

Revision to Surface Water Drainage Model**Parameters**

- Network tested for 100 year event plus 30% allowance for climate change using FSR rainfall data.
- The top water level in Attenuation basins B1.1 and B1.2 to be at least 250 mm below the level of the adjacent carriageway.
- The restricted discharge from the site is 117 l/s.

Amendments to model (CIV14979 150904 CF EF –Surface Water drainage Network – NEW PF UPDATE 24 REV A)

- Update attenuation basins to the south of 5th Avenue; in accordance with landscape plan AJA.2341-02 issue 3.
- 2 no 900mm dummy pipes removed; previously runs 5.008 & 5.009, this gave an additional volume of 97m³ of storage volume that didn't actually exist.
- Network initially tested without any control between basin B1.1 and B1.2. Although the levels in the basin were acceptable the actual discharge from the site was greater than the restricted discharge. An orifice has been inserted at the outfall of Basin B1.2, this has the effect of restricting the flow through Basin 1.1 thus reducing the discharge from the whole site to below the agreed restricted discharge.
- Basin B2 on landscape plan has not been included in the model. There is no surface water draining directly into it, therefore it would not be very effective.

Results

Attenuation Basin	Downstream Run No.	Critical Storm 100 yr Event	Adj. Carriageway level m	Max. Water level m	Difference m	Depth of water m	Max storage Volume available m ³
B1.2	5.008	480 W	199.80	199.02	0.78	1.60	1760
B1.1	5.009	480 W	199.05	198.61	0.44	1.33	887

Run No	Critical Storm	Actual Pipe Flow l/s	Restricted discharge l/s
1.011	100yr 480W	116.7	117.0

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH

REV A



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

Pipe Sizes EXPORT FOR PDS - SW NETWORK PHASE 1 Manhole Sizes EXPORT FOR PDS - SW NETWORK PHASE 1

FEH Rainfall Model	
Return Period (years)	10
Site Location 293700 206800 SN 93700 06800	
C (1km)	-0.029
D1 (1km)	0.546
D2 (1km)	0.478
D3 (1km)	0.358
E (1km)	0.295
F (1km)	2.642
Maximum Rainfall (mm/hr)	0
Maximum Time of Concentration (mins)	30
Foul Sewage (l/s/ha)	0.000
Volumetric Runoff Coeff.	0.750
Add Flow / Climate Change (%)	0
Minimum Backdrop Height (m)	0.200
Maximum Backdrop Height (m)	1.500
Min Design Depth for Optimisation (m)	1.200
Min Vel for Auto Design only (m/s)	1.00
Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

- Indicates pipe length does not match coordinates

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	225.000#	0.066	3409.1	1.000	4.00	0.0		0.030	[11	Pipe/Conduit	⚠
1.001	9.868#	0.066	149.5	0.000	0.00	0.0		0.030	o	225	Pipe/Conduit	⚠
1.002	64.250	0.100	642.5	0.047	0.00	0.0	0.600		o	900	Pipe/Conduit	⚠
2.000	10.082	0.068	148.3	0.000	4.00	0.0	0.600		o	225	Pipe/Conduit	⚠
1.003	57.307	0.130	440.8	0.033	0.00	0.0	0.600		o	900	Pipe/Conduit	⚠
1.004	9.011	0.020	450.5	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	⚠
1.005	32.569	0.072	452.3	0.037	0.00	0.0	0.600		o	900	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	0.00	17.17	197.750	1.000	0.0	0.0	0.0	0.28	580.5	0.0
1.001	0.00	17.58	197.666	1.000	0.0	0.0	0.0	0.40	15.9	0.0
1.002	0.00	18.45	197.600	1.047	0.0	0.0	0.0	1.23	781.6	0.0
2.000	0.00	4.16	197.568	0.000	0.0	0.0	0.0	1.07	42.6	0.0
1.003	0.00	19.10	197.500	1.080	0.0	0.0	0.0	1.49	945.2	0.0
1.004	0.00	19.27	197.370	1.080	0.0	0.0	0.0	0.85	93.6	0.0
1.005	0.00	19.64	197.350	1.117	0.0	0.0	0.0	1.47	933.0	0.0

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

Network Design Table for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
1.006	12.215	0.028	436.3	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	
3.000	27.584	0.183	150.7	0.550	4.00	0.0	0.600		o	225	Pipe/Conduit	
1.007	53.071	0.130	408.2	0.050	0.00	0.0	0.600		o	900	Pipe/Conduit	
4.000	50.000#	0.125	400.0	0.350	4.00	0.0	0.600		o	300	Pipe/Conduit	
4.001	25.000#	0.110	227.3	0.350	0.00	0.0	0.600		[]	4	Pipe/Conduit	
4.002	7.175#	0.029	247.4	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
1.008	24.334	0.052	468.0	0.050	0.00	0.0	0.600		o	900	Pipe/Conduit	
1.009	9.839	0.090	109.3	0.034	0.00	0.0	0.600		o	900	Pipe/Conduit	
5.000	10.700	0.001	10700.0	0.000	4.00	0.0	0.600		o	225	Pipe/Conduit	
6.000	26.838	0.120	223.7	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
5.001	14.247	0.001	14247.0	0.000	0.00	0.0	0.600		o	225	Pipe/Conduit	
5.002	3.973	0.040	99.3	0.125	0.00	0.0	0.600		o	375	Pipe/Conduit	
5.003	12.481	0.105	118.9	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	
5.004	7.750	0.070	110.7	0.000	0.00	0.0	0.600		o	450	Pipe/Conduit	
5.005	50.376	0.213	236.5	0.145	0.00	0.0	0.600		o	450	Pipe/Conduit	
7.000	9.333	0.053	176.1	0.000	4.00	0.0	0.600		o	150	Pipe/Conduit	
7.001	29.002	0.186	155.9	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	
7.002	14.996	0.836	17.9	0.000	0.00	0.0	0.600		o	150	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.006	0.00	19.78	197.278	1.117	0.0	0.0	0.0	1.49	950.2	0.0
3.000	0.00	4.43	197.433	0.550	0.0	0.0	0.0	1.06	42.3	0.0
1.007	0.00	20.35	197.250	1.717	0.0	0.0	0.0	1.54	982.6	0.0
4.000	0.00	5.07	197.600	0.350	0.0	0.0	0.0	0.78	55.1	0.0
4.001	0.00	5.26	197.450	0.700	0.0	0.0	0.0	2.22	2059.9	0.0
4.002	0.00	5.35	197.321	0.700	0.0	0.0	0.0	1.29	204.8	0.0
1.008	0.00	20.63	197.120	2.467	0.0	0.0	0.0	1.44	917.2	0.0
1.009	0.00	20.69	197.068	2.501	0.0	0.0	0.0	3.00	1906.3	0.0
5.000	0.00	5.52	198.950	0.000	0.0	0.0	0.0	0.12	4.7	0.0
6.000	0.00	4.67	198.850	0.000	0.0	0.0	0.0	0.67	11.8	0.0
5.001	0.00	7.87	198.730	0.000	0.0	0.0	0.0	0.10	4.0	0.0
5.002	0.00	7.90	198.690	0.125	0.0	0.0	0.0	1.82	200.8	0.0
5.003	0.00	8.03	198.650	0.125	0.0	0.0	0.0	1.66	183.4	0.0
5.004	0.00	8.10	198.470	0.125	0.0	0.0	0.0	1.93	307.2	0.0
5.005	0.00	8.73	198.400	0.270	0.0	0.0	0.0	1.32	209.6	0.0
7.000	0.00	4.21	199.433	0.000	0.0	0.0	0.0	0.75	13.3	0.0
7.001	0.00	4.81	199.380	0.000	0.0	0.0	0.0	0.80	14.2	0.0
7.002	0.00	4.91	199.194	0.000	0.0	0.0	0.0	2.39	42.2	0.0

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH

Date 22/03/2017 10:27

File CIV14979 150904 CF EF - Surface...

