waterman

CALCULATIONS

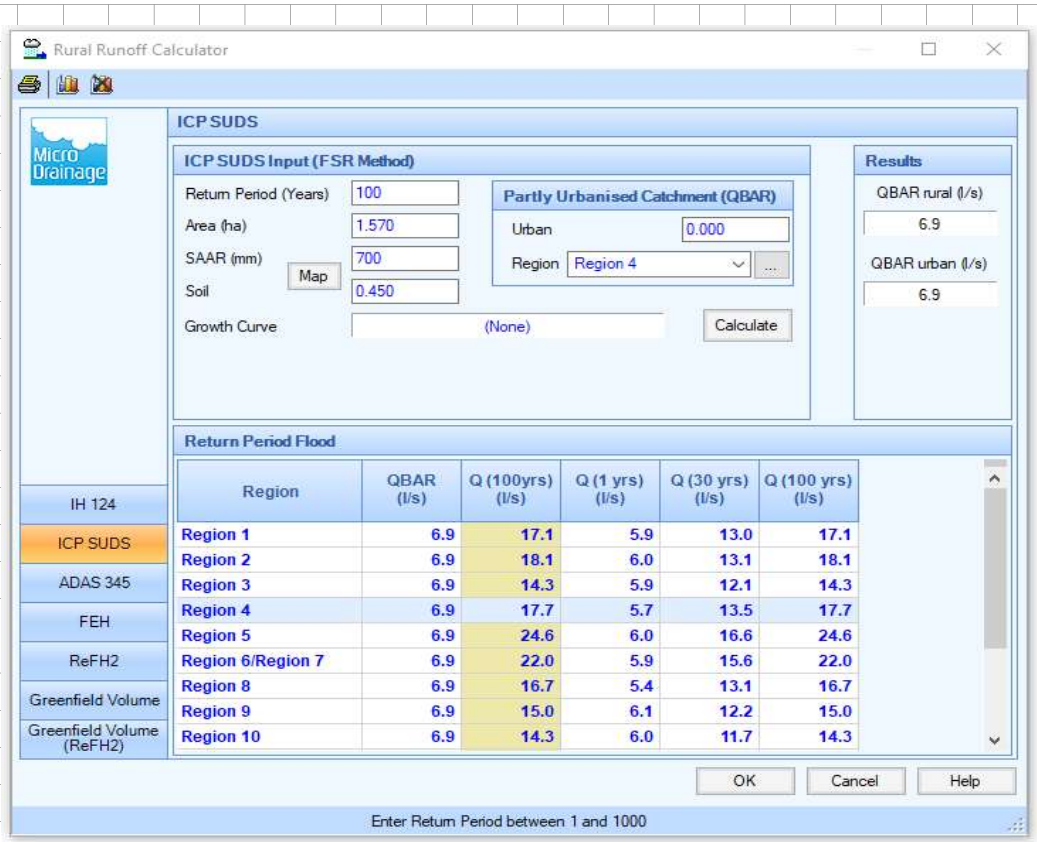
Company:	WIE	Office:	London
Sheet No:	1 of 1	Project No:	EED13833
By	K. Stokes	Date	05/07/2022
Checked:		Date	

Project Title **Mira LIF 2 - Plot Eight & Nine**

Calculations Title **Surface Water Management - ICP SUDS - Greenfields**

LOCATION	CALCULATIONS	OPTIONS

In order to calculate the rate of surface water discharge from the permeable portion of the Site, the Windes Microdrainage version W.19.1 Source Control module has been utilised. Rural runoff has been calculated using the IoH 124 Methodology, taking into account urbanisation of the London catchement. The input and output data for which are shown below;



Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	6.9	17.1	5.9	13.0	17.1
Region 2	6.9	18.1	6.0	13.1	18.1
Region 3	6.9	14.3	5.9	12.1	14.3
Region 4	6.9	17.7	5.7	13.5	17.7
Region 5	6.9	24.6	6.0	16.6	24.6
Region 6/Region 7	6.9	22.0	5.9	15.6	22.0
Region 8	6.9	16.7	5.4	13.1	16.7
Region 9	6.9	15.0	6.1	12.2	15.0
Region 10	6.9	14.3	6.0	11.7	14.3

Qbar (1 in 2.333)	6.9	l/s	*For catchment of 1.57 ha of impermeable area*
1 in 100	17.7	l/s	

Greenfield Runoff Volume

FSR Data

Return Period (years)	100
Storm Duration (mins)	360
Region	England and Wales
M5-60 (mm)	20.000
Ratio R	0.400
Areal Reduction Factor	1.00
Area (ha)	1.570
SAAR (mm)	700
CWI	105.000
Urban	0.000
SPR	47.000

Results

Percentage Runoff (%)	45.98
Greenfield Runoff Volume (m^3)	451.222

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 10
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 435950 295750 SP 35950 95750
Data Type Catchment
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 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
1.000	1	15 Winter	2	+0%	100/15 Winter		
1.001	2	15 Winter	2	+0%	30/15 Summer		
2.000	3	15 Summer	2	+0%			
1.002	4	15 Winter	2	+0%	30/15 Summer		
3.000	Dummy Rainfall L	15 Summer	2	+0%	100/15 Summer		
3.001	20	15 Winter	2	+0%	100/15 Summer		
1.003	5	15 Winter	2	+0%	100/15 Summer		
1.004	6	15 Winter	2	+0%	30/15 Summer		
1.005	7	15 Winter	2	+0%	100/15 Summer		
1.006	8	15 Winter	2	+0%	30/15 Winter		
4.000	9	15 Winter	2	+0%			
4.001	10	30 Winter	2	+0%	100/15 Summer		
5.000	11	15 Summer	2	+0%			
4.002	12	30 Winter	2	+0%	30/15 Summer		
6.000	13	15 Winter	2	+0%	100/15 Summer		
7.000	x	15 Summer	2	+0%	100/30 Winter		
4.003	14	30 Winter	2	+0%	2/15 Summer		
8.000	15	15 Summer	2	+0%			

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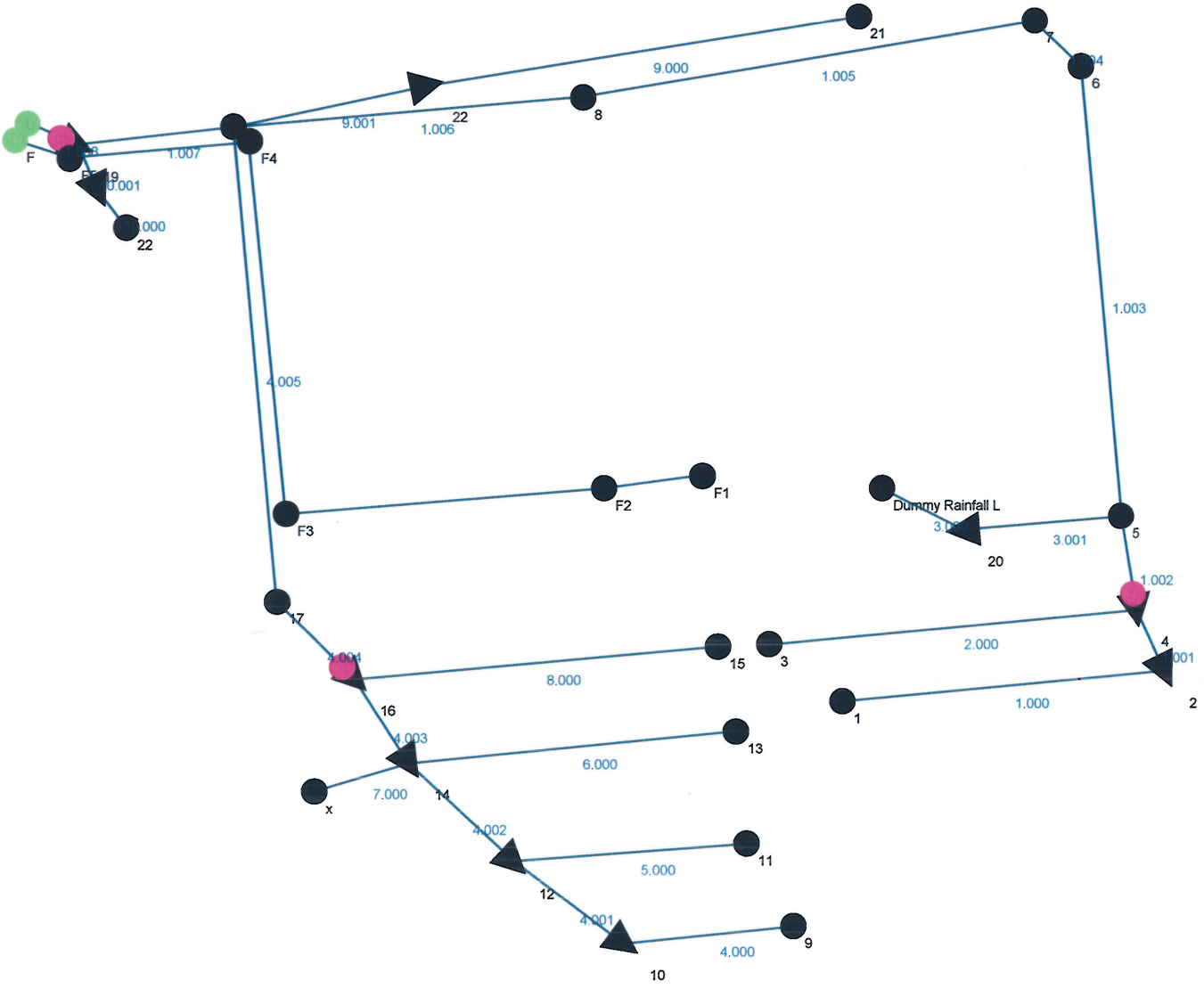
21
7
9.000
1.005
6
22
8
9.001
1.006
F
1.007
F4
22
1.003
4.005
F1
F2
F3
Dummy Rainfall L
3.001
5
20
1.002
17
4
15
3
2.000
8.000
16
1
1.000
2
13
6.000
x
7.000
14
11
5.000
12
9
4.000
10

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		94.053	-0.247	0.000	0.07		
1.001	2		93.591	-0.217	0.000	0.12		4
2.000	3		94.000	-0.300	0.000	0.00		
1.002	4		93.583	-0.020	0.000	0.09		5
3.000	Dummy Rainfall L		94.000	-0.100	0.000	0.00		
3.001	20		93.677	-0.196	0.000	0.26		7
1.003	5		93.232	-0.243	0.000	0.27		
1.004	6		92.870	-0.170	0.000	0.57		
1.005	7		92.687	-0.213	0.000	0.38		
1.006	8		92.222	-0.208	0.000	0.41		
4.000	9		94.032	-0.268	0.000	0.03		
4.001	10		93.685	-0.265	0.000	0.03		10
5.000	11		94.000	-0.225	0.000	0.00		
4.002	12		93.555	-0.070	0.000	0.08		6
6.000	13		93.807	-0.168	0.000	0.14		
7.000	x		93.900	-0.225	0.000	0.00		
4.003	14		93.548	0.153	0.000	0.18		10
8.000	15		94.000	-0.225	0.000	0.00		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	7.6	OK	
1.001	2	14.0	OK	
2.000	3	0.0	OK	
1.002	4	10.0	OK	
3.000	Dummy Rainfall L	0.0	OK	
3.001	20	33.1	OK	
1.003	5	40.8	OK	
1.004	6	61.5	OK	
1.005	7	60.5	OK	
1.006	8	59.6	OK	
4.000	9	3.0	OK	
4.001	10	4.1	OK	
5.000	11	0.0	OK	
4.002	12	8.4	OK	
6.000	13	7.8	OK	
7.000	x	0.0	OK	
4.003	14	16.5	SURCHARGED	
8.000	15	0.0	OK	

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2 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)
4.004	16	30 Winter	2	+0%	2/15 Summer				93.535
4.005	17	30 Winter	2	+0%	100/240 Winter				92.809
9.000	21	15 Winter	2	+0%	100/15 Summer				93.476
9.001	22	15 Winter	2	+0%	30/15 Summer				92.709
1.007	18	480 Winter	2	+0%	30/15 Summer				92.034
10.000	22	15 Winter	2	+0%	30/15 Summer				93.377
10.001	23	15 Winter	2	+0%	30/15 Summer				93.377
1.008	19	480 Winter	2	+0%	2/240 Winter				92.032

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
4.004	16	0.280	0.000	0.24		13	15.2	SURCHARGED	
4.005	17	-0.376	0.000	0.06			15.2	OK	
9.000	21	-0.149	0.000	0.24			13.4	OK	
9.001	22	-0.117	0.000	0.46		7	23.5	OK	
1.007	18	-0.076	0.000	0.13			26.1	OK	
10.000	22	-0.148	0.000	0.01			0.3	OK	
10.001	23	-0.081	0.000	0.74			28.1	OK	
1.008	19	0.057	0.000	0.03			4.9	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 10
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 435950 295750 SP 35950 95750
Data Type Catchment
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 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
1.000	1	15 Winter	30	+0%	100/15 Winter		
1.001	2	15 Winter	30	+0%	30/15 Summer		
2.000	3	15 Summer	30	+0%			
1.002	4	15 Winter	30	+0%	30/15 Summer		
3.000	Dummy Rainfall L	15 Summer	30	+0%	100/15 Summer		
3.001	20	15 Summer	30	+0%	100/15 Summer		
1.003	5	15 Winter	30	+0%	100/15 Summer		
1.004	6	15 Winter	30	+0%	30/15 Summer		
1.005	7	15 Winter	30	+0%	100/15 Summer		
1.006	8	480 Winter	30	+0%	30/15 Winter		
4.000	9	15 Winter	30	+0%			
4.001	10	30 Winter	30	+0%	100/15 Summer		
5.000	11	15 Summer	30	+0%			
4.002	12	30 Winter	30	+0%	30/15 Summer		
6.000	13	30 Winter	30	+0%	100/15 Summer		
7.000	x	15 Summer	30	+0%	100/30 Winter		
4.003	14	30 Winter	30	+0%	2/15 Summer		
8.000	15	15 Summer	30	+0%			

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		94.081	-0.219	0.000	0.16		
1.001	2		93.953	0.145	0.000	0.21		7
2.000	3		94.000	-0.300	0.000	0.00		
1.002	4		93.942	0.339	0.000	0.14		9
3.000	Dummy Rainfall L		94.000	-0.100	0.000	0.00		
3.001	20		93.764	-0.109	0.000	0.73		4
1.003	5		93.331	-0.144	0.000	0.67		
1.004	6		93.123	0.083	0.000	1.48		
1.005	7		92.854	-0.046	0.000	0.96		
1.006	8		92.580	0.150	0.000	0.15		
4.000	9		94.046	-0.254	0.000	0.06		
4.001	10		93.889	-0.061	0.000	0.06		15
5.000	11		94.000	-0.225	0.000	0.00		
4.002	12		93.888	0.263	0.000	0.11		24
6.000	13		93.909	-0.066	0.000	0.24		
7.000	x		93.900	-0.225	0.000	0.00		
4.003	14		93.885	0.490	0.000	0.33		21
8.000	15		94.000	-0.225	0.000	0.00		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	16.8	OK	
1.001	2	23.6	SURCHARGED	
2.000	3	0.0	OK	
1.002	4	16.0	SURCHARGED	
3.000	Dummy Rainfall L	0.0	OK	
3.001	20	93.8	OK	
1.003	5	103.5	OK	
1.004	6	158.8	SURCHARGED	
1.005	7	152.1	OK	
1.006	8	22.3	SURCHARGED	
4.000	9	6.7	OK	
4.001	10	7.7	OK	
5.000	11	0.0	OK	
4.002	12	11.1	SURCHARGED	
6.000	13	13.4	OK	
7.000	x	0.0	OK	
4.003	14	29.5	SURCHARGED	
8.000	15	0.0	OK	

