UTILITIES & UNDERGROUND INVESTIGATIONS

ABBREVIATIONS & SYMBOLS

1D 5C	1 Duct 5 Cables	CPC	Circ Plastic Chamber	EOT	End Of Trace
Ø	Diameter	CrL	Crown Level	IBD	Internal Backdrop
AR	Assumed Route	DCr	Depth To Crown	IL	Invert Level
BL	Base Level	DI	Depth To Invert	RBC	Rectangular Brick Chamber
CB	Concrete Benching	DS	Depth To Surcharge	RCC	Rectangular Conc Chamber
CBC	Circular Brick Chamber	DTB	Depth To Base	SL	Silt Level
CCC	Circular Conc Chamber	DTW	Depth To Water	SuL	Surcharge Level
CL	Cover Level	DTS	Depth To Silt	UTC	Unable To CCTV
				UTL	Unable To Lift
				UTT	Unable To Trace
				TFR	Taken From Records
				EBD	External Backdrop

- BT — BT CABLE(S)
- O/BT — OVERHEAD BT CABLE(S)
- COM — COMMUNICATIONS CABLE(S)
- CTV — CABLE TV CABLE(S)
- E — ELECTRIC CABLE(S)
- O/E — OVERHEAD ELECTRIC CABLE(S)
- FO — FIBREOPTIC CABLE(S)
- GM — GAS MAIN
- GS — GAS SERVICE
- GPR — GROUND PENETRATING RADAR (GPR) TRACE
- HW — HOT WATER PIPE
- LC — LIGHTING CIRCUIT
- SEC — SECURITY CABLING
- UIT — UNIDENTIFIED TRACE
- WM — WATER MAIN
- WS — WATER SERVICE
- COMBINED SEWER
- FOUL SEWER
- RISING MAIN
- SURFACE WATER SEWER
- UTILITIES INVESTIGATION EXTENTS

MH CL 4 .3 — UTILITIES COMMENT BOX

WM 0.61 — DEPTH TO SERVICE

DRAWING NOTES

All below ground details shown have been identified from above ground without excavation. Survey Solution use electro-magnetic and/or ground penetrating radar (GPR) methods to investigate for underground utilities, services and features. Results using these methods are not infallible and we recommend trial excavations are carried out to confirm any identifications, positions and depths.

Any areas on the drawing where services or features have not been shown are not necessarily clear of services or features but are an indication that no items have been identified during our investigations. All reasonable care and normal good practice should still be employed during design and construction processes.

Certain types of services such as plastic or concrete pipes, some conduit and ducting where direct access can not be achieved for tracing may not be shown and alternative locating methods should be used.

Survey Solutions has used all reasonable care to research available service records but the completeness or use of the service records supplied to or by Survey Solutions cannot be guaranteed. Therefore Survey Solutions cannot be held responsible for any features annotated as 'taken from records' (TFR).

Depths obtained using electro-magnetic or GPR are effected by ground conditions and should be treated as indicative only. Electro-magnetic depths to utilities and services are generally taken to the centre of a feature, GPR depths to the top of a feature and drainage depth shown to inverts, unless otherwise indicated.

Drainage pipe sizes will be obtained without entering the camber and therefore should be treated as approximate. Pipe dimensions which have not been obtained visually will be taken from records when available.

All services, drainage and utilities routes are assumed straight between access points, unless otherwise stated. The numbers of cables in runs will not be shown unless specifically requested. All services are below ground unless indicated.

Services, utilities and features may not have been surveyed if obstructed or not reasonably visible or accessible at the time of survey.

Survey Solutions accept no responsibility for the completeness or accuracy of either the topographical survey or base mapping on this project.

All critical dimensions and measurements should be checked and verified with any errors or discrepancies notified to Survey Solutions immediately. The accuracy of the digital data is the same as the plotting scale implies. All dimensions are in metres unless otherwise stated.

The contractor must check and verify all site and building dimensions, levels, utilities and drainage details and connections prior to commencing work.

Do not scale from this drawing.

AVAILABILITY OF UTILITY RECORD DRAWINGS

UTILITY	AVAILABILITY	UTILITY	AVAILABILITY	UTILITY	AVAILABILITY
SEWER	SITE	BT	PUBLIC	OIL PIPES	SITE
WATER MAIN	SITE	CABLE TV	SITE	OTHERS	NO
GAS MAIN	PUBLIC	ELECTRICITY	SITE		

REV	DESCRIPTION	DRAWN	APPR	DATE

SURVEY SOLUTIONS

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LAND SURVEYING BUILDING SURVEYING UNDERGROUND SURVEYING

PROJECT TITLE	WEST CAMBRIDGE DENSIFICATION SCHEME MADINGLEY ROAD, CB3 0EL
DRAWING DETAIL	UTILITIES AND DRAINAGE INVESTIGATION SHEET 13 OF 2[illegible]
CLIENT	PETER BRETT ASSOCIATES
SCALE	1:200
SURVEYOR	DWR/PI
SURVEY DATE	03/11/2014
CHECKED BY	[illegible]TM
APPROVED BY	RAG
DWG STATUS	FINAL
DRAWING NUMBER	15415UG-13
REVISION	
ISSUE DATE	APR 2015

Original Sheet Size A0H

Appendix C Existing Catchment Plan and On Site Drainage Arrangements

TABLE IDENTIFYING EXISTING CONTRIBUTING AREAS TO BIN BROOK AND WASHPIT BROOK WATERCOURSE

	TOTAL CATCHMENT AREA (ha)	TOTAL CATCHMENT IMPERMEABLE AREA (ha)
WASHPIT BROOK CATCHMENT	20.61ha	10.56ha
BIN BROOK CATCHMENT	45.53ha	31.52ha
	TOTAL 66.14ha	TOTAL 42.08ha

TABLE IDENTIFYING CURRENT SURFACE WATER ATTENUATION STRATEGY AND CONTRIBUTING AREAS

	*TOTAL OF CATCHMENT AREA (ha)	APPROXIMATE MEASUREMENT OF TOTAL IMPERMEABLE AREA OF CATCHMENT AREA (ASSUMED 85% OF TOTAL AREA)	**TOTAL STORAGE PROVIDED BY EXISTING DRAINAGE STRUCTURE
CATCHMENT AREA DRAINING DIRECTLY TO SOUTH-WEST LAKE	20.90ha	17.77ha	9,466m3
CATCHMENT AREA UNDEVELOPED	16.43ha	0ha	N/A
CATCHMENT AREA DRAINING TO PUBLIC SEWER ON MADINGLEY ROAD	12.42ha	10.56ha	UNKNOWN (IT IS UNDERSTOOD CATCHMENTS DRAINING TO MADINGLEY ROAD DO SO VIA ATTENUATION AND FREE-FLOW DISCHARGE)
CATCHMENT AREA DRAINING TO PAYNES POND	4.46ha	3.61ha	1,150m3 (APPROX)
CATCHMENT AREA UTILISING ON PLOT STORAGE	11.93ha	10.14ha	5,945m3 (APPROX)
	TOTAL = 66.14ha	TOTAL = 42.08ha	

EXISTING GREEN FIELD RUNOFF RATES (AS PREVIOUSLY AGREED WITH EA)

1 YEAR =2.88 l/s

30 YEAR =7.96 l/s

100 YEAR =11.79 l/s

(THE GREEN FIELD RUNOFF RATES SHOWN ABOVE ARE THE FIGURES STIPULATED WITHIN THE STAGE 1B DRAINAGE TECHNICAL NOTE DATED DECEMBER 2014)

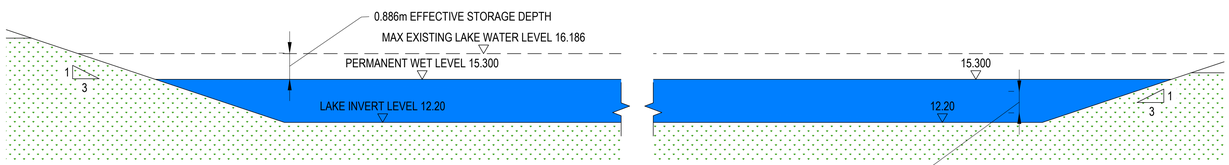
NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN UNLESS NOTED OTHERWISE.
3. ALL COORDINATES ARE IN METRES RELATIVE TO ORDNANCE SURVEY NATIONAL GRID.
4. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.

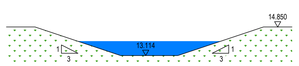
LEGEND

- EXISTING UNDERGROUND STORAGE TANK
- EXISTING DRAINAGE OUTFALL
- EXISTING SW PIPES
- EXISTING FW PIPES
- SITE BOUNDARY (66.14ha)

Madingley Road Park & Ride
EXISTING OUTFALL TO WASHPIT BROOK
FOUL SEWER DRAINS TO AW PUBLIC SEWER
Schofield Centre
MADINGLEY ROAD
High Cross Junction
GROSS CATCHMENT SIZE = 0.40ha
British Antarctic Survey
GROSS CATCHMENT SIZE = 6.76ha
GROSS CATCHMENT SIZE = 3.06ha
GROSS CATCHMENT SIZE = 0.54ha
GROSS CATCHMENT SIZE = 0.28ha
WASHPIT BROOK WATERCOURSE CATCHMENT
BIN BROOK WATERCOURSE CATCHMENT
EXISTING DITCHES
GROSS CATCHMENT SIZE = 1.43ha
Thiel Kinkel Road
Schlumberger
GROSS CATCHMENT SIZE = 1.14ha
Park and Cycle Site
250m3
GROSS CATCHMENT SIZE = 1.28ha
GEO-CELL TANK VOLUME = 560m3
GROSS CATCHMENT SIZE = 3.84ha
Department of Veterinary Science
GROSS CATCHMENT SIZE = 3.17ha
536m3
288m3
Roger Needham Building
GROSS CATCHMENT SIZE = 1.69ha
BACS Road
AVEVA Group Solutions
GROSS CATCHMENT SIZE = 1.58ha
GEO-CELL TANK VOLUME = 863m3
GROSS CATCHMENT SIZE = 1.28ha
GEO-CELL TANK VOLUME = 912m3
Queens Veterinary School Hospital
Department of Veterinary Science
JJ Thomson Avenue
William Gates Building
Clerk Maxwell Road
Atlas Building
GROSS CATCHMENT SIZE = 0.92ha
GEO-CELL TANK VOLUME =458m3
Maxwell Centre
GROSS CATCHMENT SIZE = 0.99ha
GEO-CELL TANK VOLUME =500m3 (APPROX)
Charles Babbage Road
GROSS CATCHMENT SIZE =1.21ha
GEOCELL TANK VOLUME 870m3
870m3
North Residences
GROSS CATCHMENT SIZE = 2.66ha
GEOCELL TANK VOLUME 1332m3
Rutherford Building
Nanosciences Centre
GROSS CATCHMENT SIZE = 17.61ha
West Square
GROSS CATCHMENT SIZE = 4.46ha
CLERK MAXWELL ROAD
Department of Material Science & Metallurgy
Department of Chemical Engineering & Biotechnology
GROSS CATCHMENT SIZE = 0.63ha
POND VOLUME = 450m3 (APPROX)
CEB HAS ON SITE ATENUATION AND DISCHARGES TO THE SWALE. GROSS CATCHMENT SIZE = 0.62
Institute for Manufacturing
West Forum
Cavendish Laboratory
Bragg Building
FOUL CATCHMENT DRAINS TO SOUTH EAST
The Footway/Cycleway Link
450m3
Canal
Hauser Forum
GROSS CATCHMENT SIZE = 6.80ha
Mott Building
ASSUMED TOTAL SURFACE WATER RUNOFF DISCHARGING TO BIN BROOK; (BASED ON ORIGINAL GREEN FIELD RATES)
- 1;1 YEAR RATE =90.78 l/s
- 1;30 YEAR RATE =250.90 l/s
- 1;100 YEAR RATE =371.62 l/s
Data Centre
Access Road C
EXISTING LAKE STORAGE BASED ON 85% OF CATCHMENT SHOWN ≈ 8500m³
Lake 9,466m3
GROSS CATCHMENT SIZE =0.33ha
Pond
Pond
1,150m3
Paynes Pond
Coton Footpath
Ø300mm
EXISTING SW OUTFALL TO COTON BROOK
GROSS CATCHMENT SIZE =1.27ha
University Sports Centre
ASSUMED EXISTING LAKE FLOW CONTROL RATES;
- 1;1 YEAR RATE =51.18 l/s
- 1;30 YEAR RATE =141.45 l/s
- 1;100 YEAR RATE =209.51 l/s



SECTION C-C



SECTION A-A

Mark	Revision	Date	Drawn	Chkd	Appd
B	AMENDED IN-LINE WITH CCC COMMENT	09.11.16	GC	DRM	ST
A	EXISTING FLOW ARROWS AMENDED, SECTION B-B REMOVED	14.04.16	GC	ST	ST

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.
UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake his own investigation where the presence of any existing sewers, services, plant or apparatus may affect his operations.

