used to determine a conservative estimate of the attenuation volume required and the volume space-proofed for WMZ6.

Table 3-6 - Water Management Zone 6 - Infiltration Basin Summary

Design Input		Comment
Total catchment area	47.770 ha	
Percentage of runoff	58%	
Volumetric runoff coefficient (Cv)	0.604, 0.701	Summer, winter respectively
Infiltration rate	5.58E-06 m/s	
Overflow allowance to nearby watercourse	47.77 l/s	Assumed at 1 l/s/ha [1]
Overflow to spine network	No	
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	2.100 mAOD	Based on Environment Statement groundwater contours (Annex B)

MicroDrainage Source Control Summary		
FSR	14418.3 m^3	1:100 year return period, 1440 winter storm
FEH 1999	19117.2 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**20216.7 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	8.000 mAOD	
Bottom of basin area	7165.8 m^2	
Top of basin area (excluding freeboard)	11287.5 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**19376.0 m^3**	(excluding 300mm freeboard)

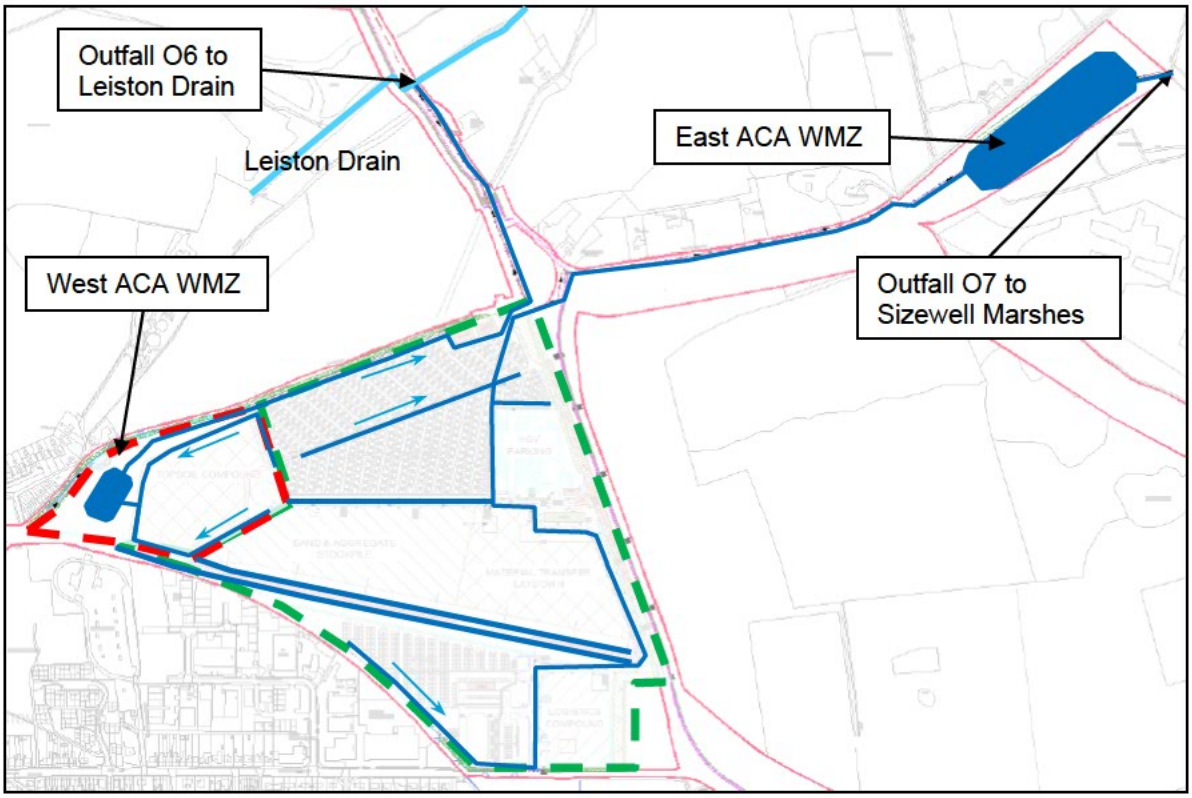
[1] Based on Environment Agency guidance - Rainfall runoff management for developments ref. SC030219. Limiting discharge rates for sites should be set to Qbar or 1 l/s/ha, whichever is greater.

3.8 Ancillary Construction Area (ACA)

3.8.1 The ACA is isolated from the TCA and MCA, and therefore has an independent surface water drainage network to that serving the main construction site. The ACA has an area of approximately 29.7 ha and encompasses caravan pitches, HGV parking, topsoil compound, sand and aggregate stockpile, material transfer laydown, park and ride and logistics compound. No infiltration is assumed within the ACA as per the DCO Outline Drainage Strategy, and runoff will be collected by a variety of features including swales, permeable paving with filter drains and conventional drainage elements.