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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)
4.004	16	30 Winter	30	+0%	2/15 Summer				93.867
4.005	17	30 Winter	30	+0%	100/240 Winter				92.820
9.000	21	15 Winter	30	+0%	100/15 Summer				93.519
9.001	22	15 Winter	30	+0%	30/15 Summer				92.867
1.007	18	480 Winter	30	+0%	30/15 Summer				92.578
10.000	22	15 Winter	30	+0%	30/15 Summer				93.572
10.001	23	15 Winter	30	+0%	30/15 Summer				93.573
1.008	19	480 Winter	30	+0%	2/240 Winter				92.576

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
4.004	16	0.612	0.000	0.31		23	19.4	SURCHARGED	
4.005	17	-0.365	0.000	0.08			19.4	OK	
9.000	21	-0.106	0.000	0.53			29.8	OK	
9.001	22	0.041	0.000	1.08		3	54.5	SURCHARGED	
1.007	18	0.468	0.000	0.22			45.7	SURCHARGED	
10.000	22	0.047	0.000	0.02			0.8	SURCHARGED	
10.001	23	0.115	0.000	1.64			62.4	SURCHARGED	
1.008	19	0.601	0.000	0.03			4.9	SURCHARGED	

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 10
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FEH
FEH Rainfall Version 2013
Site Location GB 435950 295750 SP 35950 95750
Data Type Catchment
Cv (Summer) 0.750
Cv (Winter) 0.840

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years) 2, 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
1.000	1	15 Winter	100	+40%	100/15 Winter		
1.001	2	15 Winter	100	+40%	30/15 Summer		
2.000	3	15 Winter	100	+40%			
1.002	4	15 Winter	100	+40%	30/15 Summer		
3.000	Dummy Rainfall L	15 Winter	100	+40%	100/15 Summer		
3.001	20	15 Winter	100	+40%	100/15 Summer		
1.003	5	15 Winter	100	+40%	100/15 Summer		
1.004	6	15 Winter	100	+40%	30/15 Summer		
1.005	7	960 Winter	100	+40%	100/15 Summer		
1.006	8	960 Winter	100	+40%	30/15 Winter		
4.000	9	60 Winter	100	+40%			
4.001	10	60 Winter	100	+40%	100/15 Summer		
5.000	11	60 Winter	100	+40%			
4.002	12	60 Winter	100	+40%	30/15 Summer		
6.000	13	15 Winter	100	+40%	100/15 Summer		
7.000	x	60 Winter	100	+40%	100/30 Winter		
4.003	14	60 Winter	100	+40%	2/15 Summer		
8.000	15	60 Winter	100	+40%			

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		94.310	0.010	0.000	0.27		
1.001	2		94.292	0.484	0.000	0.33		12
2.000	3		94.281	-0.019	0.000	0.01		
1.002	4		94.281	0.678	0.000	0.18		11
3.000	Dummy Rainfall L		94.478	0.378	0.000	0.56		
3.001	20		94.563	0.690	0.000	0.99		5
1.003	5		94.200	0.725	0.000	0.79		
1.004	6		93.938	0.898	0.000	1.94		
1.005	7		93.893	0.993	0.000	0.15		
1.006	8		93.966	1.536	0.000	0.15		
4.000	9		94.175	-0.125	0.000	0.06		
4.001	10		94.172	0.222	0.000	0.06		44
5.000	11		94.168	-0.057	0.000	0.00		
4.002	12		94.168	0.543	0.000	0.10		34
6.000	13		94.179	0.204	0.000	0.53		
7.000	x		94.159	0.034	0.000	0.00		
4.003	14		94.159	0.764	0.000	0.35		40
8.000	15		94.138	-0.087	0.000	0.00		

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	28.7	SURCHARGED	
1.001	2	37.9	SURCHARGED	
2.000	3	0.6	OK	
1.002	4	19.9	SURCHARGED	
3.000	Dummy Rainfall L	4.2	SURCHARGED	
3.001	20	128.3	SURCHARGED	
1.003	5	120.4	SURCHARGED	
1.004	6	207.7	SURCHARGED	
1.005	7	23.3	FLOOD RISK	
1.006	8	22.2	SURCHARGED	
4.000	9	6.6	OK	
4.001	10	7.6	SURCHARGED	
5.000	11	0.2	OK	
4.002	12	9.8	SURCHARGED	
6.000	13	29.2	SURCHARGED	
7.000	x	0.2	SURCHARGED	
4.003	14	32.2	SURCHARGED	
8.000	15	0.2	OK	

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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)
4.004	16	60 Winter	100	+40%	2/15 Summer				94.138
4.005	17	960 Winter	100	+40%	100/240 Winter				93.955
9.000	21	15 Winter	100	+40%	100/15 Summer				93.907
9.001	22	960 Winter	100	+40%	30/15 Summer				93.736
1.007	18	960 Winter	100	+40%	30/15 Summer				93.960
10.000	22	15 Winter	100	+40%	30/15 Summer				93.797
10.001	23	15 Winter	100	+40%	30/15 Summer				93.798
1.008	19	960 Winter	100	+40%	2/240 Winter				93.989

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
4.004	16	0.883	0.000	0.36		42	22.2	SURCHARGED	
4.005	17	0.770	0.000	0.05			11.3	SURCHARGED	
9.000	21	0.282	0.000	0.84			47.4	FLOOD RISK	
9.001	22	0.910	0.000	0.15		304	7.5	SURCHARGED	
1.007	18	1.850	0.000	0.22			45.8	SURCHARGED	
10.000	22	0.272	0.000	0.03			1.3	SURCHARGED	
10.001	23	0.340	0.000	2.39			91.2	SURCHARGED	
1.008	19	2.014	0.000	0.04			6.0	SURCHARGED	

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Summary Wizard of 360 minute 100 year Winter I+40% for Storm

Simulation Criteria

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

Number of Input Hydrographs	0	Number of Storage Structures	10
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
FEH Rainfall Version	2013
Site Location	GB 435950 295750 SP 35950 95750
Data Type	Catchment
Cv (Summer)	0.750
Cv (Winter)	0.840

Margin for Flood Risk Warning (mm)	300.0	DVD Status	OFF
Analysis Timestep	Fine	Inertia Status	OFF
DTS Status	ON		

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	2, 30, 100
Climate Change (%)	0, 0, 40

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)
1.000	1	360 minute 100 year Winter I+40%	94.850	94.042	-0.258	0.000
1.001	2	360 minute 100 year Winter I+40%	95.100	93.592	-0.216	0.000
2.000	3	360 minute 100 year Winter I+40%	94.850	94.000	-0.300	0.000
1.002	4	360 minute 100 year Winter I+40%	95.050	93.584	-0.019	0.000
3.000	Dummy Rainfall L	360 minute 100 year Winter I+40%	95.100	94.000	-0.100	0.000
3.001	20	360 minute 100 year Winter I+40%	95.100	93.664	-0.209	0.000
1.003	5	360 minute 100 year Winter I+40%	95.000	93.498	0.023	0.000
1.004	6	360 minute 100 year Winter I+40%	94.450	93.494	0.454	0.000
1.005	7	360 minute 100 year Winter I+40%	94.150	93.491	0.591	0.000
1.006	8	360 minute 100 year Winter I+40%	94.600	93.487	1.057	0.000
4.000	9	360 minute 100 year Winter I+40%	95.100	94.024	-0.276	0.000
4.001	10	360 minute 100 year Winter I+40%	94.850	93.896	-0.054	0.000
5.000	11	360 minute 100 year Winter I+40%	95.100	94.000	-0.225	0.000
4.002	12	360 minute 100 year Winter I+40%	94.850	93.893	0.268	0.000
6.000	13	360 minute 100 year Winter I+40%	94.950	93.897	-0.078	0.000
7.000	x	360 minute 100 year Winter I+40%	94.950	93.900	-0.225	0.000
4.003	14	360 minute 100 year Winter I+40%	94.700	93.886	0.491	0.000
8.000	15	360 minute 100 year Winter I+40%	94.850	94.000	-0.225	0.000
4.004	16	360 minute 100 year Winter I+40%	94.700	93.870	0.615	0.000

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Summary Wizard of 360 minute 100 year Winter I+40% for Storm

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
1.000	1	0.05		43.532	5.1	OK
1.001	2	0.09		85.805	10.1	OK
2.000	3	0.00		0.000	0.0	OK
1.002	4	0.09		85.816	10.0	OK
3.000	Dummy Rainfall L	0.00		0.000	0.0	OK
3.001	20	0.20		222.313	25.9	OK
1.003	5	0.23		307.481	35.8	SURCHARGED
1.004	6	0.50		449.962	53.5	SURCHARGED
1.005	7	0.34		447.957	53.3	SURCHARGED
1.006	8	0.34		438.978	49.9	SURCHARGED
4.000	9	0.02		17.101	2.0	OK
4.001	10	0.03		36.501	4.0	OK
5.000	11	0.00		0.000	0.0	OK
4.002	12	0.08		88.812	7.7	SURCHARGED
6.000	13	0.09		45.089	5.1	OK
7.000	x	0.00		0.000	0.0	OK
4.003	14	0.22		217.664	20.1	SURCHARGED
8.000	15	0.00		0.000	0.0	OK
4.004	16	0.31		215.564	19.3	SURCHARGED

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Summary Wizard of 360 minute 100 year Winter I+40% for Storm

PN	US/MH Name	Event	US/CL (m)	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.
4.005	17	360 minute 100 year Winter I+40%	94.700	93.485	0.300	0.000	0.08
9.000	21	360 minute 100 year Winter I+40%	94.150	93.488	-0.137	0.000	0.16
9.001	22	360 minute 100 year Winter I+40%	94.300	93.486	0.660	0.000	0.34
1.007	18	360 minute 100 year Winter I+40%	94.500	93.483	1.373	0.000	0.48
10.000	22	360 minute 100 year Winter I+40%	94.600	93.481	-0.044	0.000	0.00
10.001	23	360 minute 100 year Winter I+40%	94.600	93.481	0.023	0.000	0.64
1.008	19	360 minute 100 year Winter I+40%	94.300	93.481	1.506	0.000	0.03

PN	US/MH Name	Overflow (l/s)	Discharge Vol (m³)	Pipe Flow (l/s)	Status
4.005	17		213.750	19.1	SURCHARGED
9.000	21		77.733	9.1	OK
9.001	22		141.721	17.1	SURCHARGED
1.007	18		922.663	98.3	SURCHARGED
10.000	22		-0.005	0.0	OK
10.001	23		205.906	24.4	SURCHARGED
1.008	19		211.734	5.7	SURCHARGED

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

Simulation Criteria

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

Number of Input Hydrographs 0 Number of Storage Structures 10
Number of Online Controls 3 Number of Time/Area Diagrams 0
Number of Offline Controls 0 Number of Real Time Controls 0

Synthetic Rainfall Details

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

Margin for Flood Risk Warning (mm) 300.0 DVD Status OFF
Analysis Timestep Fine Inertia Status OFF
DTS Status ON

Profile(s) Summer and Winter
Duration(s) (mins) 15, 30
Return Period(s) (years) 2, 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
1.000	1	15 Winter	100	+40%	100/15 Summer		
1.001	2	15 Winter	100	+40%	30/15 Summer		
2.000	3	15 Winter	100	+40%	100/15 Winter		
1.002	4	15 Winter	100	+40%	2/15 Summer		
3.000	Dummy Rainfall L	15 Winter	100	+40%	100/15 Summer		
3.001	20	15 Winter	100	+40%	100/15 Summer		
1.003	5	15 Winter	100	+40%	100/15 Summer		
1.004	6	15 Winter	100	+40%	30/15 Summer		
1.005	7	15 Winter	100	+40%	30/15 Summer		
1.006	8	15 Winter	100	+40%	30/15 Summer		
4.000	9	30 Winter	100	+40%			
4.001	10	30 Winter	100	+40%	100/15 Summer		
5.000	11	30 Winter	100	+40%			
4.002	12	30 Winter	100	+40%	2/15 Summer		
6.000	13	15 Winter	100	+40%	100/15 Summer		
7.000	x	30 Winter	100	+40%	100/30 Winter		
4.003	14	30 Winter	100	+40%	2/15 Summer		
8.000	15	30 Winter	100	+40%			
4.004	16	30 Winter	100	+40%	2/15 Summer		
4.005	17	30 Winter	100	+40%			
9.000	21	15 Winter	100	+40%	100/15 Summer		
9.001	22	15 Winter	100	+40%	30/15 Summer		

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

PN	US/MH Name	Overflow Act.	Water Level (m)	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)
1.000	1		94.381	0.081	0.000	0.29		
1.001	2		94.363	0.555	0.000	0.37		15
2.000	3		94.352	0.052	0.000	0.01		
1.002	4		94.352	0.749	0.000	0.19		13
3.000	Dummy Rainfall L		94.845	0.745	0.000	0.80		
3.001	20		94.948	1.075	0.000	1.05		5
1.003	5		94.510	1.035	0.000	0.80		
1.004	6		94.243	1.203	0.000	2.05		
1.005	7		93.931	1.031	0.000	1.33		
1.006	8		93.096	0.666	0.000	1.42		
4.000	9		94.212	-0.088	0.000	0.09		
4.001	10		94.210	0.260	0.000	0.05		
5.000	11		94.206	-0.019	0.000	0.00		
4.002	12		94.206	0.581	0.000	0.12		24
6.000	13		94.250	0.275	0.000	0.59		
7.000	x		94.197	0.072	0.000	0.00		
4.003	14		94.197	0.802	0.000	0.49		32
8.000	15		94.176	-0.049	0.000	0.00		
4.004	16		94.176	0.921	0.000	0.36		
4.005	17		92.828	-0.357	0.000	0.09		
9.000	21		94.081	0.456	0.000	0.91		
9.001	22		93.398	0.572	0.000	1.68		4

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1	30.4	SURCHARGED	
1.001	2	41.8	SURCHARGED	
2.000	3	0.6	SURCHARGED	
1.002	4	20.7	SURCHARGED	
3.000	Dummy Rainfall L	6.0	FLOOD RISK	
3.001	20	135.7	FLOOD RISK	
1.003	5	122.0	SURCHARGED	
1.004	6	219.7	FLOOD RISK	
1.005	7	210.2	FLOOD RISK	
1.006	8	207.7	SURCHARGED	
4.000	9	10.7	OK	
4.001	10	6.7	SURCHARGED	
5.000	11	0.2	OK	
4.002	12	12.2	SURCHARGED	
6.000	13	32.5	SURCHARGED	
7.000	x	0.2	SURCHARGED	
4.003	14	44.1	SURCHARGED	
8.000	15	0.2	OK	
4.004	16	22.6	SURCHARGED	
4.005	17	22.6	OK	

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

PN	US/MH Name	Pipe Flow (l/s)	Status	Level Exceeded
9.000	21	51.2	FLOOD RISK	
9.001	22	85.1	SURCHARGED	

