MCDONALDS, HAVERHILL

Flood Risk Assessment and Drainage Strategy – Revision B – Vol. 2 of 3

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APPENDIX D

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IoH 124 Calculation of Greenfield Runoff Rate

Project:	P22-2590 McDonalds Haverhill			
OS Location	567720	E	244240	N
Date:	14.04.22			
Written By:	TT	**Checked By:**	GS	

SAAR	581	mm
Pro Rata Site Area =	50	ha
	0.5	km^2
Soil WRA Class	3	
Soil Type SPR Value	0.4	

$Qbar_{rural}$ = 0.00108 x (AREA)0.89 X (SAAR)1.17 X (SOIL)2.17

Qbar-50ha = 0.137 m^3/s

From Regional Growth Curve Factor

Region: 6

Return period	1	2	5	10	25	30	50	100	500
Growth Factor	0.85	0.88	1.28	1.62	2.14	2.24	2.62	3.19	4.49

Q_1 50ha =	0.116	m^3/s	=	116.27	l/s	=	2.325	l/s/ha
Q_2 50ha =	0.120	m^3/s	=	120.38	l/s	=	2.408	l/s/ha
Q_5 50ha =	0.175	m^3/s	=	175.09	l/s	=	3.502	l/s/ha
Q_{10} 50ha =	0.222	m^3/s	=	221.60	l/s	=	4.432	l/s/ha
Q_{25} 50ha =	0.293	m^3/s	=	292.74	l/s	=	5.855	l/s/ha
Q_{30} 50ha =	0.306	m^3/s	=	306.42	l/s	=	6.128	l/s/ha
Q_{50} 50ha =	0.358	m^3/s	=	358.40	l/s	=	7.168	l/s/ha
Q_{100} 50ha =	0.436	m^3/s	=	436.37	l/s	=	8.727	l/s/ha
Q_{500} 50ha =	0.614	m^3/s	=	614.20	l/s	=	12.284	l/s/ha

Factored for Development Impermeable Area

Site Area = 0.453

Q_{bar} site =	0.001	m^3/s	=	1.2	l/s	=	2.7	l/s/ha
Q_1 site =	0.001	m^3/s	=	1.1	l/s	=	2.3	l/s/ha
Q_2site =	0.001	m^3/s	=	1.1	l/s	=	2.4	l/s/ha
Q_5site =	0.002	m^3/s	=	1.6	l/s	=	3.5	l/s/ha
Q_{10} site =	0.002	m^3/s	=	2.0	l/s	=	4.4	l/s/ha
Q_{25} site =	0.003	m^3/s	=	2.7	l/s	=	5.9	l/s/ha
Q_{30} site =	0.003	m^3/s	=	2.8	l/s	=	6.1	l/s/ha
Q_{50} site =	0.003	m^3/s	=	3.2	l/s	=	7.2	l/s/ha
Q_{100} site =	0.004	m^3/s	=	4.0	l/s	=	8.7	l/s/ha
Q_{500} site =	0.006	m^3/s	=	5.6	l/s	=	12.3	l/s/ha

Note: For greenfield site, the critical duration is generally not relevant and the prediction of the peak rate of runoff using IoH124 does not require consideration of storm duration.

APPENDIX E

Design Settings

Rainfall Methodology	FEH-13	Minimum Velocity (m/s)	1.00
Return Period (years)	2	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	0.750	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	5.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
Storage Crates 1		5.00	76.266		567609.964	244290.261	3.816
1	0.047	5.00	76.300	1200	567660.952	244293.270	2.060
2	0.064	5.00	76.470	1200	567645.098	244286.488	1.425
3	0.000		76.450	1200	567637.164	244293.612	2.370
4	0.065	5.00	76.300	1200	567600.282	244254.370	1.425
5	0.019	5.00	76.450	1200	567609.278	244266.792	1.050
6	0.021	5.00	76.250	1200	567604.220	244276.571	1.525
7	0.000		76.400	1200	567611.652	244280.416	3.000
8	0.030	5.00	74.540	1200	567691.358	244327.139	1.425
9	0.055	5.00	75.540	1200	567657.359	244324.084	2.705
10	0.014	5.00	76.450	1200	567599.173	244310.968	3.895
11	0.022	5.00	76.470	1200	567601.377	244299.918	3.965
HB1	0.117	5.00	76.300	1200	567607.286	244288.856	3.860
13	0.000		76.335	1200	567591.639	244280.762	4.080
14	0.000		76.450	1200	567588.316	244287.186	4.370
15	0.000		76.500	1200	567582.823	244312.381	4.680
16	0.000		76.500	1200	567591.690	244349.865	5.065
MH5323	0.000		72.160	1200	567593.204	244356.360	1.500

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
2.000	1	3	23.790	0.600	74.240	74.080	0.160	149.0	225	5.37	5.0
3.000	2	3	10.663	0.600	75.045	74.980	0.065	164.0	225	5.17	5.0
2.001	3	7	28.723	0.600	74.080	73.475	0.605	47.5	225	5.62	5.0
4.000	4	6	22.548	0.600	74.875	74.725	0.150	150.0	225	5.35	5.0
5.000	5	6	11.010	0.600	75.400	74.800	0.600	18.3	150	5.08	5.0
4.001	6	7	8.368	0.600	74.725	74.670	0.055	153.0	225	5.49	5.0
2.002	7	HB1	9.502	0.600	73.400	72.515	0.885	10.7	225	5.66	5.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
2.000	1.069	42.5	0.6	1.835	2.145	0.047	0.0	19	0.383
3.000	1.018	40.5	0.9	1.200	1.245	0.064	0.0	22	0.408
2.001	1.903	75.7	1.5	2.145	2.700	0.111	0.0	22	0.748
4.000	1.065	42.3	0.9	1.200	1.300	0.065	0.0	22	0.427
5.000	2.362	41.7	0.3	0.900	1.300	0.019	0.0	8	0.642
4.001	1.054	41.9	1.4	1.300	1.505	0.105	0.0	29	0.494
2.002	4.016	159.7	2.9	2.775	3.560	0.216	0.0	21	1.545

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	8	9	34.136	0.600	73.115	72.910	0.205	166.5	225	5.56	5.0
1.001	9	10	59.646	0.600	72.835	72.555	0.280	213.0	300	6.49	5.0
1.002	10	11	11.268	0.600	72.555	72.505	0.050	225.0	300	6.67	5.0
1.003	11	HB1	12.541	0.600	72.505	72.440	0.065	192.9	300	6.85	5.0
1.004	HB1	13	17.617	0.600	72.440	72.255	0.185	95.0	150	7.14	5.0
1.005	13	14	7.233	0.600	72.255	72.180	0.075	96.4	150	7.26	5.0
1.006	14	15	25.787	0.600	72.080	71.820	0.260	99.2	150	7.68	5.0
1.007	15	16	38.518	0.600	71.820	71.435	0.385	100.0	150	8.32	5.0
1.008	16	MH5323	6.669	0.600	71.435	70.660	0.775	8.6	150	8.35	5.0
6.000	Storage Crates 1	HB1	3.024	0.600	72.450	72.440	0.010	302.4	300	5.06	5.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	1.010	40.2	0.4	1.200	2.405	0.030	0.0	16	0.327
1.001	1.073	75.9	1.2	2.405	3.595	0.085	0.0	25	0.391
1.002	1.044	73.8	1.3	3.595	3.665	0.099	0.0	28	0.403
1.003	1.128	79.7	1.6	3.665	3.560	0.121	0.0	30	0.454
1.004	1.031	18.2	6.2	3.710	3.930	0.454	0.0	60	0.932
1.005	1.023	18.1	6.2	3.930	4.120	0.454	0.0	60	0.925
1.006	1.009	17.8	6.2	4.220	4.530	0.454	0.0	61	0.916
1.007	1.005	17.8	6.2	4.530	4.915	0.454	0.0	61	0.912
1.008	3.455	61.1	6.2	4.915	1.350	0.454	0.0	32	2.219
6.000	0.899	63.5	0.0	3.516	3.560	0.000	0.0	0	0.000

Simulation Settings

Rainfall Methodology	FEH-13	Skip Steady State	x	1 year (l/s)	1.1
Summer CV	0.750	Drain Down Time (mins)	240	Check Discharge Volume	x
Winter CV	0.840	Additional Storage (m³/ha)	0.0		
Analysis Speed	Normal	Check Discharge Rate(s)	✓		

Storm Durations

15	60	180	360	600	960	2160	4320	7200	10080
30	120	240	480	720	1440	2880	5760	8640	

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	20	0	0
100	40	0	0

Pre-development Discharge Rate

Site Makeup	Greenfield	Region	6
Greenfield Method	IH124	Growth Factor 1 year	0.85
Positively Drained Area (ha)	0.454	Betterment (%)	0
SAAR (mm)	581	QBar	1.2
Soil Index	3	Q 1 year (l/s)	1.1
SPR	0.40		

Node HB1 Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	72.440	Product Number	CTL-SHE-0047-1100-1200-1100
Design Depth (m)	1.200	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.1	Min Node Diameter (mm)	1200

Node Storage Crates 1 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	72.450
Side Inf Coefficient (m/hr)	0.00000	Porosity	0.95	Time to half empty (mins)	

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	320.0	0.0	1.200	320.0	0.0	1.201	0.0	0.0

Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.59%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage Crates 1	945	73.196	0.746	10.5	226.6530	0.0000	SURCHARGED
15 minute winter	1	10	74.350	0.110	19.4	0.1240	0.0000	OK
15 minute winter	2	10	75.188	0.143	26.4	0.1622	0.0000	OK
15 minute winter	3	10	74.211	0.131	45.2	0.1477	0.0000	OK
15 minute winter	4	10	75.005	0.130	26.8	0.1476	0.0000	OK
15 minute winter	5	10	75.444	0.044	7.8	0.0496	0.0000	OK
15 minute winter	6	10	74.934	0.209	42.9	0.2361	0.0000	OK
15 minute winter	7	11	73.525	0.125	86.5	0.1414	0.0000	OK
15 minute winter	8	10	73.201	0.086	12.4	0.0972	0.0000	OK
960 minute winter	9	930	73.196	0.361	2.3	0.4082	0.0000	SURCHARGED
960 minute winter	10	945	73.195	0.640	2.7	0.7242	0.0000	SURCHARGED
960 minute winter	11	945	73.196	0.691	3.0	0.7812	0.0000	SURCHARGED
960 minute winter	HB1	930	73.195	0.755	12.3	0.8538	0.0000	SURCHARGED
960 minute winter	13	945	72.278	0.023	0.9	0.0262	0.0000	OK
960 minute winter	14	945	72.103	0.023	0.9	0.0257	0.0000	OK
960 minute winter	15	945	71.845	0.025	0.9	0.0284	0.0000	OK
960 minute winter	16	945	71.448	0.013	0.9	0.0146	0.0000	OK
960 minute winter	MH5323	945	70.673	0.013	0.9	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
960 minute winter	Storage Crates 1	6.000	HB1	-10.5	-0.543	-0.166	0.2129	
15 minute winter	1	2.000	3	19.2	0.889	0.451	0.5125	
15 minute winter	2	3.000	3	26.0	1.033	0.644	0.2688	
15 minute winter	3	2.001	7	44.5	1.935	0.589	0.6613	
15 minute winter	4	4.000	6	26.4	0.833	0.623	0.7027	
15 minute winter	5	5.000	6	7.8	1.334	0.186	0.1149	
15 minute winter	6	4.001	7	42.0	1.173	1.002	0.2969	
15 minute winter	7	2.002	HB1	86.7	2.473	0.543	0.2965	
15 minute winter	8	1.000	9	12.0	0.880	0.298	0.4648	
960 minute winter	9	1.001	10	2.3	0.366	0.030	4.2002	
960 minute winter	10	1.002	11	2.4	0.309	0.032	0.7935	
960 minute winter	11	1.003	HB1	3.4	0.147	0.043	0.8831	
960 minute winter	HB1	1.004	13	0.9	0.523	0.049	0.0298	
960 minute winter	13	1.005	14	0.9	0.524	0.049	0.0122	
960 minute winter	14	1.006	15	0.9	0.491	0.050	0.0466	
960 minute winter	15	1.007	16	0.9	0.686	0.050	0.0513	
960 minute winter	16	1.008	MH5323	0.9	1.230	0.015	0.0048	52.7

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 99.59%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Storage Crates 1	1410	73.618	1.168	12.0	355.0532	0.0000	SURCHARGED
15 minute winter	1	10	74.382	0.142	29.0	0.1606	0.0000	OK
15 minute winter	2	10	75.243	0.198	39.5	0.2236	0.0000	OK
15 minute winter	3	11	74.271	0.191	67.6	0.2157	0.0000	OK
15 minute winter	4	10	75.229	0.354	40.1	0.4001	0.0000	SURCHARGED
15 minute winter	5	10	75.454	0.054	11.7	0.0613	0.0000	OK
15 minute winter	6	10	75.068	0.343	63.8	0.3874	0.0000	SURCHARGED
15 minute winter	7	11	73.831	0.431	130.5	0.4876	0.0000	SURCHARGED
1440 minute winter	8	1410	73.619	0.504	0.8	0.5704	0.0000	SURCHARGED
1440 minute winter	9	1410	73.619	0.784	2.3	0.8871	0.0000	SURCHARGED
1440 minute winter	10	1410	73.619	1.064	2.5	1.2036	0.0000	SURCHARGED
1440 minute winter	11	1410	73.619	1.114	3.3	1.2604	0.0000	SURCHARGED
1440 minute winter	HB1	1380	73.618	1.178	11.9	1.3323	0.0000	SURCHARGED
1440 minute winter	13	1410	72.281	0.026	1.1	0.0290	0.0000	OK
1440 minute winter	14	1410	72.105	0.025	1.1	0.0284	0.0000	OK
1440 minute winter	15	1410	71.848	0.028	1.1	0.0313	0.0000	OK
1440 minute winter	16	1410	71.449	0.014	1.1	0.0161	0.0000	OK
1440 minute winter	MH5323	1410	70.674	0.014	1.1	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
1440 minute winter	Storage Crates 1	6.000	HB1	-12.0	-0.514	-0.190	0.2129	
15 minute winter	1	2.000	3	28.6	0.954	0.674	0.7226	
15 minute winter	2	3.000	3	39.0	1.135	0.963	0.3642	
15 minute winter	3	2.001	7	67.5	2.020	0.892	1.0867	
15 minute winter	4	4.000	6	39.2	0.985	0.925	0.8968	
15 minute winter	5	5.000	6	11.6	1.342	0.279	0.1285	
15 minute winter	6	4.001	7	63.0	1.585	1.503	0.3243	
15 minute winter	7	2.002	HB1	127.4	3.203	0.798	0.3779	
1440 minute winter	8	1.000	9	0.8	0.402	0.020	1.3576	
1440 minute winter	9	1.001	10	2.1	0.306	0.027	4.2002	
1440 minute winter	10	1.002	11	2.7	0.309	0.037	0.7935	
1440 minute winter	11	1.003	HB1	2.7	0.137	0.034	0.8831	
1440 minute winter	HB1	1.004	13	1.1	0.553	0.060	0.0345	
1440 minute winter	13	1.005	14	1.1	0.555	0.060	0.0141	
1440 minute winter	14	1.006	15	1.1	0.522	0.061	0.0537	
1440 minute winter	15	1.007	16	1.1	0.728	0.061	0.0592	
1440 minute winter	16	1.008	MH5323	1.1	1.305	0.018	0.0055	85.6

APPENDIX F

Suffolk County Council - Drainage proforma for SW Aspects of Planning Applications

Suffolk County Council

DO NOT PRINT... Appropriate parts of sheet 1 and all of sheet 2 to be completed, starting at top left of sheet1. Yellow cells to be completed by applicant or agent. Most cells have drop down boxes and guidance. Required data will vary, depending on previous answers. Amber cells warn of possible error, lack of required information, non compliance with policies or standards or where special considerations /information may be required. Red cells indicate missing information required for detailed applications . Purple Cells indicate missing information required for outline or detailed applications.

Form completed for Developer/applicant by (name)	GEORGE BAKER	Date	24/03/2022	Contact email or telephone	george.baker@createconsultingengine
Form checked for LPA by		Date		Ref No.	
Form checked for SCC Floods by		Date			

District council	West Suffolk – (Forest Heath & St Edmundsb	Site Name	McDonalds at Haverhill
Total Site area (ha)	0.48	Address	Bumpstead Road
Number of homes	0	Road	Haverhill Business Park
Commercial area (ha)		Town	Haverhill
Commercial built area (ha)		County	Suffolk
Area of POS (ha)		When was the last pre-app discussion with SCC Floods team?	None
Existing land status	Green Field	Is a complete FRA included in the application?	Yes
Highest Ground level (m AOD)		EA Flood Zone(s)	Fz1
Lowest ground level (m AOD)		Does adjacent existing highway drain into the site?	No
		Is site at risk of SW flooding?	Yes

Carry on filling in form. SCC Floods team will be consulted

RUNOFF DESTINATION (where proposed SW drainage from site will discharges to)

	scroll down to complete appropriate cells	Sea or Estuary	Ground (Infiltration)	SW Body	Existing SWS, highway drain or another drainage system	Existing Combined Sewer
Is Site next to Estuary or coast?		Neither				
Will the site be drained directly to sea or estuary?		No	Fill in cells in this column below			
SOIL TYPE			3			
Have on site ground investigations been undertaken?			Yes			
Is a ground investigation report included in application?			Yes			
Recommendation from GI Report regarding soakaways - Are conditions suitable?			2. No - Infiltration < 10mm/Hr			
Number of test pits that soakage tests were undertaken in.			4			
Number of test pits with completed test to BRE365			4			
Are field sheets, test results and calculations included in application?			Yes			
Min Infiltration rate from tests (mm/Hr)			0			
Max infiltration rate from tests (mm/Hr)			0			
Is infiltration type drainage proposed?			No			
			Go to next column			
	Name / Location of SW Body			None		
	Reasons (if any) for not draining to a surface water body			Too far by gravity		
	Will SW be discharged to a surface water body?			No		
				Go to next column		
	Type of existing SW piped drainage system				Surface water sewer- adopted by AW	
	Description / Location of SW drainage system				to west of site	
	Reason 1 for not draining to SWS, highway drain					
	Reason 2 for not draining to SWS , highway drain					
	Will SW be discharged to an existing piped SW drainage system?				Yes	
					Carry on down column	
				Fill appropriate column (s) (usually one only) for proposed destination		
	Existing impermeable area				0.00	
	Proposed Impermeable area				0.45	
	Method for calculating allowable discharges, existing or Green field flows				IH124 using SOIL	
	Peak discharge rate to destination					
	100 Year return period allowable discharge to SW or combined sewer agreed by AW or SCC (l/sec)					
	1 year return period	Existing (l/sec)			1.1	
		Proposed with CC & creep (l/sec)			1.1	
	100 year return period	Existing (l/sec)			4	
		Proposed with CC & creep (l/sec)			4	
		Proposed per ha (l/sec/ha)		0	8.306063489	
		Critical duration (minutes)			100	
	Proposed minimum throttle(s) aperture (mm)				75	
	Attenuation storage provided to limit peak flow (at critical duration)				365	
	Volume control	Required if proposed discharge > 2 l/sec/Ha in 100 Yr RP (see BS8582 5.2.2.4)				
	Volume of runoff in 6 Hr duration event (cubic metres)					
	100 Year RP existing					
	100 Year RP + CC +creep proposed					
	Additional capacity provided in SUDs to control volume					
	Water quality (WQ)					
	Reasons (if any) for not followng best practise for WQ:					
	During construction period					
	Permanent					
	Proposed permanent WQ SUDS:					
	Volume of proposed treatment pond (Vt) expressed as mm of rain over the impermeable areas on the site.					
	Depth of rain intercepted (refer to SUDS manual) expressed as mm of rain over the impermeable areas on the site					
	Volume intercepted (cubic metres)					
	Capacity of proposed attenuation & volume control SuDs (can be reduced by interception volume)				365	
	Area of site taken up by proposed SuDs					
	Are calculations and drawings included demonstrating there is sufficient and appropriate space for the proposed SUDS volume within the layout?				Yes	