Drawing Issue Status
PRELIMINARY

EXISTING DRAINAGE ARRANGEMENT

WEST CAMBRIDGE DENSIFICATION

Client
UNIVERSITY OF CAMBRIDGE

Date of 1st Issue	Designed	Drawn
25.11.2015	DRM	DRM
A0 Scale	Checked	Approved
1:1250@A0	DRM	RC
Drawing Number		Revision
31500/2001/149		B

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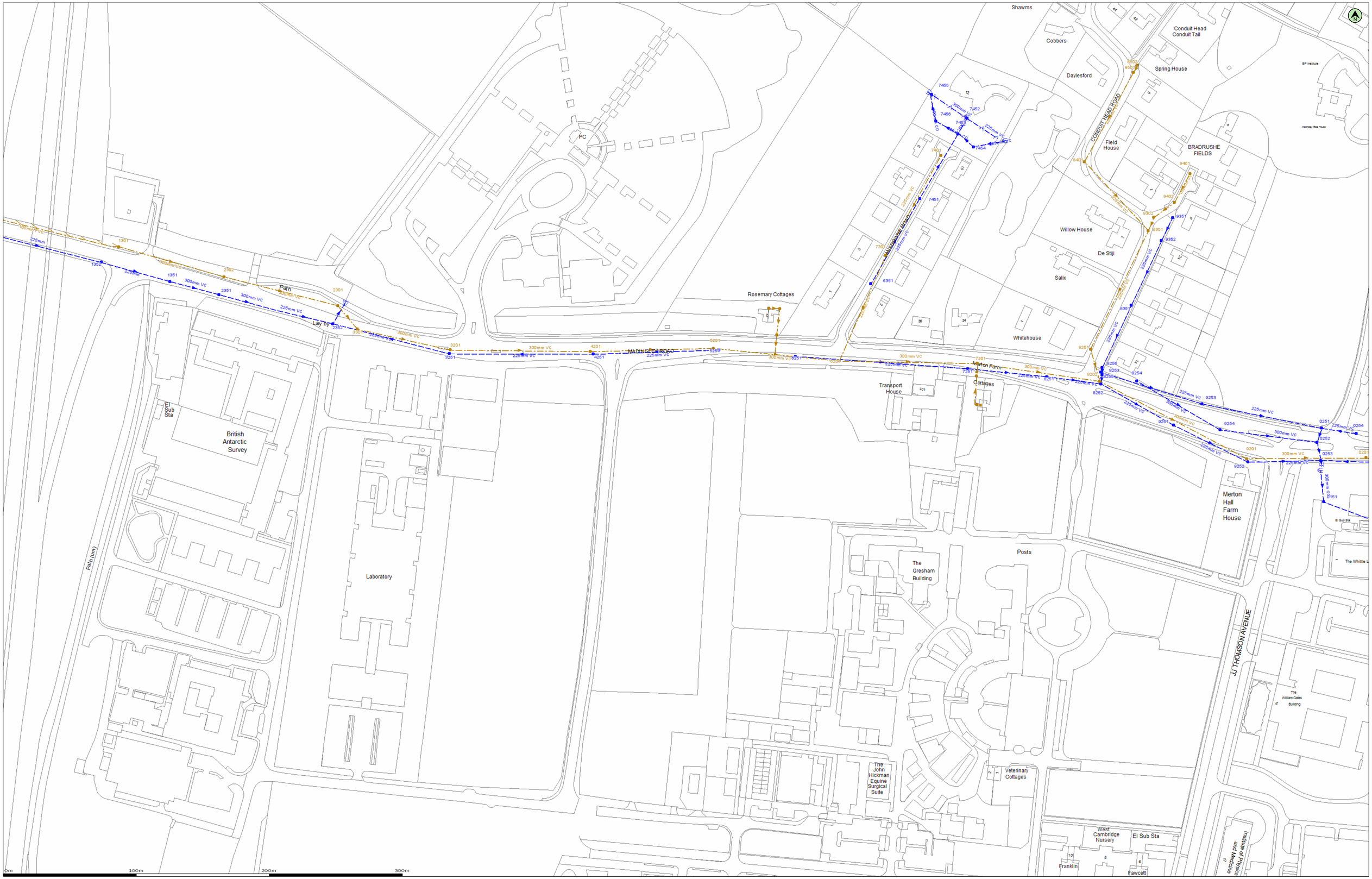
File Location: J:\31500 west cambridge master\plan\drawings\31500_2001_149 - existing indicative drainage arrangements.dwg

Appendix D Anglian Water Sewer Plans



(c) Crown Copyright and database rights 2014 Ordnance Survey 100022432 | Date: 08/09/14 | Scale: 1:1250 | Map Centre: 542559,259229 | Data updated: 09/07/14 | Our Ref: 111646 - 2 | Wastewater Plan A1

This plan is provided by Anglian Water pursuant its obligations under the Water Industry Act 1991 sections 198 or 199. It must be used in conjunction with any search results attached. The information on this plan is based on data currently recorded but position must be regarded as approximate. Service pipes, private sewers and drains are generally not shown. Users of this map are strongly advised to commission their own survey of the area shown on the plan before carrying out any works. The actual position of all apparatus MUST be established by trial holes. No liability whatsoever, including liability for negligence, is accepted by Anglian Water for any error or inaccuracy or omission, including the failure to accurately record, or record at all, the location of any water main, discharge pipe, sewer or disposal main or any item of apparatus. This information is valid for the date printed. The plan is produced by Anglian Water Services Limited from Ordnance Survey © Crown Copyright, 100018507. This map is to be used for the purposes of viewing the location of Anglian Water plant only. Any other uses of the map data or further copies is not permitted. This notice is not intended to exclude or restrict liability for death or personal injury resulting from negligence.

- 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

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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
0201	543070	259215	F	18.19	13.08	5.11
1301	542133	259374	F	21.134	16.34	4.794
2301	542297	259330	F	18.562	15.767	2.795
2302	542212	259351	F	19.27	16.099	3.171
3201	542382	259296	F	19.263	15.517	3.746
3301	542312	259312	F	18.402	15.833	2.569
4201	542487	259295	F	19.212	15.237	3.975
5201	542579	259298	F	19.504	14.908	4.596
6201	542674	259288	F	19.575	14.582	4.993
7201	542778	259286	F	19.044	14.28	4.764
7301	542709	259367	F	17.326	14.961	2.365
7401	542751	259442	F	16.58	15.34	1.24
8201	542863	259297	F	17.593	14.902	2.691
8202	542870	259273	F	18.388	13.957	4.431
8401	542858	259438	F	16.95	15.401	1.549
8501	542895	259505	F	17.99	16.24	1.75
8502	542898	259510	F	-	-	-
9201	542980	259215	F	17.8	13.43	4.37
9301	542906	259386	F	17.227	15.036	2.191
9302	542910	259396	F	17.56	15.12	2.44
9401	542938	259429	F	17.78	16.15	1.63
9402	542926	259407	F	17.65	15.63	2.02
0151	543038	259182	S	16.44	14.6	1.84
0251	543037	259238	S	17.82	15.54	2.28
0252	543033	259227	S	18.05	15.44	2.61
0253	543036	259213	S	18	-	-
0254	543063	259234	S	18.26	15.79	2.47
1351	542171	259348	S	20.087	18.434	1.653
1352	542120	259362	S	21.269	19.623	1.646
2351	542208	259338	S	19.422	17.721	1.701
2352	542294	259316	S	18.939	16.629	2.31
3251	542381	259293	S	19.23	17.233	1.997
4251	542489	259293	S	19.172	17.663	1.509
5251	542584	259296	S	19.471	18.123	1.348
6251	542641	259292	S	19.551	-	-
6351	542698	259346	S	17.67	16.406	1.264
7251	542771	259282	S	18.976	17.383	1.593
7451	542735	259410	S	16.83	15.75	1.08
7452	542770	259470	S	16.56	15.41	1.15
7453	542763	259459	S	16.7	15.47	1.23
7454	542775	259449	S	16.7	15.625	1.075
7455	542744	259488	S	16.3	15.325	0.975
7456	542747	259468	S	17.35	15.4	1.95
8251	542830	259276	S	18.865	16.907	1.958
8252	542871	259271	S	18.31	16.555	1.755
8253	542871	259279	S	18.766	16.836	1.93
8254	542898	259273	S	17.925	16.197	1.728
8255	542872	259277	S	18.75	16.66	2.09
8256	542872	259283	S	18.25	16.58	1.67
8351	542894	259330	S	17.95	16.65	1.3
9251	542926	259240	S	18.006	16.261	1.745
9252	542981	259212	S	17.81	15.813	1.997
9253	542947	259256	S	17.253	16.143	1.11
9254	542960	259236	S	17.397	15.797	1.6
9351	542925	259396	S	17.98	16.92	1.06
9352	542916	259378	S	18.02	16.84	1.18