Designed by Jtaylor

Checked by



Micro Drainage

Network 2016.1

Network Design Table for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
8.000	55.349	0.138	401.1	0.000	4.00	0.0	0.600		o	750	Pipe/Conduit	🔒
9.000	60.000#	0.200	300.0	0.478	4.00	0.0	0.600		o	300	Pipe/Conduit	🔒
9.001	25.000#	0.039	641.0	0.000	0.00	0.0	0.600		[]	10	Pipe/Conduit	🔒
9.002	8.261#	0.041	201.5	0.500	0.00	0.0	0.600		o	450	Pipe/Conduit	🔒
8.001	52.463	0.105	499.6	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	🔒
7.003	15.767	0.032	492.7	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	🔒
7.004	25.409	0.084	302.5	0.088	0.00	0.0	0.600		o	900	Pipe/Conduit	🔒
7.005	13.669	0.055	248.5	0.000	0.00	0.0	0.600		o	375	Pipe/Conduit	🔒
5.006	89.074	0.087	1023.8	0.250	0.00	0.0	0.600		o	900	Pipe/Conduit	🔒
10.000	83.451	0.556	150.1	0.200	5.00	0.0	0.600		o	225	Pipe/Conduit	🔒
10.001	17.489	0.075	233.2	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	🔒
10.002	31.339	0.157	199.6	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	🔒
10.003	28.203	0.187	150.8	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	🔒
11.000	47.494	0.150	316.6	0.250	5.00	0.0	0.600		o	225	Pipe/Conduit	🔒
5.007	5.688	0.100	56.9	0.062	0.00	0.0	0.600		o	900	Pipe/Conduit	🔒
5.008	16.000#	0.064	250.0	0.000	0.00	0.0	0.600		o	300	Pipe/Conduit	🔒
12.000	64.916	0.325	199.7	0.130	4.00	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)
8.000	0.00	4.66	198.601	0.000	0.0	0.0	0.0	1.39	614.6	0.0
9.000	0.00	5.11	198.750	0.478	0.0	0.0	0.0	0.90	63.8	0.0
9.001	0.00	5.37	198.505	0.478	0.0	0.0	0.0	1.57	2736.9	0.0
9.002	0.00	5.47	198.504	0.978	0.0	0.0	0.0	1.43	227.2	0.0
8.001	0.00	6.10	198.463	0.978	0.0	0.0	0.0	1.39	887.4	0.0
7.003	0.00	6.28	198.358	0.978	0.0	0.0	0.0	1.40	893.7	0.0
7.004	0.00	6.52	198.326	1.066	0.0	0.0	0.0	1.80	1142.8	0.0
7.005	0.00	6.72	198.242	1.066	0.0	0.0	0.0	1.14	126.4	0.0
5.006	0.00	10.26	198.187	1.586	0.0	0.0	0.0	0.97	617.6	0.0
10.000	0.00	6.31	199.675	0.200	0.0	0.0	0.0	1.06	42.3	0.0
10.001	0.00	6.59	199.119	0.200	0.0	0.0	0.0	1.03	72.5	0.0
10.002	0.00	7.06	199.044	0.200	0.0	0.0	0.0	1.11	78.4	0.0
10.003	0.00	7.43	198.887	0.200	0.0	0.0	0.0	1.28	90.3	0.0
11.000	0.00	6.09	198.925	0.250	0.0	0.0	0.0	0.73	29.0	0.0
5.007	0.00	10.29	198.100	2.098	0.0	0.0	0.0	4.16	2646.0	0.0
5.008	0.00	10.55	197.414	2.098	0.0	0.0	0.0	0.99	70.0	0.0
12.000	0.00	4.98	198.725	0.130	0.0	0.0	0.0	1.11	78.4	0.0

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH

Date 22/03/2017 10:27

File CIV14979 150904 CF EF - Surface...

Designed by Jtaylor

Checked by

Micro Drainage

Network 2016.1



Network Design Table for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	n	HYD SECT	DIA (mm)	Section Type	Auto Design
12.001	16.215	0.110	147.4	0.085	0.00	0.0	0.600		o	300	Pipe/Conduit	U
12.002	10.470	0.260	40.3	0.000	0.00	0.0	0.600		o	600	Pipe/Conduit	U
13.000	29.464	0.120	245.5	0.511	4.00	0.0	0.600		o	375	Pipe/Conduit	U
12.003	27.948	0.334	83.7	0.300	0.00	0.0	0.600		o	600	Pipe/Conduit	U
14.000	19.465	3.000	6.5	0.750	4.00	0.0	0.600		o	450	Pipe/Conduit	U
12.004	49.846#	0.118	422.4	0.200	0.00	0.0	0.600		o	600	Pipe/Conduit	U
5.009	27.818	0.180	154.5	0.000	0.00	0.0	0.600		oo	-8	Pipe/Conduit	U
5.010	5.876	0.010	587.6	0.000	0.00	0.0		0.030	\	-11	Pipe/Conduit	U
1.010	6.410	0.023	278.7	0.000	0.00	0.0		0.030	\	-1	Pipe/Conduit	U
15.000	24.382	0.820	29.7	0.000	4.00	0.0		0.030	o	225	Pipe/Conduit	U
15.001	6.910	0.020	345.5	0.000	0.00	0.0		0.030	\	-1	Pipe/Conduit	U
1.011	9.668	0.027	358.1	0.000	0.00	0.0	0.600		o	900	Pipe/Conduit	U

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)
12.001	0.00	5.18	198.400	0.215	0.0	0.0	0.0	1.29	91.4	0.0
12.002	0.00	5.23	198.290	0.215	0.0	0.0	0.0	3.85	1087.2	0.0
13.000	0.00	4.43	198.275	0.511	0.0	0.0	0.0	1.15	127.2	0.0
12.003	0.00	5.41	198.030	1.026	0.0	0.0	0.0	2.66	753.1	0.0
14.000	0.00	4.04	197.878	0.750	0.0	0.0	0.0	8.02	1275.5	0.0
12.004	0.00	6.11	197.800	1.976	0.0	0.0	0.0	1.18	333.2	0.0
5.009	0.00	10.72	197.280	4.074	0.0	0.0	0.0	2.77	4797.8	0.0
5.010	0.00	10.84	196.980	4.074	0.0	0.0	0.0	0.83	5789.3	0.0
1.010	0.00	20.85	196.970	6.575	0.0	0.0	0.0	0.67	2517.8	0.0
15.000	0.00	4.45	197.800	0.000	0.0	0.0	0.0	0.90	35.7	0.0
15.001	0.00	4.64	196.980	0.000	0.0	0.0	0.0	0.61	2261.4	0.0
1.011	0.00	20.95	196.960	6.575 ✓	0.0	0.0	0.0	1.65	1049.7	0.0

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH

Date 22/03/2017 10:27

File CIV14979 150904 CF EF - Surface...

Designed by Jtaylor

Checked by



Micro Drainage

Network 2016.1

Conduit Sections for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

NOTE: Diameters less than 66 refer to section numbers of hydraulic conduits. These conduits are marked by the symbols:- [] box culvert, \ / open channel, oo dual pipe, ooo triple pipe, O egg.

Section numbers < 0 are taken from user conduit table

Section Number	Conduit Type	Major Dimn. (mm)	Minor Dimn. (mm)	Side Slope (Deg)	Corner Splay (mm)	4*Hyd Radius (m)	XSect Area (m ²)
4	[]	1200	800	90.0	125	1.002	0.929
10	[]	1800	1000	90.0	175	1.340	1.739
11	[]	2100	1000	90.0	175	1.409	2.039
-1	\ /	500	750	9.5		0.784	3.736
-8	oo	2100	1050			1.050	1.732
-11	\ /	500	1500	30.0		1.860	7.015

Free Flowing Outfall Details for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
---------------------	--------------	--------------	--------------	------------------	----------	--------

1.011	30	199.150	196.933	0.000	1500	0
-------	----	---------	---------	-------	------	---


Simulation Criteria for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m ³ /ha Storage	2.000
Hot Start (mins)	0	Inlet Coefficient	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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	1	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.100	Storm Duration (mins)	30
Ratio R	0.200		

Pell Frischmann		Page 6
Norfolk House East 108 Saxon Gate West Milton Keynes MK9 2AH		
Date 22/03/2017 10:27	Designed by Jtaylor	
File CIV14979 150904 CF EF - Surface...	Checked by	
Micro Drainage	Network 2016.1	

Online Controls for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

Hydro-Brake Optimum® Manhole: 2, DS/PN: 1.001, Volume (m³): 472.9

Unit Reference	MD-SFP-0218-2800-1200-2800
Design Head (m)	1.200
Design Flow (l/s)	28.0
Flush-Flo™	Calculated
Objective	Future Proof
Application	Surface
Sump Available	Yes
Diameter (mm)	218
Invert Level (m)	197.666
Minimum Outlet Pipe Diameter (mm)	300
Suggested Manhole Diameter (mm)	1500

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.200	28.0	Kick-Flo®	0.784	22.8
Flush-Flo™	0.340	27.8	Mean Flow over Head Range	-	23.2

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)	Depth (m)	Flow (l/s)
0.100	7.8	0.800	23.1	2.000	35.7	4.000	49.9	7.000	65.4
0.200	22.6	1.000	25.7	2.200	37.4	4.500	52.8	7.500	67.7
0.300	27.8	1.200	28.0	2.400	39.0	5.000	55.6	8.000	69.8
0.400	27.7	1.400	30.1	2.600	40.5	5.500	58.2	8.500	71.9
0.500	27.1	1.600	32.1	3.000	43.4	6.000	60.7	9.000	73.9
0.600	26.3	1.800	34.0	3.500	46.8	6.500	63.1	9.500	75.1