Go to Sheet 2

Boxes below to be completed for all SW Systems

Proposed SW Drainage system

Extent of open SuDS	7. Underground pipes + tanks +some surface flood storage

fill in cells below

Does application include justification for not using open SUDS?	Yes
Is pumping of SW proposed?	No
Does application include justification for pumping?	No

Management and maintenance arrangements	
Is a management plan included in the application?	Yes
Life time for plan and maintenance costs	
Discount rate normally 3.5%	

Proposed SW drainage maintenance bodies	**Proposals for ensuring owners are aware of their SW drainage & maintenance requirements**
Owner (for drainage serving single property)	
	Progress with setting up maintenance arrangements

Please indicate who will maintain what	Location of SuDs elements				
SuD elements	**Private gardens or commercial land**	**Roads, verges and /or footways**	**Parking areas**	**POS**	**Other** eg Mews court
Vegetation, trees, shrubs etc	Owner	n/a	n/a		
Permeable paving.	Owner				
Rills	Owner				
Open SuDS - Erosion protection, De-silting, headwalls,dividing walls	Owner				
Open SuDS - Bollards or fencing	Owner				
Shallow pipes throttles/headwalls at driveway crossings over swales.					
Shallow pipes throttles / headwalls @ road crossings over swales					
Litter picking including clearing grates and grilles	Owner				
Gully Grates -repairs & replacement	Owner				
Gully pots, connection pipes	Owner				
Highway carrier drains					
Soakaways	Owner				
Oil or petrol interceptors	Owner				
Underground attenuation tanks	Owner				
Surface Water Sewer	Owner				
Other - please state					
Other - please state					

Availabilty of 3.5m wide access for SuDs maintenance -	1. 3.5m wide access available to all proposed SuDS

Design flood return period for:	
Buildings	100
Gardens (unless designated to store water)	
Roads	30

Design for blockage and /or Exceedance	
Are exceedance routes/ storage areas for 100 year RP event shown on submitted layout plan(s) including proposed floor and ground levels, buildings and roads.	Yes

SuDS details that are most likely to affect layout and maintenance		
Maximum depth of open SuDS (mm)		500
Maximum depth of water in open SuDS in 100 Year RP (mm)		
Steepest side slope of open SuDS (1 vertical in x horizontal)		
Steepest longintudinal gradient of any swales.		
Are any buildings < 5m of open SUDS or undergr'd soakaways?		Yes
if yes describe location(s)	road by drive through windows	
Special protective measures		
means of access/repair SUDs	close drivethrough roadway	

Health and Safety - public and maintenance operatives	
Are Designers CDM Health and Safety Plan included?	

Structural Integrity	
Have Structural design and specification details been provided for:	
Pipes -BS EN, Class, strength calcs including bed and surround.	
Tanks - including geocells / fabric surround	
Manholes BS EN, size, type etc (SFA 7th edition)	
Headwalls, dividing walls, bunds & slope stabilty.	

Other Information normally required (not exhaustive)

Are design calculations provided, cross-referenced to drawing(s -also provided) showing catchments and layout of SuDs, roads, footways and buildings?	Yes
Are landscaping /planting details shown on drawing(s) provided showing SuDS, and development layout?	Yes
Are details of SuDS including inlets, outlets, dividing walls, erosion control measures shown on provided plans.	Yes
Are extents of adoption by each body shown on drawings provided?	
Is a completed copy of SCC's Asset register sheet provided?	

APPENDIX G

Haverhill Business Park
Haverhill
Suffolk

Flood Risk Assessment & Drainage Strategy

Project Ref: NSB/12070/FRA
Second Issue

26th November 2015

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1.0 Introduction

1.1 This Drainage assessment has been prepared on behalf of Hammond Rutts Investments Limited for the proposed developments on the remaining land at Haverhill Business Park, Haverhill, Suffolk.

1.2 The site forms part of the wider Haverhill Business Park that consists of hotel, restaurant, as well as industrial and warehouse properties. The total area covered by the application is some 12.6 ha and includes the area occupied by Phoenix road and Iceni Way. The area of the site that is subject to the earth moving operations is 11.0 ha (27 acres). This is shown on the site location drawing 12070 / 280 within the appendices.

To the south of the site are residential properties, a farm and undeveloped agricultural land, with residential properties located to the north of the site on Bumpstead Road.

1.3 The site consists of seven undeveloped irregular parcels of land (NE1, NE2, SE1, SE2, SW1, NW1 and NW2) that currently hold large volumes of earthworks fill material placed in stockpiles across the site which will be used to form new development plateaus as part of an earthworks operation – refer to the separate Earthworks Strategy Report.

This report is submitted in support of the outline planning application for up to 46,000 sq.m of development that include B Class uses, Car dealerships and PFS/ restaurant as described in the Planning Supporting Statement.

This assessment has been prepared following the guidance set out in National Planning Policy frame work (NPPF) formerly Planning Policy Statement Note no. 25.

Further guidance has been obtained from:

- EA/DEFRA R&D document W5-74/A/TR/1 “Preliminary rainfall runoff for new developments” Revision D, including figures 2.1 & 2.2.
- “Interim National Procedures” point 3, 10.2 & 10.3
- The Suds Manual (ciria c697)
- “Interim Code of Practice for Sustainable Drainage Systems 2004” (ICOP SUDS).

2.0 Topography

2.1 A topographic survey of the application site has been carried out which is included in the appendices – refer to drawing 12070/230 with the appendices.

2.2 The general topography of the site is such that there is a fall from south to north with levels ranging from 86.00m AOD to 70.00m AOD approximately.

2.3 The stockpile mounds at each of the sites vary in both in height and extent. The topographical survey drawing illustrates the current stockpile extent and their heights.

2.4 The range in stockpile approximate heights are summarised below:

Plot NW1 and NW2	- 1.0m to 8.4m
Plot SW1	- 1.1m to 5.2m
Plot NE1 and NE2	- 1.4m to 14.3m
Plot SE1 and SE2	- 0.0m to 2.6m

On the basis that the earthworks application is approved and the works are carried out as outlines within this earthworks strategy document the proposed new levels across the site will be as illustrated on drawing 12070/220C.

3.0 Existing Surface Water Drainage and Proposed Storm Water Drainage Strategy

3.1 Haverhill Business Park is currently served by an adopted surface water sewer system as shown on drawing 12070/220 within the appendices.

3.2 The proposed surface water drainage strategy for the development is be based on historic agreement with Anglian Water and developed to suit the outcome of the drainage development enquiry that has been formally submitted.

3.3 It is intended the plots SE1, SE2, NE1 and NE2 discharge into the 150mm diameter foul and 150mm diameter storm water sewers currently located within Iceni Way and running parallel to Bumpstead Road within plot NW2 towards Anglian Water detention basin to the north. Drainage record plans from Anglian Water have been appended to this report and are also highlighted on BMP drawings 12070/108 and 12070/109.

3.4 The existing route of the above sewers currently pass through the southwest and western boundary of Plot NE1. It is proposed that these sewers are formally diverted – subject to the approval of Anglian Water – to be located outside of the development platform. Drainage easements will be maintained to ensure adequate access is provided.

3.5 In relation to surface water discharge rates to plots NW1 and NW2 discharge points have historically under alternative proposals been agreed in principle with Anglian Water into existing sewers that currently run between these two plots. It is still intended that the same points of discharge are proposed as outfalls to the new development layout.

Surface water discharge rates from the development are subject to further discussions and agreement with Anglian Water to ensure downstream drainage networks, including the holding pond, are not adversely affected as a result of the new development drainage proposals.

Surface water discharge from plot SW1 will be discharged into a dedicated private drainage located to its frontage at Phoenix Road that discharges into the public sewer between plot NW1 and NW2.

3.6 Drawing 12070 / 220 within the appendices illustrates the route of the existing drainage network and the proposed outfall point from the new development platforms.

3.7 At the time of writing this report a new formal application had been submitted to Anglian Water illustrating the position of their sewers and the proposed location of the new connections onto them of new foul and surface water drains from the development. The application also included the proposed new flow rates from the development site.

3.8 Description of Catchments

The Environment Agency floodplain map confirms that the application site is not within a recognised floodplain area and is categorised as in Flood Zone 1.

The Anglian Water detention outfall basin to the north of the development is believed to eventually contribute flow to the Stour Brook Watercourse to the north of the site.

4.0 Ground Investigation and Geology

A phase 2 intrusive Ground Investigation has been carried out across the site by Delta Simons in August 2015.

4.1 The work entailed deep rotary Auger boreholes down to depth of between 11m to 12m focused primarily on the areas identified as stockpiled fill material. Shallower trial pit excavations were also undertaken across the site at depths down to 4m.

4.2 A collection of disturbed soil samples from all intrusive locations for subsequent laboratory testing in the form of gas and groundwater monitoring was also undertaken.

4.3 The site investigation borehole work confirmed the stockpiled material to be comprised of reworked natural fill comprising of a firm to very stiff brown clay with varying fractions of sands and gravels.

4.4 This was then observed to be underlain by a natural strata of the Lowestoft Formation – a firm to very stiff brown CLAY with varying fractions of sands and gravels, below which was confirmed to be a strata of the Lewes Nodular CHALK formation and the Seaford Nodular CHALK formation.

4.5 The shallower trial pit logs confirmed similar findings in the stockpile areas when excavated. In areas where no stockpile of material had been placed the trial pits confirmed that generally the ground comprised of a gravelly clay material underlain by a chalk strata.

4.6 It was confirmed during investigative work that topsoil was found only in parts of the site.

4.7 Groundwater levels were recorded at being between 2.97 to 8.38m below ground level, these were however considered to be representative of perched water collecting in the boreholes and not associated with a consistent groundwater body beneath the site.

4.8 The laboratory chemical analysis of selected soil samples and groundwater samples did not identify the presence of any elevated concentrations of contamination above the respective screening criteria. As such the on-site stockpiled material has been classified as 'non-hazardous'.

4.9 Given the nature of the re-worked natural fill material generally Clay, Chalk and Gravel it is likely that soakaway infiltration drainage will not be an effective means for the disposal of surface water from the proposed development.

This should however not preclude the use of tanked infiltration drainage techniques and will be discussed later on in the report.

5.0 Proposed Site

5.1 Description of Development

It is proposed to seek outline planning permission to develop the site for some 45,965 sq. m. GEA of B class employment space that would be suitable for flexible uses with Use Class B1, B2 and B8. The Framework Plan 15016 / TP / 004 within the appendices shows how the site can be laid out as seven separate plots with buildings ranging in size from 1,983 sq. m. to 9,320 sq. m. The layout respects the existing topography of the site and proposed earth movement works. It gives the opportunity to optimise efficiency of the employee car parking areas while incorporating secure service yards for each unit as well as provision for cycles. Access to the plots is generally from Phoenix Road and Iceni Way. The exceptions to this plot NW1 which is accessed to Bumpstead Road. The Architects Framework Masterplan is appended to this report.

5.2 A soft Landscape scheme will also be integrated into the development / drainage strategy.

5.3 The proposed development site levels have been developed in line with the overall development earthworks strategy – refer to BMP Report NSB / 12070 / ERW dated 7th October 2015.

Proposed development levels will also be set such that should any flooding occur it is controlled and kept within the new development demise and not effect neighbouring properties or highway land.

5.4 We understand from discussion with local residents that flooding has on occasion been experienced to the lower off-site areas along Bumpstead Rd at times of prolonged rainfall.

From examination of the record plans it is believed that this is likely to be partially associated with the surface water flows from the existing local public sewers and local drainage ditches along Bumpstead Road.

Whilst the design, management and control of these ‘off-site’ drainage systems are by others – Anglian Water and Suffolk County Council – we will feel that in principle and subject to approval that the existing drainage networks can be modified to provide further flood protection to neighbouring properties. These could include the following:

- Introducing weir control structure into the proposed new culverted structures along Bumpstead Road to reduce the discharge rate and velocity of run-off.

This would at the same time utilise more of the storage volume available within the culverts and help to easy flooding issues experienced at Bumpstead Road.

- Introduce further banking measure to the edge of the existing Detention Pond to the north of the development behind the existing residential properties to increase its flood volume capacity. This would be a simple earth bunding exercise.

- Increase the diameter of the pipework into and out of the Detention Pond to allow higher rates of flow into it and therefore reduce the possibility of flooding of the network leading into it.

6.0 Drainage Strategy

6.1 Existing Drainage

The existing site is currently undeveloped does not discharge surface water by means of any positive drainage system to off-site sewers or watercourses.

As previously stated earlier the Business Park site currently has some provision for foul and surface water drainage discharge to cater for outfall discharges from the undeveloped plots, however new connection points will have be agreed with Anglian Water prior to connections be constructed.

It is proposed therefore that the foul and surface water discharge from the new development are allowed to utilise the existing public sewer as a means of gravity drainage connections with flow rates subject to agreement with Anglian Water once the developer services application has been concluded with them.

6.2 Proposed Drainage

The findings of the recent site investigation report compiled by Delta Simons suggests that the prevailing ground conditions will be such that infiltration drainage direct into the underlying strata will not be suitable.

The above constraint should however not prohibit the incorporation of SUDS drainage techniques into the proposed drainage strategy. These are described further below.

6.3 Proposed SUDS Measures

6.3.1 Oversized Surface Water Drainage Channels

It should be possible to incorporate within the main service yard areas a series of oversized surface water drainage channels to collect run-off and provide underground attenuation volume.

6.3.2 Porous Car Parking Areas

Although surface water infiltration directly into the ground is not proposed, we have not allowed this to prohibit the potential integration of infiltration drainage techniques into the design. A lined / tanked infiltration drainage feature can be incorporated into the design to provide further attenuation volume and attenuation of peak design flows.

This can be incorporated to new areas of staff and visitor's car parking that can be constructed as an area of permeable surfacing that could comprise of a permeable block paving system underlain by a suitable free draining subbase material that will enable surface water run-off to be attenuated. This design will help attenuate peak design flows from the developments by utilising the volume available within the permeable stone (type 1 material with no fines) within the structural layers of the construction. It is proposed that the permeable stone media is tanked by an impermeable membrane and flows are allowed to discharge back into the drainage system via a series of perforated pipes placed within the stone media.

These methods of surface water interception / collection will also avoid the need to provide full retention oil interceptor units within parking areas as the stone media under the permeable block paving will naturally capture hydrocarbon contaminants.

6.3.3 Underground Storage

Underground attenuation storage can also be provided to the surface water drainage system in the form of oversized pipes and cellular storage tanks to provide additional storage volumes at times of the higher 1 in 30 and 1 in 100 year plus climate change storm return periods.

6.3.4 Allowable Surface Flooding

Additional storage of peak storm water can be facilitated by allowing car-parking and Service yard areas to flood up to circa 100mm, provided this will not put the buildings, or neighbouring properties at risk of flooding. The proposed site levels will be set such that this is achieved, and will need to be carefully considered to ensure that flooding is routed away for the proposed new office / populated areas.

6.3.5 Filtration / Cleaning

There will be a natural filtering/cleaning out of any hydrocarbon pollution form the effect of surface water passing through the stone media underneath the permeable car parking surfacing. The use of a petrol interceptor is not proposed in this instance, although full retention interceptors will still be incorporated into the service yard drainage scheme, with by-pass interceptors incorporated to any new car parking drainage areas that are not permeable.

6.3.6 Flow Controls

Peak surface water discharge rates into the public sewer are to be controlled by the introduction of Hydrobrakes and orifice plate control units installed within the on plot manholes at the proposed outfalls and strategically on the on-site drainage networks.

Peak flow rates will be controlled from the new development such that capacity of the drainage systems to neighbouring sites will not be adversely affected. Flows rates from the new site will be ultimately agreed with Anglian Water upon review of local capacities.

6.3.7 Maintenance

The complete drainage system will have a detailed maintenance regime in place prior to occupation. This regime will involve an inspection after 3 and 6 months, and any maintenance required will be carried out. A further inspection will be carried out after 12 months, after which the maintenance schedule will be reviewed and adjusted to suit the circumstances and maintenance requirements of the development. In any case following severe storm events, the system will be inspected to ensure that all elements are performing satisfactory.

6.4 Surface Water Discharge Rates

Anglian Water have confirmed that the historic section 104 agreement for the parcels of land SW1, NW1 and NW2 currently under consideration exists. They have also confirmed that these agreement should be used for future plot drainage design.

Anglian Water have further confirmed that the remaining parcels of developable land namely plots NE1, NE2, SE1 and SE2 would be subject to discharge rates calculated using 5 l/s per hectare.

Contact has been made with the “Planning Equivalence Department” at Anglian Water to confirm the above in relation to this application whilst also to discuss alternative methods of connection onto their public sewer system.

The table below shows the proposed development areas and their proposed respective discharge rates.

Table 1

Plot No	Development Plateau Area (Ha)	Proposed Discharge Rate (L/S)
Plot SW1	0.381	7.2 (section 104)
Plot NW1	0.534	9.3 (section 104)
Plot NW2	1.480	185 (section 104)
Plot NE1	1.959	9.8 (Greenfield)
Plot NE2	3.022	15.1 (Greenfield)
Plot SE1	0.890	4.4 (Greenfield)
Plot SE2	1.098	5.5 (Greenfield)

Whilst for the purpose of this report we have based out proposals on the data in the above table we will review with Anglian Water the possible options to proportion the allowable flow rates between plots differently (pipe diameter permitting) given that the ultimate point of discharge is the same detention basin to the north of the site.

It is proposed that the above flow rates in Table 1 are used to limit the peak discharge for the 1 in 30 year and 1 in 100 year plus climate change return period.

6.5 Windes Network

Windes / Microdrainage modelling software has been used to determine the average required volume of storage for each plot for both the 1 in 30 year and 1 in 100 year plus climate change return period.

Further detailed design and modelling will determine the exact flow characteristics of the final drainage networks however table 2 below shows the average storage volume requirements that would need to be achieved using the various SUDS techniques described earlier within this report.

Design files are included with the appendices of this report.

Table 2

Plot	Discharge Rate l/s	1 in 30 year volume	1 in 100 year plus climate change volume
SW1	7.2	89	176
NW1	9.3	127	250
NW2	18.5	137	345
NE1	9.8	652	1229
NE2	15.1	1006	1896
SE1	4.4	292	561
SE2	5.5	365	688

Whilst we have shown a volume requirement for the 1 in 100 year storm in reality only the 1 in 30 volume will provide underground with the remainder upto the 100 year event being provided using controlled flooding of external areas to provide flood water containment within specific plots.

7.0 Foul Water Drainage Strategy

7.1 It is proposed that the existing foul water within Iceni Way will be used to serve plots SE1 and SE2 for future drainage connections.

7.2 It is proposed that Plot NE1 and NE2 will share a common foul drainage system that will discharge in to the existing foul water manhole located at Bumpstead Road.

