

Environmental Statement: Volume 6, Annex 1.1 – Borehole Logs

Date: May 2018





Hornsea Project Three

Offshore Wind Farm

PINS Document Reference: A6.6.1.1 APFP Regulation 5(2)(a)





Environmental Impact Assessment

Environmental Statement

Volume 6

Annex 1.1 – Borehole Logs

Liability

This report has been prepared by RPS, with all reasonable skill, care and diligence within the terms of their contract with Orsted Power (UK) Ltd.

Report Number: A6.6.1.1

Version: Final

Date: May 2018

This report is also downloadable from the Hornsea Project Three offshore wind farm website at: <u>www.hornseaproject3.co.uk</u>

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Front cover picture: Kite surfer near a UK offshore wind farm © Orsted Hornsea Project Three (UK) Ltd., 2018.	Approved by: Sophie Banham







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Acronyms

Acronym	Description
BGS	British Geological Survey
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current

Units

Unit	Description
m	Metre (distance)
km	Kilometre (distance)







1. Introduction

1.1 Purpose

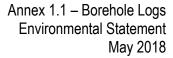
- 1.1.1.1 This annex provides details of all borehole logs within the Hornsea Three geology and ground conditions study area as defined in volume 3, chapter 1: Geology and Ground Conditions.
- 1.1.1.2 Table 1.1 and Figure 1.1 (sheets 1 to 9) confirm the location of these boreholes. The logs of all the boreholes listed in Table 1.1 are provided at Appendix A. The borehole logs were obtained from British Geological Survey (BGS).
- 1.1.1.3 The information presented in this annex has been used to inform the baseline and impact assessment presented in volume 3, chapter 1: Geology and Ground Conditions.

Easting	Northing	Label	BGS reference
610390	343440	R A F Station Weybourne NO 1	TG14SW23
610390	343330	R A F Station Weybourne NO 2	TG14SW24
610390	343250	R A F Station Weybourne NO 3	TG14SW25
610360	343170	R A F Station Weybourne NO 4	TG14SW26
611630	334400	Rifle Range Plumstead	TW13SW19
611300	333200	Great Farm Saxthorpe	TG13SW5
611460	332340	Shrub Farm Saxthorpe	TG13SW17
609980	328780	Red Pit Farm Wood Dalling	TG02NE26
612370	322350	Booton Norfolk	TG12SW1
612260	321620	The Grove Booton	TG12SW27
612030	318780	Hall Road Farm Alderford	TG11NW79
612200	314270	Morton Estate Norfolk 7	TG11SW112
612430	313480	Blackbeck Plantation Ringland	TG11SW12
612710	313300	Morton Estate Norfolk 5	TG11SW114
612800	313300	RW1-Ringland	TG11SW99
612800	313300	RW2-Ringland	TG11SW100

Table 1.1: BGS Borehole Logs.

Easting	Northing	Label	BGS reference
612820	313270	Morton Estate Norfolk 6	TG11SW115
612780	313110	Morton Estate Norfolk 4	TG11SW117
612750	310995	A47 Norwich Southern Bypass 7	TG11SW74
612960	309440	Malvern Marlingford	TG10NW33
613560	309440	Cobbs Grove Plantation Marlingford	TG10NW14
614140	308950	North of Algarsthorpe	TG10NW20
614840	307600	Valley Farm; Marlingford	TG10NW76
614680	307580	Valley Farm Barford ABH	TG10NW45
615780	306650	Glenhaven Little Melton	TG10NE87
615310	306570	Church Farm Little Melton	TG10NE43
616440	305810	Burnthouse Lane Hethersett	TG10NE49
616690	304790	Station Lane Hethersett	TG10SE3
617530	304640	Wymondham-Cringleford 28	TG10SE94
617345	304520	Wymondham-Cringleford 27	TG10SE93
617380	304440	Wymondham-Cringleford 35	TG10SE97
617500	304420	East of Hethersett Station	TG10SE7
620750	303700	A47 Norwich Southern Bypass	TG20SW82
621490	303690	A47 Norwich Southern Bypass 148 (T)	TG20SW91
620986	303665	A47 Norwich Southern Bypass 592	TG20SW127
621460	303660	A47 Norwich Southern Bypass 147	TG20SW90
620870	303650	A47 Norwich Southern Bypass 141 (T)	TG20SW83
621360	303650	A47 Norwich Southern Bypass 146 (T)	TG20SW89
620950	303640	A47 Norwich Southern Bypass 142	TG20SW84
620980	303630	A47 Norwich Southern Bypass 144 A	TG20SW87
621160	303630	A47 Norwich Southern Bypass 145	TG20SW88
620950	303620	A47 Norwich Southern Bypass 143	TG20SW85
620970	303600	A47 Norwich Southern Bypass 144 (T)	TG20SW86
618420	303560	South-West of Hall Farm Intwood	TG10SE11
620640	303280	Sports Ground Swardeston	TG20SW166
620640	303280	Sports Ground Lakenham Hewitt	TG20SW112