3.8.2 Two water management zone attenuation features are proposed to store runoff prior to discharge. Runoff from the topsoil compound area and the area west of this compound (dashed red line in Figure 3-7) will be captured in swales and attenuated in the West ACA WMZ, before discharging to the Leiston Drain near Lover's Lane. Surface water runoff from all other areas (dashed green line in Figure 3-7) within the ACA will be conveyed to the East ACA WMZ, before discharging to the Sizewell Marshes. The outflows will be limited to greenfield runoff rates (Q_{bar}).

Figure 3-7 - ACA proposed drainage



3.8.3 East ACA WMZ

3.8.4 The drainage strategy within the ACA has been modified since Basic Design following agreement with the Environment Agency and Suffolk County Council to allow more runoff to be attenuated in the East WMZ and discharge to the Sizewell Marshes. Therefore, the area currently designated for the East WMZ in the construction site plot plan is being increased to meet the required volume calculated in Table 3-7.

3.8.5 The required attenuation volume for the East ACA WMZ is conservatively estimated as 21700 m^3. Further work will be undertaken during Detailed Design to determine the actual volume required, allowing for storage in the pipe network and infiltration within the WMZ.

Table 3-7 - ACA East - Infiltration Basin Summary

Design Input		Comment
Total catchment area	25.222 ha	
Percentage of runoff	100%	
Volumetric runoff coefficient (Cv)	0.761, 0.817	Summer, winter respectively
Infiltration rate	0 m/s	

Overflow allowance to nearby watercourse	59.87 l/s	Q_{bar}
Overflow to spine network	No	
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	1.000 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	15381.1 m^3	1:100 year return period, 1440 winter storm
FEH 1999	20579.7 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**21641.3 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	2.450 mAOD	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**22000 m^3**	(excluding 300mm freeboard)

3.8.6 West ACA WMZ

3.8.7 As stated above, the ACA drainage strategy is under development and the required attenuation volume for the West ACA WMZ is conservatively estimated as 3850 m^3. The current CSPP and Civil3D model includes a significantly smaller volume based on the previous ACA drainage strategy. Further modelling will be undertaken during Detailed Design to verify the size of the attenuation basin, including allowance for storage in the pipe network. Following this, the CSPP and Civil3D model will be updated accordingly.

Table 3-8 - ACA West - Infiltration Basin Summary

Design Input		Comment
Total catchment area	4.438 ha	
Percentage of runoff	100%	
Volumetric runoff coefficient (Cv)	0.761, 0.817	Summer, winter respectively
Infiltration rate	0 m/s	

Overflow allowance to nearby watercourse	10.53 l/s	Q_{bar}
Overflow to spine network	Yes	Allowance for 200 l/s, not included in model
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	2.100 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	2698.8 m^3	1:100 year return period, 1440 winter storm
FEH 1999	3623.2 m^3	1:100 year return period, 1440 winter storm
FEH 2013	**3812.3 m^3**	1:100 year return period, 1440 winter storm
Civil 3D Model Summary		
Invert level of basin	2.500 mAOD	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**4000 m^3**	Still to be modelled, but this area has been space-proofed for this size basin

3.9 West Railway Catchment 3 - Abbey Road

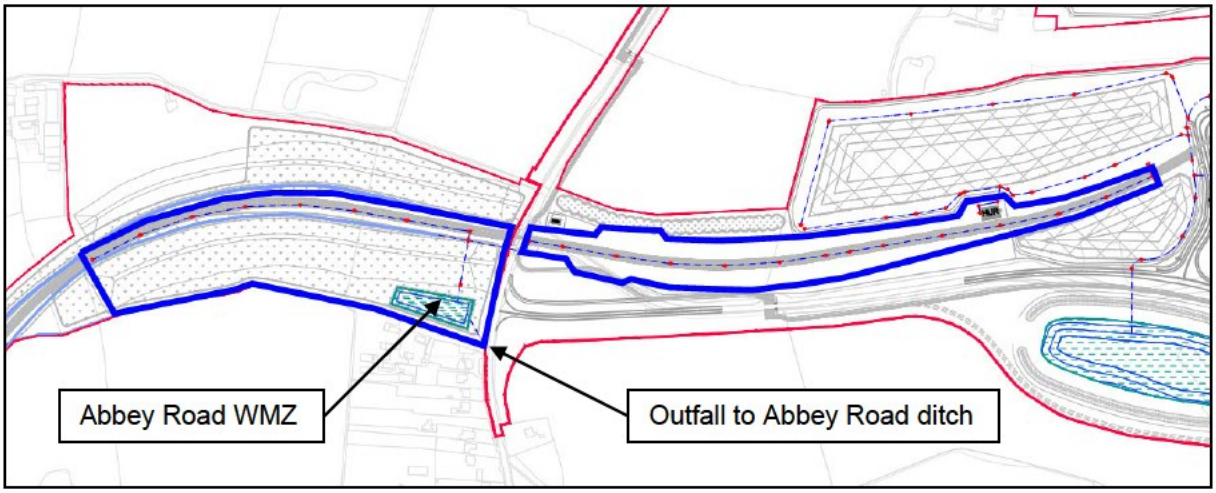
3.9.1 The West Railway Catchment 3 is one of five catchments serving the proposed Green Rail Route, which is located with the Main Development Site. The railway drainage largely relies on infiltration trenches and swales to drain the proposed track in addition to allowing continuity of existing ditches and watercourses.