7.3 It is proposed that foul drainage form plots NW1 and NW2 will discharge to the existing public sewer running between the two sites.

7.4 Foul water discharge from plot SW1 will be into a dedicated private drainage located to its frontage at Phoenix Road that discharges into the public sewer between plot NW1 and NW2.

7.5 Further consultation with Anglian Water will confirm the allowed foul water discharge rate from each plot development, however previous applications have agreed flow rates of between 1.2 to 2.1 l/s per hectare.

8.0 Highway Drainage

8.1 The current road infrastructure (Bumpstead Road, Iceni Way and Phoenix Road) are currently drained via a highway drainage system that discharges to open drainage ditches to the back of the existing footpath within the development ownership boundary and proposed development land.

8.2 It is proposed that these open ditches are diverted by introducing culverted sections and re-positioned closer to the highway footpath to limit the constraint upon the proposed new developments.

8.3 The necessary proposed easements will be put in place over the route of the diverted culverts so that sufficient highway access is provided for maintenance. The detail of the above work will be agreed with the Highway department at Suffolk County Council.

9.0 Flood Risk Assessment

9.1 Existing Information on Flood Risk

9.1.1 Tidal/Coastal

Tidal or coastal flooding is not considered a risk as the nearest coast is approx. 64 kilometres away from the site.

9.1.2 Groundwater

Groundwater flooding is not known to be an issue. The existing site has had no problem with any form of groundwater.

9.1.3 Surface Water

There is no evidence to suggest that the site currently drains to the existing adopted surface water sewers in the vicinity. Discharge of flow from the development into the public sewers is proposed and is to be approved by Anglian Water and the Environment Agency in line with historic approvals already in place.

9.1.4 Rivers / Watercourses

The Environment Agency publishes floodplain maps on the internet (http://www.environment-agency.gov.uk). These maps show the possible extent of fluvial flooding for the 1 in 100-year flood (that which would have a 1% probability of being exceeded each year) or the possible extent of tidal flooding to a 1 in 200 year event. A plan showing the extent of the flooding along the nearest marked Environment Agency marked watercourse is presented in appendix A. This plan shows that the development under consideration is outside the area of any recognised floodplain.

10.0 Summary

Baynham Meikle Partnership has prepared this Flood Risk Assessment along the lines set out in the National Planning Framework (NPPF), to support the outline Planning Application for the Haverhill Business Park.

The Flood Risk Assessment for the outline planning applications is summarised as follows:

- The Flood Maps have shown that the site is not identified to be at risk from fluvial flooding and does form part of a functional floodplain.

- The proposed redevelopments will not generate any extra flow and will not exacerbate any flooding that may already occur within the vicinity of the site.

- Surface water flows from the developments will be attenuated and discharged back into the existing adopted public network subject to agreement with Anglian Water.

  A combination of greenfield and brownfield run-off rates have been adopted through the design of the new drainage systems.

- External areas of car-parking and service yards are to be allowed to temporarily flood by no more than 100mm in extreme storm events. Finished ground levels will need to be carefully considered and flood routing will be applied to ensure protection to proposed buildings and of adjacent landowners, in the event of extreme conditions.

- The water quality will also be improved because of the use of SUDS drainage techniques such as drainage ditches and trenches.

New sustainable drainage schemes will be implemented such that surface water flows from the development will be attenuated to offer an overall betterment to the existing situation by effectively controlling and reducing flows into the local system.

This is mainly due to the peak runoff flows from the sites being reduced when compared to existing flows from the sites and adoption of recommended SUDS design techniques in line with the EA guidance.

Appendices

INDICATIVE NORTH

NOTES

1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
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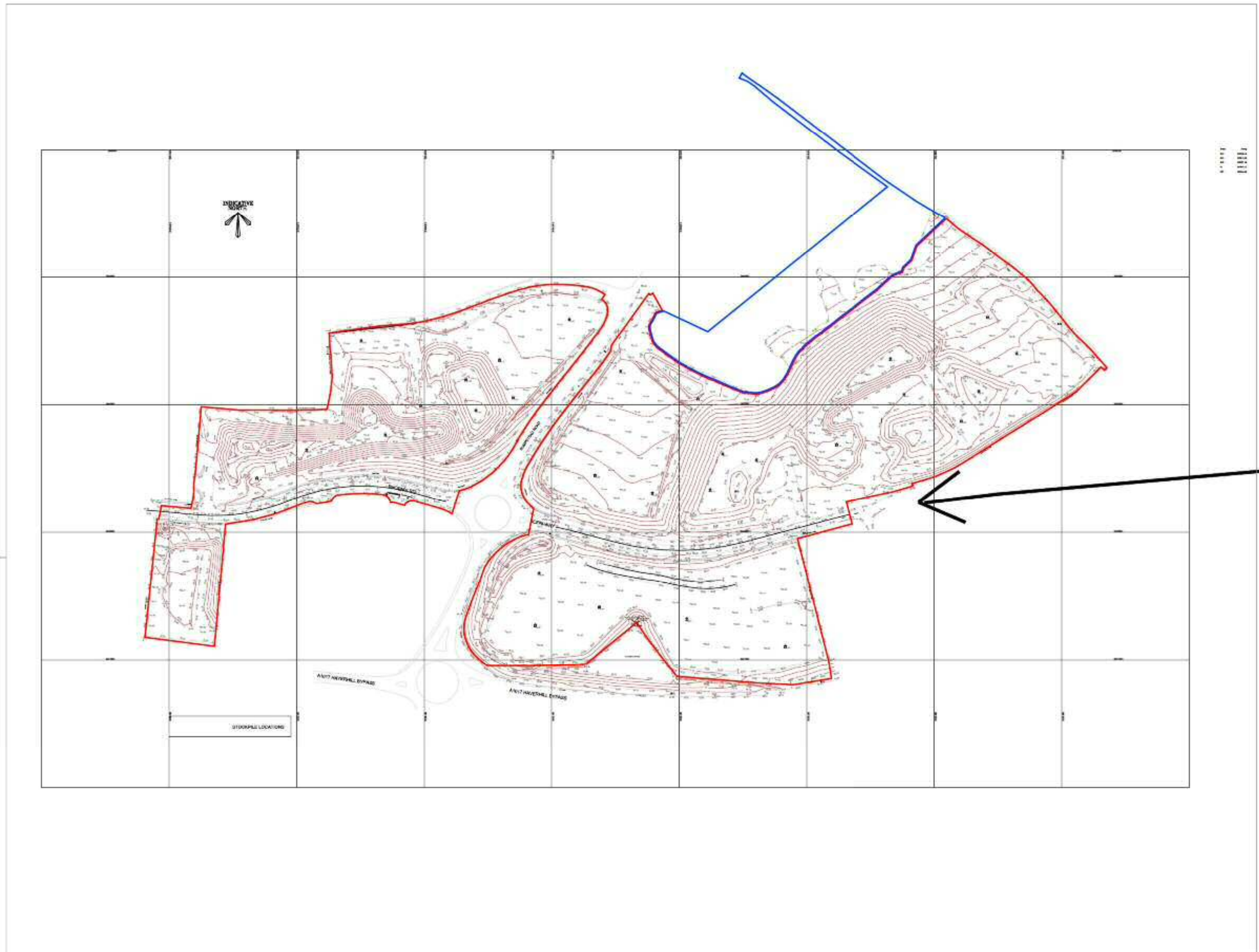

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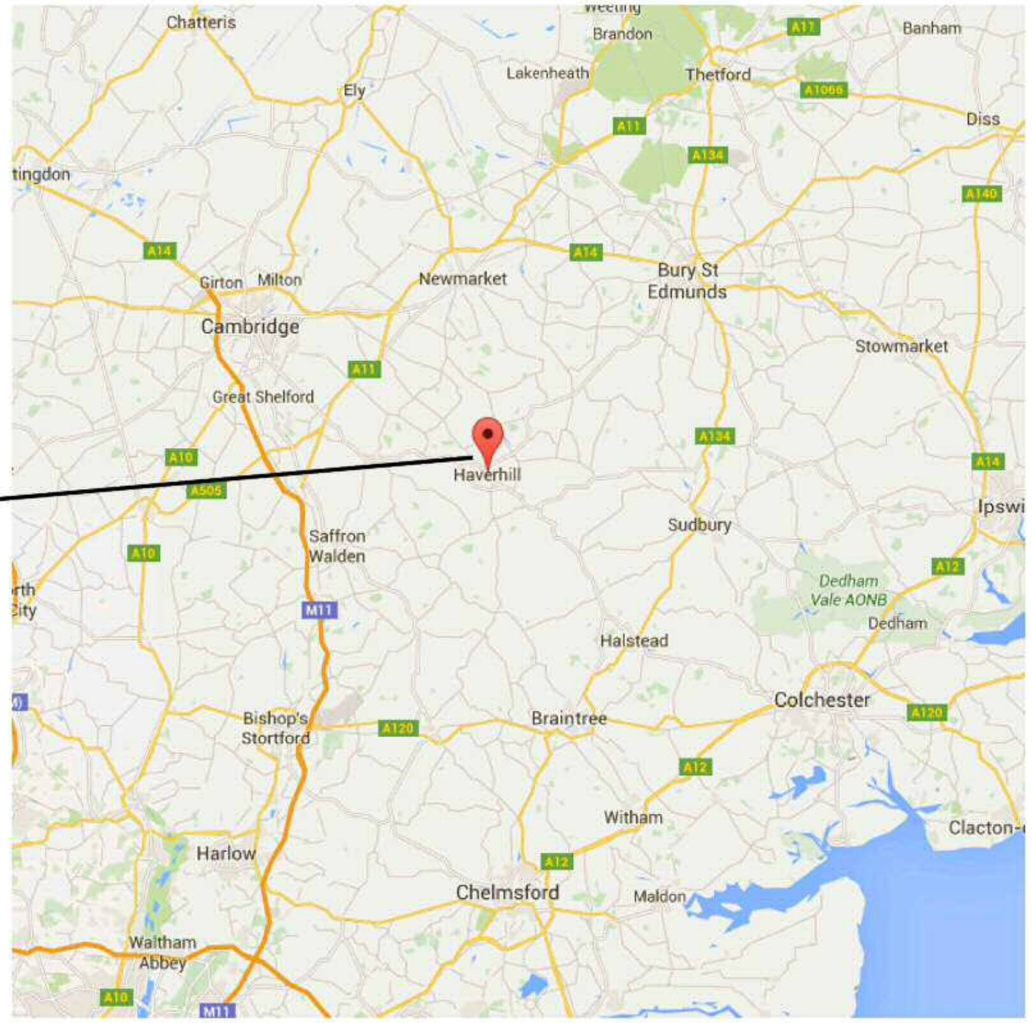

NOT TO SCALE

Rev	Date	Description	By	Checked By

Project HAVERHILL BUSINESS PARK	Dwg Number 12107/281	Rev.
Scale @ A1 1/2500	Date SEPTEMBER 15	
Title LOCATION PLAN		
Drawn by ARA	Checked by NSB	Project Engineer PLOT W

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NOTES

FOR COMMENT

Rev	Date	Description	By	Checked By

Project
HAVERHILL BUSINESS PARK
EARTHWORK PROPOSAL

Dwg Number: 12070/230
Rev.

Scale @ A1 1/1000 Date AUGUST 15

Title
EXISTING STOCKPILE MOUNDS

Drawn by AA Checked by NSB Project Engineer GC

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Note:
Drainage information has been taken from Fitzpatric As Built Drawing: 2146-63-C.

- Existing Foul Drainage
- Existing Storm Drainage
- Existing Highway Drainage
- Existing HV Electric
- Existing Water mains
- Existing Gas mains
- Existing BT Ducts
- Existing Virgin Ducts
- Existing KPN Ducts

FOR COMMENT

Rev	Date	Description	By	Checked By

Project: HAVERHILL BUSINESS PARK

Dwg Number: 12070/108 | Rev.:

Scale @ A0 – 1/500 | Date: JULY 15

Title: EXISTING SERVICES / CONSTRAINTS PLAN
SHEET 1 OF 2

Drawn by: GH | Checked by: NSB | Project Engineer: GC

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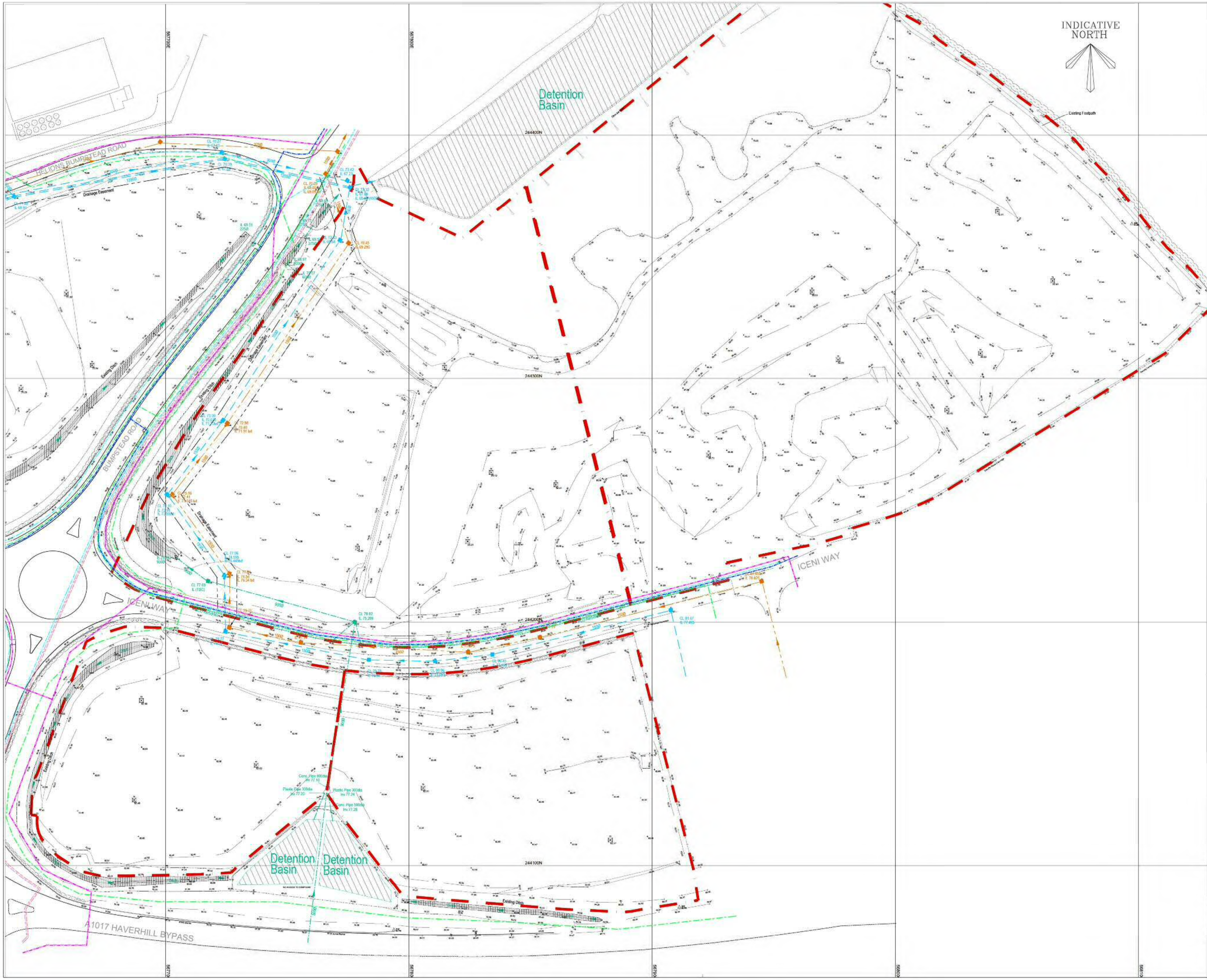

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- Existing KPN Ducts

FOR COMMENT

Rev	Date	Description	By	Checked By

Project: HAVERHILL BUSINESS PARK

Dwg Number: 12070/109

Rev.

Scale @ A0 – 1/500

Date: JULY 15

Title: EXISTING SERVICES / CONSTRAINTS PLAN SHEET 2 OF 2

Drawn by: GH — Checked by: NSB — Project Engineer: GC

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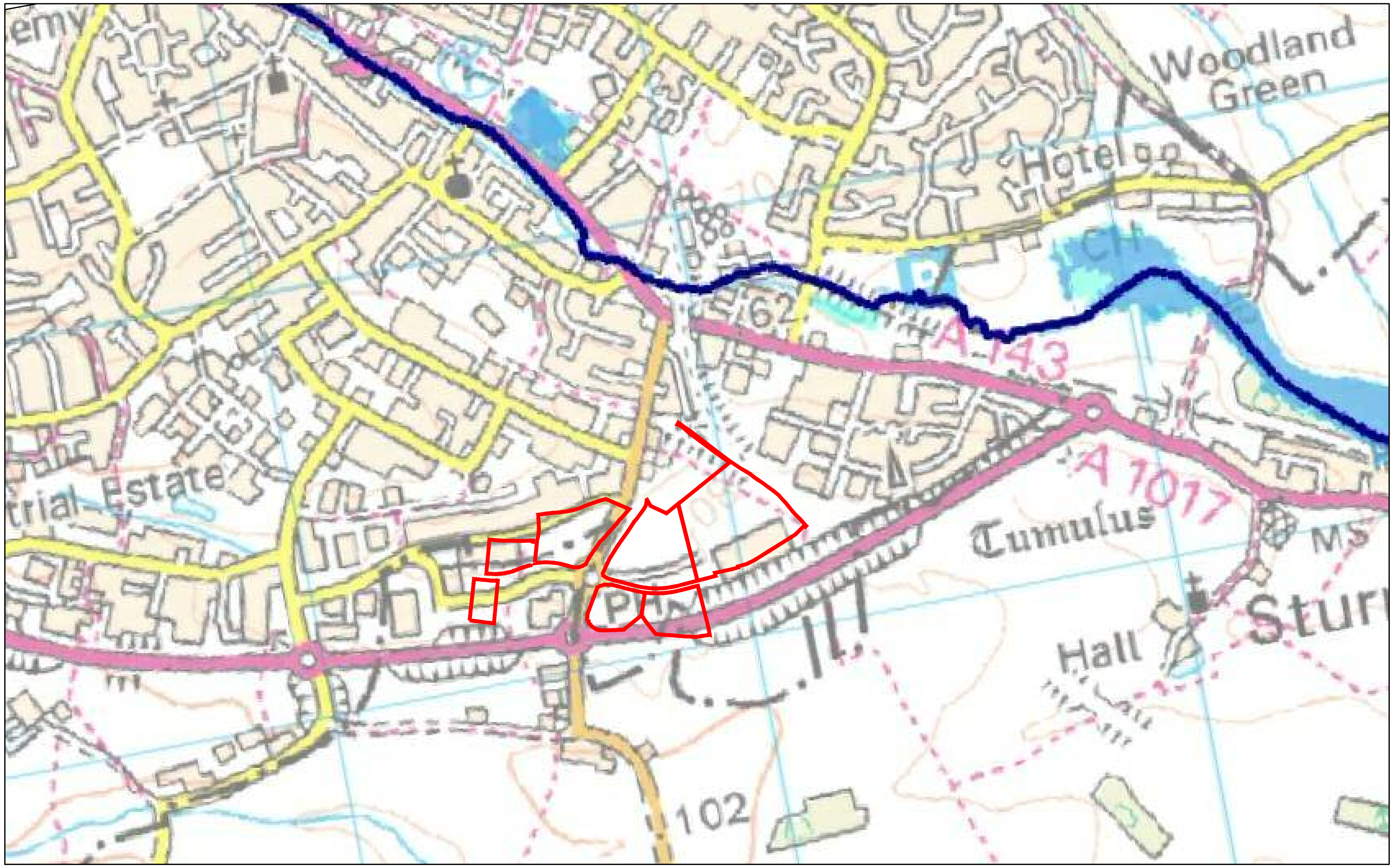