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert

Date: 08/09/14

Scale: 1:1250

Map Centre: 543706,258855

Data updated: 09/07/14

Our Ref: 111646 - 1

Wastewater Plan A0

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

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West Cambridge 2

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Manhole Reference	Easting	Northing	Liquid Type	Cover Level	Invert Level	Depth to Invert
4103	544427	259171	C	16.38	14.12	2.26
0001	544026	259080	F	11.43	9.32	2.11
0002	544071	259066	F	11.33	9.02	2.31
0201	543070	259215	F	18.19	13.08	5.11
0601	544007	258634	F	9.3	8.25	1.05
0602	544011	258687	F	9.06	6.57	2.49
0801	544019	258825	F	11.98	6.93	5.05
0802	544013	258848	F	12.24	10.52	1.72
0901	544017	258950	F	11.84	9.84	2
1001	544110	259060	F	11.28	8.92	2.36
1002	544156	259053	F	11.08	8.81	2.27
1003	544199	259044	F	10.86	8.43	2.43
1004	544105	259057	F	10.595	-1.048	11.643
1201	543152	259210	F	18.43	13.01	5.42
1601	544116	258662	F	-	-	-
1701	543154	258709	F	-	-	-
2001	544297	259023	F	10.12	8.27	1.85
2002	544291	259014	F	9.87	9	0.87
2003	544252	259037	F	10.595	-1.048	11.643
2101	543243	259188	F	18.38	12.66	5.72
2101	544209	259179	F	14.18	12.31	1.87
2102	543295	259172	F	18.08	12.48	5.6
2102	544299	259192	F	15.73	13	2.73
2202	544273	259262	F	17.93	13.02	4.91
2601	543245	258694	F	-	-	-
2601	544228	258660	F	-	-	-
3001	543373	259055	F	14.18	12.91	1.27
3001	544317	259081	F	11.57	9.36	2.21
3002	543376	259024	F	13.97	12.99	0.98
3003	543381	259065	F	14.34	12.88	1.46
3101	544355	259136	F	14.15	11.67	2.48
3101	543338	259159	F	17.65	12.35	5.3
3102	543399	259145	F	16.49	12.6	3.89
3103	544347	259129	F	13.6	12.72	0.88
3201	544365	259279	F	20.86	18.87	1.99
3203	544389	259229	F	19.07	17.59	1.48
3204	544372	259293	F	-	-	-
3205	544367	259286	F	-	-	-
3304	544394	259338	F	21.13	16.27	4.86
3400	544363	258469	F	-	-	-
3501	544350	258585	F	7.85	4.86	2.99
3601	543339	258684	F	-	-	-
3601	544320	258665	F	-	-	-
3602	544328	258656	F	8.23	5.74	2.49
3603	544327	258659	F	-	-	-
3901	544353	258920	F	9.46	6.6	2.86
3902	544397	258969	F	9.05	6.53	2.52
3903	544371	258970	F	8.981	-1.28	10.261
4000	543501	259065	F	13.426	11.521	1.905
4001	544420	259079	F	12.42	9.06	3.36
4101	544415	259100	F	13.17	10.1	3.07
4101	543418	259152	F	16.12	12.1	4.02
4107	544403	259184	F	16.66	14.71	1.95
4209	544421	259262	F	-	-	-
4210	544436	259275	F	-	-	-
4302	544418	259302	F	20.93	13.46	7.47
4601	543431	258675	F	-	-	-
4901	543481	258988	F	13.512	10.961	2.551
5101	543528	259153	F	14.7	11.79	2.91
5501	543520	258587	F	13.868	10.496	3.372
5502	543524	258582	F	13.908	11.814	2.094
5503	543572	258575	F	13.454	-	-
5601	543534	258650	F	12.646	10.428	2.218
5602	543538	258664	F	12.335	9.68	2.655
5603	543522	258662	F	-	-	-
5604	543533	258656	F	10.963	1.663	9.3
5701	543554	258736	F	11.18	9.39	1.79
5702	543561	258762	F	11.449	1.308	10.141
5801	543573	258835	F	11.23	9.02	2.21
5802	543585	258876	F	12.076	0.915	11.161
5901	543518	258964	F	12.6	10.708	1.892
5902	543597	258930	F	11.732	8.797	2.935
6001	543633	259042	F	12.323	10.659	1.664
6101	543657	259113	F	13.71	11.2	2.51
6102	543651	259106	F	12.721	-0.243	12.964
6501	543622	258565	F	13.115	10.766	2.349
6502	543672	258555	F	12.743	10.247	2.496
6901	543602	258950	F	11.884	10.095	1.789
6902	543618	258988	F	13.321	0.585	12.736
6903	543651	258912	F	11.043	8.251	2.792
7001	543744	259093	F	13.24	10.74	2.5
7401	543701	258441	F	10.26	8.53	1.73
7501	543717	258522	F	11.762	9.991	1.771
7502	543720	258546	F	12.36	9.821	2.539
7503	543790	258534	F	11.707	9.25	2.457
7504	543722	258523	F	-	-	-
7801	543705	258893	F	10.717	7.809	2.908
8001	543855	259097	F	12.34	10.18	2.16
8002	543813	259095	F	12.63	10.42	2.21
8100	543802	259116	F	11.169	-0.849	12.018
8201	543880	259284	F	14.12	11.64	2.48
8202	543862	259234	F	13.03	11.1	1.93
8501	543860	258522	F	10.927	8.793	2.134
8801	543811	258856	F	10.63	7.72	2.91
8802	543864	258836	F	10.93	7.641	3.289
8804	543882	258835	F	11.09	7.52	3.57
8805	543825	258853	F	10.69	7.71	2.98
8806	543815	258853	F	10.59	7.73	2.86
8807	543886	258830	F	11.24	7.5	3.74
9002	543942	259099	F	11.82	9.98	1.84
9003	543957	259097	F	11.7	9.78	1.92
9201	542980	259215	F	17.8	13.43	4.37
9301	543995	258399	F	9.17	6.63	2.54
9401	543999	258495	F	9.24	7.46	1.78
9402	543997	258440	F	9.07	6.87	2.2
9501	543931	258509	F	9.997	8.221	1.776
9801	543940	258828	F	12.15	7.28	4.87
9802	543938	258826	F	-	-	-
0051	544029	259084	S	11.44	8.55	2.89
0052	544089	259067	S	11.29	8.18	3.11
0053	544022	259079	S	11.41	9.75	1.66
0054	544098	259057	S	11.21	9.21	2
0055	544022	259013	S	11.22	9.7	1.52
0151	543038	259182	S	16.44	14.6	1.84
0251	543037	259238	S	17.82	15.54	2.28
0252	543033	259227	S	18.05	15.44	2.61
0253	543036	259213	S	18	-	-
0254	543063	259234	S	18.26	15.79	2.47
0255	543074	259212	S	18.28	15.74	2.54
0651	544011	258690	S	9.63	7.42	2.21
0652	544009	258639	S	-	-	-
0851	544017	258828	S	11.99	7.93	4.06
1051	544157	259056	S	10.97	7.82	3.15
1052	544198	259039	S	10.81	8.67	2.14
1151	543148	259141	S	15.39	13.97	1.42
1251	543159	259207	S	18.45	16.64	1.81
1252	543120	259211	S	18.4	16.08	2.32
1651	544134	258660	S	-	-	-
1751	543190	258739	S	13.41	12.08	1.33
1752	543186	258717	S	13.29	12	1.29
1753	543177	258719	S	13.46	11.79	1.67
2051	543217	259096	S	14.56	13.52	1.04
2051	544245	259038	S	10.58	7.32	3.26
2052	543236	259086	S	14.76	13.52	1.24
2052	544252	259030	S	10.52	7.26	3.26
2053	543258	259066	S	14.91	13.32	1.59
2053	544297	259019	S	10.14	6.93	3.21
2054	543253	259029	S	14.62	13.33	1.29
2054	544297	259034	S	10.26	9	1.26
2056	544298	259032	S	10.15	8.92	1.23
2151	543262	259181	S	18.38	-	-
2152	543208	259112	S	15.18	13.69	1.49
2153	543275	259169	S	17.98	16.24	1.74
2154	543267	259121	S	16.43	14.71	1.72
2251	544264	259246	S	17.42	12.91	4.51
2252	544265	259224	S	16.55	11.93	4.62
2352	544292	259300	S	20.06	14.24	5.82
2353	544294	259301	S	20.09	13.37	6.72
2651	544235	258660	S	-	-	-
2751	543204	258799	S	13.89	-	-
2851	543213	258839	S	14.2	12.48	1.72
2951	543245	258984	S	14.82	13.13	1.69
2952	543232	258914	S	14.79	12.77	2.02
2953	543242	258912	S	14.62	12.95	1.67
3051	543346	259039	S	13.99	12.53	1.46
3051	544324	259082	S	11.74	9.39	2.35
3052	543371	259037	S	14.03	12.61	1.42
3052	544304	259038	S	10.43	7.18	3.25
3151	543388	259108	S	15.12	-	-
3151	544311	259177	S	15	12.26	2.74
3152	544355	259134	S	14.01	10.4	3.61
3152	543329	259160	S	17.79	15.45	2.34
3153	543399	259149	S	16.46	14.52	1.94
3153	544350	259135	S	13.94	12.05	1.89
3154	544371	259150	S	15.11	11.06	4.05
3251	544362	259277	S	20.89	18.44	2.45
3252	544393	259285	S	-	-	-
3253	544382	259297	S	-	-	-
3254	544372	259290	S	-	-	-
3255	544362	259287	S	-	-	-
3352	544369	258395	S	8.5	6.32	2.18
3354	544313	259334	S	20.91	13.37	7.54
3357	544358	259319	S	-	-	-
3451	544313	258483	S	-	-	-
3452	544350	258489	S	8.5	6.47	2.03
3453	544360	258497	S	7.9	5.74	2.16
3552	544348	258583	S	7.77	6.37	1.4
3651	544313	258689	S	7.38	6.31	1.07
3652	544336	258639	S	7.87	6.35	1.52
3751	544339	258789	S	7.25	5.9	1.35
3752	544341	258786	S	7.18	5.48	1.7
3851	544345	258837	S	7.52	5.69	1.83
3852	544342	258830	S	7.43	6.43	1
3951	544379	258978	S	9.24	6.89	2.35
3952	544371	258966	S	9.18	7.06	2.12
3953	544380	258967	S	9.17	6.15	3.02
3954	544389	258971	S	9.16	7.37	1.79
3955	544344	258915	S	7.89	6.74	1.15
3956	544354	258923	S	8.49	6.06	2.43
3957	544347	258905	S	8.21	6.03	2.18
4051	543487	259018	S	13.23	11.78	1.45
4053	544421	259093	S	12.95	11.6	1.35
4151	544408	259188	S	16.83	12.28	4.55
4152	544426	259178	S	16.55	12.43	4.12
4154	544433	259121	S	14.37	13.04	1.33
4351	544416	259301	S	20.93	13.45	7.48
4951	543478	258985	S	13.567	12.107	1.46
5051	543572	259010	S	12.467	11.124	1.343
5053	543504	259081	S	13.39	12.08	1.31
5151	543526	259152	S	14.61	12.77	1.84
5152	543595	259136	S	14.01	11.73	2.28
5153	543515	259100	S	13.79	12.37	1.42
5651	543533	258632	S	13.03	11.125	1.905
5751	543554	258724	S	11.3	9.833	1.467
5752	543564	258759	S	10.954	9.214	1.74
5851	543590	258879	S	11.431	9.896	1.535
6051	543640	259056	S	12.427	10.897	1.53
6052	543622	259005	S	12.079	10.735	1.344
6151	543660	259114	S	13.71	11.43	2.28
6352	543693	258376	S	9.29	7.05	2.24
6551	543656	258556	S	12.86	11.69	1.17
6951	543623	258993	S	12.042	10.732	1.31
6952	543657	258911	S	11.351	9.891	1.46
7051	543736	259096	S	13.54	11	2.54
7451	543706	258450	S	-	-	-
7452	543707	258458	S	10.55	9.45	1.1
7551	543717	258543	S	12.4	11.14	1.26
7552	543719	258521	S	11.81	10.68	1.13
7851	543734	258885	S	10.921	9.421	1.5
8051	543815	259097	S	12.72	10.53	2.19
8052	543837	259015	S	11.6	-	-
8053	543849	259090	S	12.1	9	3.1
8151	543807	259109	S	12.69	11.32	1.37
8153	543818	259109	S	-	-	-
8154	543824	259109	S	12.54	10.37	2.17
8155	543850	259113	S	12.068	9.261	2.807
8251	543861	259233	S	13.03	11.68	1.35
8252	543859	259209	S	12.88	11.28	1.6
8351	543885	259304	S	14.74	12.5	2.24
8352	543887	259310	S	14.85	12.41	2.44
8353	543893	259302	S	14.79	12.08	2.71
8551	543819	258526	S	11.33	10.23	1.1
8552	543862	258519	S	10.78	9.76	1.02
8751	543846	258788	S	11.34	10.72	0.62
8852	543852	258836	S	10.79	8.95	1.84
8853	543806	258859	S	10.64	7.95	2.69
8855	543802	258859	S	10.65	8.88	1.77
8857	543808	258858	S	10.6	9.01	1.59
8858	543852	258842	S	-	-	-
8859	543807	258863	S	10.66	7.89	2.77
8860	543886	258831	S	11.24	7.82	3.42
8861	543819	258853	S	10.6	9.01	1.59
8951	543823	258943	S	11.297	8	3.297
9151	543946	259100	S	11.88	10.08	1.8
9152	543959	259110	S	11.39	9.32	2.07
9153	543962	259101	S	11.92	8.99	2.93
9252	542981	259212	S	17.81	15.813	1.997

Appendix E Extracts from CCTV Surface/Foul Water Drainage Investigation

Appendix – Surface water drains with greater than 20% cross-sectional area loss recorded (CCTV survey, 2014)

Surface Water Manhole (MH) No.	Distance between Manholes (m)	Area loss recorded (%)
MH 02 – MH 01	48.00	35% - 70%
MH 02 – MH 03	17.00	25%
MH 06 to MH 05	99.00	30%
MH 07 to MH 06	26.20	25% - 40%
MH 09 to MH 08	60.00	25% - 35%
MH 08 to OUTFALL	24.00	30%
MH 19 to MH 18	46.70	30%
MH 29 to MH 30	105.00	30%
MH 33 to MH 34	89.80	25% – 40%
MH 34 to MH 35	100.00	40%
MH 35 to MH 36	12.00	35%
MH 36 to MH 37	9.60	25%
MH 45 to MH 46	65.10	25%
MH 67A to MH 66A	53.00	50%
MH 74 to MH 75	33.70	40%
Point ‘A’ to MH 76	12.30	40%
MH 76 to MH 77	50.00	25%
MH 79 to MH 80	5.00	50%
MH 80 to MH 72	38.80	25%
MH 83 to MH 82	10.00	70%
MH 92 to MH 93	33.50	25% - 50%
MH 96 to MH 97	36.10	50%
MH 108 to MH 111	55.40	30%
MH 109 to MH 108	87.00	25%

MH 111 to MH 112	37.20	55%
MH 114 to MH 102	4.10	40%
MH 116 to MH 117	24.00	50%
MH 123 to MH 121	60.00	25%
MH 130 to MH 129	28.00	30%
MH 131 to MH 129	53.00	30%
MH 132 to MH 131	74.50	25%
MH 135 to MH 133	11.00	70%
MH 146 to OUTFALL	25.00	70%
LATT A to MH 90	4.20	40%
HEADER to MH 152	80.00	30%
MH 155 to MH 154	24.20	30%
MH 157 to MH 159	21.70	25% - 50%
MH 159 to MH 160	45.00	30%
MH 163 to MH 165	68.00	70%
D/PIPE to MH 166	27.10	30%

Appendix F Technical Note on Ground Conditions

West Cambridge Masterplan
Stage 1b Review

Ground Conditions and Land Quality

On behalf of **University of Cambridge**

Project Ref: 31500 | Stage 1b | October 2014

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Document Control Sheet

Project Name: **West Cambridge Masterplan Review**

Project Ref: **31500**

Report Title: **Stage 1b Review Ground Conditions and Land Quality**

Doc Ref: **31500/GEO/r002**

Date: **October 2014**

	Name	Position	Signature	Date
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Approved by	Greg Callaghan	LLP Partner		29/10/2014
For and on behalf of Peter Brett Associates LLP				

Revision	Date	Description	Prepared	Reviewed	Approved

Contents

Figures

Appendices

1 Introduction

1.1 Background

1.1.1 This report presents the findings of the information gathering and data review exercise of ground conditions and land quality for the West Cambridge site.

1.1.2 The report provides additional data to and updates the stage 1a review from October 2014 which involved, reviewing and assessing ground and land quality opportunities and constraints, gaps in data, and requirements for further work necessary to support and inform the master planning, EIA and planning application stages.

1.1.3 The brief for this element of work included:

- Collation of available records to provide a summary of ground conditions and land quality aspects.
- Consider potential for minerals extraction on the site.
- Provide a gap analysis of ground investigation and land quality data.
- Provide general strategic level advice relating to substructure, infrastructure and earthworks design.
- Provide strategic level advice on ground related and land quality constraints and opportunities.
- Set out requirements for additional data gathering including ground investigations.

1.2 Legislation and Policy

1.2.1 The likely ground conditions and environmental setting which might have associated environmental liabilities or which may affect redevelopment are a material consideration in planning applications and the minimum requirements are stipulated by Clauses 120, 121 and 122 and Glossary Page 56 of the National Planning Policy Framework (March 2012), for land potentially affected by contamination.

1.2.2 The basic requirements of a Phase 1 study are set out in the Model Procedures for the Management of Contaminated Land (CLR 11), Annex A of BS 5930 and Section 6.2 of BS 10175.Guidance on assessment are also detailed in the Environment Agency's "Guidance on Requirements for Land Contamination Reports" and Cambridge City Council document Contaminated Land in Cambridge Developers Guide April 2009.

1.2.3 Potential for minerals sterilisation will be a consideration in planning and checks on Minerals Safeguarding Areas will be required as part of the planning submission process.

1.2.4 All the above have been taken into consideration in the data gathering exercise undertaken as part of this Stage 1b study.

2 Overview of Existing Information

2.1 Introduction

2.1.1 Data gathering for the site has focused on four principal source areas as these were considered to offer the most comprehensive source of information for the site:

- Reports, surveys, drawings and studies held by Hannah Reed/PBA based on their historical association with and work on the site since the 1990s.
- Reports, surveys, drawings and studies from existing developments on the site held by Cambridge City Council.
- Data obtained from the British Geological Survey and Cambridgeshire County Council on geology and minerals.
- Ground investigation reports and information from the original planning application and EIA for the site held by the University.

2.1.2 The information provided by the various sources is listed below and areas covered by the various reports presented in Figure 1.

2.2 Data Sources

Desk Studies

2.2.1 The information provided by the various sources includes desk studies, and similar information, that have been carried out for particular areas of the site as those areas as have been considered for development. The desk studies and other information gathered comprise:

- Cape Annex – Geoenvironmental Desk Study. Prepared by Ramboll for University of Cambridge dated August 2013.
- Maxwell Centre – Geoenvironmental Desk Study. Prepared by Ramboll for University of Cambridge dated March 2013.
- University of Cambridge Data Centre – Geotechnical and Contamination Desk Study. Prepared by Ove Arup for Lynxvale Ltd dated 14 June 2012.
- University of Cambridge, Chemical Engineering and Biotechnology – Geoenvironmental Desk Study. Prepared by Ramboll for University of Cambridge Estate Management dated February 2012.
- Cambridge University Sports Centre – Technical Note on Review of ground contamination potential. Prepared by Arup dated 18 July 2011.
- High Cross, Madingley Road, Cambridge – Environmental Study. Prepared by WS Atkins dated December 1996.

Ground Investigations

2.2.2 Records of several ground investigations on the site have also been gathered. Details of these ground investigations are summarised in the following tables. The approximate locations of exploratory holes carried as part of these investigations, or the location of zones of investigation for the smaller sites, are presented in Figure 1 at the rear of this report.