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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)
1.007	18	30 Winter	100	+40%	30/15 Summer				92.514
10.000	22	15 Winter	100	+40%	30/15 Winter				93.760
10.001	23	15 Winter	100	+40%	30/15 Summer				93.761
1.008	19	30 Winter	100	+40%	30/30 Summer				92.506

PN	US/MH Name	Surcharged Depth (m)	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.007	18	0.404	0.000	1.76			360.6	SURCHARGED	
10.000	22	0.235	0.000	0.02			0.9	SURCHARGED	
10.001	23	0.303	0.000	2.29			87.3	SURCHARGED	
1.008	19	0.531	0.000	0.03			4.9	SURCHARGED	

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STORM SEWER DESIGN by the Modified Rational Method

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
1.000	47.602	0.492	96.8	0.056	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	9.840	0.205	48.0	0.056	0.00	0.0	0.600	o	300	Pipe/Conduit	
2.000	54.149	0.647	83.7	0.000	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.002	14.126	0.203	69.6	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
3.000	13.295	0.227	58.6	0.000	5.00	0.0	0.600	o	100	Pipe/Conduit	
3.001	23.407	0.400	58.5	0.286	0.00	0.0	0.600	o	300	Pipe/Conduit	
1.003	65.470	0.435	150.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.004	9.522	0.065	146.5	0.195	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.005	66.961	0.470	142.5	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
1.006	51.326	0.320	160.4	0.000	0.00	0.0	0.600	o	375	Pipe/Conduit	
4.000	24.742	0.350	70.7	0.022	5.00	0.0	0.600	o	300	Pipe/Conduit	
4.001	19.975	0.325	61.5	0.026	0.00	0.0	0.600	o	300	Pipe/Conduit	
5.000	34.013	0.600	56.7	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.002	21.028	0.230	91.4	0.069	0.00	0.0	0.600	o	300	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)
1.000	50.00	5.50	94.000	0.056	0.0	0.0	0.0	1.60	113.0	7.6
1.001	50.00	5.57	93.508	0.112	0.0	0.0	0.0	2.28	160.8	15.2
2.000	50.00	5.52	94.000	0.000	0.0	0.0	0.0	1.72	121.6	0.0
1.002	50.00	5.69	93.303	0.112	0.0	0.0	0.0	1.89	133.4	15.2
3.000	50.00	5.22	94.000	0.000	0.0	0.0	0.0	1.01	7.9	0.0
3.001	50.00	5.41	93.573	0.286	0.0	0.0	0.0	2.06	145.6	38.7
1.003	50.00	6.43	93.100	0.398	0.0	0.0	0.0	1.47	162.9	53.9
1.004	50.00	6.54	92.665	0.593	0.0	0.0	0.0	1.49	165.1	80.3
1.005	50.00	7.28	92.525	0.593	0.0	0.0	0.0	1.52	167.4	80.3
1.006	50.00	7.87	92.055	0.593	0.0	0.0	0.0	1.43	157.7	80.3
4.000	50.00	5.22	94.000	0.022	0.0	0.0	0.0	1.87	132.4	3.0
4.001	50.00	5.39	93.650	0.048	0.0	0.0	0.0	2.01	142.0	6.5
5.000	50.00	5.33	94.000	0.000	0.0	0.0	0.0	1.74	69.2	0.0
4.002	50.00	5.60	93.325	0.117	0.0	0.0	0.0	1.64	116.3	15.8

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STORM SEWER DESIGN by the Modified Rational Method

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
6.000	47.934	0.580	82.6	0.058	5.00	0.0	0.600	o	225	Pipe/Conduit	
7.000	14.472	0.125	115.8	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.003	14.669	0.140	104.8	0.112	0.00	0.0	0.600	o	300	Pipe/Conduit	
8.000	53.294	0.920	57.9	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
4.004	15.956	0.070	227.9	0.000	0.00	0.0	0.600	o	300	Pipe/Conduit	
4.005	69.428	0.434	160.0	0.000	0.00	0.0	0.600	o	450	Pipe/Conduit	
9.000	63.880	0.799	79.9	0.100	5.00	0.0	0.600	o	225	Pipe/Conduit	
9.001	28.870	0.316	91.4	0.089	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.007	23.007	0.135	170.4	0.194	0.00	0.0	0.600	o	450	Pipe/Conduit	
10.000	6.723	0.067	100.0	0.000	5.00	0.0	0.600	o	225	Pipe/Conduit	
10.001	7.313	0.073	100.2	0.271	0.00	0.0	0.600	o	225	Pipe/Conduit	
1.008	7.851	0.055	142.7	0.041	0.00	0.0	0.600	o	450	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)
6.000	50.00	5.56	93.750	0.058	0.0	0.0	0.0	1.44	57.2	7.9
7.000	50.00	5.20	93.900	0.000	0.0	0.0	0.0	1.21	48.3	0.0
4.003	50.00	5.76	93.095	0.287	0.0	0.0	0.0	1.54	108.6	38.9
8.000	50.00	5.52	94.000	0.000	0.0	0.0	0.0	1.72	68.5	0.0
4.004	50.00	6.01	92.955	0.287	0.0	0.0	0.0	1.04	73.3	38.9
4.005	50.00	6.74	92.735	0.287	0.0	0.0	0.0	1.60	255.2	38.9
9.000	50.00	5.73	93.400	0.100	0.0	0.0	0.0	1.46	58.2	13.5
9.001	50.00	6.08	92.601	0.189	0.0	0.0	0.0	1.37	54.4	25.6
1.007	50.00	8.12	91.660	1.263	0.0	0.0	0.0	1.55	247.2	171.0
10.000	50.00	5.09	93.300	0.000	0.0	0.0	0.0	1.31	52.0	0.0
10.001	50.00	5.18	93.233	0.271	0.0	0.0	0.0	1.31	51.9	36.7
1.008	50.00	8.20	91.525	1.575	0.0	0.0	0.0	1.70	270.3	213.3

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Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.056	0.056	0.056
1.001	-	-	100	0.056	0.056	0.056
2.000	-	-	100	0.000	0.000	0.000
1.002	-	-	100	0.000	0.000	0.000
3.000	-	-	100	0.000	0.000	0.000
3.001	-	-	100	0.286	0.286	0.286
1.003	-	-	100	0.000	0.000	0.000
1.004	-	-	100	0.195	0.195	0.195
1.005	-	-	100	0.000	0.000	0.000
1.006	-	-	100	0.000	0.000	0.000
4.000	-	-	100	0.022	0.022	0.022
4.001	-	-	100	0.026	0.026	0.026
5.000	-	-	100	0.000	0.000	0.000
4.002	-	-	100	0.069	0.069	0.069
6.000	-	-	100	0.058	0.058	0.058
7.000	-	-	100	0.000	0.000	0.000
4.003	-	-	100	0.112	0.112	0.112
8.000	-	-	100	0.000	0.000	0.000
4.004	-	-	100	0.000	0.000	0.000
4.005	-	-	100	0.000	0.000	0.000
9.000	-	-	100	0.100	0.100	0.100
9.001	-	-	100	0.089	0.089	0.089
1.007	-	-	100	0.194	0.194	0.194
10.000	-	-	100	0.000	0.000	0.000
10.001	-	-	100	0.271	0.271	0.271
1.008	-	-	100	0.041	0.041	0.041
				Total	Total	Total
				1.575	1.575	1.575

Simulation Criteria for Storm

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

Number of Input Hydrographs	0	Number of Storage Structures	10
Number of Online Controls	3	Number of Time/Area Diagrams	0
Number of Offline Controls	0	Number of Real Time Controls	0

Synthetic Rainfall Details

Rainfall Model	FEH
Return Period (years)	100
FEH Rainfall Version	1999
Site Location	GB 435950 295750 SP 35950 95750
C (1km)	-0.026

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Synthetic Rainfall Details

D1 (1km)	0.357
D2 (1km)	0.322
D3 (1km)	0.235
E (1km)	0.302
F (1km)	2.394
Summer Storms	Yes
Winter Storms	Yes
Cv (Summer)	0.750
Cv (Winter)	0.840
Storm Duration (mins)	30

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Online Controls for Storm

Orifice Manhole: 4, DS/PN: 1.002, Volume (m³): 6.3

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 93.303

Orifice Manhole: 16, DS/PN: 4.004, Volume (m³): 5.0

Diameter (m) 0.100 Discharge Coefficient 0.600 Invert Level (m) 92.955

Hydro-Brake® Optimum Manhole: 19, DS/PN: 1.008, Volume (m³): 7.7

Unit Reference	MD-SHE-0098-6000-2200-6000
Design Head (m)	2.200
Design Flow (l/s)	6.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	98
Invert Level (m)	91.525
Minimum Outlet Pipe Diameter (mm)	150
Suggested Manhole Diameter (mm)	1200

Control Points	**Head (m)**	**Flow (l/s)**
Design Point (Calculated)	2.200	6.0
Flush-Flo™	0.428	4.9
Kick-Flo®	0.876	3.9
Mean Flow over Head Range	-	4.7

The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated

Depth (m)	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**	**Depth (m)**	**Flow (l/s)**
0.100	3.2	1.200	4.5	3.000	6.9	7.000	10.4
0.200	4.5	1.400	4.9	3.500	7.5	7.500	10.7
0.300	4.8	1.600	5.2	4.000	7.9	8.000	11.0
0.400	4.9	1.800	5.5	4.500	8.4	8.500	11.4
0.500	4.9	2.000	5.7	5.000	8.8	9.000	11.7
0.600	4.8	2.200	6.0	5.500	9.2	9.500	12.0
0.800	4.3	2.400	6.2	6.000	9.6		
1.000	4.2	2.600	6.5	6.500	10.0		

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Storage Structures for Storm

Porous Car Park Manhole: 2, DS/PN: 1.001

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	2.3
Membrane Percolation (mm/hr)	1000	Length (m)	110.0
Max Percolation (l/s)	70.3	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	94.000	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: 4, DS/PN: 1.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	5.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	55.6	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	94.000	Cap Volume Depth (m)	0.400

Trench Soakaway Manhole: 20, DS/PN: 3.001

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.5
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	20.0
Safety Factor	2.0	Slope (1:X)	80.0
Porosity	0.30	Cap Volume Depth (m)	0.500
Invert Level (m)	93.573	Cap Infiltration Depth (m)	0.000

Complex Manhole: 10, DS/PN: 4.001

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	40.0
Membrane Percolation (mm/hr)	1000	Length (m)	2.0
Max Percolation (l/s)	22.2	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	93.650	Cap Volume Depth (m)	0.400

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	2.0
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	22.2	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	93.650	Cap Volume Depth (m)	0.400

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Porous Car Park Manhole: 12, DS/PN: 4.002

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	3.0
Membrane Percolation (mm/hr)	1000	Length (m)	90.0
Max Percolation (l/s)	75.0	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	93.800	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: 14, DS/PN: 4.003

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	4.0
Membrane Percolation (mm/hr)	1000	Length (m)	104.0
Max Percolation (l/s)	115.6	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	93.600	Cap Volume Depth (m)	0.400

Porous Car Park Manhole: 16, DS/PN: 4.004

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	2.7
Membrane Percolation (mm/hr)	1000	Length (m)	40.0
Max Percolation (l/s)	30.0	Slope (1:X)	100.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	93.600	Cap Volume Depth (m)	0.400

Infiltration Trench Manhole: 22, DS/PN: 9.001

Infiltration Coefficient Base (m/hr)	0.00000	Trench Width (m)	1.2
Infiltration Coefficient Side (m/hr)	0.00000	Trench Length (m)	120.0
Safety Factor	2.0	Slope (1:X)	100.0
Porosity	0.30	Cap Volume Depth (m)	1.000
Invert Level (m)	93.000	Cap Infiltration Depth (m)	0.000

Tank or Pond Manhole: 23, DS/PN: 10.001

Invert Level (m) 93.233

Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	15.0	1.000	162.0

Tank or Pond Manhole: 19, DS/PN: 1.008

Invert Level (m) 91.525

Depth (m)	Area (m²)	Depth (m)	Area (m²)	Depth (m)	Area (m²)
0.000	530.0	2.000	530.0	2.001	0.0

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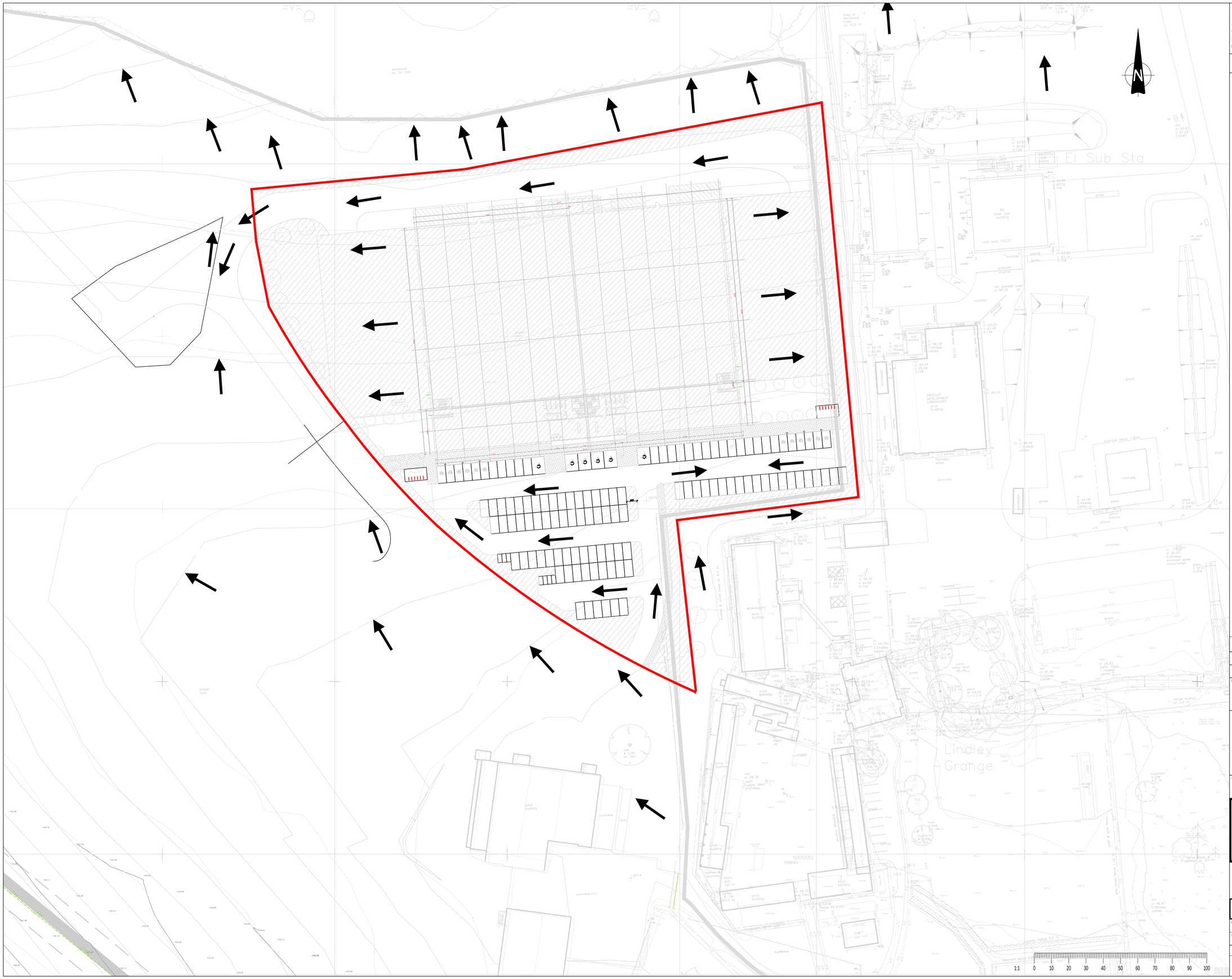
E. Proposed Overland Flow Exceedance Routes



This drawing should not be scaled. Dimensions to be verified on site.
Any discrepancies should be referred to the Engineer prior to work being put in hand.