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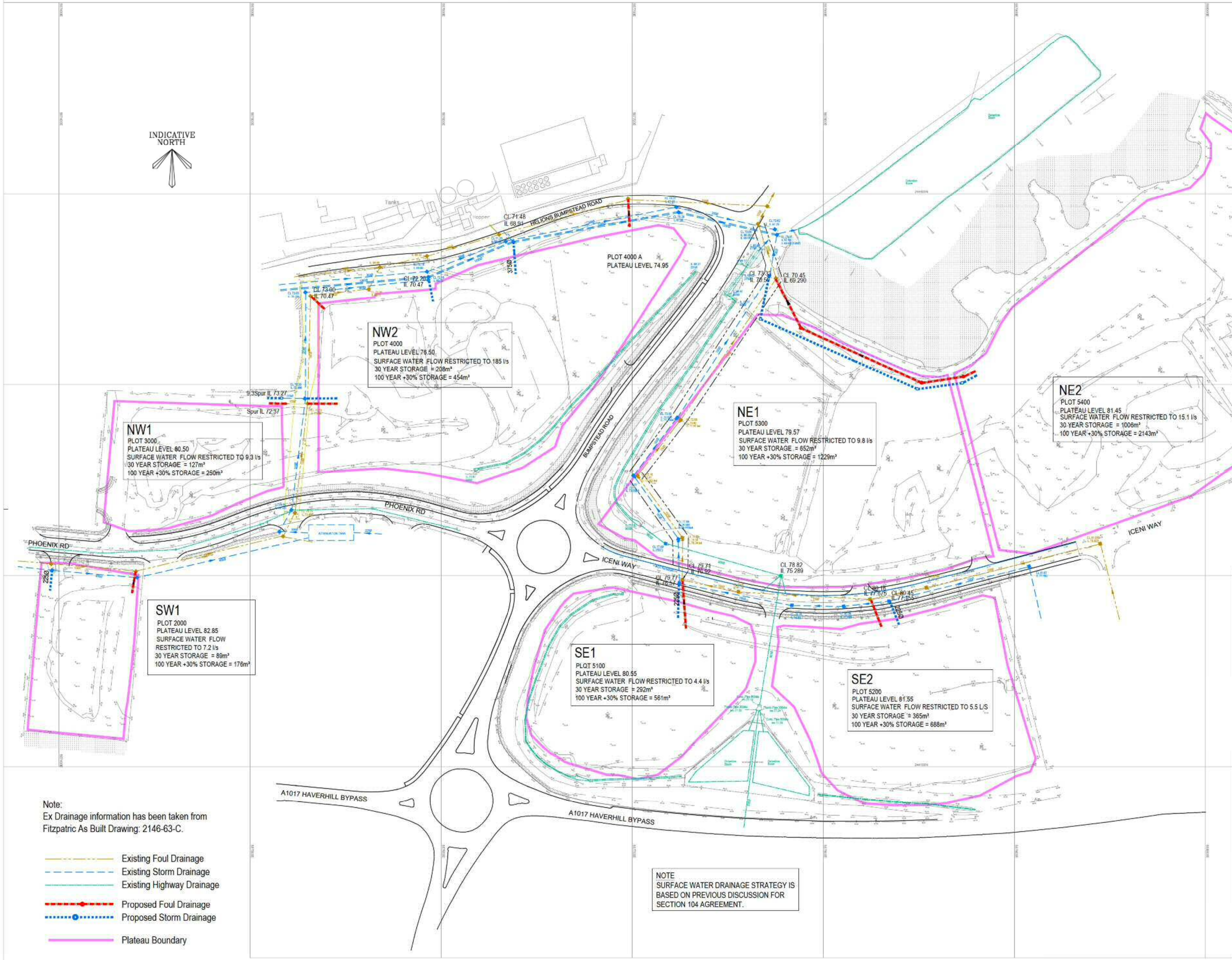
consulting structural + civil engineers

Checked by	NSB
Drawn by	JH
Proj. No.	12070
Date	NOV 15
Scale	NTS A3
Dwg.No.	SK8 Rev. -

Project HAVERHILL BUSINESS PARK

Title EA FLOOD MAP



NOTES

1. DO NOT SCALE THIS DRAWING. ALL DIMENSIONS MUST BE CHECKED / VERIFIED ON SITE.
2. TOPOGRAPHICAL SURVEY IS BY OTHERS AND NO GUARANTEE CAN BE GIVEN. ANY DISCREPANCIES NOTED ON SITE ARE TO BE REPORTED TO THE ENGINEER IMMEDIATELY.
3. THIS PLAN IS FOR GUIDANCE PURPOSES ONLY. ALL SERVICES MUST BE LOCATED & VERIFIED ON SITE.

THIS DRAWING IS BASED UPON AND IS TO BE READ IN CONJUNCTION WITH EXISTING STATUTORY UNDERTAKER SERVICE RECORDS. NO GUARANTEE CAN BE GIVEN AS TO THE ACCURACY. ALL SERVICES ARE TO BE LOCATED ON SITE WITH HAND DUG TRIAL PITS, IN ORDER TO DETERMINE THEIR PRECISE LOCATION AND DEPTH.

FOR PLANNING

Rev	Date	Description	By	Checked By
C	04/11/15	Flow rates updated. Storage volumes added	GH	NSB
B	01/10/15	Access points for plots 5100,5200, 5300,5400 revised	AA	GC
A	01/09/15	Superseded development layout removed to simplify drainage plan.	GH	GC

Project: HAVERHILL BUSINESS PARK EARTHWORK PROPOSAL

Dwg Number: 12070/220 | Rev. C

Scale @ A1: 1/1000 | Date: JULY 15

Title: INDICATIVE DRAINAGE CONNECTIONS PLAN

Drawn by: GH | Checked by: NSB | Project Engineer: GC

Baynham Meikle Partnership
consulting structural + civil engineers
8 Meadow Road, Edgbaston, Birmingham B17 8BU
Telephone: 0121 434 4100 Fax: 0121 434 4073 Email: admin@bm-p.co.uk

Schedule of approximate areas

Plot	Platform area		Unit No.	Ground floor area		First floor area		Total unit area		Plot total		Parking spaces	Platform coverage %
	sq.m	acres		sq.m	sq.ft	sq.m	sq.ft	sq.m	sq.ft	sq.m	sq.ft		
SW1	4,273.0	1.1	SW1U1	1,803.4	19,411.8	180.0	1,937.5	1,983.4	21,349.3	1,983.4	21,349.3	30	**42.2**
NW1	5,310.0	1.3	NW1U1	2,198.2	23,661.4	210.0	2,260.4	2,408.2	25,921.9	2,408.2	25,921.9	40	**41.4**
NW2	16,468.0	4.1	NW2U1	7,388.7	79,532.0	771.7	8,306.6	8,160.4	87,838.5	8,160.4	87,838.5	129	**44.9**
NE1	19,066.7	4.7	NE1U1**	8,679.9	93,430.4	438.8	4,723.2	9,118.7	98,153.7	9,118.7	98,153.7	98	**46.7**
NE2	30,219.0	7.5	NE2U1	5,479.6	58,982.4	550.0	5,920.2	6,029.6	64,902.6	15,349.6	165,223.1	73	**46.2**
			NE2U2	8,470.0	91,171.1	850.0	9,149.4	9,320.0	100,320.5			120	
SE2	10,976.0	2.7	SE2U1	4,423.6	47,615.6	477.8	5,142.5	4,901.4	52,758.1	4,901.4	52,758.1	77	**40.3**
SE1	8,899.0	2.2	SE1U1	3,647.4	39,260.6	396.4	4,266.8	4,043.8	43,527.5	4,043.8	43,527.5	52	**41.0**
Total	**95,211.7**	**23.5**	**8.0**	**42,090.8**	**453,065.4**	**3,874.7**	**41,706.7**	**45,965.5**	**494,772.1**	**45,965.5**	**494,772.1**	**619**	**44.2**

*All areas taken as GEA

** 50% of office located on the ground floor

NE2 platform includes access road

NOTES

Do not scale. Work only to figured dimensions.

Subject to Statutory Approvals.

Subject to survey

Where applicable this drawing is to be read in conjunction with other consultants drawings and with the specification.

All dimensions to be checked on site prior to commencement of work.

Plot boundaries

Retaining structure

Rev	Description	Chkd	Date

cornisharchitects

Project

HAVERHILL

Drg Title

FRAMEWORK PLAN

Status

PLANNING

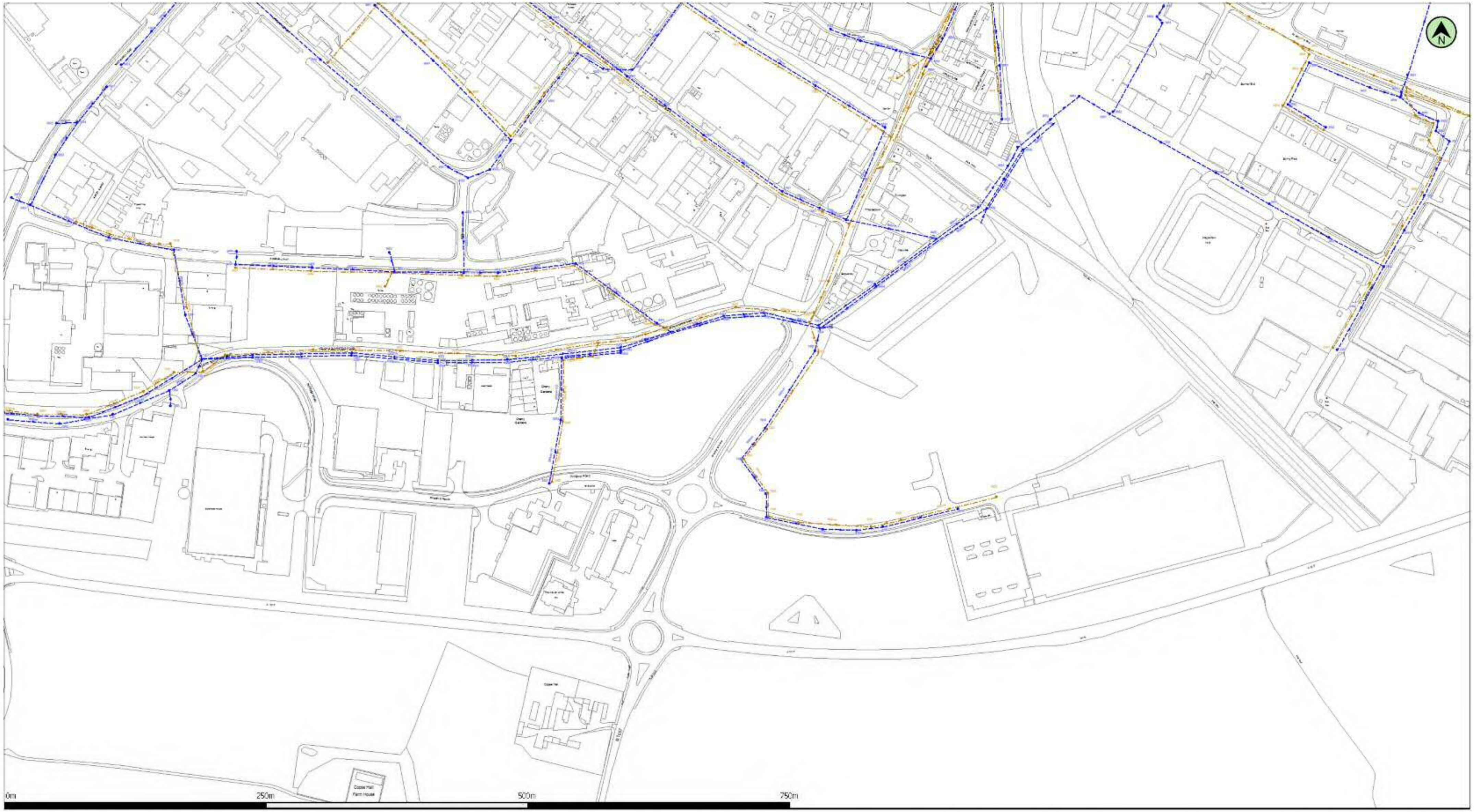
0 50 m

Scale 1:1000 @ A1

Date 27/10/2015

Drg No 15016 / TP / 004

Rev



Date: 12/02/15 | Scale: 1:3500 | Map Centre: 567697,244304 | Title: B1161846-3 | Waste Water Plan A3

This plan must be used in conjunction with the search results attached. The information shown on this drawing is based on the data currently recorded but the position must be regarded as approximate. Service pipes, private sewers and drains are not generally shown. As from 1st October 2011 ownership of private sewers and lateral drains changed in accordance with The Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011.The contents of this map do not reflect these changes.The actual position of all apparatus MUST be established by trial holes. No liability whatsoever is accepted for any error or omission. This information is valid for the date printed. This plan is produced by Anglian Water Services Ltd. trading as GEODESYS from Ordnance Survey digital map data which is protected by Crown copyright and remains the property of Ordnance Survey, (c)Crown copyright, 100022432. This map data is to be used for the purposes of viewing the location of Anglian Water 'plant' only. Any other use of the map data or further copies are not permitted.

Foul Sewer
Surface Sewer
Combined Sewer
Final Effluent
Rising Main (Colour denotes effluent type)
Private Sewer (Colour denotes effluent type)
Decommissioned Sewer (Colour denotes effluent type)

Outfall (Colour denotes effluent type)
Inlet (Colour denotes effluent type)
Manhole (Colour denotes effluent type)
Sewage Treatment Works
Pumping Station

GEODESYS
LAND & PROPERTY INFORMATION

Osprey House, 1 Percy Road, Huntingdon, PE29 6SZ

DX123730 Huntingdon 6

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0201	F	-	80.04	-
0202	F	-	79.29	-
0401	F	-	85.99	-
0402	F	-	84.92	-
1301	F	-	78.34	-
1302	F	-	77.78	-
1303	F	-	76.19	-
1401	F	-	83.54	-
1402	F	-	83.12	-
1601	F	-	60.34	-
2301	F	-	75.92	-
2301	F	-	-	-
2302	F	-	74.85	-
2401	F	-	-	-
2402	F	-	-	-
2501	F	-	-	-
2502	F	-	-	-
2601	F	-	-	-
2602	F	-	60.54	-
2603	F	-	-	-
2604	F	-	-	-
3301	F	-	73.69	-
3401	F	-	-	-
3401	F	-	-	-
3402	F	-	-	-
3402	F	-	-	-
3501	F	-	-	-
3502	F	-	-	-
3503	F	-	-	-
3504	F	-	-	-
3505	F	-	-	-
3601	F	-	60.7	-
3601	F	-	-	-
3602	F	-	60.88	-
3603	F	-	-	-
3603	F	-	-	-
4301	F	-	71.04	-
4401	F	-	-	-
4402	F	-	-	-
4501	F	-	82.79	-
4601	F	-	-	-
5200	F	78.5	73.435	5.065
5201	F	75.15	71.897	3.253
5301	F	70.9	69.283	1.617
5302	F	72.3	70.47	1.83
5303	F	71.3	69.69	1.61
5304	F	73	70.706	2.294
5401	F	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
5601	F	-	78.54	-
5602	F	-	78.3	-
5603	F	-	80.67	-
5604	F	-	77.91	-
5605	F	-	80.68	-
6301	F	-	-	-
6302	F	-	69.1	-
6303	F	-	68.65	-
6501	F	-	76.06	-
7100	F	-	-	-
7101	F	-	-	-
7200	F	-	-	-
7201	F	-	-	-
7202	F	-	-	-
7301	F	-	67.73	-
7302	F	-	-	-
7303	F	-	-	-
7401	F	-	67.41	-
7402	F	-	69.46	-
7501	F	-	70.75	-
7601	F	-	-	-
7602	F	-	-	-
8100	F	-	-	-
8101	F	-	-	-
8401	F	-	66.93	-
8501	F	-	69.85	-
8502	F	-	66.33	-
8503	F	-	68.18	-
8504	F	-	-	-
8601	F	-	64.64	-
8602	F	-	65.7	-
8603	F	-	65.68	-
8604	F	-	66.91	-
8605	F	-	67.73	-
9200	F	-	-	-
9601	F	-	-	-
0251	S	-	80.66	-
0252	S	-	82.64	-
0253	S	-	79.68	-
0254	S	-	85.19	-
0451	S	-	88.69	-
0452	S	-	85.17	-
0551	S	-	88.99	-
0551	S	-	-	-
0552	S	-	91.29	-
0552	S	-	63.37	-
0553	S	-	92.61	-
0554	S	-	92.35	-

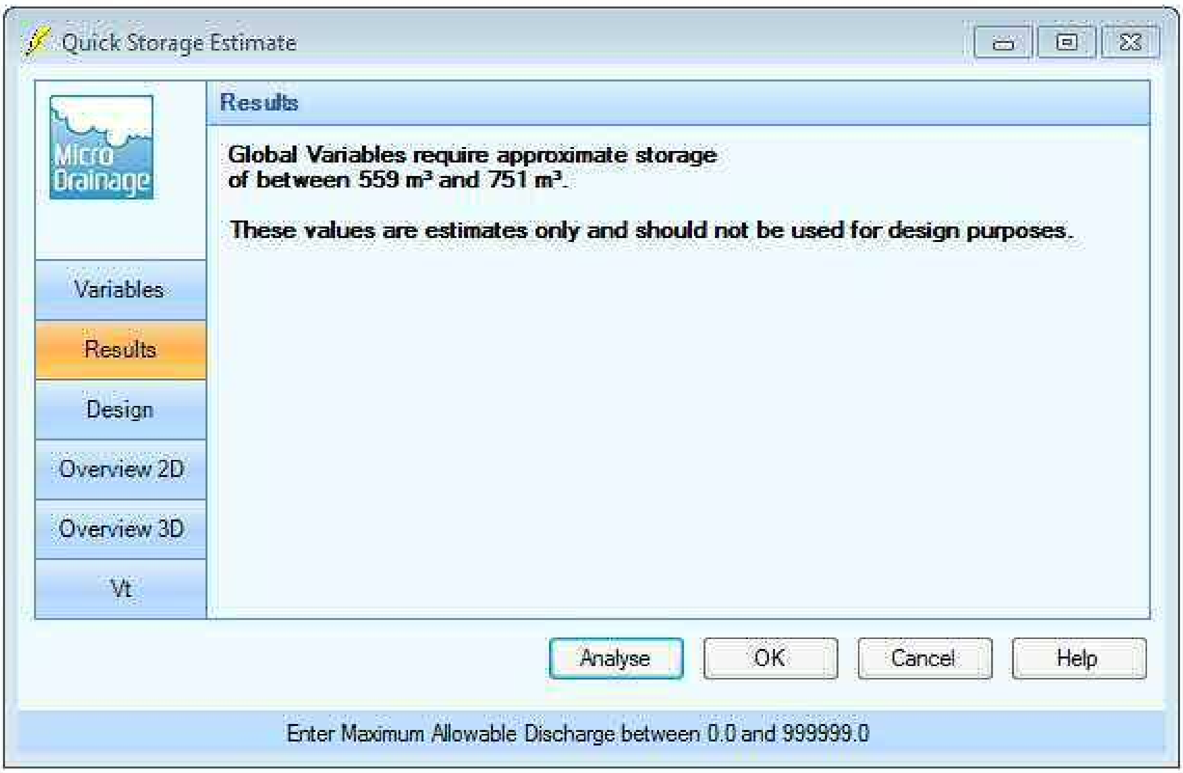
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0651	S	-	93.42	-
0651	S	-	-	-
0652	S	-	-	-
1251	S	-	80.19	-
1352	S	-	78	-
1353	S	-	76.89	-
1354	S	-	-	-
1356	S	-	-	-
1357	S	-	-	-
1451	S	-	82.8	-
1551	S	-	-	-
1552	S	-	-	-
1651	S	-	-	-
1651	S	-	61.36	-
1652	S	-	-	-
1652	S	-	-	-
2351	S	-	-	-
2351	S	-	-	-
2352	S	-	-	-
2352	S	-	-	-
2451	S	-	-	-
2451	S	-	-	-
2452	S	-	-	-
2452	S	-	-	-
2453	S	-	-	-
2551	S	-	-	-
2552	S	-	-	-
2651	S	-	-	-
2652	S	-	-	-
3351	S	-	-	-
3352	S	-	-	-
3451	S	-	-	-
3451	S	-	-	-
3452	S	-	-	-
3452	S	-	-	-
3551	S	-	-	-
3551	S	-	-	-
3552	S	-	-	-
3553	S	-	-	-
3554	S	-	60.08	-
3555	S	-	-	-
3556	S	-	-	-
3651	S	-	-	-
3651	S	-	59.92	-
3652	S	-	-	-
3653	S	-	-	-
4351	S	-	-	-
4352	S	-	-	-