3.9.2 West Railways Catchment 3 is approximately 6.5 ha and is in cutting with a level crossing at Abbey Road. Cut-off ditches are proposed on both the side of the rail cutting in order to capture the runoff from the landscape bund. A filter drain is proposed at the downside of the embankment to drain the railway runoff. A WMZ basin coupled with hydro-brake is proposed to limit the discharge as required. Runoff that does not infiltrate at source will convey to a WMZ infiltration basin and overflow to the Abbey Road ditch.

3.9.3 Figure 3-8 shows the currently proposed Abbey Road WMZ basin location. This location may be updated in the future to account for emerging flood

modelling information and existing known flooding issues in the vicinity of the current proposed WMZ basin.

Figure 3-8 - West Railway Catchment 3 – Abbey Road WMZ



3.9.4 Abbey Road WMZ

3.9.5 Table 3-9 summarises the parameters used to determine a conservative estimate of the attenuation volume required and the volume space-proofed for the Abbey Road WMZ.

Table 3-9 - Abbey Road WMZ - Infiltration Basin Summary

Design Input		Comment
Total catchment area	6.478 ha	
Percentage of runoff	50%	
Volumetric runoff coefficient (Cv)	0.568, 0.680	Summer, winter respectively
Infiltration rate	1.06E-04 m/s	
Overflow allowance to nearby watercourse	6.50 l/s	Assumed at 1 l/s/ha [1]
Overflow to spine network	No	
Sediment forebay	Included	To be detailed in next design phase
Access ramp	Included	To be detailed in next design phase
Groundwater level	3.000 mAOD	Based on Environment Statement groundwater contours (Annex B)
MicroDrainage Source Control Summary		
FSR	1048.1 m^3	1:100 year return period, 240 winter storm

FEH 1999	**1413.5 m^3**	1:100 year return period, 240 winter storm
FEH 2013	1338.8 m^3	1:100 year return period, 600 winter storm
Civil 3D Model Summary		
Invert level of basin	6.742 mAOD	
Bottom of basin area	1268.6 m^2	
Top of basin area (excluding freeboard)	1964.5 m^2	
Freeboard allowance	300mm	
Side slopes	1:3	
Total volume provided	**1872.0 m^3**	(excluding 300mm freeboard)

[1] Based on Environment Agency guidance - Rainfall runoff management for developments ref. SC030219. Limiting discharge rates for sites should be set to Qbar or 1 l/s/ha, whichever is greater.

4 SUMMARY

4.1.1 This technical note summarises the required storage volumes for each WMZ attenuation basin across the SZC enabling works site. The volumes calculated are conservative and based on several assumptions. Further hydraulic modelling will be undertaken during Detailed Design which will decrease the required storage volumes. Table 4-1 provides a summary of the worst-case hydraulic model required storage volumes against the volumes currently provided for on the CSPP.

Table 4-1 - Water Management Zone - Infiltration Basin Summary

Design Input	Design Volume (m^3) (worst case)	CAD Modelled Volume (m^3)	Comment
WMZ1	14690.4	17328	Sufficient volume provided
WMZ2	12663.5	17694.5	Sufficient volume provided
WMZ3	15685.8	17341	Sufficient volume provided
WMZ4	13422.3	25688.8	Sufficient volume provided
WMZ5	12891.1	17223.8	Sufficient volume provided
WMZ6	20216.7	19376	Sufficient volume provided [3]
WMZ – ACA west	3812.3	4000	[1],[2] Sufficient volume provided

WMZ – ACA east	21641.3	22000	[1],[2] Sufficient volume provided
WMZ – Abbey Road	1413.5	1872	Sufficient volume provided

[1] Construction site plot plan is being updated to include additional volume as necessary to account for updated discharge strategy at the ACA in accordance with recent discussions with the EA and SCC.

[2] All WMZ infiltration basins have been sized based on source control models which do not consider additional storage volume in the network. Sizing the basins in this way allows space allocation on the plot plan, so that basin volumes and footprints can likely be downsized in the next design phase.

[3] Additional storage is provided in the Type 3 subbase of the permeable paving within the carpark of the plaza to provide the required design volume.

REFERENCES

1. Outline Drainage Strategy at Volume 2, Chapter 2, Appendix 2A of the Environmental Statement [APP-181]

2. Environment Agency – Climate change allowances, Table 2. Flood risk assessments: climate change allowances - GOV.UK (www.gov.uk)

3. CIRIA - The SuDS Manual 2015. CIRIA C753

4. Fugro - Sizewell C Infiltration Testing Report on Ground Investigation without Geotechnical Evaluation. G200003U_GIR Rev 02

5. Environment Agency - Rainfall Runoff Management for Development. SC030219