CAPE Annexe, University of Cambridge. Engineers: Ramboll. Contractor: Fugro. Date: November 2013					
Scope: Ground investigation for a proposed extension to CAPE building					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
4 no. TP	0.5-4.0m	MG: 0.4-0.5m GC: 19.5+m (via CPT interpretation)	Laboratory: 19 no. MC/PI 2 no. PSD 16 no. pH/SO_4	Laboratory: Soil - 5 no. general contaminant suite and asbestos screen	None
5 no. CPT	20m				

University of Cambridge Data Centre, University of Cambridge. Engineers: Ove Arup. Contractor: BAM Riches. Date: September 2012					
Scope: Ground investigation for a proposed new data centre					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
1 no. BH (CP)	30m	TS/MG: 0.5-2.7m HD: 0-2.1m GC: 16.6+m	In-situ: SPTs and U100s in BH (CP). Laboratory: 12 no. MC/PI 12 no. PSD 6 no. CBR 17 no. Triax 5 no. pH/SO_4	Laboratory: Soil - 10 no. Metals/ Inorganics/PAH/ BTEX 5 No. TPH/VOC/SVOC 9 no. asbestos screen 6 no. leachate	Ground gas: CH_4 0.3-0.7% CO_2 0.0-0.1% O_2 20.2-20.7% Flow 0.0l/hr
6 no. BH (WS)	3-3.2m				
9 no. TP	2-4.3m				

University of Cambridge, Chemical Engineering and Biotechnology Building. Engineers: Ramboll. Contractor: Ground Engineering & RSK. Date: January & July 2012					
Scope: Ground investigation (separate geoenvironmental and geotechnical phases) for a proposed chemical engineering and biotechnology building					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
6 no. TP	2.8-4.1m	MG:1.5-3.0m HD: 0.0-1.4m GC:32.0+m	In-situ: SPTs in BH (CP & WS) Laboratory 21 no. PSD 20 no. MC/PI 21 no. pH/SO_4 18 no. Triax 4 no. Consol	Laboratory: Soil – 12 no. Metals/ Inorganics/TPH/PAH 9 no. asbestos screen 6 no. leachate	Groundwater monitoring on 4 occasions
2 no. BH (CP)	25m & 35m				
4 no. BH (WS)	0.7-5m				

Cambridge University Sports Centre Phase 1 Western University Campus. Engineers: Arup. Contractor: Ground Engineering. Date October 2011					
Scope: Ground investigation for proposed sports centre.					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
10 no. TP	3-3.6m	MG:0.4-2.0m HD: 0-1.9m GC: 27.5+m	In-situ: SPTs in BH Laboratory 4 no. PSD 19 no. MC 9 no. PI 6 no. pH/SO_4 4 no. Triax 6 no. Compaction	In-situ: PID in trial pits Laboratory: Soil 8 no. general contaminant suite 6 no. asbestos screen 6 no. PCB/volatiles 6 no. leachability 5 no. gamma spec radiological analysis	None
1 no. BH (CP)	30m				
8 no. CPT	10m				

Report on a Ground Investigation, Infrastructure Phase 3, Charles Babbage Road. Engineers: Hannah Reed. Contractor: Ground Engineering. Date: June 2010					
Scope: Ground investigation for proposed car park.					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
3 no. BH (CP)	10-20m	MG:1.0-1.7m HD:0.7m GC:18.2+m	In-situ: U100s Laboratory: 12 no. MC 3 no. PI 8 no. Consol	None	None

Site Investigation Report at Materials Science and Metallurgy Building, University of Cambridge. Engineers: Ramboll. Contractor: ST Consult. Date: December 2009					
Scope: Factual ground investigation report at site of proposed Materials and Metallurgy Building					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
5 no. BH (WS)	4-9.5m	MG: 0.8-2.1m HD: 0.5-1.2m GC: 30+m	In-situ: SPTs in BH (WS); SPTs and U100s in BH (CP). Laboratory: 45 no MCs 42 no PI 29 no. PSD 14 no. pH/SO_4 4 no. Consol 15 no. Triax	Laboratory: Soil - 19 no. Metals/Inorganics/ Hydrocarbons/VOCs/ SVOCs 5 no. Leachate Groundwater – 6 no. Metals/Inorganics/PAH/ TPH/Phenols	Ground gas: CH_4 <0.1% CO_2 0.0-2.9% O_2 16.8-21.2% Flow <1.0l/hr Groundwater: Dry – 2.4m bgl
3 no. BH (CP)	15-30m				
6 no. TP	2-4m				
5 no. CBR	-				

West Cambridge Development – Infrastructure Phase 3, Madingley Road, Cambridge Engineers: Hannah Reed. Contractor: RSA Geotechnics. Date: October 2009					
Scope: Factual ground investigation report for proposed infrastructure route					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
13 no. TP	1.1-1.3m	TS: 0.3m MG: 0-0.5m HD/GC: 0.8+m	Laboratory: 10 no. MC/PI 10 no. PSD 10 no. pH/SO_4 10 no. Compaction 10 no. CBR 10 no. MCV 10 no. Triax	None	None

West Cambridge Development. Madingley Road, Cambridge - Ground Investigation Report. Engineers: Richard Jackson Plc. Date: September 2008					
Scope: Ground investigation for development parcel					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
17 no. TP	2.3-3.2m	TS: 0.1-0.4m MG: 0.3-2.3m HD: 0.6-2.6m GC: 2.9+m	Laboratory 9 no. MC/PI 2 no. CBR 2 no. Compaction	Soil - 16 no. General contaminant suite 14 no. Additional lead tests 4 no. VOCs	None

West Cambridge Development, Madingley Road, Cambridge. Engineers: Hannah Reed. Contractor: Geotechnical and Environmental Associates. Date: April 2007					
Scope: Ground investigation to determine appropriate method of stabilisation for near surface soils					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
7 no. TP	1.5-2.8m	MG: 0.5-0.8m HD:0.0-1.7m GC: 1.0+m	Laboratory: 2 no. MC/PI/Compaction/ CBR/PSD 2 no. Lime stabilisation suite using 2% lime	None	None

University of Cambridge, Institute for Manufacturing Building, Charles Babbage Road, Cambridge. Engineers: Ove Arup. Contractor: Ground Engineering. Date 2007					
Scope: Ground investigation for proposed building					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
2 no. BH (CP)	30m	MG: 0.3-2.1m HD: 0-1.0m GC: 29+m	In-situ: SPTs and U100s in BH (CP). Laboratory: Unknown – only logs reviewed	Unknown – only exploratory hole logs available for review	
6 no. TP	4-4.1m				
9 no. CPT	10.2-13.5m				

West Cambridge Development Site. Engineers: WSP. Contractor: Fugro. Date 1998					
Scope: Geotechnical site investigation and contamination survey					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
11 no. BH (CP)	10-20m	TS: 0-0.8m MG: 0-1.4m HD: 0-1.9m GC: 17.5+m	In-situ: SPTs and U100s in BH (CP). Laboratory: 44 no. MC 16 no. PI 2 no. PSD 19 no. Triax 6 no. Consol 6 no. CBR 18 no. pH/SO_4	Soil – 36 no. general contaminant suite	None
39 no. TP	1.8-3.3m				
12 no. CPT	10-15m				

High Cross, Madingley Road, Cambridge. Engineers: WS Atkins. Date 1996					
Scope: Environmental study to investigate incident of cattle poisoning					
Exploratory Holes	Depths	Geological Summary	Geotechnical Testing	Geoenvironmental Testing	Monitoring
Surface or near surface	Surface or near surface	Not applicable	None	State Veterinary Investigation Centre 1995 Soil - 7 no. lead ADAS 1996 Soil (compound samples) – 46 no. lead Atkins 1996 Soil – 131 no. lead and other metals	None

2.2.3 Some desk studies and ground investigation reports make reference to other ground investigations carried out within the site boundary; copies of these investigations have not been retrieved during this stage. These investigations comprise:

- Ground Investigation for CAPE Building carried out by Geotechnical Engineering in February 2001. The investigation comprised 3 no. boreholes and 6 no. trial pits.
- Ground Investigation for Physics of Medicine Building carried out by Ground Engineering in April 2006. The investigation comprised 5 no. boreholes and 8 no. trial pits.

Although the reports are currently not held by PBA, the zones of investigation for these sites have been gleaned from other reports and studies. The locations of these zones of ground investigation are shown on Figure 1.

British Geological Survey

2.2.4 The British Geological Survey (BGS) on-shore historical borehole record archive has been searched to collect logs of exploratory holes located within or close to the site boundary. The locations of these records are shown on Figure 1. The exploratory hole logs relate to the following developments:

- Ground investigation for Schlumberger laboratory dated 1991, located in the western area of the site.
- Ground investigation for University of Cambridge CAD centre dated 1998, located in the western area of the site.
- Pre-construction ground investigation for Cambridge Western Bypass (now M11 Motorway) dated 1969, located on western edge of site boundary.
- Madingley Road 33kV Sub-station dated 1989, located on the northern boundary of the site.
- Unknown investigation for Cambridge City Council dated 1970, located in the north-east corner of the site.

- Ground investigation for Eaton Gate development dated 1995, located just beyond the south-east corner of the site boundary.

2.2.5 It should be noted that the positioning of these exploratory holes is based on grid references supplied by BGS for each log, but is not necessarily the actual location of the exploratory hole.

2.3 Site History

2.3.1 The overview of the site history has been gleaned from historical Ordnance Survey (OS) maps, and other historical information, presented in desk studies which have been collected as part of this study.

2.3.2 The site was largely comprised of agricultural fields during the late 19th and early 20th Centuries. In the early 1940s, the southern and western areas of the site were developed as a wartime industrial facility (the Shorts site). The facility was used to repair bomber aircraft (that had been dismantled at the nearby Bourn airfield) and salvage used parts from redundant bombers. Phase 1 of the Shorts site, comprising hangars, the administration block, canteen and stores were located in the western area of the site and was completed in 1941. Phase 2 of the Shorts site, comprising hangars, offices, a maintenance building and fuel compound were located in the southern area of the site and was completed in 1942.

2.3.3 After the war the site was vacated, with site buildings being used by the University, and by the Home Office for storage.

2.3.4 By the late 1960s the Phase 1 site in the western area of the site had been demolished and some laboratory buildings were shown in this area. The Phase 2 site buildings in the southern area were still present at this time. The University of Cambridge - School of Veterinary Medicine is shown in the central area of the site at this time.

2.3.5 By the early 1980s, the M11 Motorway had been constructed on the western boundary of the site. Laboratory buildings, a university Design Centre and a building labelled “British Antarctic Survey” were shown in the western area of the site. The Phase 2 site buildings in the southern area of the site were no longer shown (they were demolished in 1972). This area of the site was taken over by the University Farm and was used for grazing cattle or for grass cutting. Other laboratory buildings were shown in the south-eastern area of the site at this time.

2.3.6 The 2002 and 2008 OS maps show further university development in the eastern and western areas of the site.

2.4 Ground and Groundwater Conditions

2.4.1 The geological map of the area indicates that the site is completely underlain by Gault Formation (generally referred to as Gault Clay comprising pale to dark grey or blue-grey clay or mudstone). The geological map also indicates that along a very small area of the northern site boundary, the Gault Formation is overlain by Head Deposits (comprising clay, silt, sand and gravel).

2.4.2 The Gault Clay was encountered in the all the ground investigations carried out at the site, generally beneath a veneer of topsoil, Made Ground and/or Head Deposits. The Gault Clay was typically described as stiff to very stiff grey/brown becoming grey clay.

2.4.3 The Gault Clay is a non-aquifer i.e. a formation generally regarded as containing insignificant quantities of groundwater.

2.4.4 Groundwater was generally not encountered during ground investigations at the site, as would be anticipated given the dominant clay geology. Minor seepages were reported in some

exploratory holes, although this was generally from Made Ground and Head Deposits horizons and was not considered to be significant.

2.5 Land Quality

2.5.1 In general terms, the ground investigation reports that have been reviewed, that have included geoenvironmental testing, have not identified gross or widespread contamination.

2.5.2 An incident of lead poisoning of cattle in the southern area of the site (adjacent to the former Phase 2 Shorts site) in August 1995 was investigated by the Ministry of Agriculture Fisheries and Food (MAFF) State Veterinary Service's Veterinary Investigation Centre in 1995 and subsequently by ADAS and WS Atkins in 1996. It was concluded that the animals had died from the ingestion of a grey material (possibly lead paint) located in the hedge of one of the fields. The grey material was found to contain up to 27% lead.

2.5.3 The soils in the area of the former Phase 2 Shorts site in the southern area of the site have been subject to contamination testing, as have soils at sites bordering this area. In general, elevated concentrations of contaminants have not been encountered in this area, or in neighbouring areas.

2.5.4 The majority of the site was largely greenfield prior to development during the latter part of the 20th Century. As such, the potential for widespread contamination in the remaining undeveloped areas of the site is considered to be low.

2.6 Unexploded Ordnance

2.6.1 No specific study of unexploded ordnance (UXO) has been carried out for the whole site. Cambridge was bombed during the Second World War and the Shorts site could be deemed a potential bomb target.

2.6.2 Spent ammunition from aircraft guns may have been deposited in the area west of the road between the Phase 1 and 2 areas of the Shorts site.

2.6.3 The desk study undertaken by Arup for the University of Cambridge Data Centre (neighbouring the former War Depot area) included a preliminary UXO risk assessment. This assessment indicates that the nearest record of bombs landing west of Cambridge City Centre are located approximately 2km south-east of the site. Based on the assessment, Arup concluded that their site was unlikely to have been bombed during the Second World War.

2.6.4 Other preliminary UXO assessments carried out on different areas within the site boundary report the risk of unexploded ordnance as low/moderate based on high level bomb map information supplied by Zetica.

2.6.1 No evidence for UXO or other munitions were encountered during previous investigations or during redevelopment of the site areas to date.

2.7 Minerals

2.7.1 The site does not fall within a Minerals Safeguarding Area as set out in the Cambridgeshire and Peterborough Minerals and Waste Development Plan-Core Strategy adopted in July 2011.

2.7.2 The nature of the ground conditions is such that the potential for mineral extraction at the site would be extremely limited.

2.8 Site Levels, Earthworks and Existing Development

2.8.1 The northern site boundary with Madingley Road falls from approximately 19.50-16.80 m OD west to east and the southern site boundary of the site falls from approximately 17.50m to 12.70m OD west to east.

2.8.2 Within the site area there is a west to east running ridge that also falls in elevation eastwards from about 19.70m to 14.70m OD broadly through the middle to upper third of the site. The highest areas seem to be along Charles Babbage Road and the Plaza area which has been built up.

2.8.3 The large attenuation pond in the southern area was excavated below existing ground level and spoil from this excavation was stabilised with lime and used to construct the Plaza area such that this is the area of highest elevation at the site

2.8.4 The site has been subject to various phases of development such that foundations, slabs, road construction and areas of engineered fill including locally lime stabilised soil will be present in the areas of proposed buildings.

3 Geotechnical Considerations

3.1 Introduction

3.1.1 This section is intended to give general geotechnical guidance for masterplanning at the site. A number of geotechnical factors and constraints will need to be considered in the design of foundations, earthworks, and infrastructure for the civil engineering and building work during future development. Large areas of the site are 'green field' and would be unaffected by past industrial development. The following sections outline the geotechnical factors that should be taken into account during master planning.