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Pickfords Wharf, Clink Street, London SE1 9DG t 020 7928 7888 f 03333 444 501

GENERAL NOTES

1. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEER'S, ARCHITECT'S OR OTHER RELEVANT DRAWINGS AND SPECIFICATIONS.
2. ALL DIMENSIONS AND LEVELS ARE TO BE CHECKED ON SITE BY THE CONTRACTOR PRIOR TO PREPARING ANY WORKING DRAWINGS OR COMMENCING ON SITE.
3. THE CONTRACTOR MUST ENSURE AND WILL BE HELD RESPONSIBLE FOR THE OVERALL STABILITY OF THE BUILDING/STRUCTURE/EXCAVATION AT ALL STAGES OF THE WORK.
4. ALL WORK BY THE CONTRACTOR MUST BE CARRIED OUT IN SUCH A WAY THAT ALL REQUIREMENTS UNDER THE HEALTH AND SAFETY AT WORK ACT ARE SATISFIED.
5. ALL WORK IS TO BE CARRIED OUT IN COMPLIANCE WITH THE REQUIREMENTS OF THE RELEVANT STATUTORY AUTHORITIES AND REGULATIONS.

KEY:

RED LINE BOUNDARY

PROPOSED OVERLAND FLOW PATH

Status	Date	Description	By	Chk
REV SG	08:07:22	FIRST ISSUE	AS	SP

Amendments

Project
PLOT 8 & 9 - POLESTAR

Title
PROPOSED OVERLAND FLOW EXCEEDANCE ROUTES AND LEVELS

Client
SWANVALE DEVELOPMENTS LTD

waterman
5th Floor One Cornwall Street Birmingham B3 2DX
t 0121 212 7700
mail@watermangroup.com www.watermangroup.com

Status
PRELIMINARY

Designed By	AS	Director	SP	Waterman Ref	WIE13833
Drawn By	AS	Date	JULY 2022	Scales @ A1	1:500

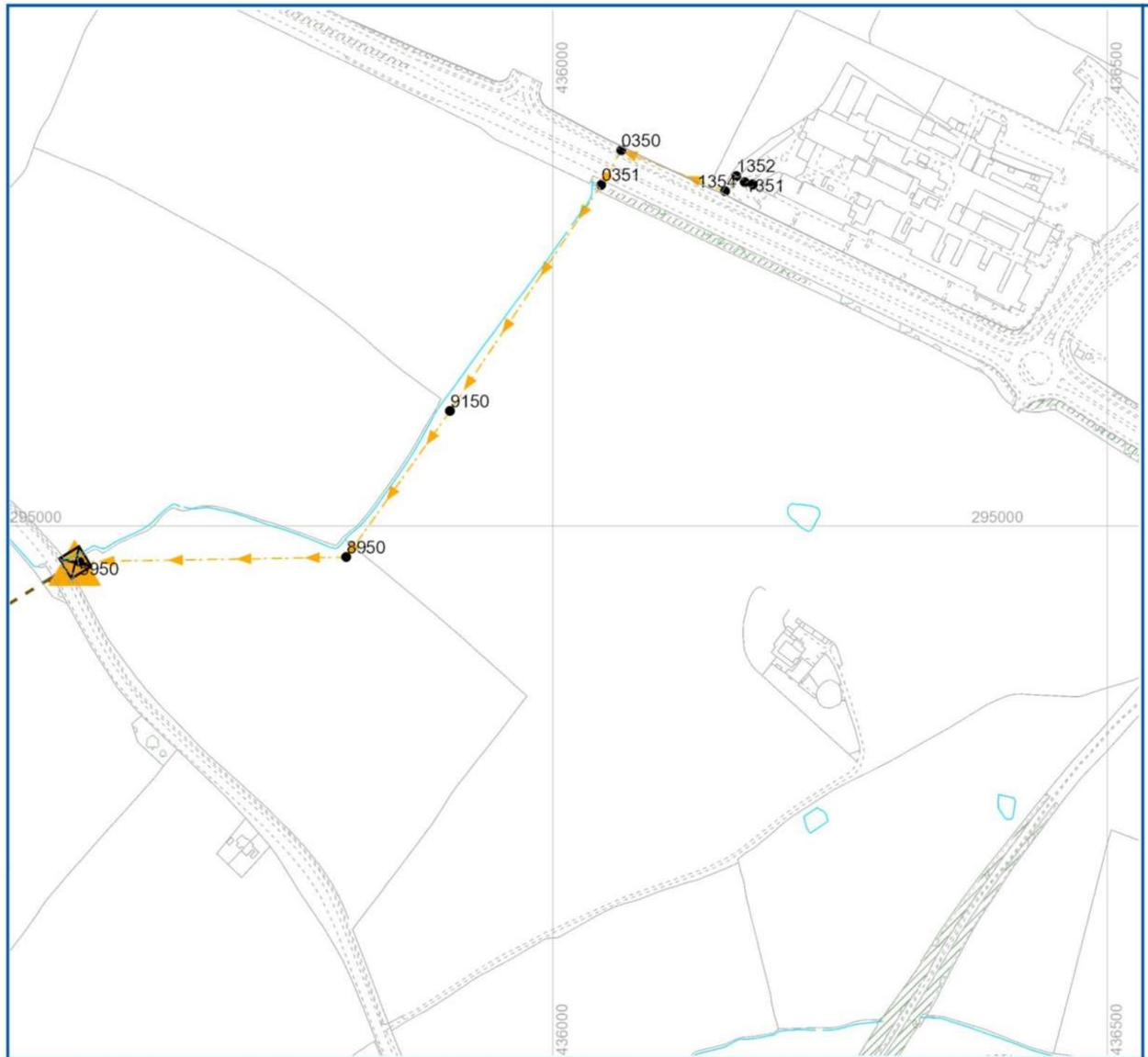
Project - Originator - Volume - Level - Type - Role - Number: 13833-WIE-ZZ-XX-DR-D-92202

Revision: P01

File Path
\\W-hcs\wie\Projects\EED\13833\120 - Plot 8 & 9\100\7_CAD\02-Drainage\

(P)100_P1 SitePlan, 13833-EED-ZZ-XX-M2-C-02001-SURVEY, 16133, 29084 2d, 30838 2d Topo DRAFT, 30950 - Western Ditch, A1-Wat-BS-S, SK021-variant-c-2

F. Severn Trent Asset Location Records



Reference	Cover Level	Invert Level Upstream	Invert Level Downstream	Purpose	Material	Pipe Shape	Max Size	Min Size	Gradient	Year Laid
SP36951354	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP36951350	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP35945950	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	<UNK>	31/12/1899 00:00:00
SP36950350	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP35959150	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP36950351	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP36951351	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP36951352	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00
SP35948950	<UNK>	<UNK>	<UNK>	F	VC	C	225	<UNK>	0	31/12/1899 00:00:00

LEGEND

LandlineLine
- Polygon Closing Line
- Property Closing Line
- Bottom Of Slope
- Top Of Slope
- Step
- Mean High Water
- Traffic Calming
- Standard Gauge Track
- Bottom Of Cliff
- Top Of Cliff
- Mean Low Water
- Path
- Overhead Construction
- Culvert
- Pylon
- Ridge Or Rock Line
- Narrow Gauge Track
- Railway Buffer
- Tunnel Edge
- Line Of Posts
- Drain
- Default Line
- Building Outline
- Edge Line
- Road Or Track
- Building Division
- Inland water Line
- General Surface Natural Line
- Building Overhead Line
- Landform Natural Line
- Historic Interest Line
- Landform Manmade Line
- Unclassified

LandlineArea
- Other
- Mixed Woodland Fill
- Nonconiferous Tree Fill
- Coniferous Tree Fill
- Orchard Fill
- Coppice Or Osiers Fill
- Scrub Fill
- Boulders Fill
- Rock Fill
- Scree Fill
- Rough Grassland Fill
- Heath Fill
- Saltmarsh Fill
- Marsh Fill
- Reeds Fill
- Slope Fill
- Cliff Fill

Ancillary
- Balancing Lagoon
- Grease Trap
- Interceptor
- Screen

Chamber
- Flushing Chamber
- Soakaway
- Overflow

Fitting
- Blind Shaft
- Facility Connector
- Head Node
- Lamphole
- Sewerage Air Valve
- Sewerage Chemical Injection Point
- Sewerage Hatch Box
- Sewerage Pressure Washout
- Vent Column
- Waste Water Outfall

Control Valve
- Hydrobrake
- Penstock
- Sewerage Isolation Valve
- Sewerage Non Return Valve

Manhole
- Foul Bifurcation Manhole
- Combined Bifurcation Manhole
- Surface Water Bifurcation Manhole
- Dual Manhole
- Foul Single Manhole
- Combined Single Manhole
- Surface Water Single Manhole
- Twin Manhole
- Foul Adopted Manhole
- Combined Adopted Manhole
- Surface Adopted Manhole
- Transferred Manhole
- Unsurveyed Manhole
- Operational Site

Waste Water Pump
- S104
- Transferred Asset
- S102
- Null STW
- Adopted Sewer
- None
- Highway Drain
- Null Private
- S24

Storage
- DS Disposal Site
- Off-Line Waste Water Storage
- On-Line Waste Water Storage
- Wet Well

Waste Water Process Structure
- STP Sewage Treatment Point
- STS Sewage Treatment Structure
- SLTP Sludge Treatment Point
- SLTS Sludge Treatment Structure

Gravity Sewer Pipe
- Foul Gravity Sewer
- Combined Gravity Sewer
- Surface Water Gravity Sewer
- S104 Surface Water Gravity Sewer
- S104 Combined Gravity Sewer
- S104 Foul Gravity Sewer
- Private Surface Water Gravity Sewer
- Private Combined Gravity Sewer
- Private Foul Gravity Sewer
- Surface Water Unsurveyed Pipe
- Combined Unsurveyed Pipe
- Foul Unsurveyed Pipe
- Transferred Surface Water Sewer
- Transferred Combined Sewer
- Transferred Foul Sewer
- Disposal Pipe
- Overflow Pipe
- Culverted Water Course
- Waste Internal Site Pipe
- Sewer Service Connection
- Gravity Sewer Others

Pressure Sewer Pipe
- Surface Water Pressure Sewer
- Combined Pressure Sewer
- Foul Pressure Sewer
- S104 Surface Water Pressure Sewer
- S104 Combined Pressure Sewer
- S104 Foul Pressure Sewer
- Private Surface Water Pressure Sewer
- Private Combined Pressure Sewer
- Private Foul Pressure Sewer
- Surface Water Vacuum Sewer
- Foul Vacuum Sewer
- Combined Vacuum Sewer
- S104 Surface Water Vacuum Sewer
- S104 Combined Vacuum Sewer
- S104 Foul Vacuum Sewer
- Private Surface Water Vaccum Sewer
- Private Combined Vacuum Sewer
- Private Foul Vacuum Sewer
- Surface Water Siphon
- Combined Siphon
- Foul Siphon
- Private Surface Water Siphon
- Private Combined Siphon
- Private Foul Siphon
- S104 Surface Water Siphon
- S104 Combined Siphon
- S104 Fr
- Surface
- Combi
- Foul Ur
- Dispos

Service Pipe
- Surface
- Combi
- Foul La
- S104 Su
- S104 Co
- S104 Fr
- Private
- Private
- Private
- Transfe
- Transfe
- Transfe

Print500mLine

MATERIALS

- - NONE
- AC - ASBESTOS CEME
- BR - BRICK
- CC - CONCRETE BOX CULVERT
- CI - CAST IRON
- CO - CONCRETE
- CSB CONCRETE SEGMENTS (BOLTED)
- CSU - CONCRETE SEGMENTS (UNBOLTED)
- DI - DUCTILE IRON
- GRP - GLASS REINFORCED PLASTIC
- MAC - MASONRY IN REGULAR COURSES
- MAR - MASONRY RANDOMLY COURSED
- PE - POLYETHLENE
- PF - PITCH
- PP - POLYPROPYLENE
- PSC - PLASTIC STEEL COMPOSITE
- PVC - POLYVINYL CHLORIDE
- RPM - REINFORCED PLASTIC MATRIX
- SI - SPUN (GREY) IRON
- ST - STEEL
- U - UNKNOWN
- VC - VITRIFIED CLAY
- XXX - OTHER

CATEGORIES

- W - WEIR
- C - CASCADE
- DB - DAMBOARD
- SE - SIDE ENTRY
- FV - FLAP VALVE
- BD - BACK DROP
- S - SIPHON
- D - HIGHWAY DRAIN
- S104 - SECTION 104

SHAPE

- C - CIRCULAR
- E - EGG SHAPED
- 0 - OTHER
- R - RECTANGLE
- S - SQUARE
- T - TRAPEZOIDAL
- U - UNKNOWN

PURPOSE

- C - COMBINED
- E - FINAL EFFLUENT
- F - FOUL
- L - SLUDGE
- S - SURFACE WATER

N W E S

SEVERN TRENT

Severn Trent Water Limited
Asset Data Management
PO Box 5344
Coventry
CV3 9FT
Telephone: 0345 601 6616

SEWER RECORD (Tabular)

O/S Map Scale: 1:5,000

This map is centred upon:

Date of Issue: 09-06-21

X: 436019.23 **Y:** 294994.16

Disclaimer Statement:

1 Do not scale off this Map.

2 This plan and any information supplied with it is furnished as a general guide, is only valid at the date of issue and no warranty as to its correctness is given or implied. In particular this plan and any information shown on it must not be relied upon in the event of any development or works (including but not limited to excavations) in the vicinity of SEVERN TRENT WATER assets or for the purposes of determining the suitability of a point of connection to the sewerage or distribution systems.

3 On 1 October 2011 most private sewers and private lateral drains in Severn Trent Water's sewerage area, which were connected to a public sewer as at 1 July 2011, transferred to the ownership of Severn Trent Water and became public sewers and public lateral drains. A further transfer takes place on 1 October 2012. Private pumping stations, which form part of these sewers or lateral drains, will transfer to ownership of Severn Trent Water on or before 1 October 2016. Severn Trent Water does not possess complete records of these assets. These assets may not be displayed on the map.