Orifice Manhole: Headwall 1, DS/PN: 5.008, Volume (m³): 9.1

Diameter (m) 0.150 Discharge Coefficient 0.600 Invert Level (m) 197.414

Hydro-Brake Optimum® Manhole: HEADWALL 8, DS/PN: 1.011, Volume (m³): 40.2

Unit Reference	MD-SHE-0414-1170-1600-1170
Design Head (m)	1.600
Design Flow (l/s)	117.0
Flush-Flo™	Calculated
Objective	Minimise upstream storage
Application	Surface
Sump Available	Yes
Diameter (mm)	414
Invert Level (m)	196.960
Minimum Outlet Pipe Diameter (mm)	450
Suggested Manhole Diameter (mm)	Site Specific Design (Contact Hydro International)

Control Points	Head (m)	Flow (l/s)	Control Points	Head (m)	Flow (l/s)
Design Point (Calculated)	1.600	117.0	Kick-Flo®	1.212	102.3
Flush-Flo™	0.649	117.0	Mean Flow over Head Range	-	95.9

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

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

Hydro-Brake Optimum® Manhole: HEADWALL 8, DS/PN: 1.011, Volume (m³): 40.2

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.100	11.2	0.800	116.0	2.000	130.4	4.000	182.9	7.000	240.6
0.200	40.4	1.000	112.1	2.200	136.6	4.500	193.8	7.500	248.9
0.300	78.7	1.200	103.2	2.400	142.5	5.000	204.0	8.000	256.9
0.400	112.1	1.400	109.7	2.600	148.2	5.500	213.8	8.500	264.6
0.500	115.5	1.600	117.0	3.000	158.9	6.000	223.1	9.000	272.2
0.600	116.9	1.800	123.9	3.500	171.3	6.500	232.0	9.500	279.5

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

Storage Structures for EXPORT FOR PDS - SW NETWORK PHASE 1.SWS

Tank or Pond Manhole: Spur 3, DS/PN: 3.000

Invert Level (m) 197.433

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	400.0	0.250	400.0	0.500	400.0	0.750	400.0	1.000	400.0

Tank or Pond Manhole: Headwall 1, DS/PN: 5.008

Invert Level (m) 197.414

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	574.0	1.200	861.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	607.0	1.400	913.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	656.0	1.600	968.0	2.800	0.0	4.000	0.0		
0.600	706.0	1.800	1021.0	3.000	0.0	4.200	0.0		
0.800	757.0	2.000	1077.0	3.200	0.0	4.400	0.0		
1.000	808.0	2.200	1132.0	3.400	0.0	4.600	0.0		

Tank or Pond Manhole: HEADWALL 6, DS/PN: 5.009

Invert Level (m) 197.280

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	393.0	1.200	717.0	2.400	0.0	3.600	0.0	4.800	0.0
0.200	437.0	1.400	776.0	2.600	0.0	3.800	0.0	5.000	0.0
0.400	492.0	1.600	836.0	2.800	0.0	4.000	0.0		
0.600	546.0	1.800	897.0	3.000	0.0	4.200	0.0		
0.800	602.0	2.000	0.0	3.200	0.0	4.400	0.0		
1.000	659.0	2.200	0.0	3.400	0.0	4.600	0.0		

Tank or Pond Manhole: HEADWALL 8, DS/PN: 1.011

Invert Level (m) 196.960

Depth (m)	Area (m ²)	Depth (m)	Area (m ²)	Depth (m)	Area (m ²)
0.000	200.0	0.500	200.0	1.000	200.0
0.250	200.0	0.750	200.0	1.500	200.0

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

Summary of Critical Results by Maximum Level (Rank 1) for EXPORT FOR PDS - SW NETWORK PHASE

1.SWS

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 Coefficient 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 Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 3 Number of Storage Structures 4 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model FSR M5-60 (mm) 20.000 Cv (Summer) 0.750
Region England and Wales Ratio R 0.200 Cv (Winter) 0.840

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

Profile(s) Summer and Winter
Duration(s) (mins) 60, 120, 180, 240, 360, 480, 600, 720, 960, 1440
Return Period(s) (years) 100
Climate Change (%) 30

	US/MH		Return	Climate	First (X)	First (Y)	First (Z)	Overflow	Water	Surcharged	Flooded
	Name	Storm	Period	Change	Surcharge	Flood	Overflow	Act.	Level	Depth	Volume
									(m)	(m)	(m ³)
1.000	Spur 1	360 Winter	100	+30%	100/120 Winter				200.079	1.329	0.000
1.001	2	360 Winter	100	+30%	100/60 Summer				200.079	2.188	0.000
1.002	24	480 Winter	100	+30%	100/180 Winter				198.634	0.134	0.000
2.000	Spur 2	480 Winter	100	+30%	100/60 Summer				198.631	0.838	0.000
1.003	25	480 Winter	100	+30%	100/120 Winter				198.631	0.231	0.000
1.004	25A	480 Winter	100	+30%	100/60 Summer				198.628	0.883	0.000
1.005	26A	480 Winter	100	+30%	100/120 Winter				198.618	0.368	0.000
1.006	26B	480 Winter	100	+30%	100/120 Summer				198.615	0.437	0.000
3.000	Spur 3	480 Winter	100	+30%	100/60 Summer				198.632	0.974	0.000
1.007	26	480 Winter	100	+30%	100/60 Winter				198.614	0.464	0.000
4.000	Spur 4	60 Summer	100	+30%	100/60 Summer				198.670	0.770	0.000
4.001	12	480 Winter	100	+30%	100/120 Winter				198.613	0.363	0.000
4.002	12	480 Winter	100	+30%	100/60 Summer				198.613	0.842	0.000
1.008	27	480 Winter	100	+30%	100/60 Summer				198.610	0.590	0.000
1.009	28	480 Winter	100	+30%	100/60 Summer				198.606	0.638	0.000
5.000	6B	480 Winter	100	+30%					199.096	-0.079	0.000
6.000	5	480 Winter	100	+30%	100/240 Winter				199.097	0.097	0.000
5.001	6A	480 Winter	100	+30%	100/240 Winter				199.097	0.142	0.000
5.002	6	480 Winter	100	+30%	100/240 Winter				199.097	0.032	0.000
5.003	7	480 Winter	100	+30%	100/240 Winter				199.096	0.071	0.000
5.004	8	480 Winter	100	+30%	100/180 Winter				199.093	0.173	0.000
5.005	9	480 Winter	100	+30%	100/180 Winter				199.092	0.242	0.000
7.000	37	240 Winter	100	+30%					199.433	-0.150	0.000
7.001	36	240 Winter	100	+30%					199.380	-0.150	0.000
7.002	35	480 Winter	100	+30%					199.258	-0.086	0.000
8.000	1	600 Winter	100	+30%	100/480 Winter				199.363	0.012	0.000
9.000	Spur 5	60 Summer	100	+30%	100/60 Summer				200.807	1.757	0.000
9.001	28	480 Winter	100	+30%					199.396	-0.109	0.000

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

Summary of Critical Results by Maximum Level (Rank 1) for EXPORT FOR PDS - SW NETWORK PHASE

1.SWS

PN	US/MH Name	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	Spur 1	0.10		101.2	SURCHARGED	
1.001	2	1.98		30.6	FLOOD RISK	
1.002	24	0.05		30.4	SURCHARGED	
2.000	Spur 2	0.01		0.3	SURCHARGED	
1.003	25	0.04		31.4	SURCHARGED	
1.004	25A	0.57		31.4	SURCHARGED	
1.005	26A	0.05		32.4	SURCHARGED	
1.006	26B	0.07		32.3	SURCHARGED	
3.000	Spur 3	0.65		25.6	SURCHARGED	
1.007	26	0.06		51.3	SURCHARGED	
4.000	Spur 4	2.34		121.4	SURCHARGED	
4.001	12	0.04		60.4	SURCHARGED	
4.002	12	0.46		60.4	SURCHARGED	
1.008	27	0.12		76.7	SURCHARGED	
1.009	28	0.08		78.1	SURCHARGED	
5.000	6B	0.00		0.0	OK	
6.000	5	0.01		0.1	SURCHARGED	
5.001	6A	0.03		0.3	SURCHARGED	
5.002	6	0.10		10.8	SURCHARGED	
5.003	7	0.09		10.8	SURCHARGED	
5.004	8	0.06		10.7	SURCHARGED	
5.005	9	0.12		23.1	SURCHARGED	
7.000	37	0.00		0.0	OK	
7.001	36	0.00		0.0	OK	
7.002	35	0.00		0.1	OK	
8.000	1	0.00		0.2	SURCHARGED	
9.000	Spur 5	2.68		162.5	SURCHARGED	
9.001	28	0.03		41.1	OK	