3.1.2 The geology of the site consists of Gault Clay variously covered with Superficial Deposits (mainly Head Deposits). Head Deposits may include deposits of glacially re-worked Gault Clay which may be indistinguishable from weathered Gault Clay.

3.2 Foundation Conditions

Made Ground

3.2.1 Made Ground has been identified in some of the ground investigations carried out at the site. The Made Ground encountered has been of variable thickness and composition. Local pockets of Made Ground may be found in others areas of the site even where there is no apparent history of industrial development.

3.2.2 Due to the inherent variability in composition, thickness and strength, structures and infrastructure constructed on Made Ground may be at risk from high total and/or differential settlements.

3.2.3 The potential presence of buried former foundations, structures or other obstructions should not be overlooked as these may cause differential settlements or prevent penetration of piles.

Head Deposits

3.2.4 Based on the information obtained it is likely that the Head Deposits, when present, will not exceed 3m in thickness and consist of firm to stiff sandy gravelly clay. Conventional foundations bearing on to Head Deposits are expected to be suitable for lightly loaded structures, but the depth, thickness and composition of the Head Deposits may be highly variable. Foundations that span different or variable soil types may need to be stepped or lightly reinforced.

3.2.5 More heavily loaded foundations may need to be extended down to the underlying more competent and consistent Gault Clay stratum, either by using trench fill foundation or by piling.

Gault Clay

3.2.6 Traditional shallow spread or strip foundations are likely to be suitable for some developments on the Gault Clay. However, the Gault Clay is susceptible to weathering and softening which could affect the allowable bearing pressure and, consequently the depth of the weathering and foundation design parameters should be established on a site specific basis. Gault Clay is also susceptible to ground movements, shrinkage and swelling, due to seasonal and long term moisture changes. All clay soils consolidate to a varying degree under applied loading, and the allowable bearing pressure will be determined to ensure total and differential settlements remain within structural tolerances.

3.2.7 Heavily loaded foundations for major structures may exceed settlement tolerances and in such cases piled foundations will be required. Consequently large span buildings, high rise

structures or buildings that are very sensitive to settlement may need piled foundations at this site, even if situated on undisturbed natural ground.

3.2.8 Piled foundations will be required where buildings are to be constructed with undercrofts.

3.3 Shrinkage and Swelling of Clay Soils

3.3.1 Previous ground investigations at the site have shown that the Gault Clay is of high to very high plasticity and is therefore particularly susceptible to volume change.

3.3.2 Seasonal changes in moisture content can affect the near surface soils and foundations in clay soils adopt a minimum depth to avoid such movements. Vegetation such as trees and dense hedgerows can desiccate clay soils to considerable depth and the shrinkage or swelling caused by the planting or removal of trees and hedgerows on clay soils is a common cause of structural damage. New trees planted near foundations cause shrinkage, while the ground below trees and hedgerows that have been removed and built over can take many years to resaturate. In doing so, the ground can swell, causing heave and structural damage.

3.4 Slope Stability

3.4.1 In general, the gently sloping topography of the site would not be expected to give rise to significant slope stability issues. However, the presence of Head Deposits at the surface increases the risk of slope instability. Relict slip surfaces roughly parallel to the ground surface and often covering large areas may be present within the Head Deposits themselves, and also in the underlying periglacially weathered clay.

3.4.2 Excavations through these relict slip surfaces, e.g. to create level platforms for development, may lead to reactivation and ground instability. Head Deposits may have already been disturbed by earthwork operations in some areas

3.5 Roads

3.5.1 Roads constructed in areas where natural soft materials are present at formation level, may require capping layers, or alternatively stabilisation with lime or cement to minimise consumption of granular resources. Roads in areas of Made Ground will require investigation prior to construction to determine the nature and thickness of the fill material and its properties, and mitigating measures designed accordingly.

3.5.2 CBR tests carried out for the Phase 3 infrastructure ground investigation recorded CBR values of approximately 6% (unsoaked) for near surface samples collected from the Head Deposits/weathered Gault Clay.

3.6 General Excavations

3.6.1 Excavations in natural ground, such as for services, should not present any problems specific to the site area. Clay soils predominate and consequently groundwater inflows are likely to be slight and easily controlled. Excavations will require side support wherever man entry is required and in soft or loose material side support should also be provided wherever there is a risk of collapse.

3.7 Aggressive Ground Conditions

3.7.1 The Gault Clay is known to contain sulphate minerals which in the presence of groundwater and air can give rise to aggressive conditions for buried concrete. Previous investigations have reported the sulphate conditions to be DS-3, according to BS 8500-1:2005, and concrete

for foundations specified accordingly. A check on conditions should be made prior to construction.

3.8 Infiltration Drainage

3.8.1 The Gault Clay is practicably impermeable so there is no scope for the use of infiltration drainage for the attenuation of runoff from buildings and paved areas. Surface water systems should be designed in accordance with the principles of sustainable urban drainage, SUDS.

3.9 Re-use of Materials

3.9.1 From the overview of earthworks testing carried out as part of previous on-site ground investigations, the re-use of site won natural materials for earthworks is likely to be practicable. The Gault Clay and Head Deposit materials are considered to be suitable for most applications although moisture conditioning may be required to achieve optimum conditions for some applications.

3.9.2 Successful lime stabilisation tests have been carried out on samples of Gault Clay recovered from the southern area of the site as part of an earlier ground investigation.

3.10 Existing Buildings and Infrastructure

3.10.1 There is existing infrastructure and drainage in areas of proposed buildings which will either require diverting or being built over which may necessitate use of piled foundations.

3.10.2 Foundations and slabs to existing structures could clash with proposed foundations, there are potential areas of disturbed ground due to previous building work and there may be limits on foundation techniques such as piling due to vibration.

3.10.3 Lime stabilised soils will probably require a piled foundation solution to support structures unless this material is excavated and levels reduced.

4 Land Quality Considerations

4.1 Introduction

4.1.1 The site was largely used as agricultural fields up until the Second World War when parts of the southern and western areas of the site were developed for an industrial war-time use. Since then, these industrial buildings have been demolished and the site has been developed primarily for university buildings and laboratories.

4.1.2 The site is situated in a relatively low sensitivity geoenvironmental setting for the following reasons:

- The solid geology underlying the site is the low permeability Gault Clay – a non-aquifer.
- There are no significant groundwater abstractions within the site boundary.
- There are no Source Protection Zones (SPZs) on or overlapping the site.
- There are no significant European designated environmental receptors on the site such as Ramsar sites or Special Protection Areas (SPAs).

4.1.3 The overall potential for land contamination issues on the site is low.

4.2 Contamination

4.2.1 The main currently undeveloped areas of the site are largely “greenfield” land and these areas of the site are considered relatively low risk with respect to potential land quality constraints.

4.2.2 Potential sources of contamination have been identified from desk studies carried out within the site boundary: area of the Phase 2 Shorts site (aircraft maintenance facility) present in the southern area between 1942 and 1972, areas of Made Ground, areas of the site where construction materials have been deposited or stored, electrical substations and areas of waste storage associated with on-site laboratories.

4.2.3 From the findings of ground investigations carried out at the site, the site history and the natural ground conditions, it is considered unlikely that soil contamination will represent a significant risk to future development at the site but may be present locally around point sources or related to specific site activities.

4.2.4 There may be locally elevated levels of ground gas and carbon dioxide in particular associated with deeper areas of made ground that may require some form of gas mitigation for buildings.

4.3 Re-use of Soil

4.3.1 The potential for cut and fill and on site reuse of arisings will be limited by site levels, existing development and density of future development .Off-site disposal of soil is therefore possible and soil chemistry and the level of contamination will have an impact on the cost of disposal particularly where Made Ground is excavated.

5 Potential Development Constraints and Opportunities

5.1 Geotechnical Constraints

There are no major geotechnical constraints to site development but PBA's geotechnical appraisal has identified the potential for the following issues, some local and others widespread that will need to be taken into consideration in terms of building form and layout and which will impact on the cost of development.

Areas of potential geotechnical constraints are presented in Figure 2.

- The presence of Made Ground with variable physical properties potentially requiring the deepening of shallow foundations or necessitating piled foundations.
- The potential of reactivating relict slip surfaces during excavation;
- The potential for shrinkage and swelling in the natural strata requiring the deepening of shallow foundations or necessitating piled foundations;
- The possible presence of naturally elevated sulphate in the Gault Clay strata requiring specific buried concrete design;
- The limited potential for infiltration drainage;
- The presence of clay sub-grades which are susceptible to softening and trafficking requiring the importation of capping material or requiring soil stabilisation;
- Existing area of lime stabilised fill – buildings piled.
- The locations of existing development foundations to new buildings or necessitates specific foundation types.

5.2 Land Quality Constraints

5.2.1 There are no major land quality constraints that will impact on future development, but PBA have identified a number of issues that will need to be taken into consideration.

- The potential for localised areas of Made Ground that are gassing;
- The potential for localised hot spots of contamination around point sources that require treatment/removal;
- The classification of waste materials for off-site disposal;
- The potential presence of unexploded ordnance (UXO).

5.3 Geotechnical Opportunities

The anticipated ground conditions at the site will offer relatively straightforward conditions for future development because:

- Generally the site is level with limited earthworks or site re-profiling required.

- Site soils are generally suitable for shallow foundations for lightly loaded structures.
- Overall the sub-grade conditions at the site are favourable.
- There is potential for re-using site won natural materials in earthworks for future development.

5.4 Land Quality Opportunities

Land quality is not a major issue due to the largely greenfield nature of the site.

- The site will not be classed as “Contaminated Land”;
- No site wide remediation will be required;
- There are no major sensitive environmental receptors on or off-site;
- Volumes of materials requiring off-site disposal will be limited.

6 Data Gaps

6.1 Site History

6.1.1 To date, the history of the site has been pieced together from available information presented in desk studies focussed on small areas of the site. A complete overview of the history of the site, including those areas yet to be developed, would be beneficial moving forward to support the future Environment Statement and planning applications.

6.2 Ground and Groundwater Conditions

6.2.1 Various ground investigations have been carried out at the site over the last 20 years. However, there are still some areas of the site, particularly in the north-central area and also in the eastern area (east of the School of Veterinary Medicine) which have not been subject to ground investigation.

6.2.2 The ground conditions in these areas are unlikely to be significantly different to other investigated areas of the site, although confirmatory investigation would be required for future development in these areas.

6.2.3 Where piled foundations may be required deep boreholes will be necessary.

6.3 Existing Buildings and Infrastructure

6.3.1 The nature and extent of existing building foundations and slabs will be required given the proposed density of the development where building foundations and slabs could clash and where there may be restrictions on for example piling due to vibration or impact on adjoining structures.

6.4 Land Quality

6.4.1 No site wide investigation or assessment of land quality has been undertaken for the site. Assessment has been on a project by project basis and therefore there are data gaps in information.

6.4.2 Previous locations of historical buildings and both historical and current activities that could have given rise to potential contamination such as the aircraft maintenance facility will require targeted investigation.

6.5 UXO

6.5.1 The presence of hangars and aircraft maintenance facility on the site which may have been targeted during WWII will require further study to determine the overall risk rating from UXO. At this stage, there is insufficient information to assess the risks of UXO at the site.

6.6 Archaeology

6.6.1 Although the site has been developed over the last few decades with buildings and infrastructure, the potential for archaeological remains will need to be taken into account in masterplanning.

6.7 Existing Processes and Activities

6.7.1 Information on existing processes and activities that take place in each building, particularly in relation to emissions and discharges, storage and waste management, will be required to fully assess potential for contamination and pollution.

6.7.2 Existing surface water quality information will similarly be required from attenuation ponds and other existing on-site drainage.

7 Recommendations

7.1 Recommended Activities

7.1.1 The further work recommended to ensure a comprehensive understanding of all ground related aspects of the site that will contribute to site master planning and Environmental Statement preparation is detailed in Appendix A and summarised below. Proposed exploratory hole locations are presented in Figure 3.

- A comprehensive Phase 1 desk study suitable for planning and for EIA for the site to include:

  i. An up to date Envirocheck report, including historical OS maps, covering the whole of the site area.

  ii. Liaison and consultation with Cambridge City Council and University of Cambridge Estates to collect ground condition data they hold for the site.

  iii. Review of the original EIA and development specific information that was not obtained or was unavailable in time for Stage 1b.

  iv. A detailed review and summary of exploratory hole logs and geoenvironmental and geotechnical laboratory testing on soil samples retrieved from the site during previous ground investigations.

  v. A preliminary UXO assessment for the site.

  vi. Review of existing processes and activities including discharges, emissions, surface water quality, storage and waste disposal.

- A Phase 2 intrusive investigation to include:

  i. Investigation in areas where there is currently a gap in data.

  ii. Investigation targeted at specific areas where either land quality or ground conditions are of potential concern or where detailed design is required for specific land parcels.

  iii. Classification of soils in terms of waste disposal.

Figures

Appendix A

Scope of Additional Work

1. Phase 1 Ground condition Assessment

The objective of the Phase 1 is to identify the likely ground conditions and environmental setting which might have associated environmental liabilities or which may affect development in those areas which are currently undeveloped. A combined ground condition assessment including geotechnical information will also appraise the likely foundation requirements and geological or geotechnical constraints at the site.

A Phase 1 Ground Condition Assessment is the minimum requirement under the National Planning Policy Framework (NPPF) definition of "site investigation information" for sites where development is proposed.

The Phase 1 would comprise a desk study to collect relevant information in the public domain, a detailed review of information collated from previous desk studies and ground investigations, a site walkover and a Tier 1 Preliminary Risk Assessment (qualitative). UK policy and legislation promote the use of a staged risk based approach to the assessment of ground quality/conditions. The underlying principle is the evaluation of *pollutant linkages* in order to assess whether the presence of a source of contamination could potentially lead to harmful consequences.

The basic requirements of a Phase 1 are set out in the Model Procedures for the Management of Contaminated Land (CLR 11), Annex A of BS 5930 and Section 6.2 of BS 10175. The assessment also considers the requirements detailed in the Environment Agency's "Guidance on Requirements for Land Contamination Reports".

Given the former wartime use of parts of the site, it is also recommended that a preliminary unexploded ordnance (UXO) survey is carried out as part of the Phase 1 Ground Condition Assessment to assess the risk of UXO to be present on the site.