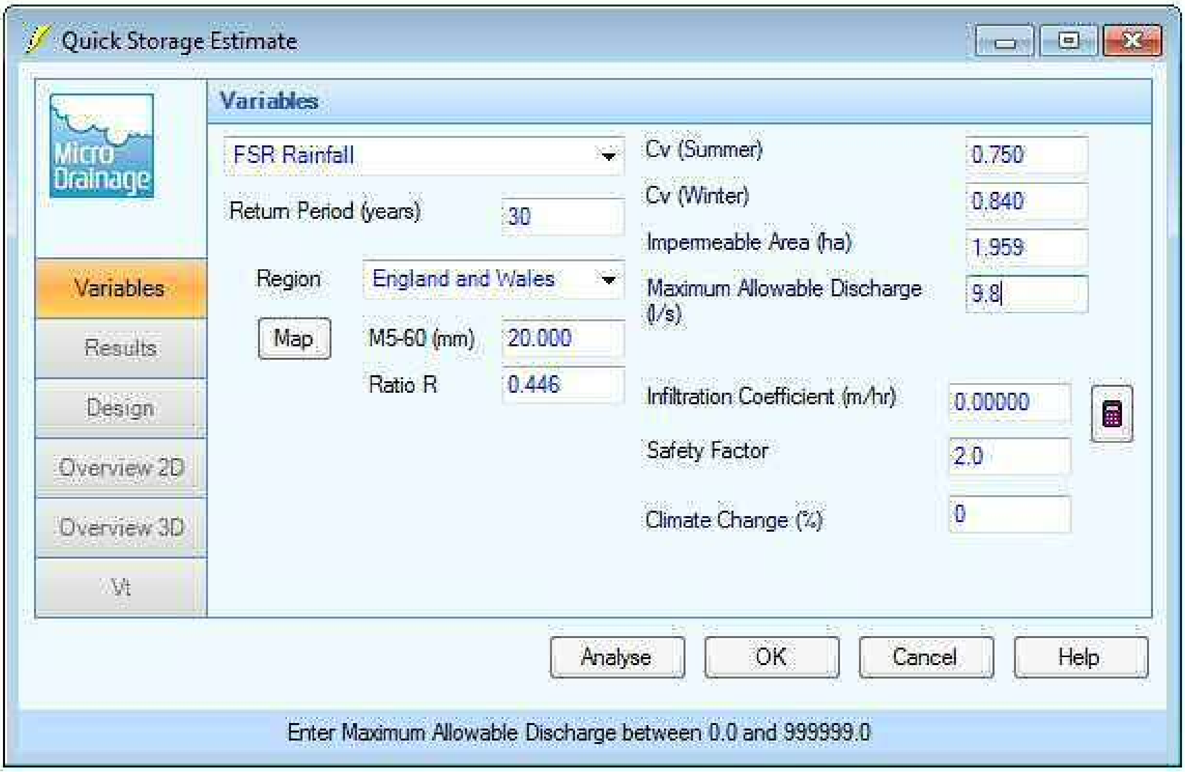
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
4353	S	-	-	-
4354	S	-	-	-
4451	S	-	-	-
4452	S	-	-	-
4453	S	-	-	-
4551	S	-	-	-
4552	S	-	-	-
4553	S	-	-	-
4554	S	-	83.2	-
4651	S	-	-	-
5251	S	78.9	76.532	2.368
5252	S	75.3	72.996	2.304
5351	S	-	-	-
5352	S	-	-	-
5353	S	72.2	70.47	1.73
5354	S	73	70.706	2.294
5451	S	-	-	-
5551	S	-	81.15	-
5651	S	-	78.62	-
5652	S	-	77.74	-
5653	S	-	77	-
5654	S	-	78.32	-
5655	S	-	78.95	-
6351	S	-	-	-
6353	S	-	-	-
6354	S	-	-	-
6551	S	-	76.41	-
7150	S	-	-	-
7151	S	-	-	-
7250	S	-	-	-
7251	S	-	-	-
7252	S	-	-	-
7351	S	-	-	-
7352	S	-	-	-
7353	S	-	-	-
7354	S	-	-	-
7355	S	-	-	-
7451	S	-	69.83	-
7551	S	-	71.11	-
7651	S	-	-	-
7652	S	-	-	-
7653	S	-	71.99	-
8150	S	-	-	-
8151	S	-	-	-
8451	S	-	67.82	-
8452	S	-	-	-
8454	S	-	-	-
8455	S	-	-	-

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
8551	S	-	70.28	-
8651	S	-	59.27	-
8652	S	-	67.4	-
8653	S	-	66.82	-
8654	S	-	67.07	-
8655	S	-	65.5	-
9250	S	-	-	-
9451	S	-	-	-
9452	S	-	-	-
9551	S	-	-	-
9552	S	-	-	-
9553	S	-	-	-
9554	S	-	-	-
9555	S	-	-	-
9556	S	-	-	-
9651	S	-	-	-

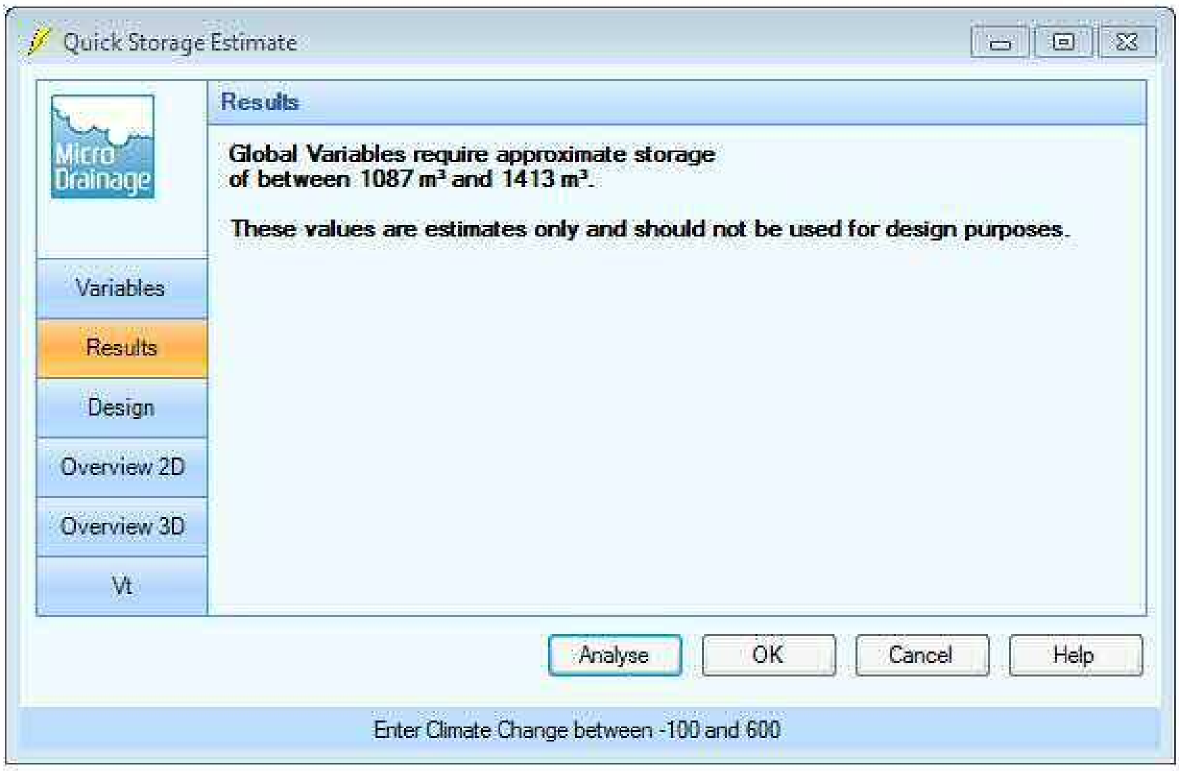
Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