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

Micro Drainage

Network 2016.1

Summary of Critical Results by Maximum Level (Rank 1) for EXPORT FOR PDS - SW NETWORK PHASE

1.SWS

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) SurchARGE	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
9.002	26	600 Winter	100	+30%	100/60 Summer				199.375	0.421
8.001	4	600 Winter	100	+30%					199.363	0.000
7.003	11	480 Winter	100	+30%					199.258	0.000
7.004	12	720 Winter	100	+30%	100/720 Winter				199.226	0.000
7.005	13	600 Winter	100	+30%	100/60 Summer				199.177	0.560
5.006	14	720 Winter	100	+30%	100/720 Winter				199.087	0.000
10.000	16	60 Summer	100	+30%	100/60 Summer				200.694	0.794
10.001	17	60 Summer	100	+30%					199.364	-0.055
10.002	18	60 Summer	100	+30%					199.260	-0.084
10.003	19A	60 Summer	100	+30%					199.083	-0.104
11.000	2	60 Summer	100	+30%	100/60 Summer	100/60 Summer			200.152	1.002
5.007	19	480 Winter	100	+30%	100/360 Winter				199.021	0.021
5.008	Headwall 1	480 Winter	100	+30%	100/60 Summer				199.020	1.306
12.000	20	60 Summer	100	+30%	100/60 Summer				199.574	0.549
12.001	21	60 Summer	100	+30%	100/60 Summer				199.440	0.740
12.002	21A	60 Summer	100	+30%	100/60 Summer				199.331	0.441
13.000	22	60 Summer	100	+30%	100/60 Summer				199.487	0.837
12.003	23A	60 Summer	100	+30%	100/60 Summer				199.154	0.524
14.000	Spur 5	60 Summer	100	+30%	100/60 Summer	100/60 Summer			199.500	1.172
12.004	23	60 Summer	100	+30%	100/60 Summer				198.951	0.551
5.009	HEADWALL 6	480 Winter	100	+30%	100/120 Winter				198.605	0.275
5.010	HEADWALL 7	480 Winter	100	+30%	100/180 Winter				198.603	0.123
1.010	HEADWALL 9	480 Winter	100	+30%	100/60 Summer				198.603	0.883
15.000	40	480 Winter	100	+30%	100/60 Summer				198.602	0.577
15.001	Headwall 10	480 Winter	100	+30%	100/60 Summer				198.602	0.872
11	HEADWALL 8	480 Winter	100	+30%	100/60 Summer				198.602	0.742

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
9.002	26	0.000	0.48		72.3	SURCHARGED	
8.001	4	0.000	0.10		71.2	OK	
7.003	11	0.000	0.18		80.9	OK	
7.004	12	0.000	0.08		66.6	SURCHARGED	
7.005	13	0.000	0.74		73.9	SURCHARGED	
5.006	14	0.000	0.18		97.4	SURCHARGED	
10.000	16	0.000	1.52		62.7	SURCHARGED	
10.001	17	0.000	1.00		62.1	OK	
10.002	18	0.000	0.87		62.0	OK	
10.003	19A	0.000	0.76		61.9	OK	
11.000	2	1.789	2.78		77.3	FLOOD	1
5.007	19	0.000	0.18		167.7	SURCHARGED	
5.008	Headwall 1	0.000	0.67		39.6	SURCHARGED	
12.000	20	0.000	0.60		45.2	SURCHARGED	
12.001	21	0.000	0.98		75.6	SURCHARGED	
12.002	21A	0.000	0.15		77.4	SURCHARGED	
13.000	22	0.000	1.65		185.4	SURCHARGED	
12.003	23A	0.000	0.64		368.7	SURCHARGED	
14.000	Spur 5	0.273	0.28		268.7	FLOOD	1
12.004	23	0.000	2.41		703.5	SURCHARGED	
5.009	HEADWALL 6	0.000	0.06		168.4	SURCHARGED	
5.010	HEADWALL 7	0.000	0.03		161.1	SURCHARGED	
1.010	HEADWALL 9	0.000	0.11		216.8	SURCHARGED	

Norfolk House East
108 Saxon Gate West
Milton Keynes MK9 2AH



Date 22/03/2017 10:27

Designed by Jtaylor

File CIV14979 150904 CF EF - Surface...

Checked by

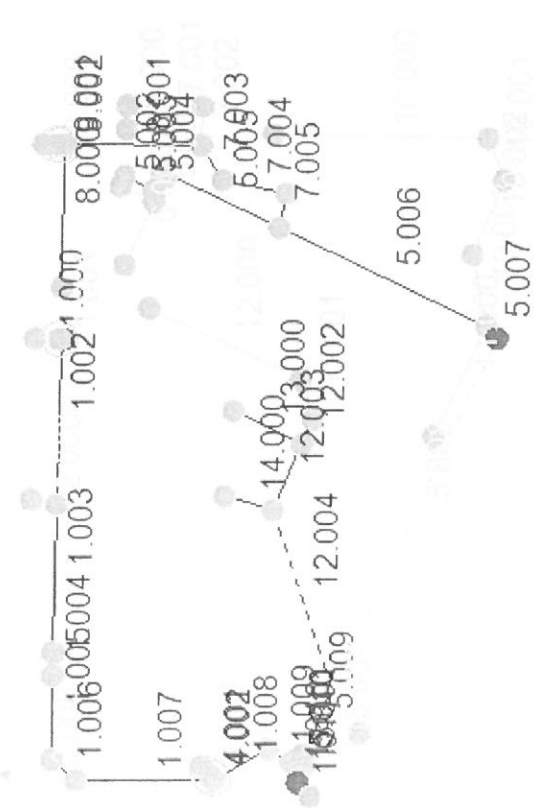
Micro Drainage

Network 2016.1

Summary of Critical Results by Maximum Level (Rank 1) for EXPORT FOR PDS - SW NETWORK PHASE1.SWS

PN	US/MH Name	Flooded Volume (m ³)	Flow / Overflow Cap. (l/s)	Pipe Flow (l/s)	Status	Level Exceeded
15.000		40	0.000	0.01	0.3	SURCHARGED
15.001	Headwall	10	0.000	0.00	0.7	SURCHARGED
1.011	HEADWALL	8	0.000	0.23	116.7	SURCHARGED

Allowable discharge 117 l/s



PLANNING SCHEME FOR ZONE A
(Main Site Entrance, Car Park & Ninth Avenue Site Frontage)

- This Landscape Zone has a more formal character. It encompasses the Main Site Entrance, Car Parking areas and the site frontage along Ninth Avenue.
- The perimeter planting scheme here will comprise structural planting to the boundary with Ninth Avenue, located upon an amended, topsoiled landform (to 1.5m height), this will include ANS and Feathered broadleaved specimen trees, along with specimen pines planted for highlight effects, underplanted with Structural Shrub Planting.
- The Car Park planting scheme will comprise ANS Trees along with groundcover planting.

Tree Planting

- These trees will form the main vertical elements of the landscape framework; these will be of the following species:
 - Quercus petraea* (ANS)
 - Sorbus aucuparia* (ANS) - including 5 Nr specimen trees within the cuttings of the Visitor Café
 - Alnus glutinosa* (Feathered)
 - Betula pendula* (Feathered & Multi-stemmed)
 - Sorbus aucuparia* (Feathered & Multi-stemmed)

- Specimen pines for planting highlight effects to be:
 - Pinus sylvestris*

- All ANS Trees to be supplied bare-rooted at 10-12cm girth
- All Feathered trees to be supplied bare-rooted, to a height of between 1.2 and 2.5m
- All Multi-stemmed Trees to have a minimum of three stems and shall be supplied root-balled 1.75-2.0m height
- All Specimen Pines to be supplied root-balled, 1.75-2.0m height
- Each tree will be planted into a mixture of imported topsoil and tree-planting compost, 50% by volume. Completed planting pits will be mulched to a depth of 75mm with green compost complying with BS1 PAS 100.
- All Standard and Multi-stemmed trees will be supported by twin short peeled-larch stakes, with one stake driven against the prevailing wind, supported by a single tie
- All Feathered trees will be supported by a single short peeled-larch stake, driven at an angle to support the tree against the prevailing wind, and secured by a single tie.

Structural Shrub Planting

- This planting is designed to provide separation of the main site access approach road from the adjacent service road.
- The shrub species to be planted will be:
 - Cornus alba* 'Sibirica'
 - Cornus 'Midwinter Fire'*
 - Corylus avellana*
 - Fraxinus excelsior*
 - Ilex aquifolium*
 - Viburnum davidii*

- All shrubs to be supplied as bare-rooted transplants 45-60cm high, except for *aquifolium*, to be supplied as 60-80cm high container-grown plants in 3-litre pots.
- All shrubs to be planted into prepared topsoil planting beds 450mm deep at minimum 1.5m centres. Prior to planting, all shrub planting areas are to be spread to a depth of 50mm with a layer of green compost complying with BS1 PAS 100 and incorporated into the soil by rotavating. Completed planting areas will be mulched to a depth of 75mm with the same type of green compost.