2. Phase 2 Ground Condition Assessment

An intrusive ground investigation (Phase 2) will provide information on the ground conditions and geotechnical parameters for the design of the geotechnical aspects of proposed development in those areas currently undeveloped. In addition, information on land contamination is obtained at the same time to verify the findings of the Phase 1 assessment and confirm the assessed contamination risk associated with proposed development.

Based on the extent of previous ground investigations at the site, and the known historical uses of the site (particularly the former Shorts site), the proposed scope of intrusive work to fill in the gaps of areas currently un/under investigated at the site could comprise:

i) The sinking of seven boreholes to a depth of about 15 m using cable percussion techniques with standard penetration testing and recovery of soil samples.
ii) The excavation of twenty-six trial pits to examine the near surface ground conditions including the recovery of samples of the soils encountered.
iii) The construction of groundwater and ground gas monitoring wells in selected boreholes together with the monitoring of groundwater and ground gas levels.
iv) Geotechnical testing of selected soil samples to determine general geotechnical parameters.

v) Chemical analysis of soil samples for a range of potential contaminants (the exact testing suite would depend on the outcome of Phase 1).

vi) Waste acceptance criteria testing

The need for any further work beyond the Phase 1 and 2 assessments, for example detailed plot specific ground investigations to assist in design of building foundations, remediation strategies, verification reports etc., will depend on the findings of the Phase 1 and Phase 2 assessments and it is recommended that the proposals for any further work are addressed on completion of these assessments.

3. ES Chapter

Following completion of the ground condition assessment studies, a chapter on Ground Condtions and Land Contamination which will present an assessment of the likely impact of the proposed development on aspects of the land and water environment will be required for inclusion in the Environmental Statement.

Consultation with the regulators at an early stage is recommended as this promotes stakeholder engagement and assists in the appropriate scoping of works for key milestone deliverables.

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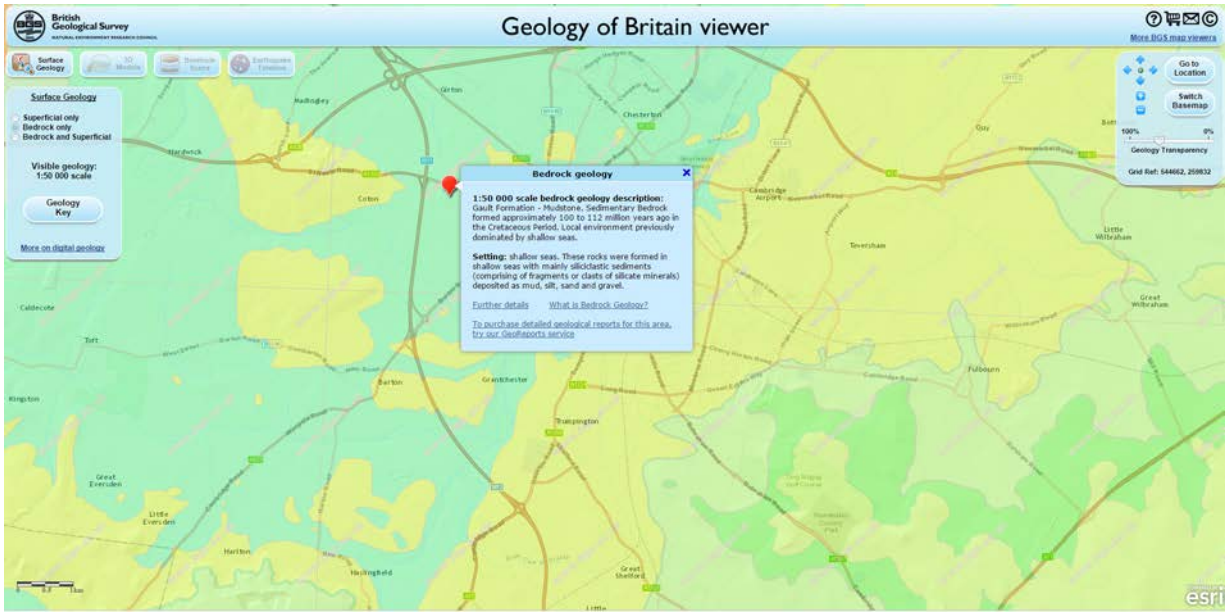
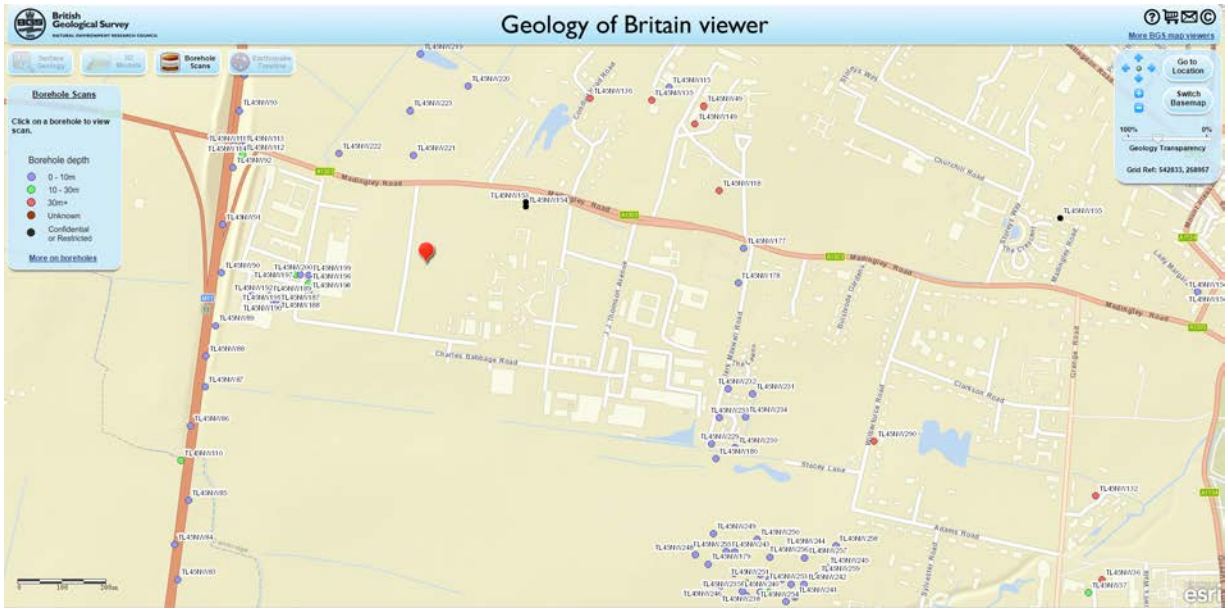
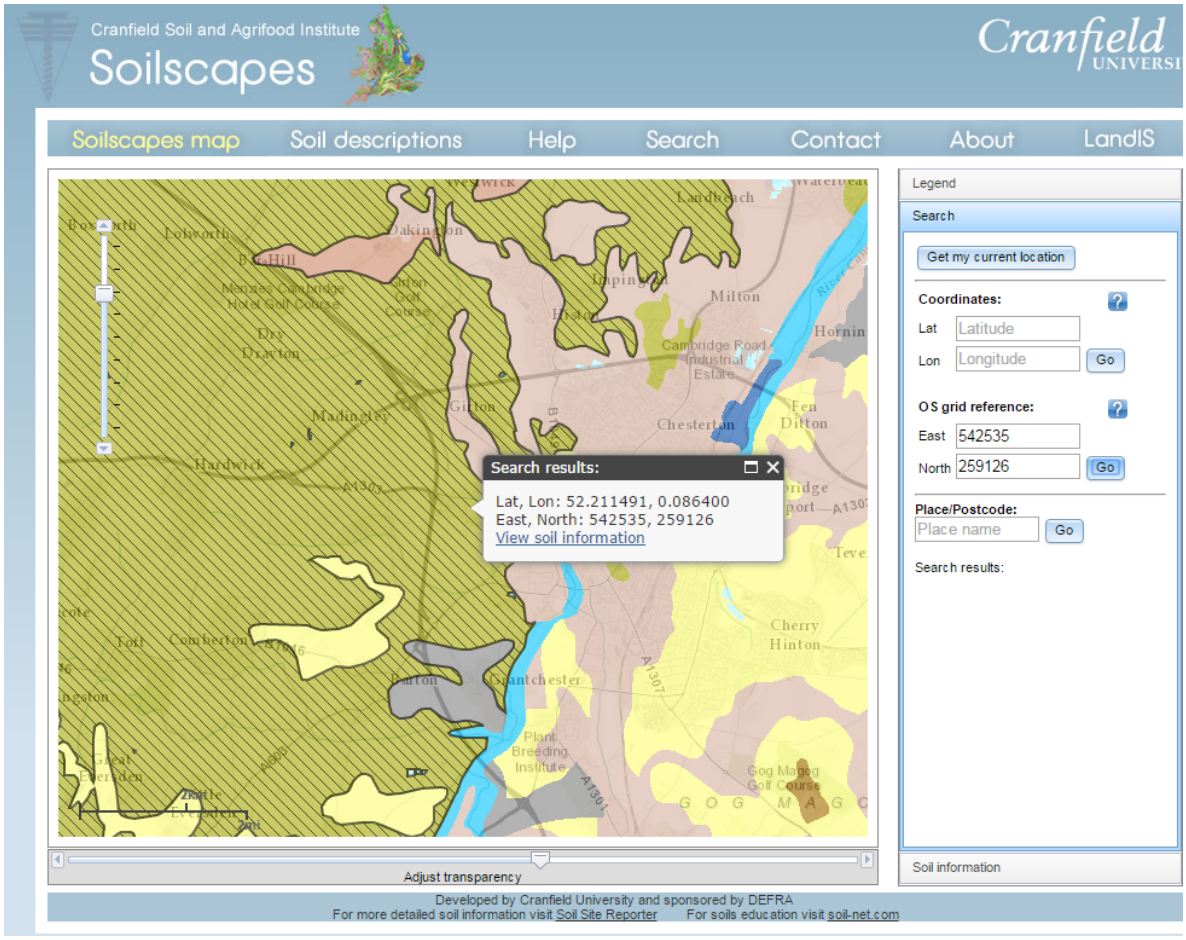
Appendix G Extracts from British Geological Survey (BGS) Borehole Logs

BGS maps – Accessed on 29/9/2015





Soilscapes – Accessed on 2/10/2015



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Soilscapes

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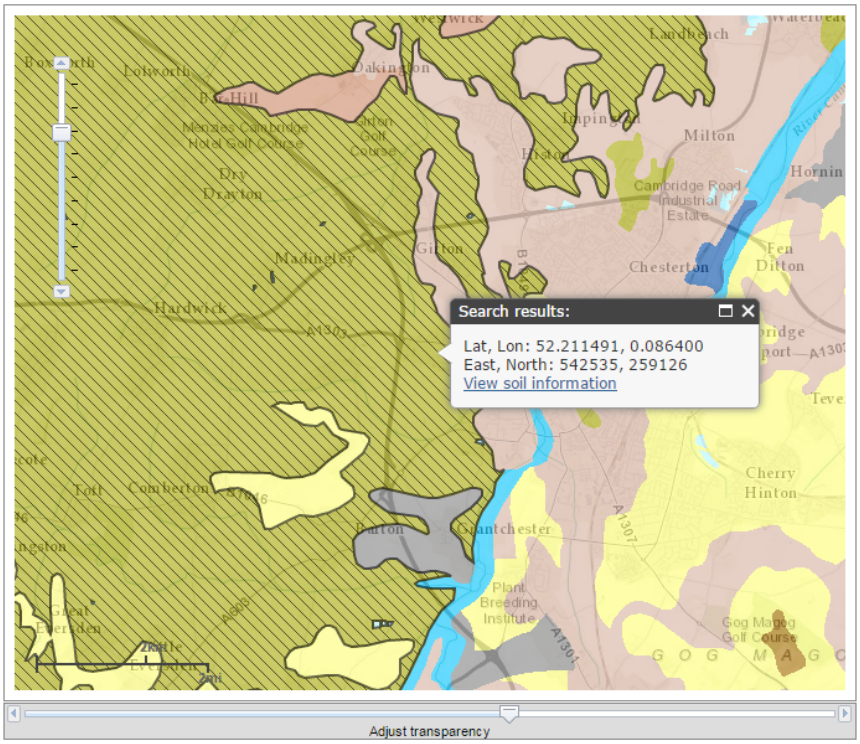

Legend

Search

Soil information

Drainage:
Slightly impeded drainage

Fertility:
High

Habitats:
Base-rich pastures and classic chalky boulder clay ancient woodlands; some wetter areas and lime-rich flush vegetation

Landcover:
Arable some grassland

Carbon:
Low

Drains to:
Stream network

Water protection:
Land is drained and nitrate vulnerable; potential for rapid pollutant transport; surface capping can trigger sheet erosion of fine sediment to stream network

General cropping:
Suited to autumn sown crops and grass but shortage of soil moisture can restrict yield, and timeliness with field work is important to avoid structural damage particularly in spring

Developed by Cranfield University and sponsored by DEFRA
For more detailed soil information visit Soil Site Reporter For soils education visit soil-net.com

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Soilscapes

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Descriptions of the full range of soilscapes are available below. For a full soils guide, including detailed descriptions of soil types and associations, please visit the LandIS Soils Guide.