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G. Borehole Ground Information

Figure 1 – Site Location Map

Job Number 20188	**Project** MIRA, Watling Street, Nuneaton, CV10 0TU
Client Swan Vale Developments	**Date** May 2022

Figure 2 – Trial Hole Location Plan

Job Number 20188	**Project** MIRA, Watling Street, Nuneaton, CV10 0TU
Client Swan Vale Developments	**Date** May 2022

Soils Limited
Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No. **TPSK1**

Project Name:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	Project No.: 20188	Method:
			Plant: Colden Plant Hire
Location:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Support:
Client:	HORIBA MIRA Ltd	Trial Pit Length: m	Trial Pit Width: m
Dates:	24/05/2022	Level:	Co-ords:

Hole Type: TP
Scale: 1:25
Logged By: JC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D ES		0.30			Grass over brown, slightly sandy, slightly gravelly SILT. Gravel is well rounded fine to coarse flint. Roots and rootlets. TOPSOIL
	0.50	D ES		0.70			Brown, slightly gravelly CLAY. Gravel is well rouded fine ro coarse flint. roots and rootlets
	1.00	D ES					Reddish brown and grey mottled, slightly gravelly CLAY. Gravel is well rounded fine to coarse flint. roots and rootlets.
	1.50	D ES		1.50			End of Pit at 1.500m

General Remarks:
Roots encountered to depth. No groundwater encountered

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Soils Limited
Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No.
TPSK2
Sheet 1 of 1

Project Name:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	Project No.: 20188	Method:
			Plant: Colden Plant Hire
Location:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Support:
Client:	HORIBA MIRA Ltd	Trial Pit Length: m	Trial Pit Width: m
Dates:	24/05/2022	Level:	Co-ords:

Hole Type: TP
Scale: 1:25
Logged By: JC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D ES		0.30			Grass over brown, slightly sandy, slightly gravelly SILT. Gravel is well rounded fine to coarse flint. Roots and rootlets. TOPSOIL
	0.50	D ES		0.66			Brown, slightly gravelly CLAY. Gravel is well rouded fine ro coarse flint. roots and rootlets
	1.00	D ES					Reddish brown and grey mottled, slightly gravelly CLAY. Gravel is well rounded fine to coarse flint. roots and rootlets.
	1.50	D ES		1.50			End of Pit at 1.500m

General Remarks:
Roots encountered to depth. No groundwater encountered

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Soils Limited
Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No. **TPSK4**

Project Name:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	Project No.: 20188	Method:
			Plant: Colden Plant Hire
Location:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Support:
Client:	HORIBA MIRA Ltd	Trial Pit Length: m	Trial Pit Width: m
Dates:	24/05/2022	Level:	Co-ords:

Hole Type: TP
Scale: 1:25
Logged By: JC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D ES		0.30			Grass over brown, slightly sandy, slightly gravelly SILT. Gravel is well rounded fine to coarse flint. Roots and rootlets. TOPSOIL
	0.50	D ES		0.70 0.70			Brown, slightly gravelly CLAY. Gravel is well rouded fine ro coarse flint. roots and rootlets LAND DRAIN Reddish brown and grey mottled, slightly gravelly CLAY. Gravel is well rounded fine to coarse flint. roots and rootlets.
	1.00	D ES					
	1.50	D ES		1.50			End of Pit at 1.500m

General Remarks:
Roots encountered to depth. No groundwater encountered

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Soils Limited
Newton House, Cross Road, Tadworth KT20 5SR
Tel: 01737 814221 Email: admin@soilslimited.co.uk

Trial Pit Log

Trial Pit No. **TPSK6**

Project Name:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	Project No.: 20188	Method:
			Plant: Colden Plant Hire
Location:	MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Support:
Client:	HORIBA MIRA Ltd	Trial Pit Length: m	Trial Pit Width: m
Dates:	25/05/2022	Level:	Co-ords:

Hole Type: TP
Scale: 1:25
Logged By: JC

Water Strike	Samples & In Situ Testing: Depth	Type	Results	Depth (m)	Level (mAOD)	Legend	Stratum Description
	0.20	D ES					Grass over brown, slightly sandy, slightly gravelly SILT. Gravel is well rounded fine to coarse flint. Roots and rootlets. TOPSOIL
				0.35			Brown, slightly gravelly CLAY. Gravel is well rouded fine ro coarse flint. roots and rootlets
	0.50	D ES					
				0.70			Reddish brown and grey mottled, slightly gravelly CLAY. Gravel is well rounded fine to coarse flint. roots and rootlets.
	1.00	D ES					
	1.50	D ES		1.50			End of Pit at 1.500m

General Remarks:
Roots encountered to depth. No groundwater encountered

Groundwater Remarks:

Sample Type
D: Disturbed
B: Bulk
J: Jar
W: Water

Appendix B. Infiltration Soakage Data

Soakaway Calculations

Soakaway Test No.	TPSK1
Site Name.	MIRA, Watling Street, Nuneaton
Job No.	20188

Field Test

Trial Pit Log (include details of groundwater):
See trial Pit

Depth of Pit	1.50	m blg
Width of Pit	0.60	m
Length of Pit Top	2.40	m
Length of Pit Base	2.00	m
Depth of First Reading	0.31	m bgl
Depth of Pit Soaked	1.19	m
ap50	4.748	m2
Vp75-25	0.770644	m3
t75-25	0.0	min
Amount of water used total	1.5413	m3
Flow rate	#DIV/0!	m/sec.

Calcualtions for Area of Trapeziod Side

Length at top of soak	2.3173
Length at 75% of soak	2.24
Length at 25% of soak	2.08
Area of middle 50% of one trapezoid side	1.2844

Calculations of length of one angled short side

Length of angled short side	1.2316

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)
0.31	0	100
0.32	3.0	99
0.32	12.0	99
0.33	36.0	98
0.34	54.0	97
0.36	69.0	96
0.37	73.0	95
0.37	117.0	95
0.37	172.0	96
0.37	232.0	96
0.50	1266.0	85
0.51	1341.0	84

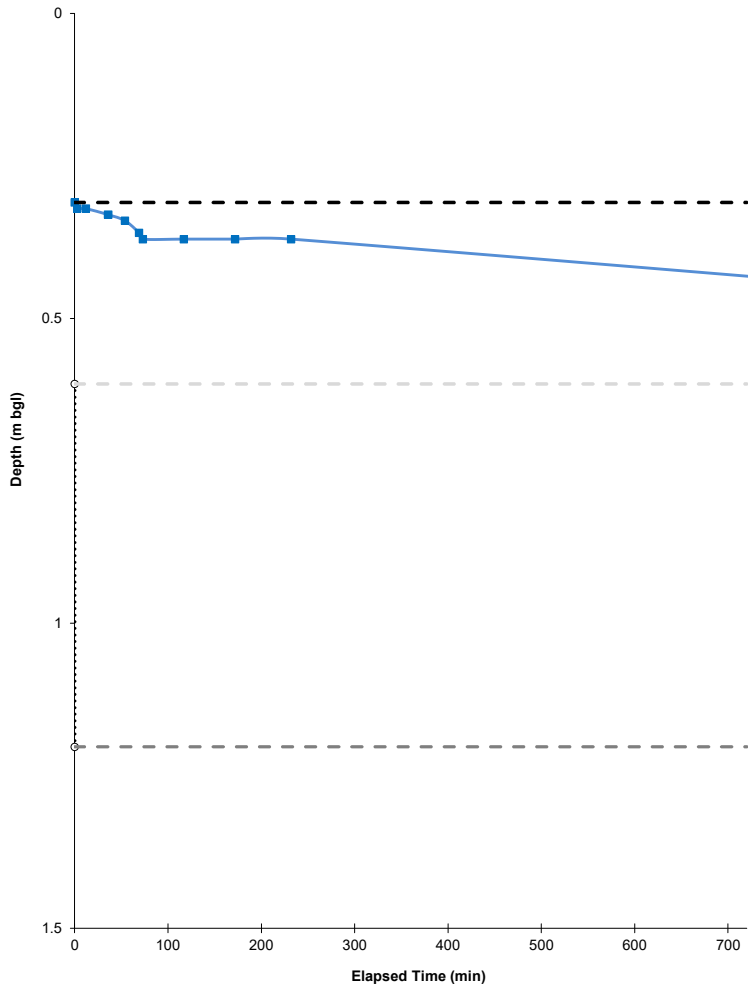
Total drai	0.20			
T75	0.000		0.6075	75% effective storage depth
T25	0.000		1.2025	25% effective storage depth
T75-25	0.000	Derived from Best Fit		

Comments

BRE Digest 365:2016

SOILS LIMITED
Newton House, Cross Road, Tadworth
Surrey, KT20 5SR
Telephone: 01737 814 221

Infiltration Rate Plot



Notes: The horizontal dashed black line represents the top of the water i.e. first reading

The light grey dashed represents 75% of the effective storage depth, The dark grey represents 25% of the effective storage depth. The blue line is the depth to water with time. Where a red line is present it is extrapolated data.

Soakaway Calculations

Soakaway Test No.	TKSK2
Site Name.	MIRA, Watling Street, Nuneaton
Job No.	20188

Field Test

Trial Pit Log (include details of groundwater):
See trial Pit

Depth of Pit	1.50	m blg
Width of Pit	0.60	m
Length of Pit Top	2.30	m
Length of Pit Base	1.80	m
Depth of First Reading	0.63	m bgl
Depth of Pit Soaked	0.87	m
ap50	3.622	m2
Vp75-25	0.507645	m3
t75-25	0.0	min
Amount of water used total	1.0153	m3
Flow rate	#DIV/0!	m/sec.

Calcualtions for Area of Trapeziod Side

Length at top of soak	2.09
Length at 75% of soak	2.02
Length at 25% of soak	1.87
Area of middle 50% of one trapezoid side	0.8461

Calculations of length of one angled short side

Length of angled short side	0.9171

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)
0.63	0	100
0.64	6.0	99
0.68	12.0	94
0.72	16.0	90
0.75	27.0	86
0.79	36.0	82
0.81	41.0	79
0.82	44.0	78
0.82	67.0	79
0.82	105.0	79
0.82	151.0	79
0.83	208.0	78
0.83	265.0	78
0.85	1301.0	76
0.85	1375.0	76
0.85	1510.0	76

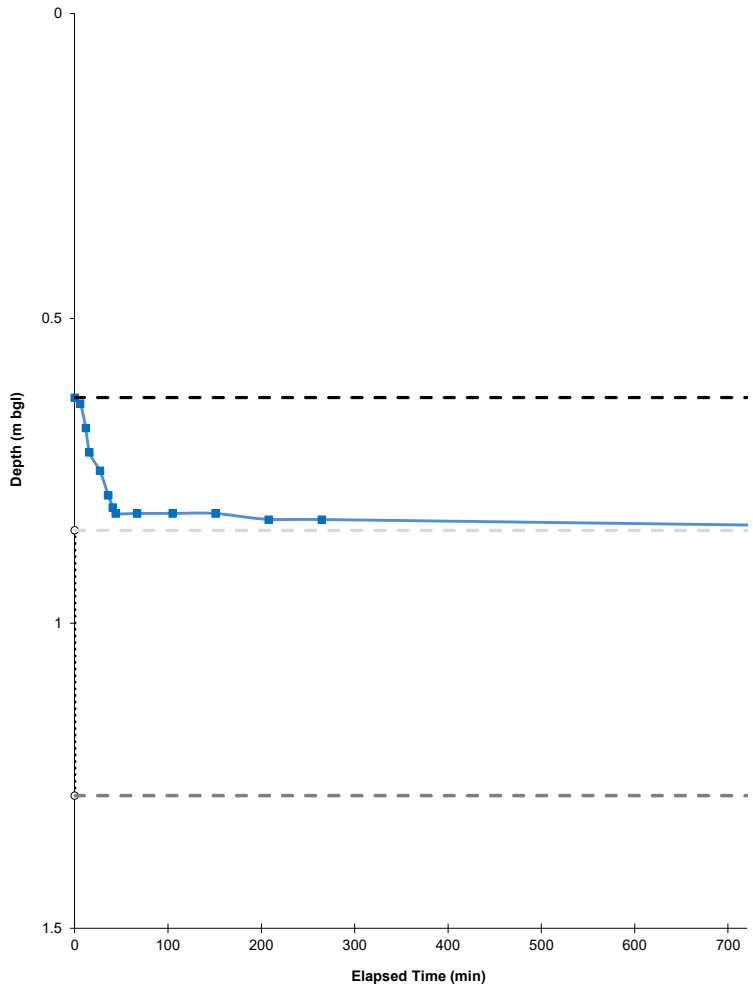
Total drai	0.22			
T75	0.000		0.8475	75% effective storage depth
T25	0.000		1.2825	25% effective storage depth
T75-25	0.000	Derived from Best Fit		

Comments

BRE Digest 365:2016

SOILS LIMITED
Newton House, Cross Road, Tadworth
Surrey, KT20 5SR
Telephone: 01737 814 221

Infiltration Rate Plot



Notes: The horizontal dashed black line represents the top of the water i.e. first reading

The light grey dashed represents 75% of the effective storage depth, The dark grey represents 25% of the effective storage depth. The blue line is the depth to water with time. Where a red line is present it is extrapolated data.

Soakaway Calculations

Soakaway Test No.	TPSK4
Site Name.	MIRA, Watling Street, Nuneaton
Job No.	20188

Field Test

Trial Pit Log (include details of groundwater):
See trial Pit

Depth of Pit	1.50	m blg
Width of Pit	0.60	m
Length of Pit Top	2.00	m
Length of Pit Base	1.80	m
Depth of First Reading	0.63	m bgl
Depth of Pit Soaked	0.87	m
ap50	3.343	m2
Vp75-25	0.484938	m3
t75-25	0.0	min
Amount of water used total	0.9699	m3
Flow rate	#DIV/0!	m/sec.

Calcualtions for Area of Trapeziod Side

Length at top of soak	1.916
Length at 75% of soak	1.89
Length at 25% of soak	1.83
Area of middle 50% of one trapezoid side	0.8082

Calculations of length of one angled short side

Length of angled short side	0.8777

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)
0.87	0	100
0.88	1.0	98
0.88	4.0	98
0.88	9.0	98
0.88	46.0	98
0.88	90.0	98
0.88	109.0	98
0.88	147.0	98
0.88	196.0	100
0.88	246.0	100
0.88	307.0	100
0.91	1347.0	95
0.91	1422.0	95
0.91	1542.0	95

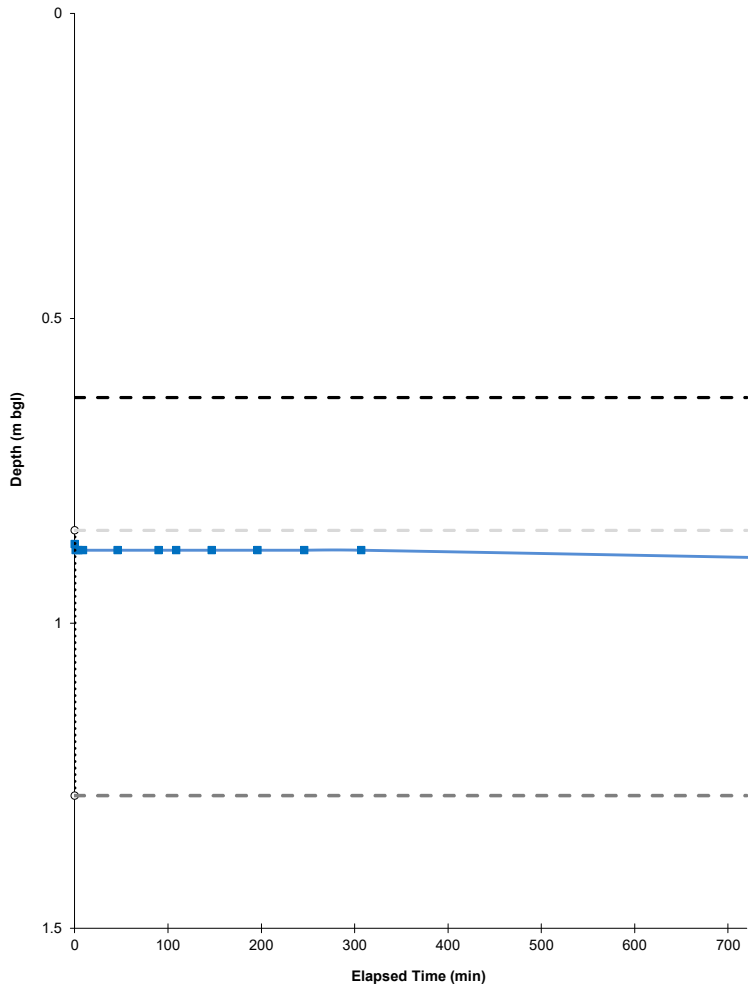
Total drai	0.04			
T75	0.000		0.8475	75% effective storage depth
T25	0.000		1.2825	25% effective storage depth
T75-25	0.000	Derived from Best Fit		

Comments

BRE Digest 365:2016

SOILS LIMITED
Newton House, Cross Road, Tadworth
Surrey, KT20 5SR
Telephone: 01737 814 221

Infiltration Rate Plot



Notes: The horizontal dashed black line represents the top of the water i.e. first reading

The light grey dashed represents 75% of the effective storage depth, The dark grey represents 25% of the effective storage depth. The blue line is the depth to water with time. Where a red line is present it is extrapolated data.