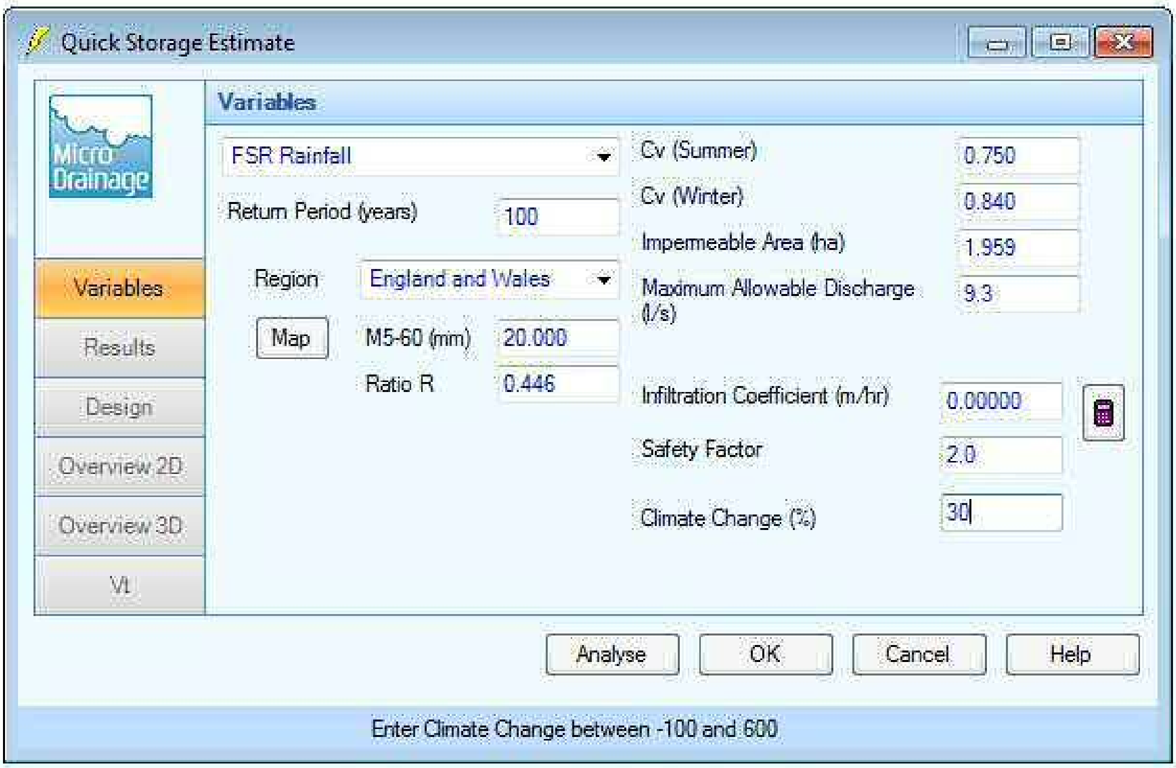
NE1 30 YEAR STORAGE



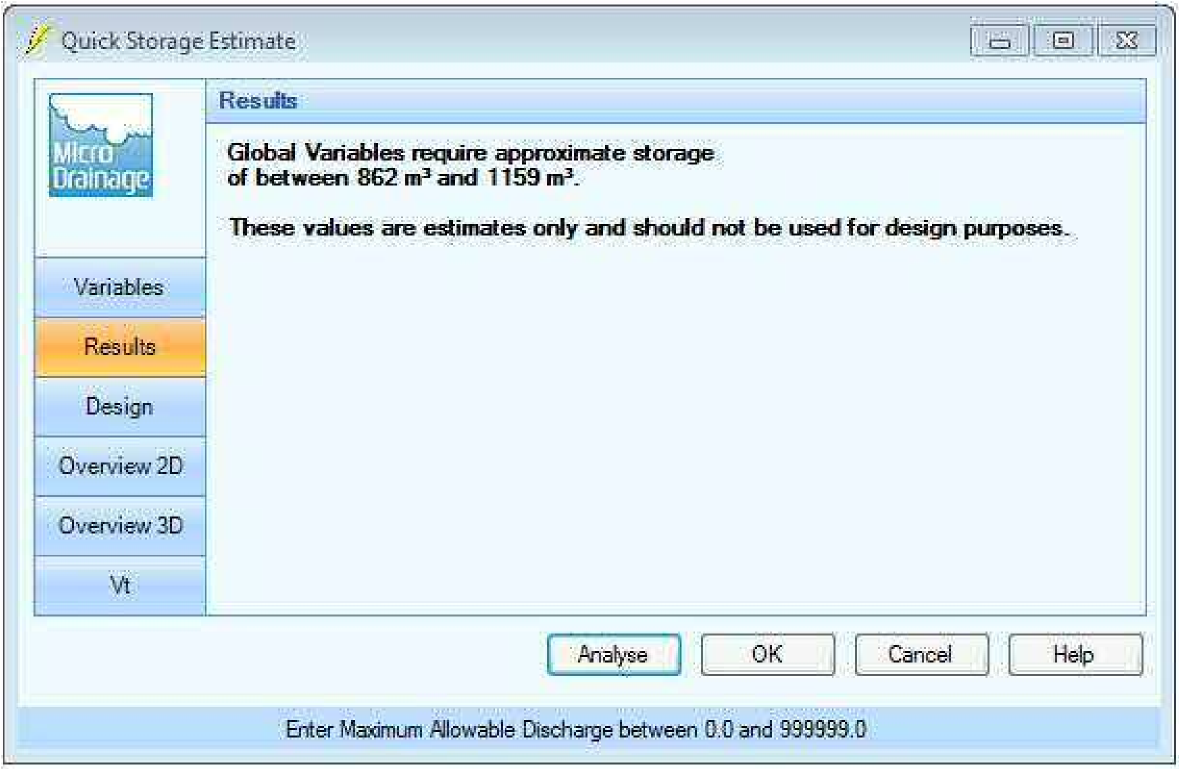


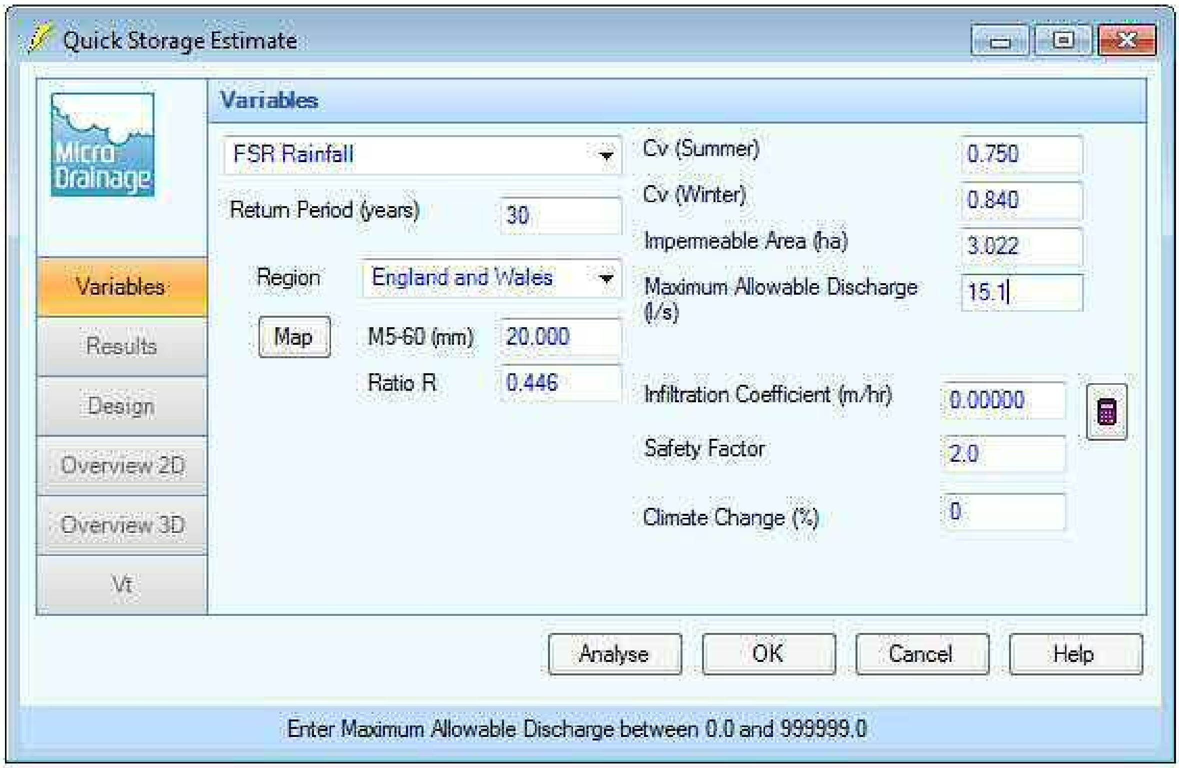
NE1 100 YEAR +30% STORAGE



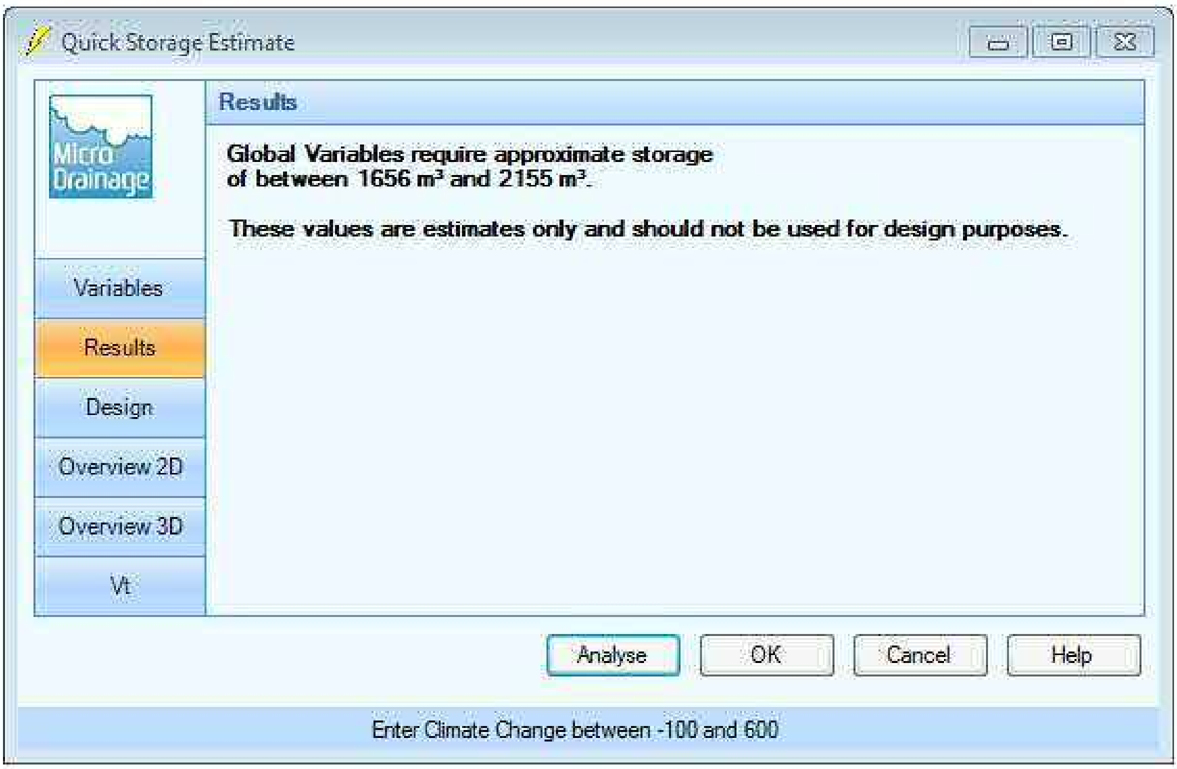


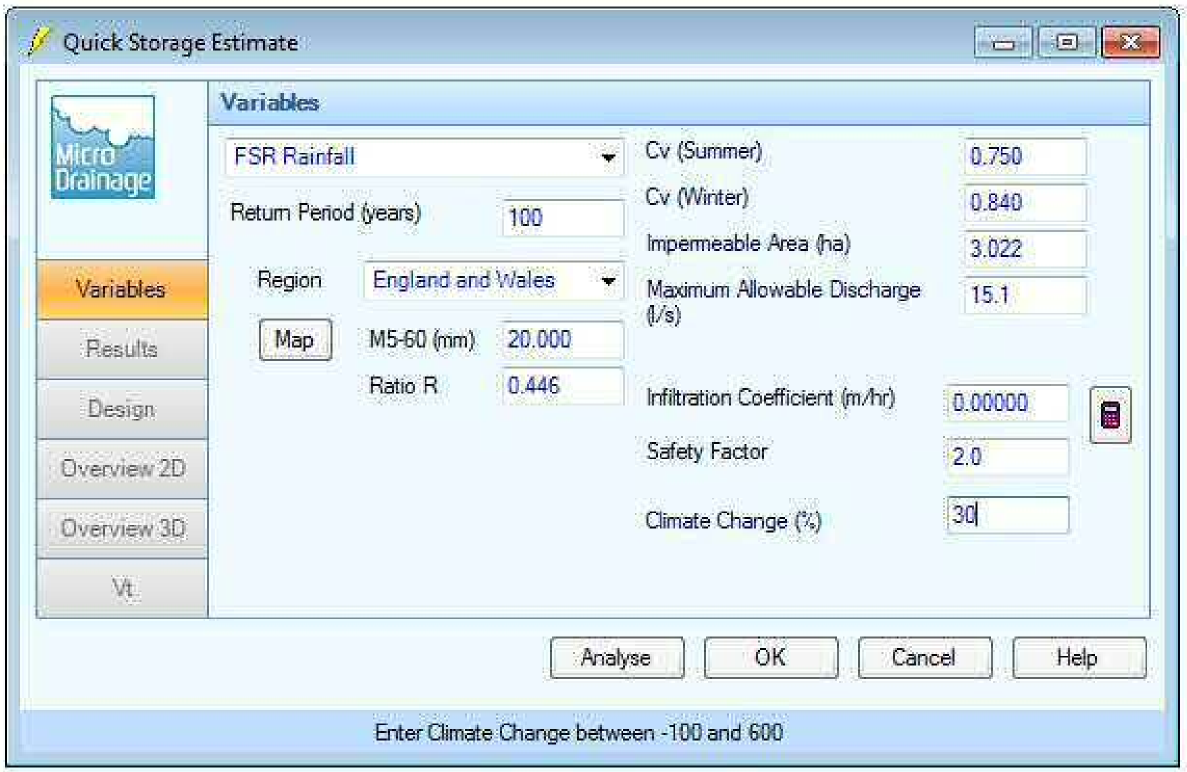
NE2 30 YEAR STORAGE



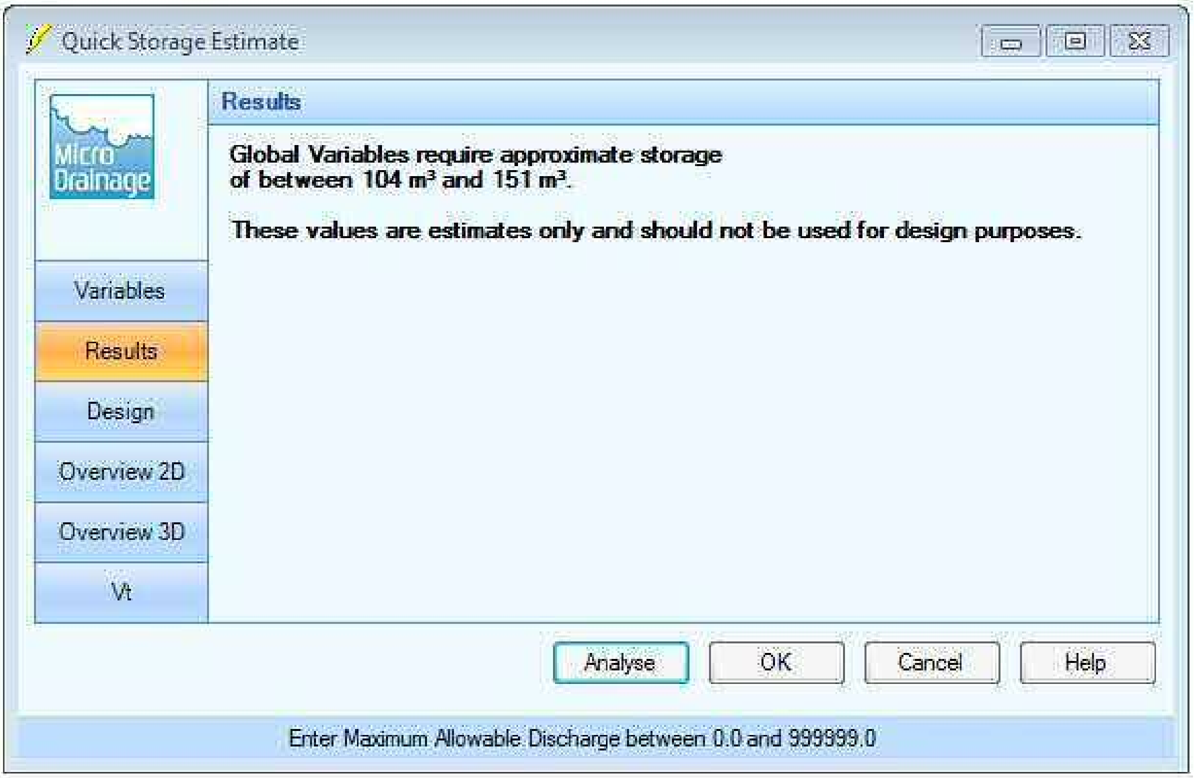


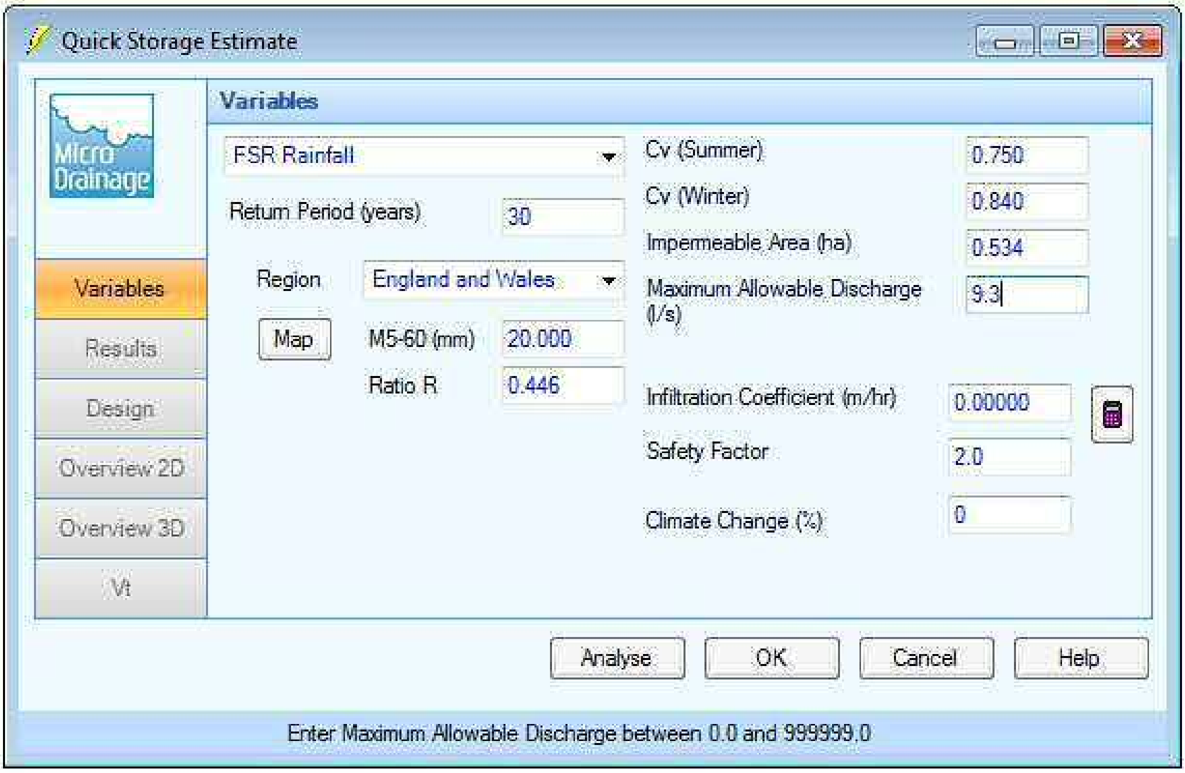
NE2 100 YEAR + 30% STORAGE



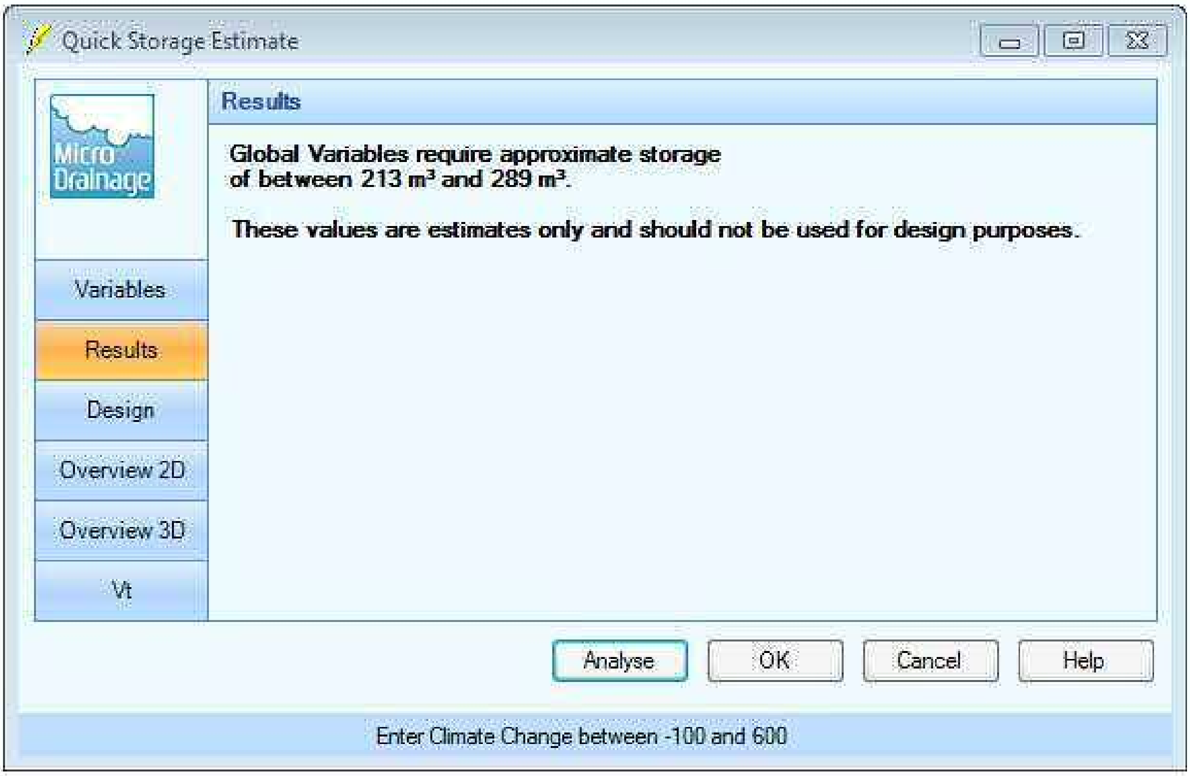