ID	Description
1	Saltmarsh soils
2	Shallow very acid peaty soils over rock
3	Shallow lime-rich soils over chalk or limestone
4	Sand dune soils
5	Freely draining lime-rich loamy soils
6	Freely draining slightly acid loamy soils
7	Freely draining slightly acid but base-rich soils
8	Slightly acid loamy and clayey soils with impeded drainage
9	Lime-rich loamy and clayey soils with impeded drainage
10	Freely draining slightly acid sandy soils
11	Freely draining sandy Breckland soils
12	Freely draining floodplain soils
13	Freely draining acid loamy soils over rock
14	Freely draining very acid sandy and loamy soils
15	Naturally wet very acid sandy and loamy soils
16	Very acid loamy upland soils with a wet peaty surface
17	Slowly permeable seasonally wet acid loamy and clayey soils
18	Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils
19	Slowly permeable wet very acid upland soils with a peaty surface
20	Loamy and clayey floodplain soils with naturally high groundwater
21	Loamy and clayey soils of coastal flats with naturally high groundwater
22	Loamy soils with naturally high groundwater
23	Loamy and sandy soils with naturally high groundwater and a peaty surface
24	Restored soils mostly from quarry and opencast spoil
25	Blanket bog peat soils
26	Raised bog peat soils
27	Fen peat soils

Soilscape description:
Lime-rich loamy and clayey soils with impeded drainage

Texture:
Clayey, some loamy

Coverage:
England: 5.3% Wales: 0% England &Wales: 4.5%

Drainage:
Slightly impeded drainage

Fertility:
High

Habitats:
Base-rich pastures and classic chalky boulder clay ancient woodlands; some wetter areas and lime-rich flush vegetation

Landcover:
Arable some grassland

Carbon:
Low

Drains to:
Stream network

Water protection:
Land is drained and nitrate vulnerable; potential for rapid pollutant transport; surface capping can trigger sheet erosion of fine sediment to stream network

General cropping:
Suited to autumn sown crops and grass but shortage of soil moisture can restrict yield, and timeliness with field work is important to avoid structural damage particularly in spring

Developed by Cranfield University and sponsored by DEFRA
For more detailed soil information visit Soil Site Reporter For soils education visit soil-net.com

Norwest Holst Soil Engineering Ltd.

Borehole No. **1**

TL5NW 916

BOREHOLE LOG

Contract No. F9081
Location Schlumberger, Cambridge
Client Buro Happold
Method of Boring Cable Percussion
Diameter of Borehole 150mm

4227
5906

Sheet 1 of 2
Chainage
Ground Level 21.27 m.A.O.D.
Date 27/2/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Firm yellowish brown silty CLAY with a little fine rounded gravel.		0.30	20.97		0.00-0.10 0.30-0.40 0.50-0.70 (55)		
Soft to firm dark grey silty CLAY with a little fine to medium sub-rounded to rounded gravel.		0.70 1.00	20.57 20.27		0.70-0.80 1.00-1.10		
Firm to stiff light brown mottled grey white sandy CLAY with some fine rounded gravel.		1.60	19.67		1.50-1.95 s	"8"	
Soft to firm orange brown very sandy CLAY with much fine to medium rounded and a little coarse sub-angular to sub-rounded gravel.					2.50-2.80 (85) 2.80-2.90		
Stiff blue grey fissured silty CLAY.					3.50-3.95 s	"14"	
					4.50-4.90 (90) 4.90-5.00		
					6.00-6.45 s	"18"	
					7.10-7.20		
					7.50-7.90 (90) 7.90-8.00		
					9.00-9.45 s	"28"	

Type of Sample

Is S.P.T. ■ Undisturbed
Ic C.P.T. X Vane
0 Jar △ Water
● Bulk ▮ Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blows

Groundwater: Not encountered during drilling.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

Norwest Holst Soil Engineering Ltd.

Borehole No. **2**

TL45NW197

BOREHOLE LOG

Contract No. F9081
Location Schlumberger Cambridge
Client Buro Happold
Method of Boring Cable Percussion
Diameter of Borehole 150mm

4224
5908

Sheet 1 of 2
Chainage
Ground Level 21.16 m.A.O.D.
Date 28/2/91

Description of Strata	Legend	Depth Below G.L.(m)	O.D. Level (m)	Casing Depth at Sampling	Sampling and Coring	"N"/ R.Q.D.%	Daily Progress
Firm brownish grey silty CLAY with a little fine rounded gravel.		0.30	20.86		0.00-0.10 0.30-0.40		
Firm to stiff grey brown silty slightly sandy CLAY with a little fine to coarse sub-angular to sub-rounded gravel.		1.20 1.40	19.96 19.76		1.00-1.20 (60) 1.20-1.30 1.40-1.50		
Soft to firm orange brown very sandy CLAY with much fine to medium subrounded to rounded gravel.		2.10	19.06		1.50-1.95 S	"8"	
Firm blue grey mottled light grey sandy CLAY with a little subangular gravel of chalk.					2.50-2.80 (75) 2.80-2.90		
Stiff blue grey fissured silty CLAY					3.50-3.95 S	"17"	
					4.50-4.90 (80) 4.90-5.00		
					6.00-6.45 S	"17"	
					7.50-7.80 (85) 7.80-7.90		
					9.00-9.45 S	"26"	

Type of Sample

Is S.P.T. ■ Undisturbed
Ic C.P.T. X Vane
0 Jar △ Water
● Bulk ▮ Piezometer

Remarks (Observations of Ground Water etc.) ( ) U100 Blows.

Water levels are subject to seasonal or tidal variations and should not be taken as constant

TL45NW 198

Norwest Holst Soil Engineering Ltd.

Trial Pit No. **5**

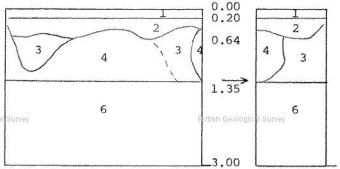
4227
5904

TRIAL PIT LOG

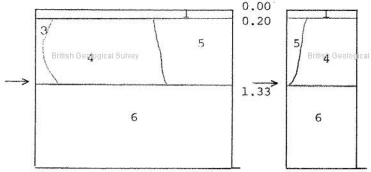
Contract No. P9081
Location Schlumberger, Cambridge
Client Buro Hapold
Excavation Plant JCB 3CX, Site Master
Dimensions (l x b x h) 2.00 x 1.00 x 3.00m

Chainage
Ground Level 21.10 m.A.O.D.
Date 8/3/91

ELEVATIONS:—

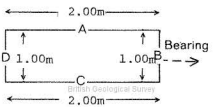


SIDE A SIDE B



SIDE C SIDE D

PLAN (Not to scale)



SAMPLES

No. & Type	Depth m.
D1	0.50
B1	0.85
D2	0.70
W1	1.09
B2	2.20

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m²
1	0.00 0.20	Topsoil.	0.46m 13.2
2	0.20 0.64	Soft light brown slightly sandy CLAY with a little fine to coarse angular gravel of flint.	13.5 10.1 14.4
3	0.64 1.35	Soft light grey CLAY with a little, locally same, fine, predominantly medium, rounded gravel of chalk and with some rootlets and rootways.	0.77m 13.5 12.8 19.5
4	0.64 1.35	Compact light orangish brown clayey fine to coarse SAND and fine to coarse angular to rounded GRAVEL of flint, and quartzite.	0.63m 9.16
5	0.20 1.35	Firm orangish brown sandy CLAY, with a little fine to coarse angular to rounded gravel of flint, quartzite and iron deposits.	13.5 10.3
6	1.35 3.00	Firm to stiff grey and grey brown mottled CLAY. 1.35-1.70m ... with a little fine to medium gravel sized rounded gravel of chalk. From 1.70m...becoming dark grey, closely fissured CLAY with occasional root systems on fissures.	

NOTES Cv/Cp: Approximate value of undrained shear strength from hand vane/penetrometer
Groundwater: Slight seepage from sand and gravel pockets / lenses at 1.09m
Pumping: Not required.
Supports/Stability: Spalling from sand and gravel lenses / shoring absent.

TL45NW 199

Norwest Holst Soil Engineering Ltd.

Trial Pit No. **6**

Contract No. F9081

TRIAL PIT LOG

4227
5908

Location Schlumberger Cambridge

Client Buro Hapold

Chainage .....

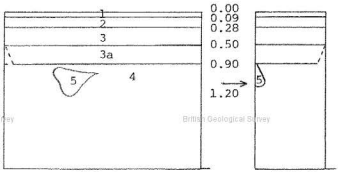
Excavation Plant JCB 3CX Sitemaster

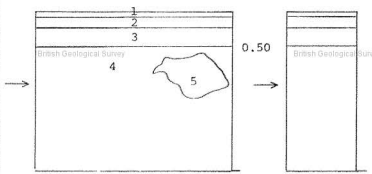
Ground Level ..21.02.... m.A.O.D.

Dimensions (l x b x h) 2.00 x 1.00 x 3.00m

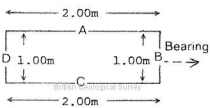
Date .....11/3/91.....

ELEVATIONS





PLAN (Not to scale)



SAMPLES

No. & Type	Depth m.
B1, D1	0.50
B2, D2	1.00
D3	1.00*
B3	1.20
B4, D4	2.00
B5, D5	3.00
W1	1.20

* Sample taken in strata (3a)

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m²
1	0.00-0.09	Topsoil.	1.00m 78 86 57
2	0.09-0.28	MADE GROUND: Red and brown fine to coarse sand with much fine to coarse gravel sized brick fragments, concrete and felt-like geomembrane.	96 67 88 71
3	0.28-0.50	Firm to stiff brown sandy CLAY with some fine to coarse angular gravel of flint, quartzite and iron deposits.	2.50m 98
3a	0.50-0.90	Soft to firm brown slightly sandy CLAY with some fine to coarse angular gravel of flint and iron deposits.	113 97 93
4	0.50-3.00	Stiff, grey, occasionally light brown mottled CLAY. 0.50-1.70m ... with a little fine gravel sized chalk fragments closely fissured. from 1.70m ... with occasional dark reddish brown root systems along fissures and with occasional up to coarse gravel sized pockets of soft orange brown clay.	3.00m 98 113 108 93

NOTES Cv/Cp Approximate value of undrained shear strength from hand vane/penetrometer

Groundwater: Slight seepages from gravel horizons i.e. strata (5)

Pumping: Absent

Supports/Stability: Spalling of pit sides from gravel lenses.

TL45NW 200

Norwest Holst Soil Engineering Ltd.

Trial Pit No. **7**

Contract No. F9081
Location Schlumberger Cambridge
Client Buro Hapold
Excavation Plant JCB 3CX, Sitemaster
Dimensions (l x b x h) 2.00 x 1.00 x 3.00m

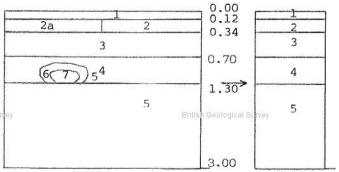
TRIAL PIT LOG

4225
5908

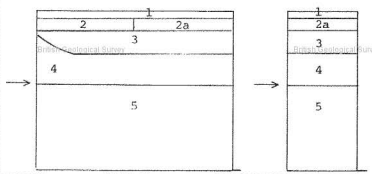
Chainage
Ground Level 21.08 m.A.O.D.
Date 11/3/91

Sheet 1 of 2

ELEVATIONS:-

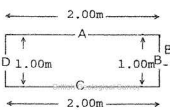


SIDE A SIDE B



SIDE C SIDE D

PLAN (Not to scale)



SAMPLES

No. & Type	Depth m.
B1,D1	0.70
B2	1.00
B3,D2	2.00
B4	3.00

No.	Depth m.	STRATA DESCRIPTION	Cv/Cp kN/m²
(1)	0.00-0.12	Topsoil.	0.70m strata 3
(2)	0.12-0.34	MADE GROUND: Compact reddish brown clayey very sandy fine to coarse gravel of brick fragments, concrete.	72 72 67 72
(3)	0.12-0.34	MADE GROUND: Firm brown clay with a little fine to coarse angular gravel of brick fragments.	1.30m 88 88 88 93
(3)	0.34-0.70	Firm to stiff orangish brown slightly sandy CLAY with a little fine to coarse angular gravel of flint.	88 2.00m 99 95 93
(4)	0.70-1.30	Firm to stiff brownish grey CLAY with a little fine to coarse angular gravel of flint.	88 96
(6)	0.70-1.30	Firm orangish brown slightly sandy to sandy much fine to coarse angular to rounded gravel of flint quartzite and chalk.	2.50m 98 95
(7)	0.80-1.30	Compact orangish brown clayey very sandy fine to coarse angular to rounded GRAVEL.	93 93 95

NOTES Cv/Cp Approximate value of undrained shear strength from hand vane/penetrometer
Groundwater: Very slight seepage from sand and gravel lenses
Pumping: Not required
Supports/Stability: Spalling from sand and gravel lenses.

TL45 NW 4220, 5901 187

IGES	19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax:01926 851394	Job No. 6769	Site : CADCENTRE, CAMBRIDGE. Client : YORKON LIMITED. Engineer :	BOREHOLE LOG BH 1 Sheet 1 of 1
Method: Endrive Hand System.		Date: 27/04/98	Drilling Crew: Dametre Drilling. Logged By: BW	Scale: 1:25
Dia (mm): 100	Coord:	Ground Level m.:		

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
							Turf over TOPSOIL.	
						0.20		
	0.50	P		75			Firm to stiff grey brown silty CLAY with rare fine chalk and flint gravel.	
	0.75	D						
	0.80	P		85				
	0.90	P		85				
	1.00	D&P		110			- becoming stiff from 1.0m bgl.	
	1.50	D&P		125				
	2.00	P		200		2.00	Very stiff grey mottled brown quickly becoming grey silty CLAY.	
	2.25	D						
	2.50	P		175				
27/04/98						3.00		

3176/
TL45NW

Remarks

1/ Groundwater was not encountered.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks

TL 45 NW 4220, 5902 188

IGES	19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax:01926 851394	Job No. 6769	Site : CADCENTRE, CAMBRIDGE. Client : YORKON LIMITED. Engineer :

BOREHOLE LOG BH 2 Sheet 1 of 1

Method	Date	Drilling Crew	Logged By	Scale
Endrive Hand System.	27/04/98	Danetre Drilling.	BW	1:25

Dia (mm) 100 | Coord | Ground Level m.

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
							Turf over TOPSOIL.	
						0.20	Pea Gravel (French Drain). MADE GROUND.	
			▽					
	0.60	P		110		0.60	Stiff grey brown silty CLAY with occasional fine chalk and flint gravel.	
	0.70	P		125				
	0.80	D						
						1.00	Very stiff grey mottled brown quickly becoming grey silty CLAY.	
	1.10	D&P		150				
	1.50	P		150				
	1.75	D						
	2.00	P		160		2.00		
27/04/98								

Remarks

GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks
0.50				water from French Drain.