Soakaway Calculations

Soakaway Test No.	TPSK6
Site Name.	MIRA, Watling Street, Nuneaton
Job No.	20188

Field Test

Trial Pit Log (include details of groundwater):
See trial Pit

Depth of Pit	1.50	m blg
Width of Pit	0.60	m
Length of Pit Top	2.60	m
Length of Pit Base	1.80	m
Depth of First Reading	0.63	m bgl
Depth of Pit Soaked	0.87	m
ap50	3.919	m2
Vp75-25	0.530352	m3
t75-25	0.0	min
Amount of water used total	1.0607	m3
Flow rate	#DIV/0!	m/sec.

Calcualtions for Area of Trapeziod Side

Length at top of soak	2.264
Length at 75% of soak	2.15
Length at 25% of soak	1.92
Area of middle 50% of one trapezoid side	0.8839

Calculations of length of one angled short side

Length of angled short side	0.986

Field Data

Depth to Water (m)	Elapsed Time (min)	Head of Water (% of Ho)
0.63	0	100
0.63	14.0	100
0.63	29.0	100
0.63	60.0	100
0.64	102.0	99
0.64	130.0	99
0.64	163.0	99
0.64	221.0	99
0.64	461.0	99

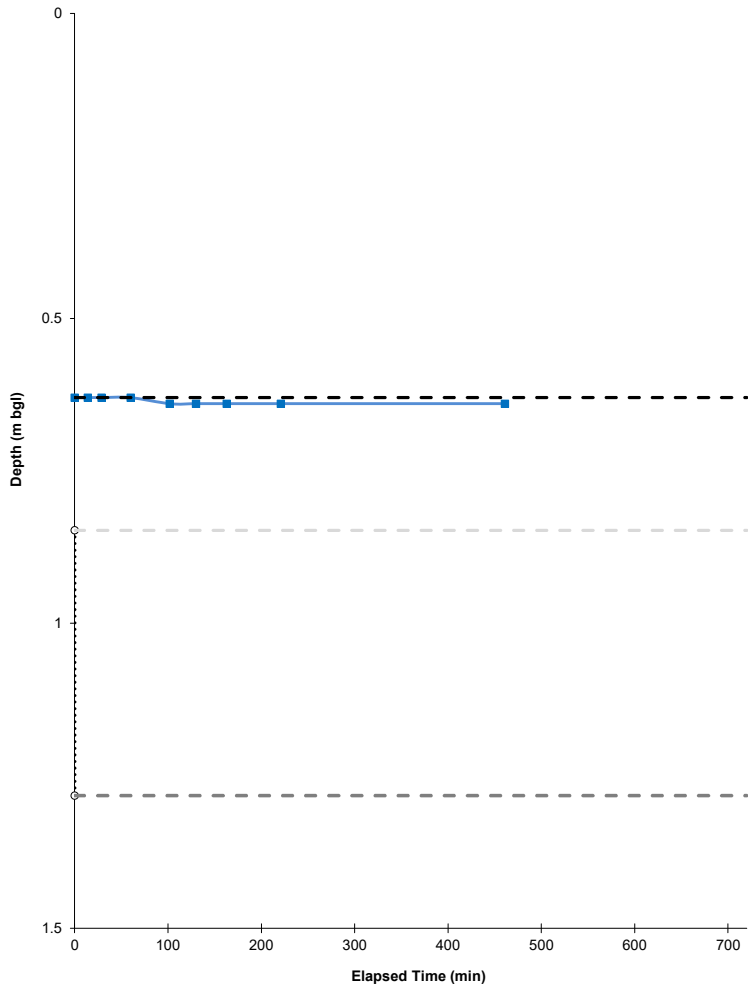
Total drai	0.01			
T75	0.000		0.8475	75% effective storage depth
T25	0.000		1.2825	25% effective storage depth
T75-25	0.000	Derived from Best Fit		

Comments

BRE Digest 365:2016

SOILS LIMITED
Newton House, Cross Road, Tadworth
Surrey, KT20 5SR
Telephone: 01737 814 221

Infiltration Rate Plot



Notes: The horizontal dashed black line represents the top of the water i.e. first reading

The light grey dashed represents 75% of the effective storage depth, The dark grey represents 25% of the effective storage depth. The blue line is the depth to water with time. Where a red line is present it is extrapolated data.

Contract Name:	Client:	Hole ID:
MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	HORIBA MIRA Ltd	**WS1**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
20188	25/05/22	CF	LW	PRELIM	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
			Premier 3	01/06/2022	1:50

Weather: Cloudy | Termination: No penetration, reached maximum safe blow count | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D			(0.30) 0.30		Firm brown slightly gravelly sandy desiccated CLAY. Gravel is sub-rounded fine to coarse igneous. Frequent rootlets. TOPSOIL.		
0.40	D			0.55		Stiff becoming very stiff orangish brown, reddish brown and brown mottled slightly sandy silty CLAY. Sand is predominantly fine. Occasional black speckling. Occasional rootlets.		
0.60	D			0.75		Very stiff light grey mottled reddish brown slightly gravelly very sandy CLAY. Sand is predominantly fine. Gravel is angular fine siltstone. Frequent thin interlaminated fine light grey sand and silty clay. Rare band of siltstone/mudstone. Rare rootlets. *Band of light grey very weak siltstone.*		
0.90	D					Very stiff reddish brown mottled red, slightly gravelly slightly sandy CLAY. Gravel is angular fine to coarse very weak to weak mudstone and fine very weak siltstone. Occasional lens and thin to thick laminations of light grey fine sand. *Band of orangish brown strong siltstone/mudstone.*		
1.40	D			(1.55)				
1.90	D							
2.40	D			2.30 2.50		Very stiff orangish brown mottled red slightly sandy gravelly CLAY. Gravel is angular to sub-angular fine to coarse very weak mudstone. *Band of orangish brown and red mudstone.*		
						End of Borehole at 2.50m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 0.70m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0	0.00	No groundwater encountered.

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Client: HORIBA MIRA Ltd			Hole ID: **WS2**
	Contract Number: 20188	Start and End Date: 24/05/22	Logged By: CF	Checked By: LW	Status: PRELIM	Hole Type: **WS**
	Easting:	Northing:	Ground Level:	Plant Used: Premier 3	Print Date: 01/06/2022	Scale: 1:50

Weather: Cloudy | Termination: No penetration, reached maximum safe blow count | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D			(0.35) 0.35		Firm becoming stiff brown slightly gravelly sandy desiccated CLAY. Gravel is sub-rounded to well-rounded fine to coarse flint and igneous. Frequent rootlets. TOPSOIL.		
0.50	D			(1.53) 1.88		Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to medium extremely weak to very weak mudstone. Occasional rootlets becoming rare. Rare light grey fine sand inclusions.		
1.00	D							
1.50	D							
1.90	D			1.96		Light grey mottled red extremely weak to weak SILTSTONE. Occasional interbedded silty clay and gravelly sand. Gravel is angular fine to medium extremely weak siltstone.		
2.10	D					Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to coarse extremely weak to very weak mudstone. Occasional very weak to weak siltstone band. Rare light grey mottling and fine sand inclusions.		
2.60	D			(1.54)		*Interbedded light grey very weak siltstone with red silty clay.* *Band of light grey mottling. Fine gravel-sized fine sand inclusions.*		
3.10	D					*Band of light grey very weak siltstone.*		
3.50	D			3.50		End of Borehole at 3.50m		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 0.85m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0	0.00	No groundwater encountered.

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Client: HORIBA MIRA Ltd			Hole ID: **WS3**
	Contract Number: 20188	Start and End Date: 24/05/22	Logged By: CF	Checked By: LW	Status: PRELIM	Hole Type: **WS**
	Easting:	Northing:	Ground Level:	Plant Used: Premier 3	Print Date: 01/06/2022	Scale: 1:50

Weather: Cloudy | Termination: No penetration, reached maximum safe blow count | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.10	D			0.15		Firm becoming stiff brown slightly gravelly sandy desiccated CLAY. Gravel is sub-rounded to well-rounded fine to coarse flint and igneous. Frequent rootlets. Rare coarse sand-sized red brick (<5%). TOPSOIL.		
0.30	D			(0.35)		Very stiff orangish brown mottled red, slightly gravelly sandy CLAY. Gravel is sub-angular to well-rounded fine to medium extremely weak mudstone and flint. Occasional rootlets. Rare black speckling.		
0.60	D			0.50		Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to medium extremely weak mudstone. Occasional rootlets. Rare light grey fine sand inclusions.		
0.80	D			0.75		Stiff dark brown mottled reddish brown slightly sandy silty CLAY. Sand is predominantly fine. Occasional black speckling. Occasional rootlets.		
1.00	D			0.90		Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to coarse extremely weak to very weak mudstone. Occasional very weak to weak siltstone band. Rare black speckling in upper boundary. Rare light grey mottling and fine sand inclusions. Rare rootlets. Rare desiccated rootlets with black mottling.		
1.50	D					*Occasional dark reddsih brown mottling.*		
2.00	D			(2.10)		*Band of light grey mottling. Fine gravel-sized fine sand inclusions.*		
2.30	D					*Band of orangish brown and red mudstone.*		
2.50	D							
3.00	D			3.00		End of Borehole at 3.00m		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Remarks:
Rootlets observed to 1.30m bgl. Desiccated rootlet noted at 2.55m bgl.

Water Strikes					
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0	0.00	No groundwater encountered.

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	HORIBA MIRA Ltd	**WS4**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
20188	24/05/22	CF	LW	PRELIM	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
			Premier 3	01/06/2022	1:50

Weather: Cloudy | Termination: No penetration, reached maximum safe blow count | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D			0.20		Dark brown clayey very gravelly SAND. Gravel is angular fine to medium igneous, flint, fine red brick, sandstone and clinker. Frequent rootlets. MADE GROUND.		
0.30	ES/D			(0.40)		Brown clayey very gravelly SAND. Gravel is angular to well-rounded fine to coarse flint, concrete, red brick, clinker and igneous. Occasional flint and concrete cobbles. Occasional glass and plastic fragments. Occasional rootlets. MADE GROUND.		
0.40	D			0.50		Stiff becoming very stiff brown mottled reddish brown, slightly sandy slightly gravelly CLAY. Gravel is angular to well-rounded fine to coarse flint, concrete, red brick, clinker and igneous. Occasional plastic fragments. Occasional rootlets. MADE GROUND.		
0.60	ES/D			(0.35)				
0.70	D			0.85		*Band of odourless black mottling.*		
1.00	D					Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to medium extremely weak mudstone. Occasional rootlets becoming rare. Rare light grey fine sand inclusions.		
1.50	D			(1.65)				
2.00	D							
2.40	D							
2.55	D			2.50		Light grey mottled red very weak to medium strong SILTSTONE. Occasional interbedded silty clay and gravelly sand. Gravel is angular fine to medium very weak siltstone.		
2.80	D			2.60		Very stiff reddish brown mottled red, slightly sandy slightly gravelly becoming gravelly CLAY. Gravel is angular fine to coarse extremely weak to very weak mudstone and weak siltstone. Rare light grey mottling and fine sand inclusions.		
				(0.40)				
				3.00		End of Borehole at 2.90m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.15m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0	0.00	No groundwater encountered.

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

Contract Name:	Client:	Hole ID:
MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU	HORIBA MIRA Ltd	**WS5**

Contract Number:	Start and End Date:	Logged By:	Checked By:	Status:	Hole Type:
20188	24/05/22	CF	LW	PRELIM	**WS**
Easting:	**Northing:**	**Ground Level:**	**Plant Used:**	**Print Date:**	**Scale:**
			Premier 3	01/06/2022	1:50

Weather: Cloudy | Termination: No penetration, reached maximum safe blow count | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D			(0.30) 0.30		Firm becoming stiff brown slightly gravelly sandy desiccated CLAY. Gravel is sub-rounded to well-rounded fine to coarse flint, igneous and sandstone. Frequent rootlets. TOPSOIL.		
0.40	D			(0.70)		Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to medium extremely weak to very weak mudstone. Occasional black speckling. Occasional rootlets becoming rare.		
0.90	D			1.00		*Lens of orangish brown clayey sandy gravel, gravel is extremely weak mudstone.*		
1.10	D			(0.70)		Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to medium extremely weak to very weak mudstone and very weak siltstone. Occasional lens of light grey sand and calcareous gravel (GYPSUM?). Rare rootlets.		
1.60	D			1.70				
1.75	D			1.80		Brown mottled red very weak to medium strong SILTSTONE. Occasional interbedded silty clay and gravelly sand. Gravel is angular fine to medium very weak siltstone. Frequent white fine calcareous sand.		
1.90	D			(0.70)		Very stiff reddish brown mottled red, slightly sandy slightly gravelly becoming gravelly CLAY. Gravel is angular fine to medium extremely weak to very weak mudstone and rare very weak siltstone. Sand is predominantly fine.		
2.40	D			2.50				
2.60	D			(0.35)		Reddish brown, red and light grey mottled, sandy very clayey GRAVEL. Gravel is angular fine to coarse extremely weak to weak mudstone and very weak siltstone.		
2.90	D			2.85 2.90		Orangish brown weak to medium strong MUDSTONE. Occasional grey speckling.		
						End of Borehole at 2.90m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 1.25m bgl.

Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
			0	0.00	No groundwater encountered.