Ground Cover Planting

- This type of planting, consisting of shrubs and herbaceous plants, will be used beneath specimen trees and within the car park.
- Species will include:
 - Colostea conspicua* 'Decorus'
 - Geranium 'Bikovo'*
 - Prunus 'Otto Luyken'*
 - Viburnum davidii*

- All plants to be supplied in 3-litre pots, planted at 3-5m centres
- All plants to be planted into prepared topsoil planting beds 450mm deep. Prior to planting, all ground cover planting areas are to be spread to a depth of 50mm with a layer of green compost complying with BS1 PAS 100 and incorporated into the soil by rotavating. Completed planting areas will be mulched to a depth of 75mm with the same type of green compost.

Hedgerow to Car Park Perimeter

- Single species hedgerow, comprised of a double staggered row of bare-rooted transplants 60-80cm high, planted at 200cm centres / 8 per line; planted into a prepared trench 600mm wide and 450mm deep, back-filled with a mixture of topsoil and tree planting compost, 50% by volume.
- All plants to be:
 - Fagus sylvatica*

- Completed planting trench to be mulched to a depth of 75mm with green compost complying with BS1 PAS 100.

PLANNING SCHEME FOR ZONES B1 & B2
(Fifth Avenue Site Frontage)

- This Landscape Zone provides a more naturalistic frontage to Fifth Avenue, strongly based upon the edges of the drainage swales and attenuation ponds.

Tree Planting

- The planting scheme here will be comprised of ANS and Feathered broadleaved specimen trees to form the main vertical elements of the structural landscape framework; these will be of the following species:
 - Quercus petraea* (ANS)
 - Sorbus aucuparia* (ANS)
 - Alnus glutinosa* (Feathered)
 - Betula pendula* (Feathered)
 - Sorbus aucuparia* (Feathered)

- Feathered trees shall be supplied bare-rooted, to a height of between 1.2 and 2.5 metres
- ANS Trees shall be supplied bare-rooted at 10-12cm girth
- Each tree will be planted into a mixture of imported topsoil and tree-planting compost, 50% by volume. Completed planting pits will be mulched to a depth of 75mm with green compost complying with BS1 PAS 100
- All Feathered trees will be supported by a single short peeled-larch stake, driven at an angle so as to support the tree against the prevailing wind, and secured by a single tie.

Structural Shrub Planting

- This planting is designed to reinforce the green frontage to the Turbine & Fuel Storage Hall.
- The species to be planted shall be:
 - Alnus glutinosa* 20%
 - Populus tremula* 5%
 - Quercus petraea* 15%
 - Sorbus aucuparia* 15%
 - Corylus avellana* 20%
 - Salix cinerea* 20%
- All shrubs to be supplied as bare-rooted transplants 45-60cm high
- All shrubs to be planted into prepared topsoil planting beds 450mm deep at min 1.5m centres. Prior to planting, all shrub planting areas are to be spread to a depth of 50mm with a layer of green compost complying with BS1 PAS 100 and incorporated into the soil by rotavating. Completed planting areas will be mulched to a depth of 75mm with the same type of green compost.

PLANNING SCHEME FOR ZONE C
(Balance of Plant Yard)

- This Landscape Zone forms a boundary to the Balance of Plant Yard and is intended to provide a green boundary to the Gasification & Turbine Hall.
- The planting will be set upon a gently graded top-soiled mound to a height of 1.5m, and will be comprised of ANS and Feathered broadleaved specimen trees to form the main vertical elements of the structural landscape framework; these will be of the following species:
 - Betula pendula* (ANS and Feathered)
 - Quercus petraea* (ANS)
 - Sorbus aucuparia* (ANS & Feathered)
 - Alnus glutinosa* (Feathered)
 - Quercus robur* (Feathered)

- Structural Shrub Planting
 - The species to be planted shall be:
 - Alnus glutinosa* 20%
 - Betula pubescens* 15%
 - Crataegus monogyna* 10%
 - Corylus avellana* 10%
 - Ilex aquifolium* 5%
 - Quercus petraea* 15%
 - Sorbus aucuparia* 10%
 - Viburnum opulus* 10%

- All shrubs to be supplied as bare-rooted transplants 45-60cm high; except for *aquifolium*, to be supplied as 60-80cm high container-grown plants in 3 litre pots.
- All shrubs to be planted into prepared topsoil planting beds 450mm deep at min 1.5m centres. Prior to planting, all shrub planting areas are to be spread to a depth of 50mm with a layer of green compost complying with BS1 PAS 100 and incorporated into the soil by rotavating. Completed planting areas will be mulched to a depth of 75mm with the same type of green compost.

PLANNING SCHEME FOR ZONE D
(Northern Area of Site and Eastern Site Boundary)

- This Landscape Zone forms a naturalistic linear internal boundary treatment along with a continuation of a green boundary along Ninth Avenue that separates the site from the adjacent commercial premises. This planting will be comprised of Feathered broadleaved trees to form the structural landscape framework; these will be comprised of the following species:
 - Betula pendula* (Feathered)
 - Quercus petraea* (Feathered)
 - Sorbus aucuparia* (Feathered)

- All plants to be supplied as feathered trees, bare-rooted, to a height of between 1.2 and 2.5 metres.
- Each tree will be planted into a mixture of imported topsoil and tree-planting compost, 50% by volume. Completed planting pits will be mulched to a depth of 75mm with green compost complying with BS1 PAS 100.
- All feathered trees will be supported by a single short peeled-larch stake, driven at an angle so as to support the tree against the prevailing wind, and secured by a single tie.

PLANNING SCHEME FOR ZONES E1 & E2
(Car Parking Areas)

- This planting will be comprised of ANS and Feathered broadleaved specimen trees that will form the main elements of the structural landscape framework around the Car Parking Areas and will be of the following species:
 - Betula pendula* (ANS and Feathered)
 - Quercus petraea* (ANS and Feathered)
 - Sorbus aucuparia* (ANS and Feathered)

- ANS Trees to be supplied as bare rooted trees to 10-12cm girth
- Feathered trees to be supplied as bare-rooted, to a height of between 1.2 and 2.5 metres.

Ground Cover Planting

- This type of planting, consisting of shrubs and herbaceous plants, will be used beneath specimen trees and within the car parking areas.
- Species will include:
 - Colostea conspicua* 'Decorus'
 - Geranium 'Bikovo'*
 - Prunus 'Otto Luyken'*
 - Viburnum davidii*

- All plants to be supplied in 3-litre pots planted at 3-5m centres.
- All plants to be planted into prepared topsoil planting beds 450mm deep. Prior to planting, all ground cover planting areas are to be spread to a depth of 50mm with a layer of green compost complying with BS1 PAS 100 and incorporated into the soil by rotavating. Completed planting areas will be mulched to a depth of 75mm with the same type of green compost.

NATIVE WILDFLOWER PLUG PLANTING FOR DRAINAGE SWALE
ENHANCEMENT - ZONE B(2) -
(Main & Existing Site Entrance)

- Native wildflower plants to form areas of supplementary planting in the base of the drainage swales, for enhanced visual effect and to provide additional invertebrate nectar sources/animal food plant material.

- Species to include:
 - Cardamine pratensis*
 - Filipendula ulmaria*
 - Lolium perenne*
 - Lycium flor-cucull*
 - Pulsatilla dysenterica*
 - Ranunculus flammula*

- All plants to be of Welsh native origin, supplied as plug plants between 55cc and 110cc in volume, planted at 5-10 plants/m2 into the finished substrate surface, in single-species groups of between 5 and 20 Nr.
- Additional planting in groups of between 5 and 20 Nr of the following species:
 - Iris pseudacorus*

- All plants to be of Welsh native origin, supplied as container-grown plants in 2-litre containers, planted at 5-10 plants/m2 into the finished substrate surface.