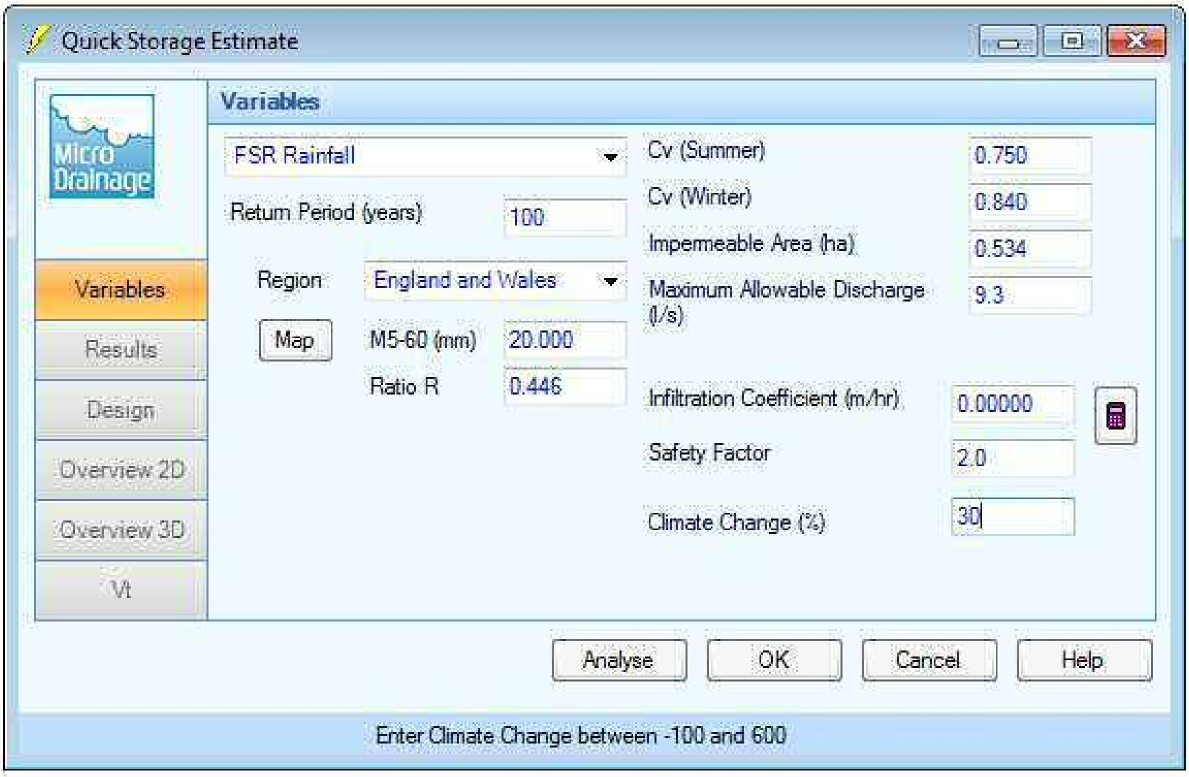
NW1 30YEAR STORAGE



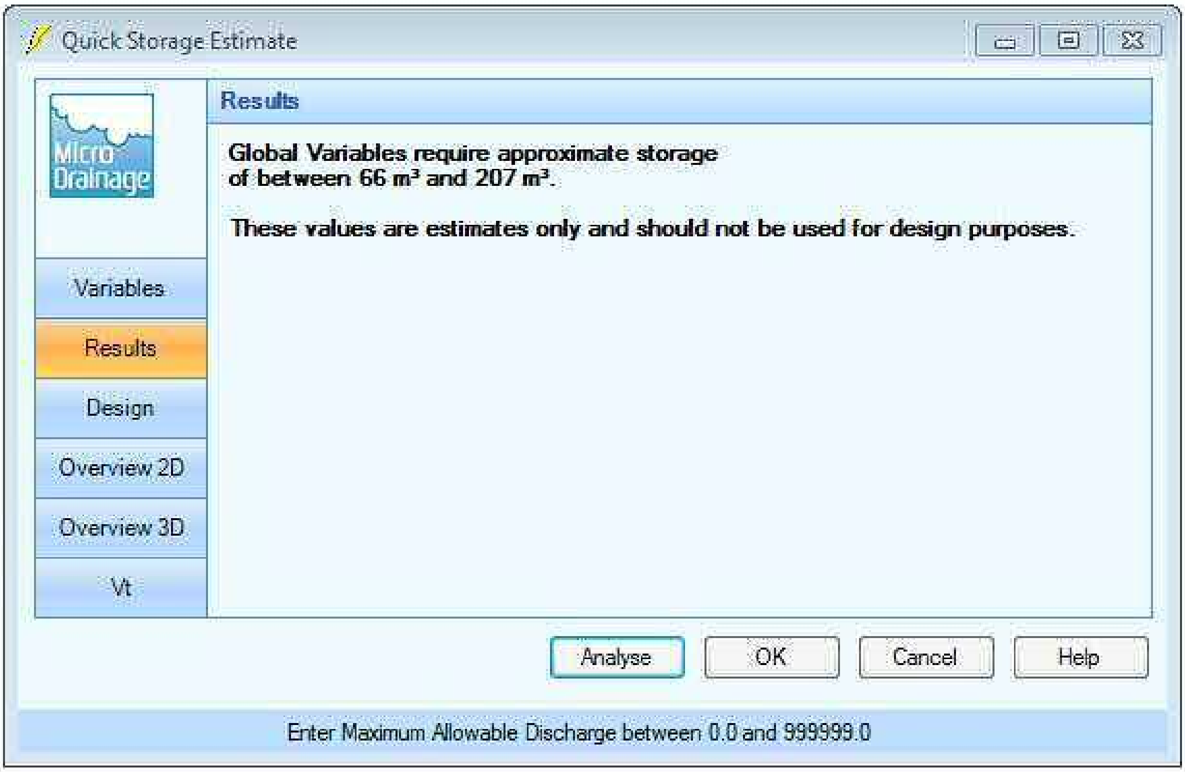


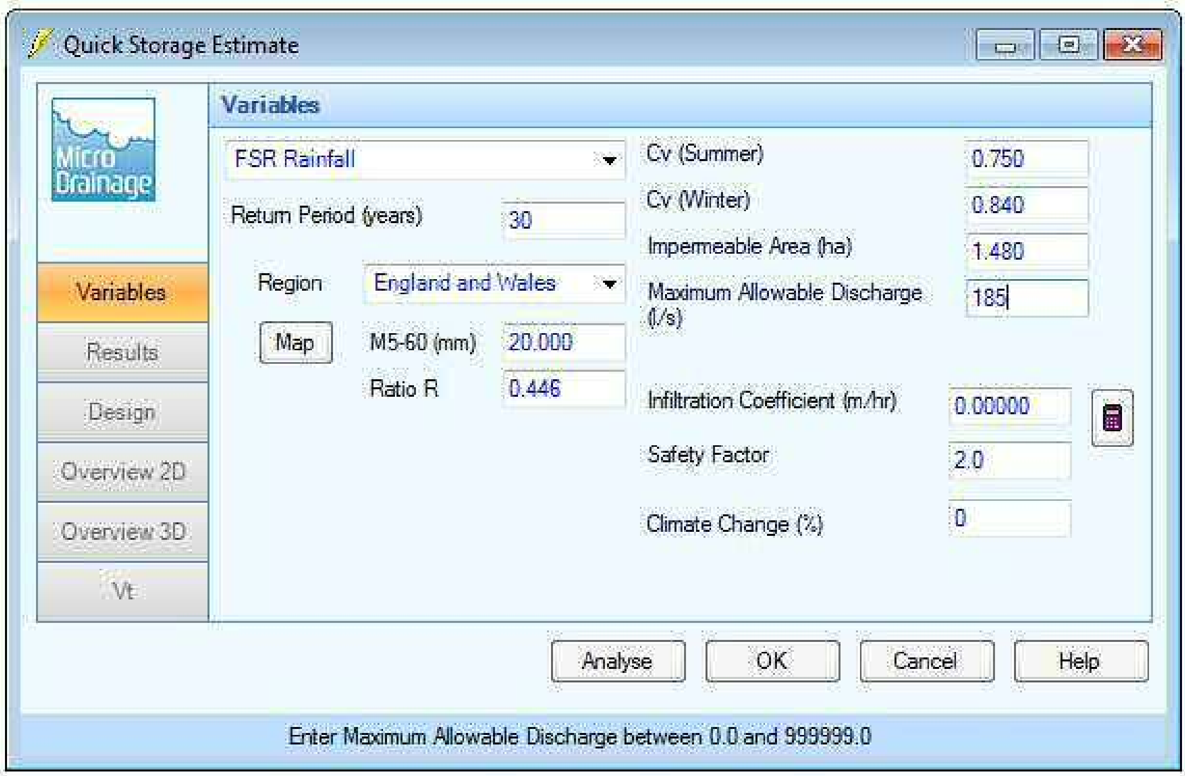
NW1 100YEAR + 30% STORAGE



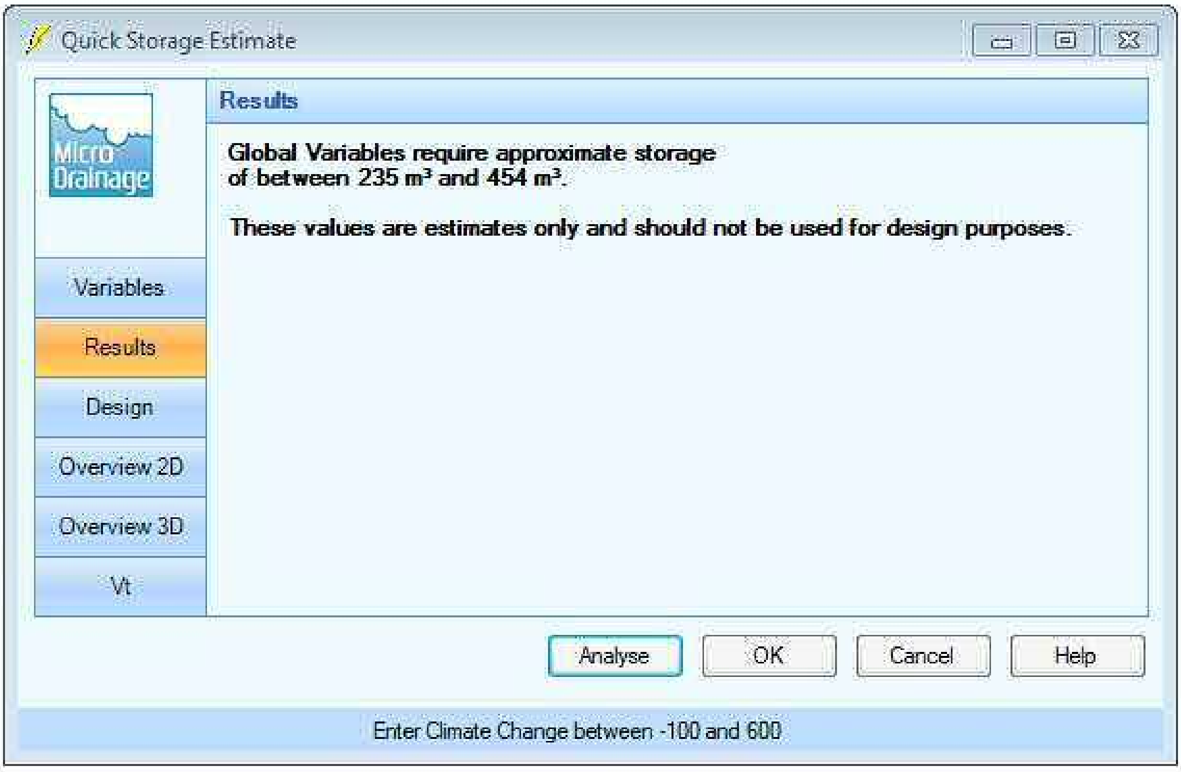


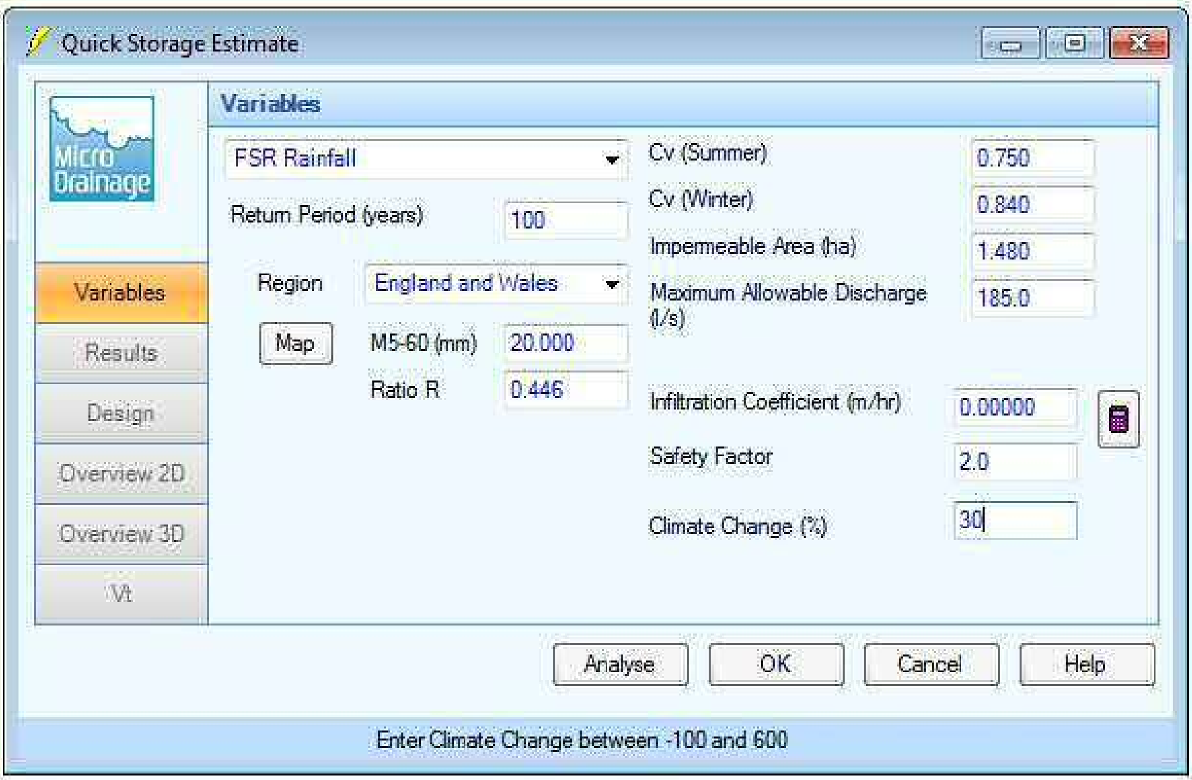
NW2 30 YEAR STORAGE



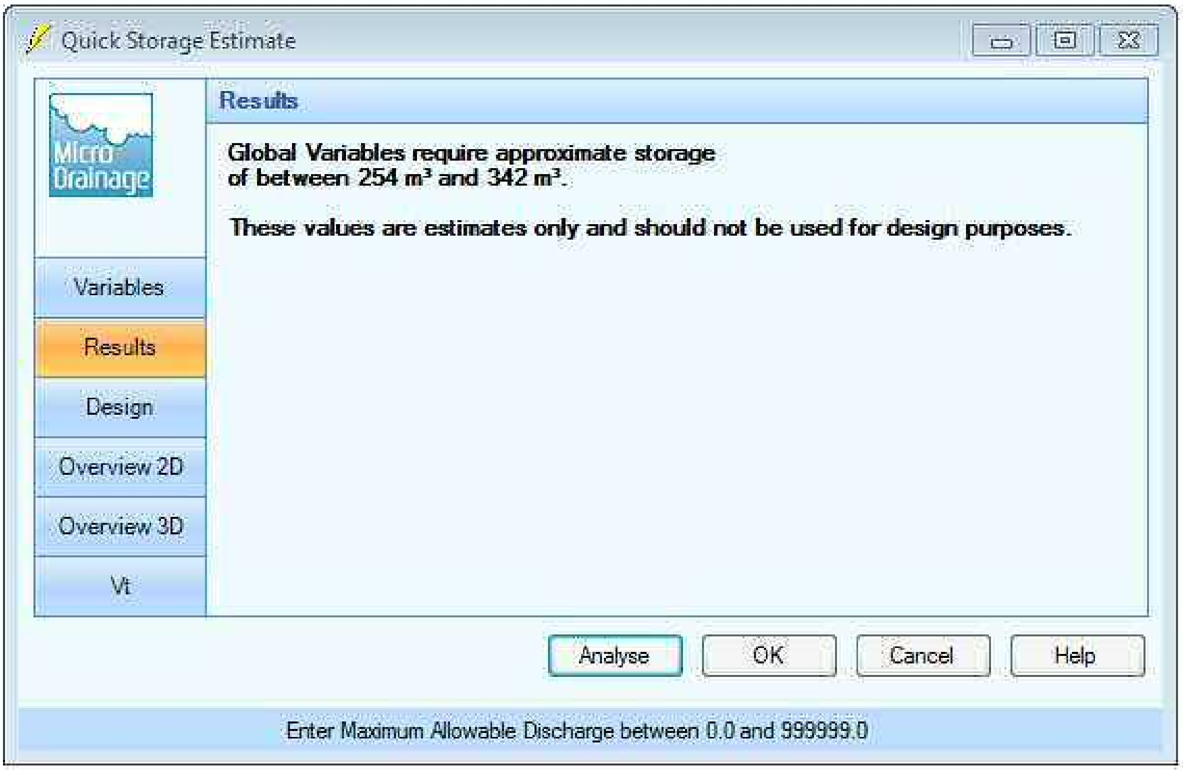


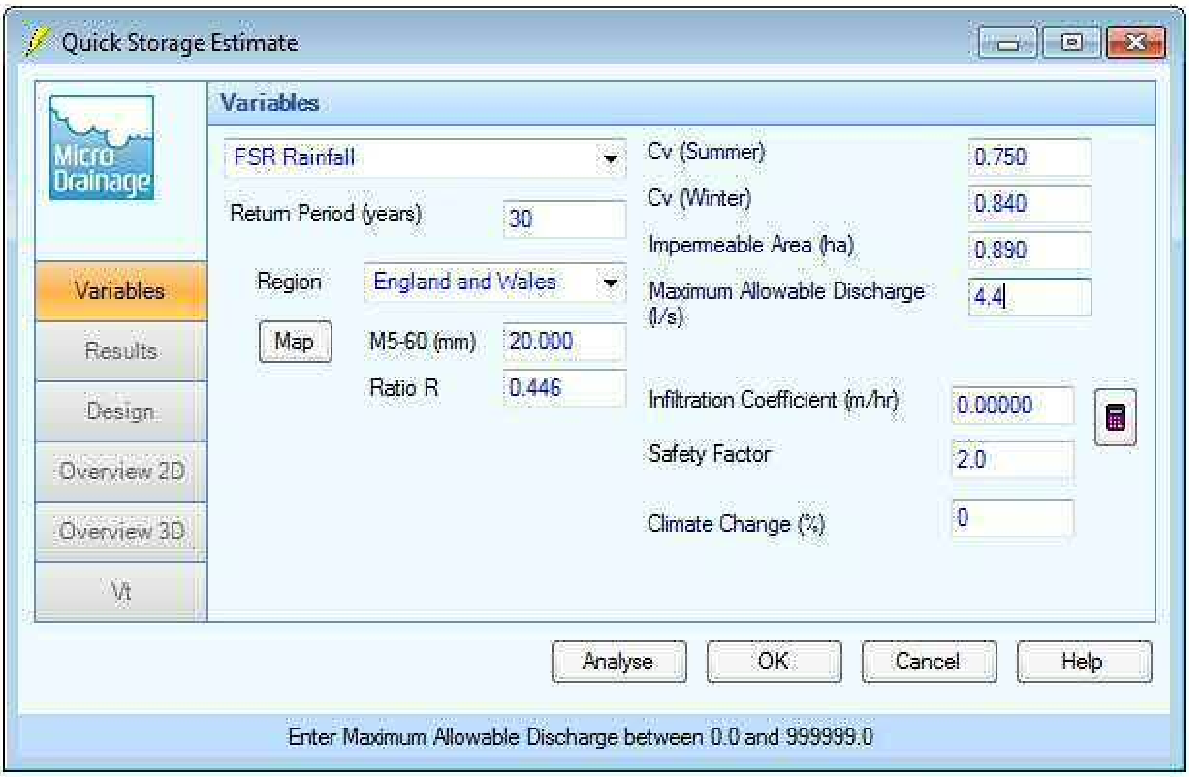
NW2 100 YEAR + 30% STORAGE



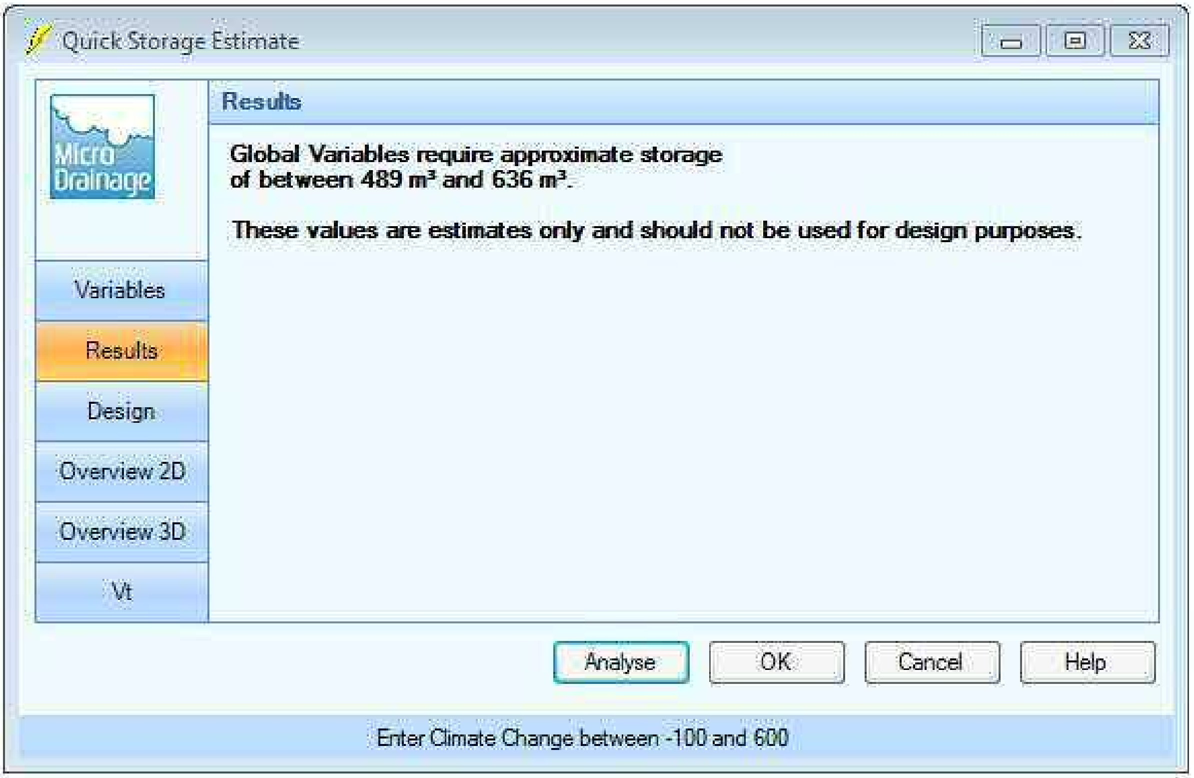