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

soils LIMITED	Contract Name: MIRA, Watling Street, Nuneaton, Leicestershire CV10 0TU		Client: HORIBA MIRA Ltd			Hole ID: **WS6**
	Contract Number: 20188	Start and End Date: 24/05/22	Logged By: CF	Checked By: LW	Status: PRELIM	Hole Type: **WS**
	Easting:	Northing:	Ground Level:	Plant Used: Premier 3	Print Date: 01/06/2022	Scale: 1:50

Weather: Cloudy | Termination: Reached required depth (4.0m) | Sheet 1 of 1

Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Type	Results	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.20	D			(0.30) 0.30		Firm becoming stiff brown slightly gravelly sandy desiccated CLAY. Gravel is sub-rounded to well-rounded fine to coarse flint, igneous and sandstone. Frequent rootlets. TOPSOIL.		
0.40	D					Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to medium extremely weak to very weak mudstone. Occasional black speckling becoming rare. Occasional light grey fine sand lenses and inclusions. Occasional rootlets becoming rare.		
0.90	D			(1.40)				
1.40	D							
1.80	D			1.70 1.85		Brown mottled red very weak to medium strong SILTSTONE. Occasional interbedded silty clay and gravelly sand. Gravel is angular fine to medium very weak siltstone. Frequent white fine calcareous sand.		
2.00	D			(0.45) 2.30		Very stiff reddish brown mottled red, slightly sandy slightly gravelly becoming gravelly CLAY. Gravel is angular fine to medium extremely weak to very weak mudstone and rare very weak siltstone. Sand is predominantly fine.		
2.40	D			(0.65)		Reddish brown mottled red, sandy very clayey GRAVEL. Gravel is angular fine to coarse extremely weak to weak mudstone and very weak siltstone. *Band of orangish brown medium strong to strong mudstone.*		
2.90	D			2.95		Light grey very weak to medium strong clayey sandy very gravelly SILTSTONE. Occasional interbedded silty clay and gravelly sand. Gravel is angular fine to medium very weak to medium strong siltstone.		
3.10	D			(0.45) 3.40				
3.50	D			(0.60)		Very stiff reddish brown mottled red, slightly sandy slightly gravelly CLAY. Gravel is angular fine to coarse extremely weak to very weak mudstone. Rare sub-angular fine calcareous gypsum gravel. Rare coarse sand-sized light grey mottling.		
4.00	D			4.00		End of Borehole at 4.00m		

1 2 3 4 5 6 7 8 9 10

Start & End of Shift Observations					Borehole Diameter		Casing Diameter	
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)

Remarks:
Rootlets observed to 0.90m bgl.

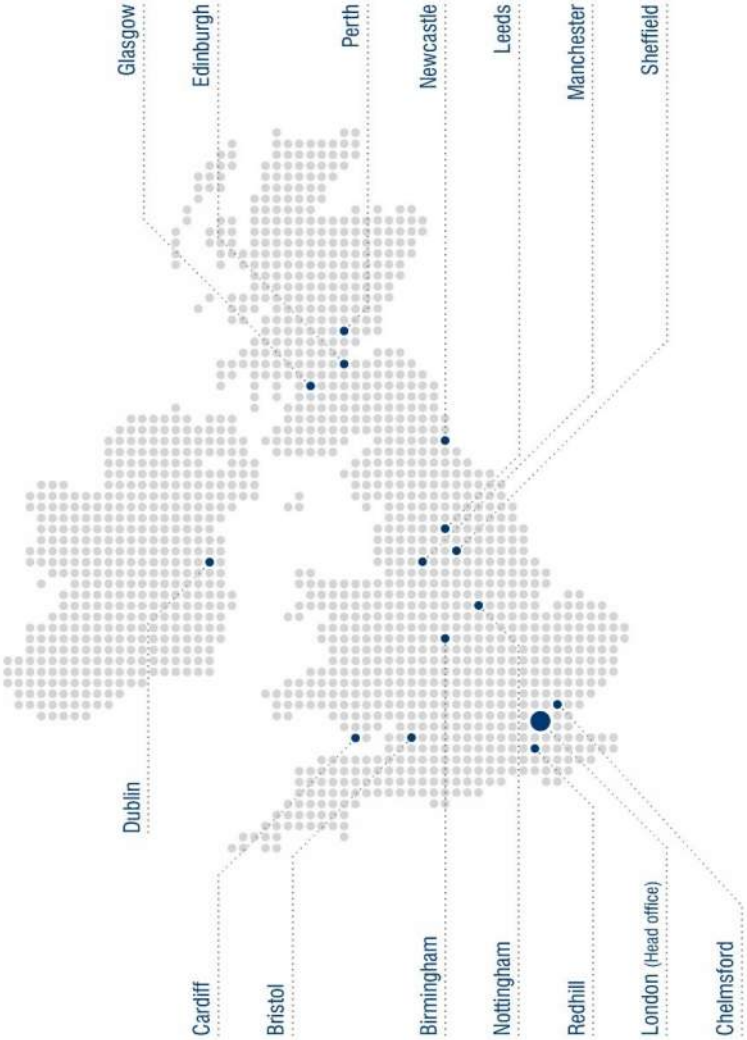
Chiselling				Installation			
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)

Water Strikes

Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
3.20			20	3.20	Groundwater struck at 3.20m bgl.

Hand vane (HV), Hand penetrometer (HP) reported in kPa. PID reported in ppm.

UK and Ireland Office Locations



Remediation and Discovery Strategy

MIRA Technology Park – LIF 2 Infrastructure, Land North of A5

Remediation and Discovery Strategy

September 2022

Waterman Infrastructure & Environment Limited
Pickfords Wharf, Clink Street, London, SE1 9DG
www.watermangroup.com

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This document has been prepared and checked in accordance with Waterman Group's IMS (BS EN ISO 9001: 2015, BS EN ISO 14001: 2015 and BS EN ISO 45001:2018)

Issue	Date	Prepared by	Checked by	Approved by
First	September 2022	Robbie J Moore Senior Contaminated Land Consultant	Carl Slater Technical Director	Carl Slater Technical Director

Comments

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We disclaim any responsibility to the client and others in respect of any matters outside the scope of the above.

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Executive Summary

Objectives
Remediation Strategy for ground contamination risks at MIRA Technology Park LIF 2 Infrastructure Site, Land North of the A5, Nuneaton. This report is to support a future planning application for redevelopment of the site for commercial use.

Mitigation Measures	
Boundary Treatment	Sealing of buried services at the Site boundary.
Treatment of Soils	Assessment of excavated soils for re-use, and treatment if necessary to ensure they meet criteria for the proposed end use
Materials Management	Materials Management Plan for the earthworks. Stockpile management, dust prevention, leachate management and waste classification for materials to be removed.
Decommissioning of Surface Drainage	Decommissioning of any redundant drainage encountered during demolition and Site stripping works.
Unforeseen Contamination	Addendum Remediation Method Statement to be prepared if unforeseen contamination is encountered during the works.
Imported Materials	All materials to be from a known source and appropriate for their intended use, with sampling, testing, and certification to be provided.
Soft Landscaping	Imported soils for soft landscaping areas to be from a known source and appropriate for their intended use, with sampling, testing, and certification to be provided.
Buried Services	Installation of new services in clean service corridors. Water supply pipes to be suitable for use on brownfield sites.
Protection of Groundwater	Adequate measures will be put in place to protect the aquifers underlying the Site. Fuel storage will be adequately bunded and drip trays and spill kits will be provided, with Site workers familiar with their use.
Laboratory Testing	Chemical analysis of soils and groundwater to be undertaken by UKAS and MCERTS accredited laboratories.
Discovery Strategy	Watching brief to be maintained at all points of excavation throughout the development works. Contractor to prepare addendum remedial method statement for any unanticipated contamination encountered, with this included within the Validation Report.
Statutory Approvals	Hinkley and Bosworth Borough Council, Leicestershire County Council, the Environment Agency, and the local water company to be consulted and approvals obtained for the works.
Validation	Validation Report to be prepared and submitted to the statutory authorities for approval.

1. Introduction

1.1 Objectives

Waterman Infrastructure & Environment Limited ("Waterman") was instructed by Waterman Structures Limited on behalf of Swanvale Developments Limited to undertake a Preliminary Risk Assessment (PERA) for ground contamination at the MIRA Technology Park LIF 2 Infrastructure Site, Land North of the A5, Nuneaton (hereafter termed "the Site").

This assessment follows on from the Ground Conditions and Contamination, Flood Risk Assessment and Outline Drainage Strategy desk study report prepared by Waterman in April 2022 (*report reference EED13833-117-R-2.4.2-FRA*) and ground investigation factual report prepared for the Site by Soils Ltd in May 2022 (*report reference 20188/FDLR*).

The Remediation Strategy covers the approach to management of contamination risk on the Site and sets out outline mitigation measures to reduce any identified risk to an acceptable level. A Discovery Strategy for actions to be undertaken should any potential contamination be identified during redevelopment works is also set out in this document.

1.2 Proposed Development

The Site (Red Line boundary) covers an area of approximately 15.6 hectares (ha) and currently forms part of the MIRA Technology Park including currently undeveloped land to the north-west of the park, farmland and farm buildings in the east.

The proposed development has not been finalised but will involve demolition of all existing structures and construction of new commercial buildings, with car parking, soft landscaping, and attenuation ponds. An outline development layout is included in Appendix A.

1.3 Planning Context

The purpose of this report is to support a future masterplan planning application for development of the Site as an expansion to the adjacent MIRA complex.

1.4 Regulatory Context

National Planning Policy Framework 2021

The National Planning Policy Framework (NPPF) 2021 sets out Government planning policy for England and how this is expected to be applied to development. Paragraph 120 of Section 11 – Making effective use of land and paragraphs 174, 183, 184 and 188 of Section 15 – Conserving and enhancing the natural environment of the NPPF relate to contaminated land matters and state the following:

120. Planning policies and decisions should:

c) give substantial weight to the value of using suitable brownfield land within settlements for homes and other identified needs, and support appropriate opportunities to remediate despoiled, degraded, derelict, contaminated or unstable land;

174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans; and

f) remediating and mitigating despoiled, degraded, derelict, contaminated and unstable land, where appropriate.

183. Planning policies and decisions should ensure that:

a) a site is suitable for its proposed use taking account of ground conditions and any risks arising from land instability and contamination. This includes risks arising from natural hazards or former activities such as mining, and any proposals for mitigation including land remediation (as well as potential impacts on the natural environment arising from that remediation);

b) after remediation, as a minimum, land should not be capable of being determined as contaminated land under Part IIA of the Environmental Protection Act 1990; and

c) adequate site investigation information, prepared by a competent person, is available to inform these assessments.

184. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

188. The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities.

Environmental Protection Act 1990 and Contaminated Land Statutory Guidance 2012

In order to assess the contamination status of the Site, with respect to the proposed end use, it is necessary to assess whether the Site could potentially be classified as “Contaminated Land”, as defined in Part IIA of the Environmental Protection Act 1990 and Contaminated Land Statutory Guidance 2012. This is assessed by the identification and assessment of potential contaminant linkages. The linkage between the potential sources and potential receptors identified needs to be established and evaluated.

To fall within this definition, it is necessary that, as a result of the condition of the land, substances may be present in, on or under the land such that:

a) significant harm is being caused or there is a significant possibility of such harm being caused; or

b) significant pollution of controlled waters is being caused, or there is significant possibility of such pollution being caused.

It should be noted that DEFRA has advised (Ref. Section 4, DEFRA Contaminated Land Statutory Guidance 2012) Local Authorities that land should not be designated as “Contaminated Land” where:

a) the relevant substance(s) are already present in controlled waters;

b) entry into controlled waters of the substance(s) from land has ceased; and

c) it is not likely that that further entry will take place.

These exclusions do not necessarily preclude regulatory action under the Environmental Permitting (England and Wales) Regulations 2016, which make it a criminal offence to cause or knowingly permit a water discharge of any poisonous, noxious or polluting matter to controlled waters. In England and Wales, under The Water Resources Act 1991 (Amendment) (England and Wales) Regulations 2009, a works notice may be served by the regulator requiring appropriate investigation and clean-up.

1.5 Constraints

The assessment was undertaken in accordance with the scope agreed between Waterman and Waterman Structures Ltd, as documented in Waterman's fee letter (*reference STR17364-211206-SC-Fee Proposal, dated 22 December 2021*), and with Waterman's standard Terms of Appointment.

The benefit of this report is made to Swanvale Developments Ltd.

The information contained in this report is based on the findings of the previous environmental risk assessment, observations made on-Site, exploratory hole records and laboratory test results undertaken by Soils Ltd.

Constraints to the investigation include:

- The ground conditions reported relate only to the point of excavation and do not necessarily guarantee a continuation of the ground conditions throughout the non-inspected area of the Site. Whilst such exploratory holes would usually provide a reasonable indication as to the general ground conditions, these cannot be determined with complete certainty;
- The Soils Ltd ground investigation report provided did not include sampling or testing of soils or groundwater at the Site;
- Waterman has endeavoured to assess all information provided to them during this investigation but makes no guarantees or warranties as to the accuracy or completeness of this information;
- The scope of this investigation includes an assessment of the presence of asbestos containing materials in the ground at the Site but not within buildings or structures or below ground structures (basements, buried service ducts and the like); and
- The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at or adjacent to the Site.

2. Ground Conditions

2.1 Site History

Earliest available mapping information in 1887-1902 identifies the historical land use at the Site as farmland, with a railway line intersecting the north-eastern corner. From 1934 the area became occupied by the RAF and developed as Lindlay Airfield. In 1905 a shooting range was present on part of the Site, and by 1961 the airfield was disused and the area in use by MIRA as a vehicle testing facility.

Recorded land uses within 500m of the Site include factories and works including an oil factory, cement works, print works, garages, power station and various wharfs.

2.2 Geology and Hydrogeology

Geology on-Site has been established from British Geological Survey (BGS) mapping, nearby BGS borehole logs and findings of the Soils Ltd ground investigation at the Site. Geology and hydrogeology are summarised in Table 1.

Table 1: Site Geology

Stratum	Area Covered	Estimated Thickness	Hydrogeological Classification
Topsoil, or gravel surfacing in farm buildings area	Entire Site	0.3-1.3m	Not classified
Boulder Clay (Lacustrine and Glaciofluvial deposits)	Western area of the Site only	0.3-0.4m	Secondary A Aquifer
Mercia Mudstone	Entire Site	Base not proven at 6.1m bgl	Secondary B Aquifer

A single groundwater strike was encountered at one window sample location during the Soils Ltd. works at 3.2m bgl. This level did not change after 20 minutes observation. Groundwater was not encountered at the remaining five window sample holes.

Surface Waters

Drainage ditches surround the Site and run north to south adjacent to the hedgerows separating the eastern and western fields. This ditch outflows to the nearby River Anker off-site to the west, and at the time of the walkover was observed to be dry. Two ponds are in the centre-east of the Site. The northern of these was found to be dry at the time of the walkover, with water present in the southern feature.

The nearest recorded surface waters to the Site are a series of rivers and surface ponds at Caldecote Brook located 480m north. The River Anker is 575m west.

The drainage ditches, ponds and Caldecote Brook have not been classified for Ecological Potential by the EA under the Water Framework Directive. The River Anker has been assessed with a ‘good’ ecological and chemical rating.

No surface water abstractions are recorded within 1km of the Site. A single discharge consent is detailed, 56m north-east authorising trade discharge to Caldecote Brook.

2.3 Observations During Ground Investigation

Ground investigation works comprised six window sample holes to depths between 2.5m bgl and 4.0m bgl, and four trial pits to 1.5m bgl.

Soil and Groundwater Chemical Quality

Chemical soil and groundwater sampling was not undertaken as part of the investigation works. During excavation of the exploratory holes, no visual or olfactory evidence for contamination was observed in the holes or arisings.

Asbestos

Visible fragments of asbestos or asbestos containing materials (ACMs) were not identified at the Site.

Ground Gas and Vapours

Considering the identified geology beneath the Site and proposed development design, the Site is considered very low risk for ground gas issues.

Soil and groundwater observations during excavation works do not indicate any potential vapour risk at the Site. The potential for vapour risk to new development structures is low.