TL 45 NW 4718 5903 189

IGES	19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax:01926 851394	Job No. 6769	Site : CADCENTRE, CAMBRIDGE. Client : YORKON LIMITED. Engineer :	BOREHOLE LOG BH 3 Sheet 1 of 1

Method	Date	Drilling Crew	Logged By	Scale
Endrive Hand System.	27/04/98	Danetre Drilling.	BW	1:25

Dia (mm)	Coord	Ground Level m.
100		

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
							Turf over TOPSOIL.	
						0.20		
							Firm to stiff grey brown silty CLAY with rare fine chalk and flint gravel and occasional rootlets.	
	0.50	P		75		0.50		
							Stiff grey mottled brown silty CLAY with occasional rootlets in upper surface.	
	0.70	D						
	0.75	P		110				
	0.90	P		125				
	1.00	P		150				
							- becoming dark grey and very stiff from 1.00m bgl.	
	1.25	D						
	1.50	P		125				
	1.75	D						
	2.00	P		160				
	2.50	D&P		150				
27/04/98	3.00	P		175		3.00		

Remarks

1/ Groundwater was not encountered.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks

TL 45 NW 4219 5902 190

British Geological Survey **IGES** 19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax:01926 851394	Job No. **6769**	Site : CADCENTRE, CAMBRIDGE. Client : YORKON LIMITED. Engineer :		**BOREHOLE LOG** **BH 4** Sheet 1 of 1
Method Endrive Hand System.	Date 27/04/98	Drilling Crew Danetre Drilling.	Logged By BW	Scale 1:25
Dia (mm) 100	Coord	Ground Level m.		

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
							Turf over TOPSOIL.	
						0.50		
	0.70	P		200			Very stiff grey brown silty CLAY with rare fine to medium flint and chalk gravel.	
27/04/98						1.00		

Remarks

1/ Groundwater was not encountered.

GROUNDWATER				
Struck	Cased	20 mins	Sealed	Remarks

TL45 NW 4219/5901 191

IGES	19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax: 01926 851394	Job No. 6769	Site : CADCENTRE, CAMBRIDGE. Client : YORKON LIMITED. Engineer :	BOREHOLE LOG BH 5 Sheet 1 of 1

Method	Date	Drilling Crew	Logged By	Scale
Endrive Hand System.	27/04/98	Dametre Drilling.	BW	1:25

Dia (mm) 100 | Coord | Ground Level m.

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
							Turf over TOPSOIL.	
						0.20	Brown silty fine to coarse sand. MADE GROUND.	
	0.50	D&P		85		0.40	Firm to stiff grey brown silty CLAY with rare fine chalk and flint gravel.	
	0.75	P		100		0.60	Stiff becoming very stiff grey mottled brown quickly becoming grey silty CLAY with rare rootlets in upper surface.	
	0.90	P		160				
	1.00	D&P		185				
	1.50	D&P		175				
	1.75	P		185				
27/04/98						2.00		

Remarks

1/ Groundwater was not encountered.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks

TL 45 NW 4214 / 5903 192

IGES	19 Talisman Square, KENILWORTH, CV8 1JB. Tel: 01926 851113 Fax: 01926 851394	Job No. 6769	Site : CADCENTRE, CAMBRIDGE. Client : YORKON LIMITED. Engineer :	BOREHOLE LOG BH 6 Sheet 1 of 1

Method	Date	Drilling Crew	Logged By	Scale
Endrive Rand System.	27/04/98	Danetre Drilling.	BW	1:25

Dia (mm) 100 | Coord | Ground Level m.

Date & Casing Depth	Depth m.	Sample Type	Water Level	SPT N or Cu	M/C %	Depth m.	Description of Strata	Legend
							Turf over TOPSOIL.	
						0.20		
	0.40	D					Soft silty sandy clay with occasional fine to coarse mixed gravel. MADE GROUND.	
						0.60		
	0.70	P		125			Stiff becoming very stiff grey brown silty CLAY with rare chalk and flint gravel.	
	0.80	P		175				
	0.90	P		125				
	1.00	D&P		150				
	1.50	P		175				
	2.00	P		175				
						2.20		
27/04/98								

Remarks

1/ Groundwater was not encountered.

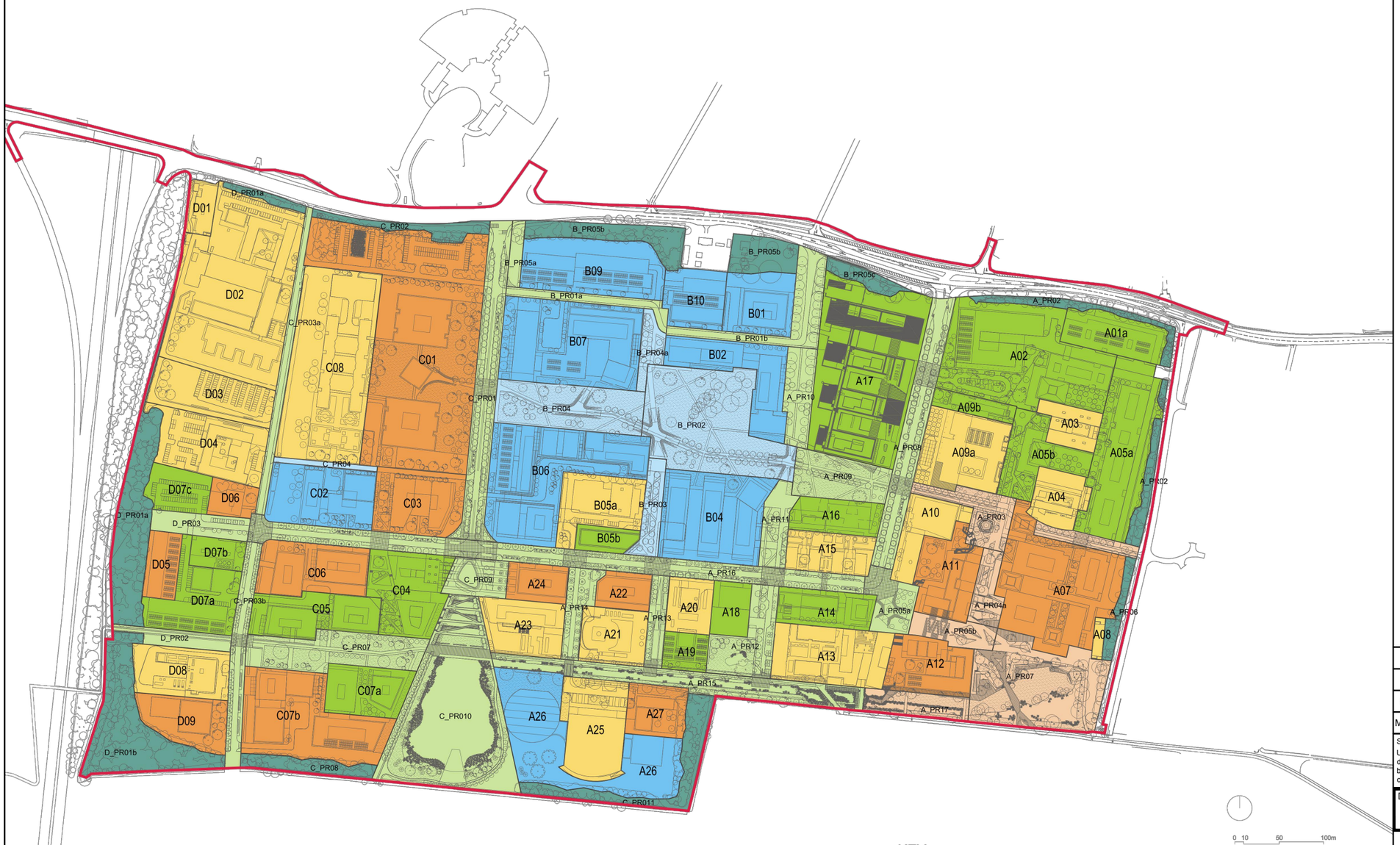
GROUNDWATER

Struck	Cased	20 mins	Sealed	Remarks

Appendix H Illustrative Development Land Use Schedule

	TOTAL GEA [m2]	Non-residential Institutions (D1) GEA					Commercial Research (B1) GEA			Assembly and Leisure (D2)	Multi Storey Car Parks	Cycling Facilities	Sui Generis	Population				Car Parking Requirements
		Departmental	Teaching and meeting shared	Cafes and restaurants shared	Nursery	TOTAL D1 [m2]	Work space	Restaurants and Cafes	TOTAL					Students	Uni. Staff	Comm. Staff	TOTAL	
EXISTING (including buildings to be demolished and Roger Needham)	153,869	110,345	0	554	649	111,548	34,286	0	34,286	6,060	0	0	1,975	2,775	1,514	1,006	5,295	1,028
BUILT IN PHASE 1	177,364	77,140	6,200	800	0	84,140	50,670	2,274	52,944	0	31,780	2,850	2,700	1,893	1,069	2,536	5,498	1,589
BUILT IN PHASE 2	177,846	76,625	12,247	4,986	1,000	94,858	47,700	700	48,400	0	30,788	1,710	2,000	2,015	1,084	1,987	5,086	1,143
BUILT IN PHASE 3	99,307	17,480	0	720	0	18,200	53,882	1,297	55,179	4,060	21,868	0	0	583	291	2,695	3,569	849
TOTAL EXISTING + BUILT	608,386	281,590	18,447	7,060	1,649	308,746	186,538	4,271	190,809	10,120	84,436	4,560	6,675	7,266	3,959	8,224	19,448	4,609
TOTAL PHASE 3 = EXISTING + BUILT - DEMOLISHED	559,196	232,400	18,447	7,060	1,649	259,556	186,538	4,271	190,809	10,120	84,436	4,560	6,675	6,175	3,350	8,224	17,748	4,414
CUMMULATIVE PHASE 1 (existing + built - demolished)	301,693	157,945	6,200	1,354	649	166,148	84,956	2,274	87,230	6,060	31,780	2,850	4,675	3,866	2,180	3,542	9,588	2,505
CUMMULATIVE PHASE 2 (existing + built - demolished)	459,889	214,920	18,447	6,340	1,649	241,356	132,656	2,974	135,630	6,060	62,568	4,560	6,675	5,592	3,058	5,529	14,179	3,566
CUMMULATIVE PHASE 3 (existing + built - demolished)	559,196	232,400	18,447	7,060	1,649	259,556	186,538	4,271	190,809	10,120	84,436	4,560	6,675	6,175	3,350	8,224	17,748	4,414

Appendix I Illustrative Development Plot Plan



KEY:

- APPLICATION SITE BOUNDARY
- PHASE 1
- PHASE 2
- PHASE 3
- NO WORKS
- PUBLIC REALM PHASE 1
- PUBLIC REALM PHASE 2
- PUBLIC REALM PHASE 3
- PUBLIC REALM NO WORKS
- WOODLAND

WEST CAMBRIDGE_DRAFT PLOT PLAN INCLUDING PUBLIC REALM
with Development Schedule Version 9
Scale 1:2000@A1
AECOM, March 2017

NOTES

1. ALL DIMENSIONS ARE IN MILLIMETRES UNLESS NOTED OTHERWISE.
2. ALL LEVELS ARE IN METRES RELATIVE TO ORDNANCE DATUM NEWLYN UNLESS NOTED OTHERWISE.
3. ALL COORDINATES ARE IN METRES RELATIVE TO ORDNANCE SURVEY NATIONAL GRID.
4. THE CONTRACTOR IS TO VERIFY ALL DIMENSIONS ON SITE BEFORE COMMENCING WORK OR PREPARING SHOP DRAWINGS.
5. THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL ENGINEERS AND ARCHITECTS DRAWINGS AND SPECIFICATIONS.

Mark	Revision	Date	Drawn	Chkd	Appd
P1	MASTERPLAN, LANDSCAPING & PLOT BOUNDARIES AMENDED	23.06.17	GC	ST	ST

SCALING NOTE: Do not scale from this drawing. If in doubt, ask.

UTILITIES NOTE: The position of any existing public or private sewers, utility services, plant or apparatus shown on this drawing is believed to be correct, but no warranty to this is expressed or implied. Other such plant or apparatus may also be present but not shown. The Contractor is therefore advised to undertake their own investigation where the presence of any existing sewers, services, plant or apparatus may affect their operations.

Drawing Issue Status
PRELIMINARY

WEST CAMBRIDGE

ILLUSTRATIVE DEVELOPMENT PLOT PLAN

Client
UNIVERSITY OF CAMBRIDGE

Date of 1st Issue	Designed	Drawn
02.05.2017	-	GC
A3 Scale	Checked	Approved
NTS	ST	ST
Drawing Number		Revision
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Appendix J Extracts from the South Cambridgeshire District Council's Strategic Flood Risk Assessment (SFRA) and Anglian Water Flood History & Cambridgeshire County Council Flood Report

KEY

- South Cambridgeshire DC & Cambridge City Council Boundaries
- Low Potential for Infiltration
- Uncertain Potential for Infiltration
- High Potential for Infiltration

NOTES

1. This drawing looks at the infiltration potential within the South Cambridgeshire and Cambridge City Boundaries. SuDS hierarchy must be applied to all potential developments. Intrusive ground investigations to determine the viability of infiltration must still be undertaken as part of a site specific FRA. Should infiltration devices prove to be unviable based on intrusive ground investigations and BRE 365 Soakage Tests then alternative SuDS should be used.

2. In areas with potential infiltration, reference should be made to the location of the various Source Protection Zones, as shown in Appendix C.

3. This plan has been produced using information transcribed from the British Geological Survey; Solid and Drift Editions 204, 205, 206, 187, 188, and 189.

4. This plan should be read in conjunction with Section 8 of the Cambridge City and South Cambridgeshire SFRA.

OAKINGTON
IMPINGTON
HISTON
MILTON
GIRTON
MADINGLEY
CAMBRIDGE
TRUMPINGTON
GREAT SHELFORD
LITTLE SHELFORD
HARSTON

0 0.5 1 1.5 2 Kilometres

SCALE: 1:45,000

1 2 3 4 5

WSP

TITLE:

SOUTH CAMBRIDGESHIRE DC AND CAMBRIDGE CITY COUNCIL LEVEL 1 SFRA

FIGURE No:

SUDS INFILTRATION FEASIBILITY PLAN
1402 - C - 2.5

Date Modified: 22/09/2010

Drawn By: ukdid001

File: Q:\WSP_UK\WSP_D\Hertford\Cambridge SFRA\Cambridgeshire SFRA 2\DRAWINGS\C2.5 Suds Infiltration Feasibility.mxd