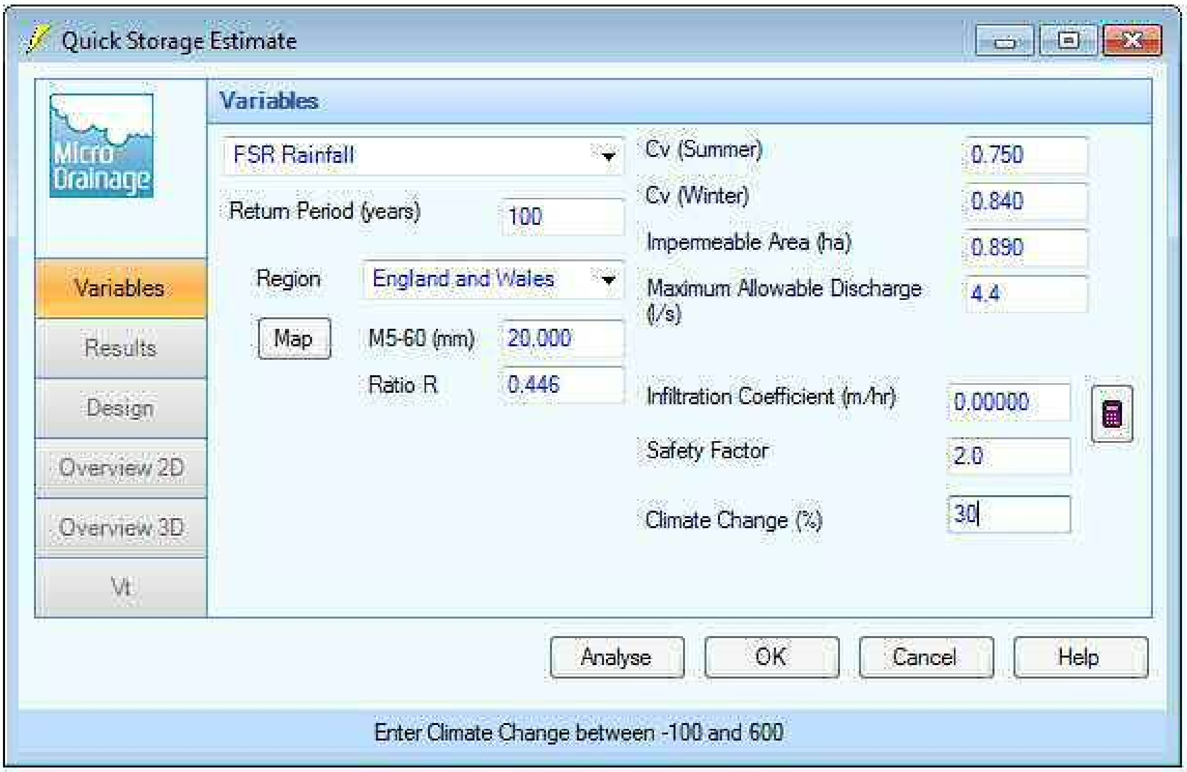
SE1 30 YEAR STORAGE



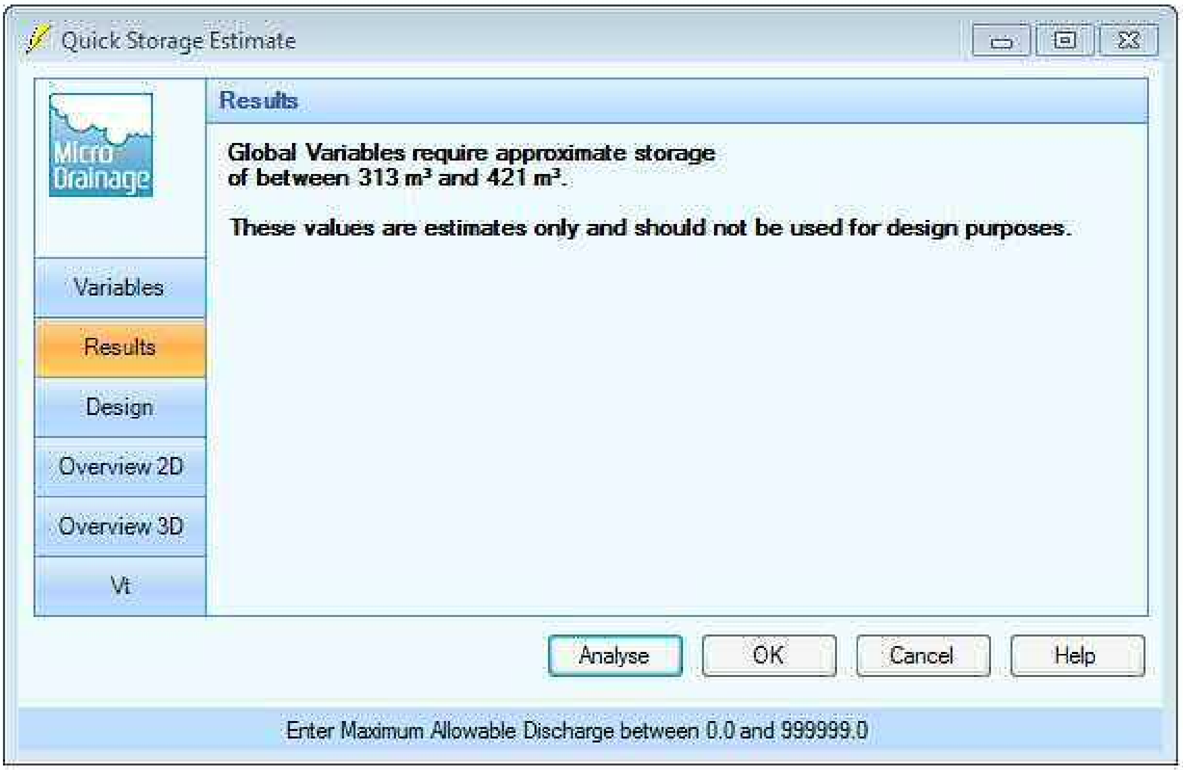


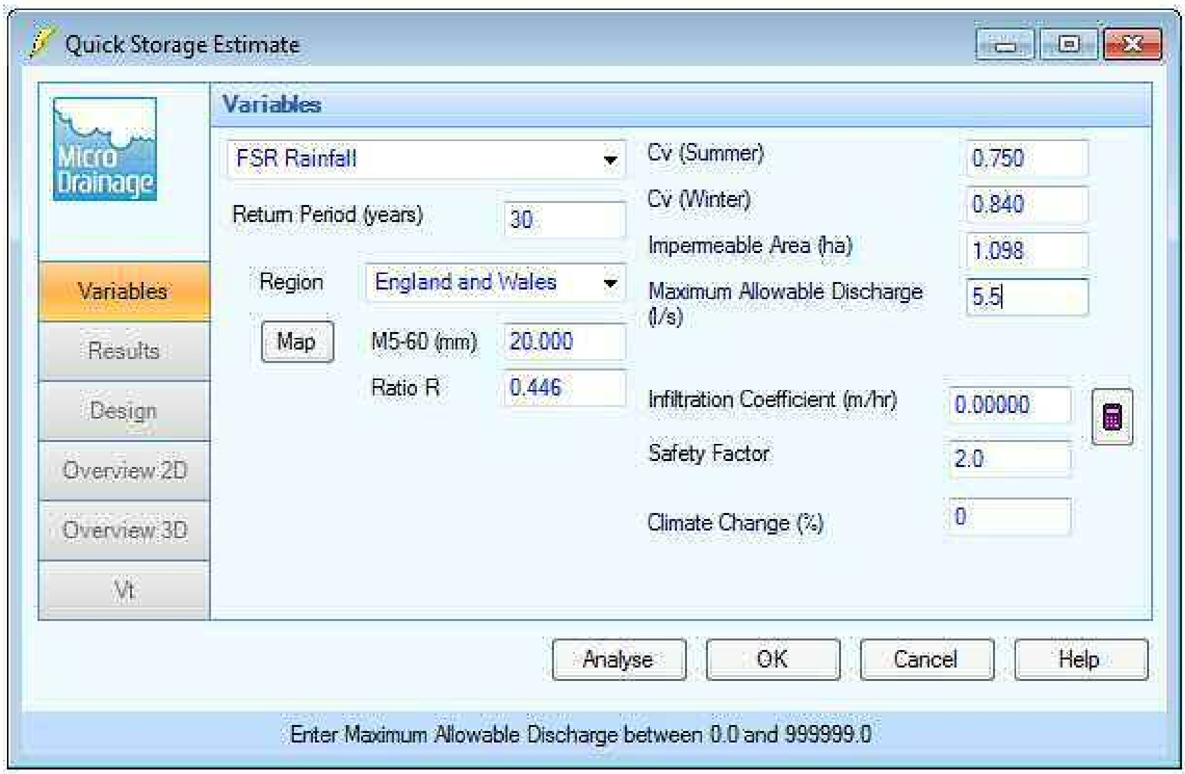
SE1 100 YEAR + 30% STORAGE



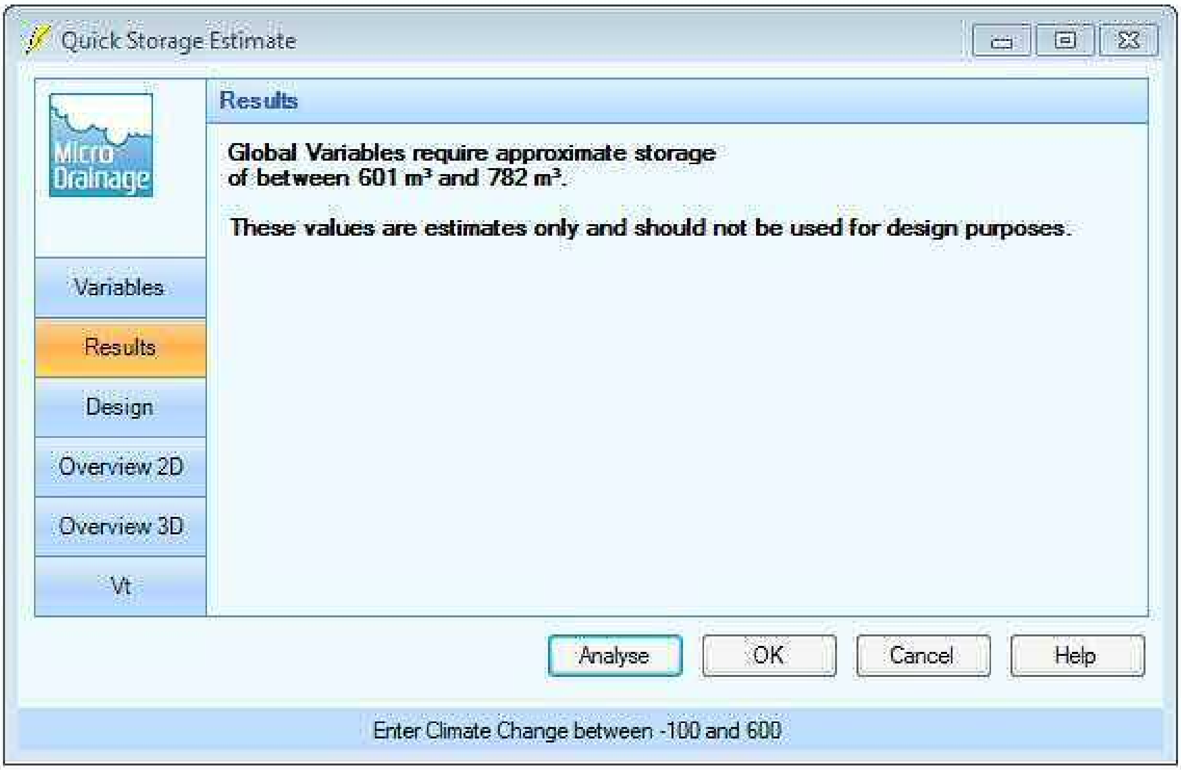


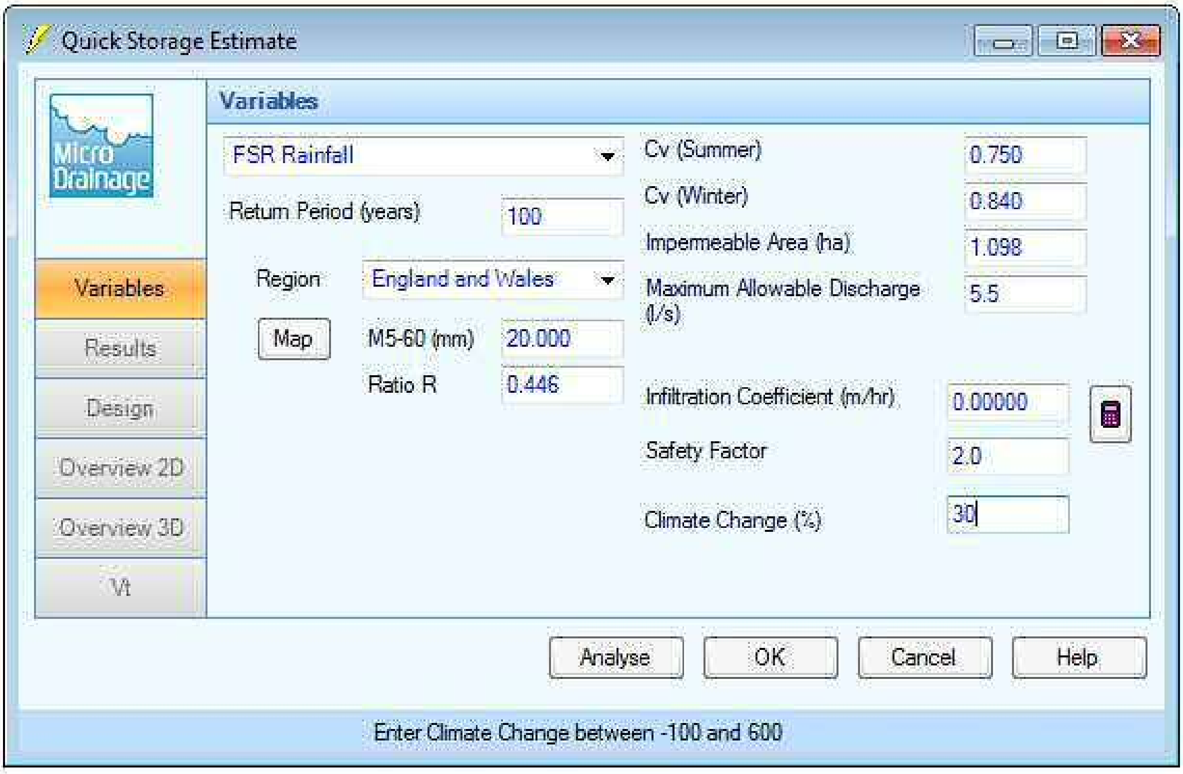
SE2 30 YEAR STORAGE



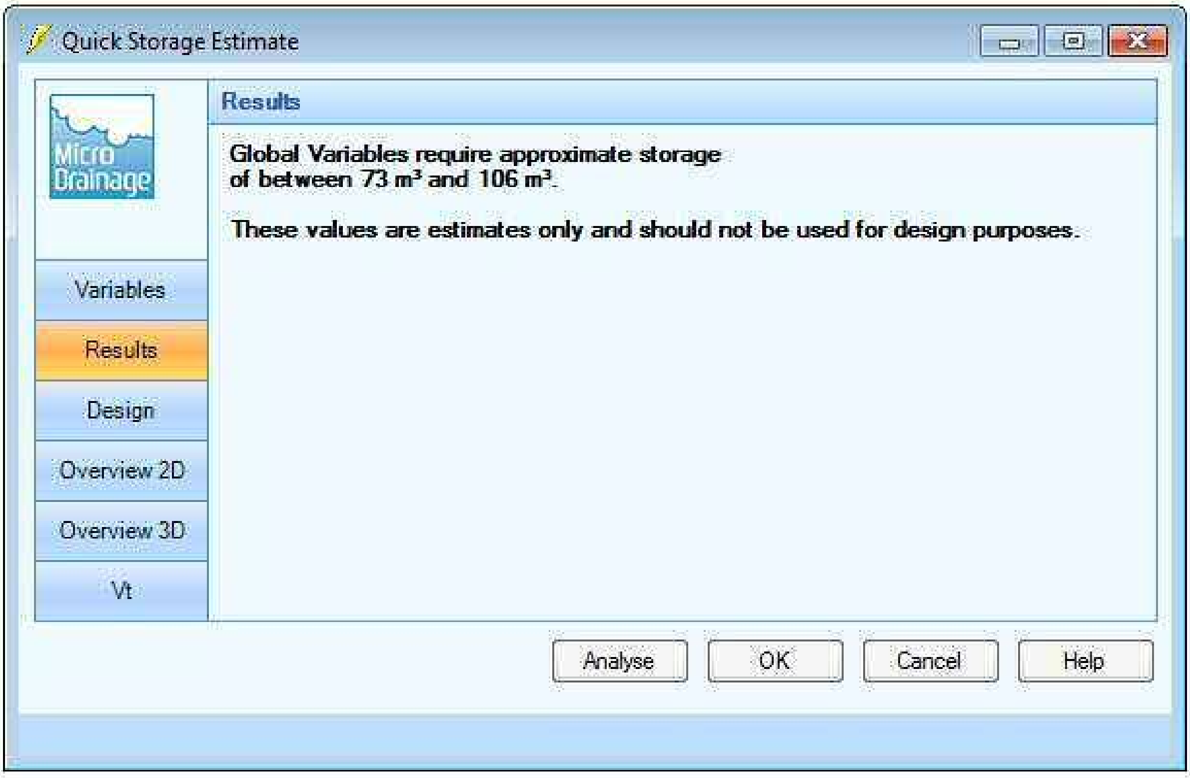


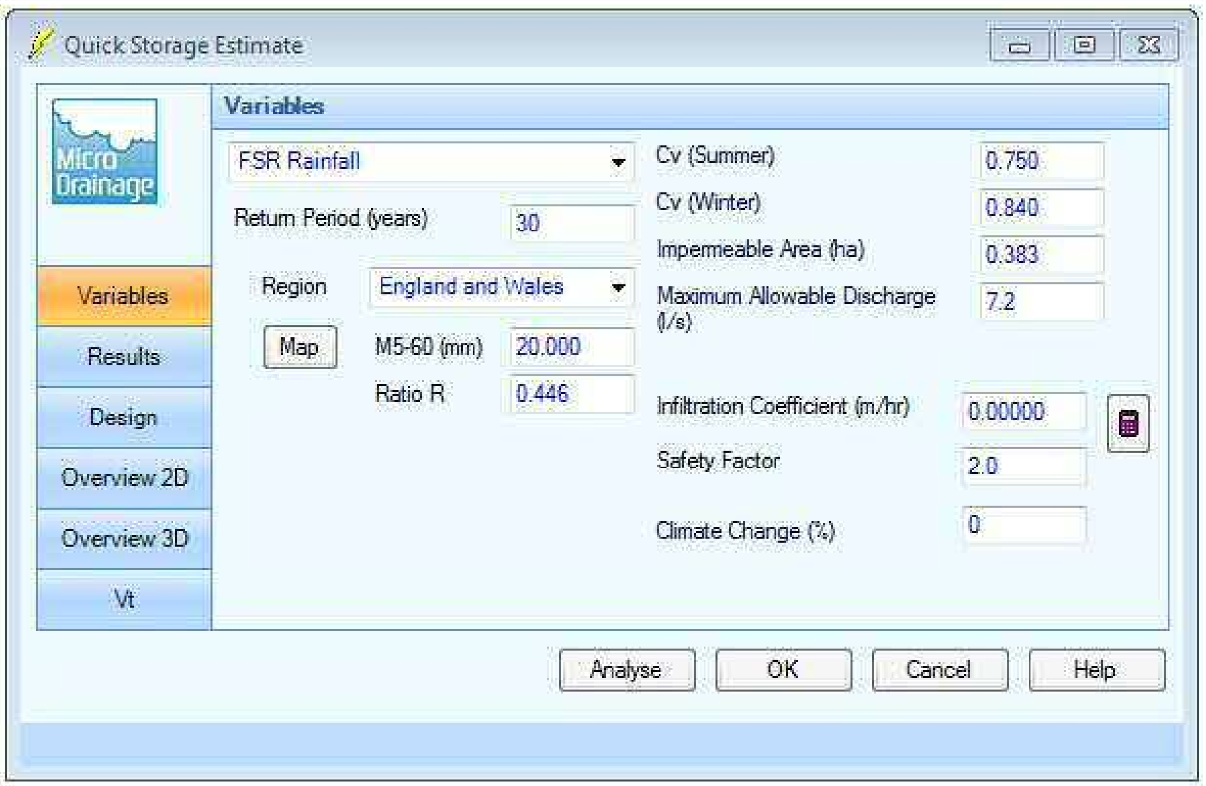
SE2 100 YEAR + 30% STORAGE





SW1 30 YEAR STORAGE





SW1 100 YEAR + 30% STORAGE