LANDSCAPE TREATMENT FOR SURFACE WATER DRAINAGE SWALE - ZONE B(1)
(Fifth Avenue Frontage)

- These areas form a large part of the 'Restored Habitat Area' proposed as part of the discharge of planning conditions relating to biodiversity (refer to 'Wildlife Protection Plan' document, by Pell Frischmann).
- Finished drainage swale subsoil profiles (bases and banks) to be treated by spreading a layer of seed-rich vegetable soil 50mm deep, to be sourced by stripping from the upper 50-75mm of the existing site, so as to provide a basis for the natural regeneration of species-diverse grassland appropriate to the locality.
- Soil conditioner to be a proprietary green compost made from recycled plant waste to meet the requirements of BS1 PAS 100:2011. Specification for composted materials: British Standards Institute (PAS 100); to be applied as a 25mm deep layer to the prepared reclaimed soil surface and incorporated to a depth of 100mm using a rotavator prior to over-seeding.
- Finished surfaces to be over-seeded with a fescue-based grassland seed mix: Low Maintenance Mixture 'A4' by Germinal GB: sown at 15gms/m2. No pre-seeding fertiliser to be applied.
- Following germination and completion of the first establishment mowing operations, the sward is to be inoculated with the following native wildflower species, so as to provide larval food plants for Marsh Fritillary butterflies:
 - Succisa pratensis*

- All plants to be supplied as plug plants of Welsh native origin, between 55cc and 110cc in volume, planted by hand at 5 plants/m2 into the finished substrate surface.

MEADOW GRASSLAND SWARDS - ZONES A B1 B2 C & D

- For all meadow grassland areas beyond the attenuation ponds and the drainage swale. These areas are to be sown onto the prepared substrate of 100mm deep imported topsoil.
- Finished ground surface to be seeded with a fescue-based grassland seed mix: Low Maintenance Mixture 'A4' by Germinal GB: sown at 25gms/m2. No pre-seeding fertiliser to be applied.

NATIVE WILDFLOWER PLUG PLANTING FOR MEADOW GRASSLAND SWARD
ENHANCEMENT - ZONES B1 & B2

- For all meadow grassland areas other than within drainage swales.
- Following successful germination and the completion of the first establishment mowing operations, all meadow grassland swards are to be inoculated with the following native wildflower species, planted in discrete areas, so as to achieve 20% cover by area of the total grassland sward:
 - Centaurea nigra*
 - Lolium perenne*
 - Primula vulgaris*
 - Succisa pratensis*

- All plants to be of Welsh native origin, supplied as plug plants between 55cc and 110cc in volume, planted by hand in single-species groups at 5 plants/m2 into the finished substrate surface.

CLOSE-MOWN GRASSLAND SWARDS - ZONES A & B

- These areas are to be sown onto the prepared substrate of 100mm deep imported topsoil.
- Finished ground surface to be seeded with a fescue-based grassland seed mix: Low Maintenance Mixture 'A4' by Germinal GB: sown at 25gms/m2. No pre-seeding fertiliser to be applied.

KEY

Site Boundary



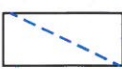
Beech Hedge



Close-Mown Grass



Landscape Zones



Structural Shrubs



Indicative Landform to 1.5m Hgt



Specimen Trees



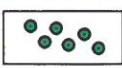
Groundcover Planting



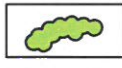
Drainage Swales



Feathered Trees



Supplementary Pond & Swale Planting



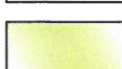
Max extent of Water to Swales



Beech Hedge



Wild Flower Meadow Grassland



Wildlife Protection & Protected Vegetation



NOTE:

- TREE PROTECTION SHALL BE CARRIED OUT STRICTLY IN ACCORDANCE WITH THE PELL FRISCHMANN ARBORICULTURAL SURVEY, R57006004/C JAN 2015
- IN PARTICULAR THE PROTECTIVE FENCING SPECIFIED ADJACENT TO THE WESTERN AND NORTHERN BOUNDARIES SHALL BE ERECTED FOR THE DURATION OF THE WORKS, TO THE ALIGNMENT SHOWN ON THEIR TREE CONSTRAINTS PLAN

PROVISIONAL WILDLIFE PROTECTION AREA
Refer to Pell Frischmann Wildlife Protection Plan

REMOVED / RETAINED TREES & TREE PROTECTION MEASURES
TO NORTH AND WEST BOUNDARIES
Refer to Pell Frischmann Arboricultural Survey & Report Ref R57006004/C JAN 2015

MANAGEMENT RULES

Contractual establishment maintenance will apply to all site areas for a period of not less than 5 years from the date of completion of all planting and seeding works.

Zone A - Main Site Entrance

Establishment Maintenance

- Formative pruning of specimen trees to be undertaken annually.
- All tree supporting stakes and ties to be inspected twice annually and replaced if defective. All tree stakes to be removed at the end of 3 years of establishment.
- Hedgerow to be clipped once annually in September.
- Weed control to all tree bases and planted areas by application of glyphosate translocated herbicide to control perennial weeds, using controlled-droplet application methods: 3 Nr applications per growing season.
- Close-mown grass to be mown to a height of 25mm and cuttings dispersed evenly across the sward 12-14 times per year. Bulb areas in mown grass to be left until top growth has died-back in late spring, then mown to 25mm high and all airings removed from site; mown to 25mm thereafter and cuttings dispersed evenly across the sward.
- Selective mowing of attenuation pond and swale grassland sward to be linked to monitoring of sward development for Marsh Fritillary butterfly conservation.
- Periodic control of growth of pernicious perennial weeds and growth of soft rush and compact rush by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.

Post-Establishment Maintenance & Management

- Hedgerow to be clipped once annually in September.
- Meadow grassland areas to be mown to a height of 50mm and the cuttings removed from the site, in late April and mid-September.
- Drainage swale grassland sward to be cut selectively, in response to the monitoring of butterfly habitat development, with differential mowing of areas to safeguard larval feeding on *Succisa pratensis* plants. The drainage swales and their immediate vicinity form part of the 'Restored Habitat Area' proposed as part of the discharge of planning conditions relating to biodiversity (refer to 'Wildlife Protection Plan' document, by Pell Frischmann).
- Periodic control of pernicious perennial weeds and rush growth by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.
- Close-mown grass to be mown to a height of 25mm and cuttings dispersed evenly across the sward 12-14 times per year. Bulb areas in mown grass to be left until top growth has died-back in late spring, then mown to 25mm high and all airings removed from site; mown to 25mm thereafter and cuttings dispersed evenly across the sward.

Zone B - Main Entrance and Fifth Avenue Frontage

Establishment Maintenance

- Zone B forms a large part of the 'Restored Habitat Area' proposed as part of the discharge of planning conditions ecology relating to biodiversity (refer to 'Wildlife Protection Plan' document, by Pell Frischmann).
- Formative pruning of specimen trees to be undertaken annually.
- All tree supporting stakes and ties to be inspected twice annually and replaced if defective. All tree stakes to be removed at the end of 3 years of establishment.
- Weed control to all tree bases by application of glyphosate translocated herbicide to control perennial weeds, using controlled-droplet application methods: 3 Nr applications per growing season.
- Close-mown grass to be mown to a height of 25mm and cuttings dispersed evenly across the sward 12-14 times per year.
- Mowing of drainage swale grassland sward to be linked to monitoring of sward development for Marsh Fritillary butterfly conservation. Periodic control growth of soft rush and compact rush by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.

Post-Establishment Maintenance & Management

- Meadow grassland areas to be mown to a height of 50mm and the cuttings removed from the site, in late April and mid-September.
- Attenuation pond sward to be cut selectively, in response to monitoring of butterfly habitat development, with differential mowing of areas to safeguard larval feeding on *Succisa pratensis* plants.
- Periodic control of growth of rush growth and pernicious perennial weeds by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.
- Close-mown grass to be mown to a height of 25mm and cuttings dispersed evenly across the sward 12-14 times per year.

Zone C - Boundary to Balance of Plant Yard

Establishment Maintenance

- Formative pruning of specimen trees to be undertaken annually.
- All tree supporting stakes and ties to be inspected twice annually and replaced if defective. All tree stakes to be removed at the end of 3 years of establishment.
- Weed control to all tree bases and the grassland sward, by application of glyphosate translocated herbicide to control perennial weeds, using controlled-droplet application methods or weed-wipers: 3 Nr applications per growing season.
- Meadow grassland to be mown to a height of 50mm twice annually, in late April and in mid-September and all airings removed from site.

Post-Establishment Maintenance & Management

- Meadow grassland areas to be mown to a height of 50mm, twice annually, in late April and mid-September, and all airings removed from site.
- Periodic control of growth of pernicious perennial weeds by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.

Zone D - Northern Area of Site and Eastern Site Boundary

Establishment Maintenance

- Formative pruning of specimen trees to be undertaken annually.
- All tree supporting stakes and ties to be inspected twice annually and replaced if defective. All tree stakes to be removed at the end of 3 years of establishment.
- Weed control to all tree bases and the grassland sward, by application of glyphosate translocated herbicide to control perennial weeds, using controlled-droplet application methods or weed-wipers: 3 Nr applications per growing season.
- Meadow grassland to be mown to a height of 50mm twice annually, in late April and in mid-September and all airings removed from site.

Post-Establishment Maintenance & Management

- Meadow grassland areas to be mown to a height of 50mm, twice annually, in late April and mid-September, and all airings removed from site.
- Periodic control of growth of pernicious perennial weeds by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.