2.4 Variations of Proposed Ground Investigation Methodology

The Environmental Assessment prepared by Waterman as part of the wider Ground Conditions and Contamination, Flood Risk Assessment and Outline Drainage Strategy included recommendations for further work to determine the risk posed by potential land contamination. Recommendations relating to ground conditions are reproduced below:

- Although the risk of encountering contamination on the Site is low, confirmatory environmental chemistry testing will be undertaken during the geotechnical investigation to be done to inform future building design. The chemical test suite will include asbestos, metals, speciated total petroleum hydrocarbons (TPH) and polyaromatic hydrocarbons (PAHs);
- Construction workers should be provided with, and use appropriate PPE while undertaking works at the Site;
- Works at the Site should be completed in-line with the Control of Asbestos Regulations (2012);
- Construction workers should be asbestos awareness trained; and
- Construction materials and stockpiled soils during the works should be appropriately stored to prevent dust emissions to nearby roads, farms and the wider MIRA complex;

Soils Ltd. undertook the ground investigation works across the Site, which comprised six window sample holes and four trial pits. However, soil and groundwater sampling was not undertaken as part of this investigation, with a visual inspection of arisings completed instead. This inspection did not identify any contamination in soils or groundwater encountered.

As set out in the previous reports, the risk of ground contamination is low. Potential contamination sources identified for the Site were primarily related to use of the nearby land as an airfield, with risk of hydrocarbon contamination to soils and groundwater. Therefore, gross contamination resulting from this land use would be readily identifiable by visual inspection in lieu of soils and groundwater chemical testing. Furthermore, the proposed land use as commercial buildings will reduce the potential for future Site users to contact soils at the Site, limiting the pathways for any contamination to these receptors.

To fully reduce the risk to the Site, a watching brief for evidence of ground contamination will be undertaken as part of the validation measures. A discovery strategy for dealing with any contamination encountered during the watching brief is set out in Section 3.5.

3. Remediation Strategy

This strategy is designed to ensure the contaminant linkages identified in the ground conditions section of the desk study are adequately mitigated both during, and on completion of the development.

The Contractor appointed to complete the Development will undertake the mitigation works. All remediation works will be documented in a Validation Report. This report will provide details of the mitigation measures implemented and any remediation work undertaken. Full details to be included within the Validation Report are outlined in Section 4.

3.1 Protection of Workers and the General Public

3.1.1 Construction Workers

The health and safety of all construction workers and visitors on-Site will be managed during the development works through provision of appropriate welfare facilities, decontamination facilities, appropriate storage of fuels, chemicals, and construction materials.

The Waterman PRA and Soils Ltd ground investigation report detailing the Site history, ground conditions and the potential for contaminated soils and groundwater will be provided to the Contractor.

Personal protective equipment (PPE) suitable for the activities being undertaken will be provided where necessary. The Contractor will complete a method statement for all demolition and construction activities, which will be appended to this report once available. All works will be progressed in line with the approved method statements.

3.1.2 Surrounding Site Receptors

Mitigation measures will be employed to minimise airborne dust emissions or surface run-off from stockpiled materials. The appointed Contractor will determine the methods for appropriate handling and storage of materials, which may include use of hoardings, damping down and covering of stockpiles where necessary. Where material is sent off-Site via highways, wheel washing facilities and road sweeping may be employed to prevent material being tracked into the road. These measures will ensure the public are protected throughout the duration of the works.

On-Site fuel storage will be adequately bunded, with drip trays and spill kits provided as necessary. Site workers will be familiar with the use of spill kits, and any leaks or spills will be recorded and reported to Site management regardless of volume.

3.2 Buried Services

All new underground services will be situated in clean service corridors. Drinking water supply pipes used will be resistant to chemical attack, in consultation with the local water authority. Redundant services encountered during the ground works shall be appropriately decommissioned and capped at the Site boundary.

3.3 Material Management

3.3.1 Materials Management Plan

Where it is proposed to re-use material on-Site, the Contractor will be responsible for determining the most appropriate framework through which the soils are re-used. This is likely to be through the CL:AIRE ‘Definition of Waste’ Code of Practice (DoWCoP), or alternatively through a waste exemption permit sought from the Environment Agency.

Should approval be sought via DoWCoP, the Contractor will prepare a Materials Management Plan (MMP) which will collate all the relevant information to demonstrate the soils are not waste (quantities, quality, and certainty of use) and will include details of the tracking system, contingency, and verification requirements. The MMP will also state what works are due to be undertaken, how they have been assessed and who will be carrying them out. The MMP will be signed off by a Qualified Person (QP) who is not part of the design team.

Any material re-used on-Site will be confirmed free of visual and olfactory evidence of contamination, including (but not limited to) the visual presence of asbestos containing materials, bituminous materials containing coal-tar, and hydrocarbon staining and odours.

The total volume of material re-used on-Site, types of material and location of emplacement will be documented in the Validation Report.

3.3.2 Management Measures

Stockpiling of soil arisings will be managed in a controlled manner, with different material types segregated and clearly labelled. Each stockpile will be identified according to assumed or confirmed categorisation, source, type and deposition date, and details of any chemical analyses.

Stockpiles will be physically separated to avoid cross contamination and temporary road access provided for placement and loading. Stockpiles of contaminated material will be positioned on impervious surfaces to prevent any potential leachate to ground.

3.3.3 Validation of Ground Conditions

Sampling of soils and groundwater was not undertaken during ground investigation at the Site, however no evidence for contamination was identified during visual inspection of arisings. As identified in the desk study for the Site, potential contamination is limited to hydrocarbons from use of nearby land as an airfield.

An environmental engineer will regularly attend Site during ground works to examine arisings and confirm any visual evidence for contamination identified. The engineer will keep a photographic record of the works as excavation progresses, which will be included in the Validation Report.

Visual inspection of pile arisings and exposed soils at formation level within the new building and attenuation ponds footprints will be undertaken to confirm unanticipated gross hydrocarbon contamination is not evident. If encountered, the process for removal and validation of unanticipated contamination is set out in Section 3.5.

3.3.4 Asbestos Management Plan

Ground works by Soils Ltd. did not identify any visual evidence for asbestos contamination. Should potential asbestos be encountered during the redevelopment, works in the affected area will cease and the Contractor shall make the environmental engineer aware.

3.3.5 Imported Materials

Where secondary aggregates are brought to or generated on-Site these will be completed in accordance with the Waste and Resources Action Group (WRAP) Quality Protocol for the production of aggregates from inert waste and confirmed free of visual and olfactory evidence of contamination, including (but not limited to) the visual presence of asbestos containing materials and bituminous materials containing coal-tar, and hydrocarbon staining and odours. Alternatively, a waste exemption or environmental permit will be obtained from the Environment Agency for the re-use of Site-won soils and/or aggregates.

Imported materials will be sampled on Site to confirm their suitability, at the rates detailed in Section 3.3.7. Chemical criteria for imported material are set out in Appendix B.

Records will be collected detailing the total volume of imported soils for inclusion in the Validation Report.

3.3.6 Surplus Material

The waste hierarchy will be followed for surplus materials, as follows:

- Re-use of suitable materials on-Site where possible;
- Processing or treatment of unsuitable materials to allow re-use on-Site;
- Re-use off-Site;
- Processing or treatment to allow re-use off-Site;
- Transport to an off-Site waste recovery facility; or
- Disposal to landfill.

Most excavated materials will need to be disposed of off-site. Surplus soils will be subjected to analysis to confirm the correct waste classification of the material and identify a suitable licensed disposal facility. Copies of all relevant licences for the disposal / treatment facility will be provided prior to the waste being taken off-Site.

Quantities of materials disposed off-Site, and the receiving facilities will be recorded during the works. All consignment notes for the materials transferred will be collated and a selection provided in the Validation Report.

3.3.7 Topsoil for Soft Landscaping

The new development buildings will be surrounded by grass landscaping and trees. It is assumed that existing topsoil across the Site will be re-used for this purpose, however, should additional topsoil/subsoil bel imported it will be certified as clean, uncontaminated, and suitable for use, and will be from a known source.

A minimum of three samples of soil per source will be submitted for analysis to confirm its suitability. Samples will be taken in-situ following soil placement and submitted for the chemical analysis listed in Appendix B2 and will comply with the limits in the table. If the volume of soil from any source exceeds 1500m^3, samples at a rate of one sample per 500m^3 over and above 1500m^3 should be submitted to confirm suitability.

3.3.8 Protection of Groundwater during the Works

The Boulder Clay and Mercia Mudstone are classified as Secondary (A) Aquifer and Secondary (B) Aquifers respectively. Whilst it is not anticipated that development works will expose this groundwater, measures will be required to protect these water bodies underlying the Site.

Any fuel storage on-Site will be adequately bunded, with drip trays and spill kits provided. Site workers will be familiar with their use. Any leaks or spills will be reported to Site management, regardless of volume.

Access to the fuel storage will be locked and restricted. Fuel dispenser pumps with “hold open latches” will not be permitted on Site.

3.4 Laboratory Testing and Accreditation

Any further chemical analysis required at the Site will be undertaken by UKAS and MCERTS accredited laboratories.

3.5 Discovery Strategy for Unforeseen Contamination

The Contractor shall maintain a watching brief at all points of excavation throughout the development works. Should unforeseen contaminated materials or liquids be encountered, work in the area will be stopped to assess the extent and nature of the contamination. The Contractor will prepare an addendum remedial method statement for dealing with the encountered contamination, likely to involve excavation and removal of all visually impacted material from the Site. Depending on the nature of the contamination identified, verification samples may also be collected from the base and sides of the excavations with appropriate chemical testing to demonstrate the material has been effectively remediated.

The addendum remedial method statement and chemical analysis of validation samples will be included within the Validation Report.

3.6 Statutory Approvals

All necessary approvals from the statutory authorities, including Hinkley and Bosworth Borough Council, Leicestershire County Council, the Environment Agency and local water company will be obtained for the works undertaken.

A watching brief will be undertaken throughout the works, with documentary evidence collected demonstrating compliance with this Remediation Strategy.

A Validation Report will be prepared upon completion of the below-ground development works and submitted for statutory approval. The scope of this Validation Report is set out in Section 4.

The works will be carried out and comply with all current applicable standards, codes, regulations, planning conditions, guidance notes, legislation and health and safety conditions.

4. Validation Report

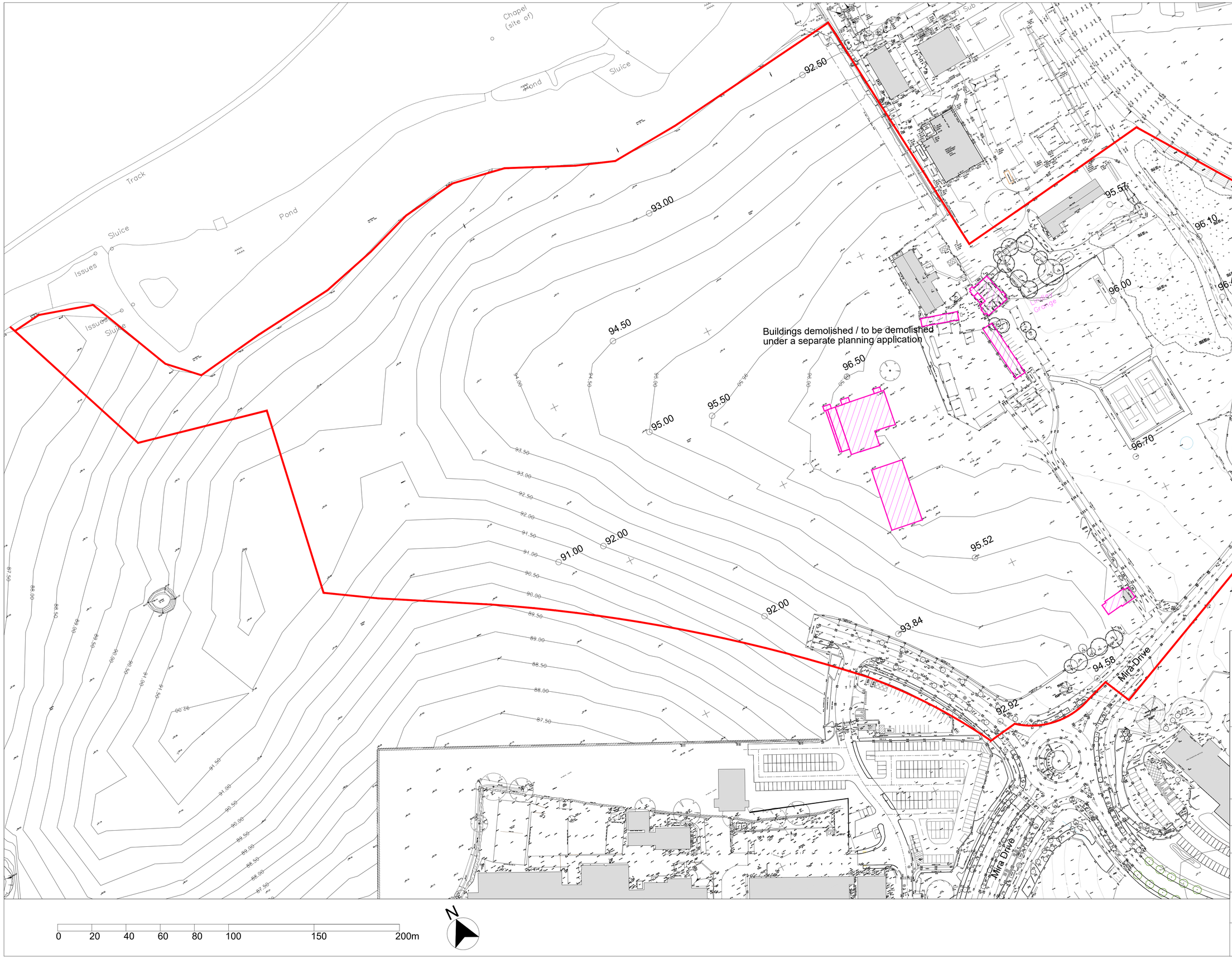
A Validation Report will be prepared detailing all contaminated land works undertaken as part of the development. The Validation Report will include the following information:

- For materials imported, re-used or exported from the Site;
  - Material source location, type and volumes;
  - Details of any processes undertaken on the material, such as remediation processes or generation of secondary aggregates;
  - Records to demonstrate the material has been procured or produced in accordance with appropriate protocols;
  - Location and details of validation samples collected;
  - Laboratory chemical test results for validation samples collected;
  - Details for any locations in which re-used or imported materials have been emplaced, including final thicknesses and total area covered; and
  - Locations where material has been exported, including volumes sent and relevant documentation. Exported material data should be separated based on the waste classification of the materials;
  - Summary of consignment notes and chain of custody documents relating to the disposal of soils, groundwater and asbestos containing materials from the Site;
- Details of any unanticipated contamination encountered during the works in accordance with the discovery strategy;
- Photographic record and visual inspection record of the formation level for the new building slab;
- As-built drawings showing final levels, excavated/infilled areas, and other relevant details; and
- Relevant approvals from Leicestershire Council, the Environment Agency and the local water authority for the works carried out.

APPENDICES

A. Site Plans

- **Site Location Plan**
- **Site Plan**
- **Proposed Outline Development Plans**



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Geddes Architects

Studio 3.31 Canterbury Court Kennington Park
1-3 Brixton Road London SW9 6DE
www.geddesarchitects.com T +44 203 150 4605

Client
Horiba - Mira Ltd
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Project
Infrastructure
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Title
Existing Site Plan
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