ZONES E1 & E2 - Car Parking Areas

Establishment Maintenance

- Formative pruning of specimen trees to be undertaken annually.
- All tree supporting stakes and ties to be inspected twice annually and replaced if defective. All tree stakes to be removed at the end of 3 years of establishment.
- Weed control to all tree bases and the grassland sward, by application of glyphosate translocated herbicide to control perennial weeds, using controlled-droplet application methods or weed-wipers: 3 Nr applications per growing season.
- Meadow grassland to be mown to a height of 50mm twice annually, in late April and in mid-September and all airings removed from site.

Post-Establishment Maintenance & Management

- Periodic control of growth of pernicious perennial weeds by spot-treatment with glyphosate translocated herbicide, using controlled-droplet application methods or weed-wiper.
- Periodic trimming to edges of groundcover plants at kerb edges, as required.



10 20 30 40 50m

SCALE BAR

Issue 3: March 2017 - FOR PLANNING

Amendments to Swales / General Layout and associated planting design

Issue 2: May 2015 - FOR PLANNING

Cycle shelters added / planting densities added

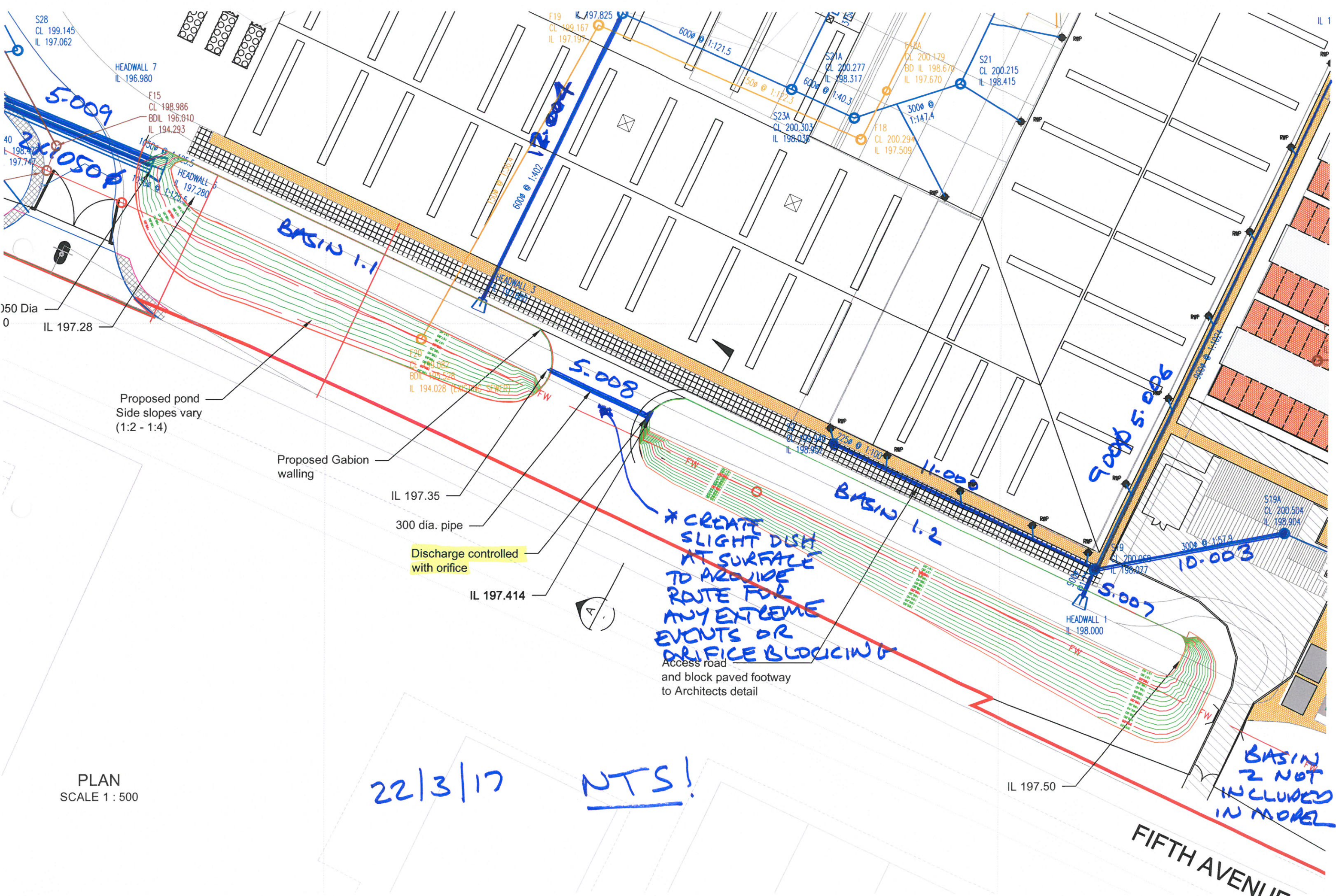
Issue 1: Feb 2015 - FOR PLANNING

ANTHONY JELLARD ASSOCIATES
LANDSCAPE ARCHITECTURE * LANDSCAPE PLANNING * URBAN DESIGN

Client	Enviro Parks (Wales) Ltd		
Project	Enviro Parks, Hirwaun		
Drg Title	Landscape Strategy Plan		
Date	March 2017		
Scale	500 @ A0 / Refer to Bar Scale		
Drg.Nr.	AJA.2341-02	Author: JC/RKR	Issue: 03

PEAR TREE COTTAGE * GROSWMONT * NR ABERGAVENNY * MONMOUTHSHIRE * NP7 5LG
TEL / FAX: 01600 750475

NOT INCLUDED IN DRAINAGE MODEL



S28
CL 199.145
IL 197.062

HEADWALL 7
IL 196.980

F15
CL 198.986
BDIL 196.010
IL 194.293

HEADWALL 5
IL 197.280

350 Dia
0
IL 197.28

Proposed pond
Side slopes vary
(1:2 - 1:4)

Proposed Gabion
walling

IL 197.35

300 dia. pipe

Discharge controlled
with orifice

IL 197.414

* CREATE
SLIGHT DUSH
AT SURFACE
TO PROVIDE
ROUTE FOR
ANY EXTREME
EVENTS OR
ORIFICE BLOCKING

Access road
and block paved footway
to Architects detail

PLAN
SCALE 1 : 500

22/3/17

NTS!

IL 197.50

FIFTH AVENUE

BASIN
2 NOT
INCLUDED
IN MODEL

IL 1

S19A
CL 200.504
IL 198.904

S19
CL 200.068
IL 198.077

HEADWALL 1
IL 198.000

10.003

S.007

BASIN 1.2

11.000

S.008

BASIN 1.1

5.009

12.004

600 @ 1:121.5

500 @ 1:122.3

600 @ 1:40.3

300 @ 1:147.4

F18
CL 200.294
IL 197.509

S23A
CL 200.303
IL 198.038

S21A
CL 200.277
IL 198.317

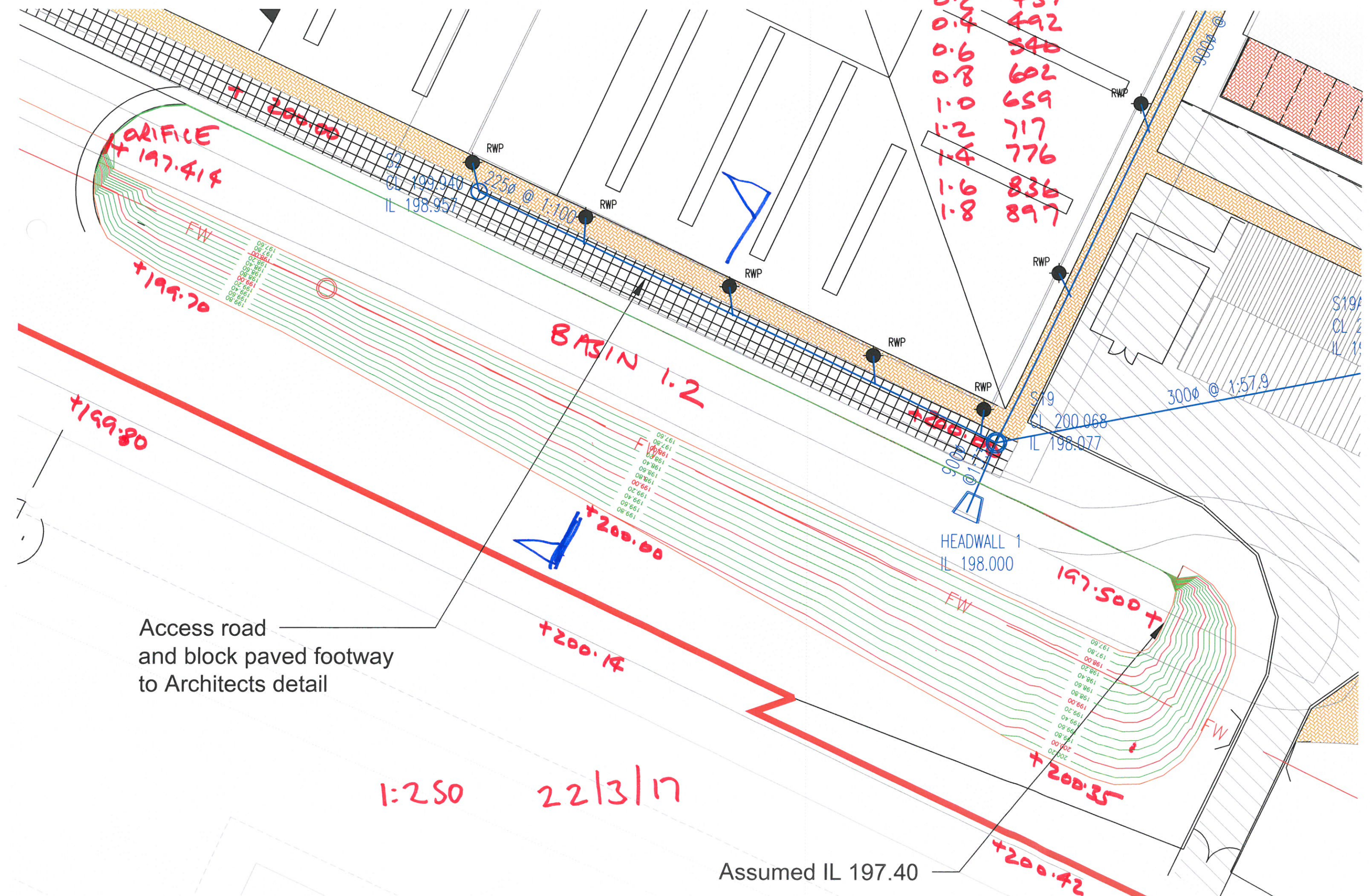
S21
CL 200.215
IL 198.415

S21A
CL 200.179
BD IL 198.670
IL 197.670

F19
CL 199.167
IL 197.197

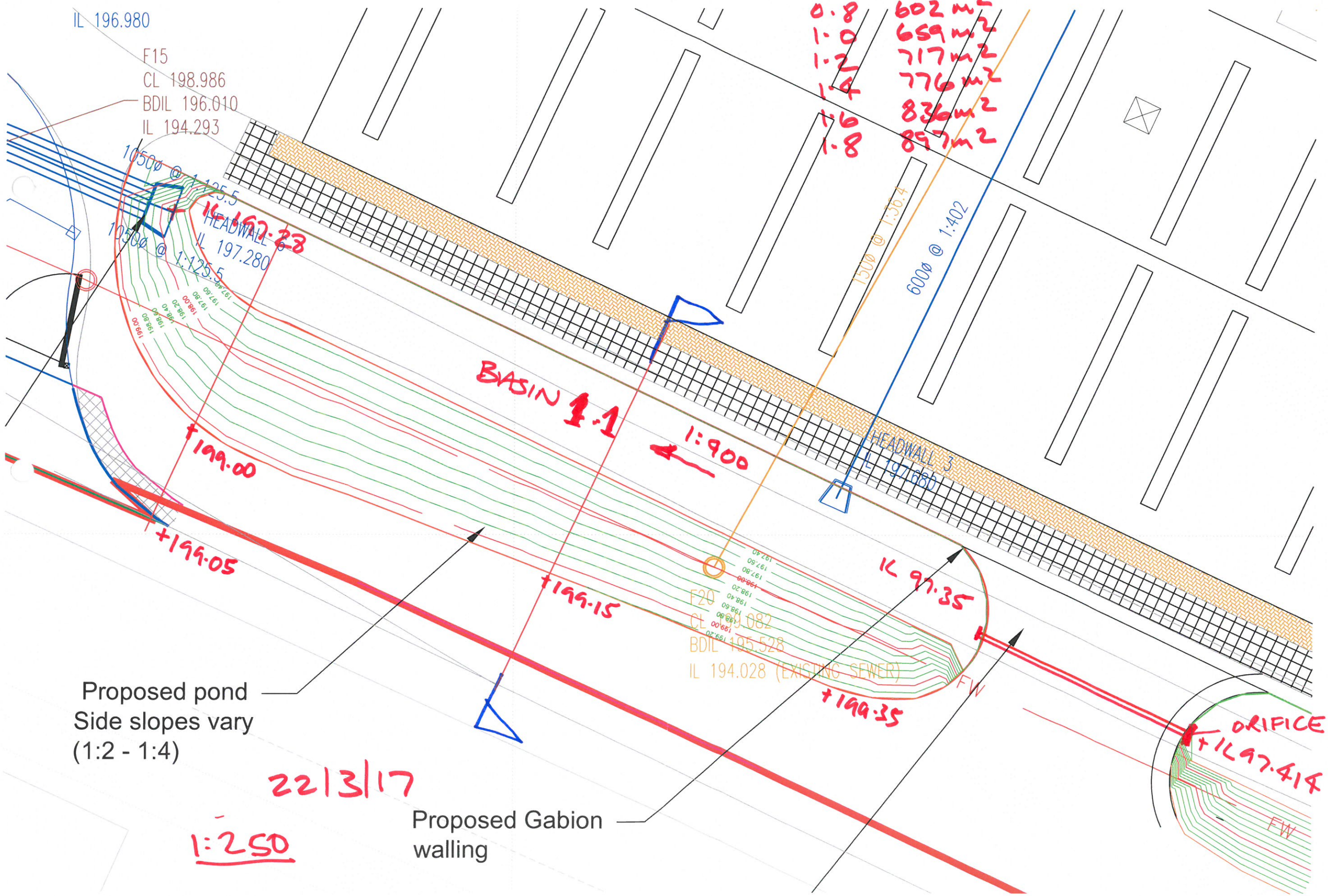
IL 197.825

0	393
0.2	437
0.4	492
0.6	546
0.8	602
1.0	659
1.2	717
1.4	776
1.6	836
1.8	897



DEPTH / AREA OF BASIN

0	393m ²
0.2	437m ²
0.4	492m ²
0.6	546m ²
0.8	602m ²
1.0	659m ²
1.2	717m ²
1.4	776m ²
1.6	836m ²
1.8	897m ²

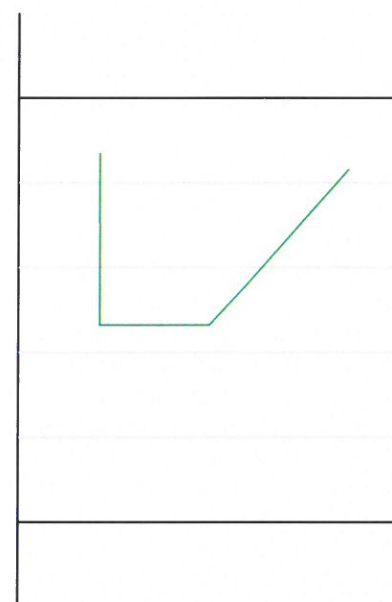


22/3/17

1:250

8

DATUM 194.000
195.000
200.000



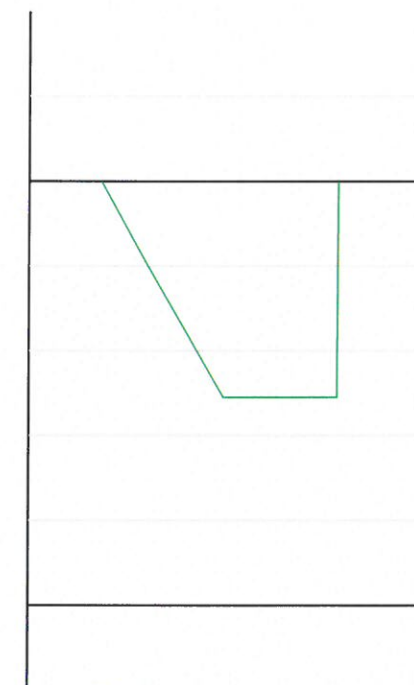
OFFSET	0.0	10.0	20.0	22.6
SURFACE LEVEL	199.350	197.320	199.163	

TYPICAL SECTION BASIN B1.1
(LOOKING UPSTREAM)

(NTS)

10

DATUM 194.000
195.000
200.000



OFFSET	0.0	10.0	20.0	24.2
SURFACE LEVEL	200.000	197.960	200.000	

TYPICAL SECTION BASIN B1.2
(LOOKING DOWNSTREAM)