Easting	Northing	Label	BGS reference
621360	303180	Near Mangreen Hall Swardeston	TG20SW14
620640	303150	Police House Swardeston	TG20SW55
619570	302330	South-West of Hospital Farm Swardeston	TG10SE18







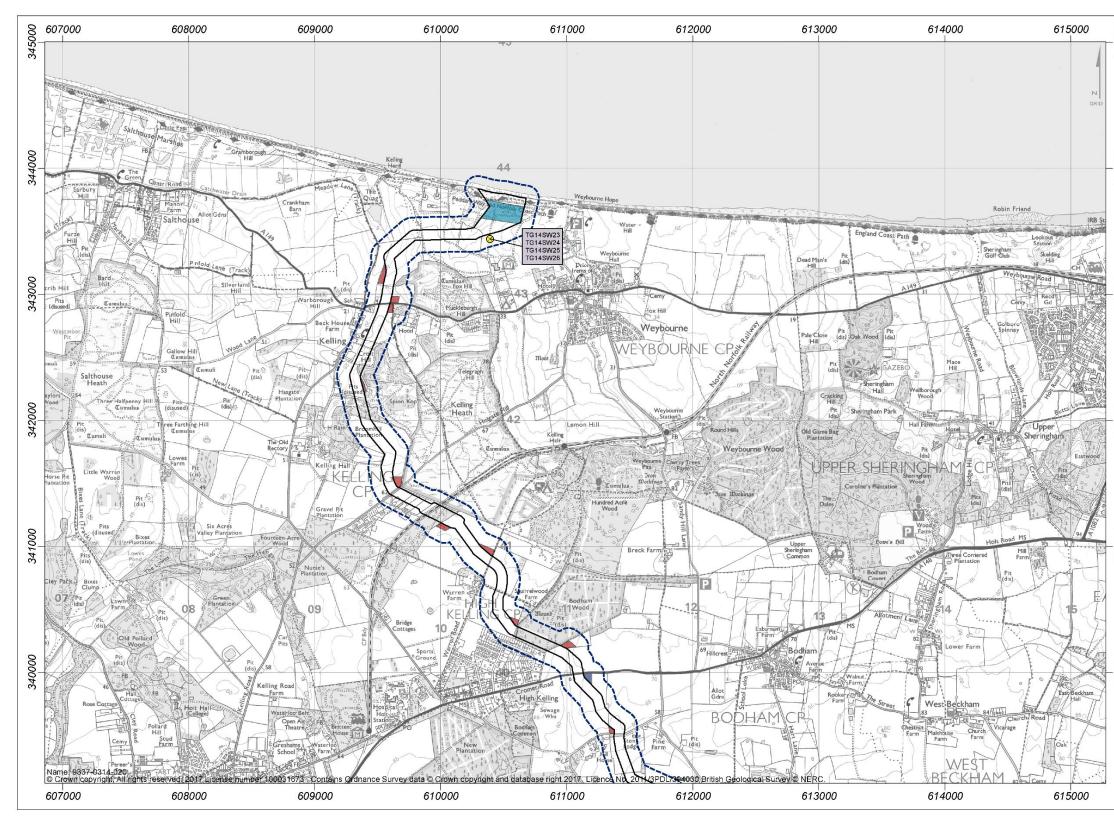


Figure 1.1: BGS Borehole Locations.



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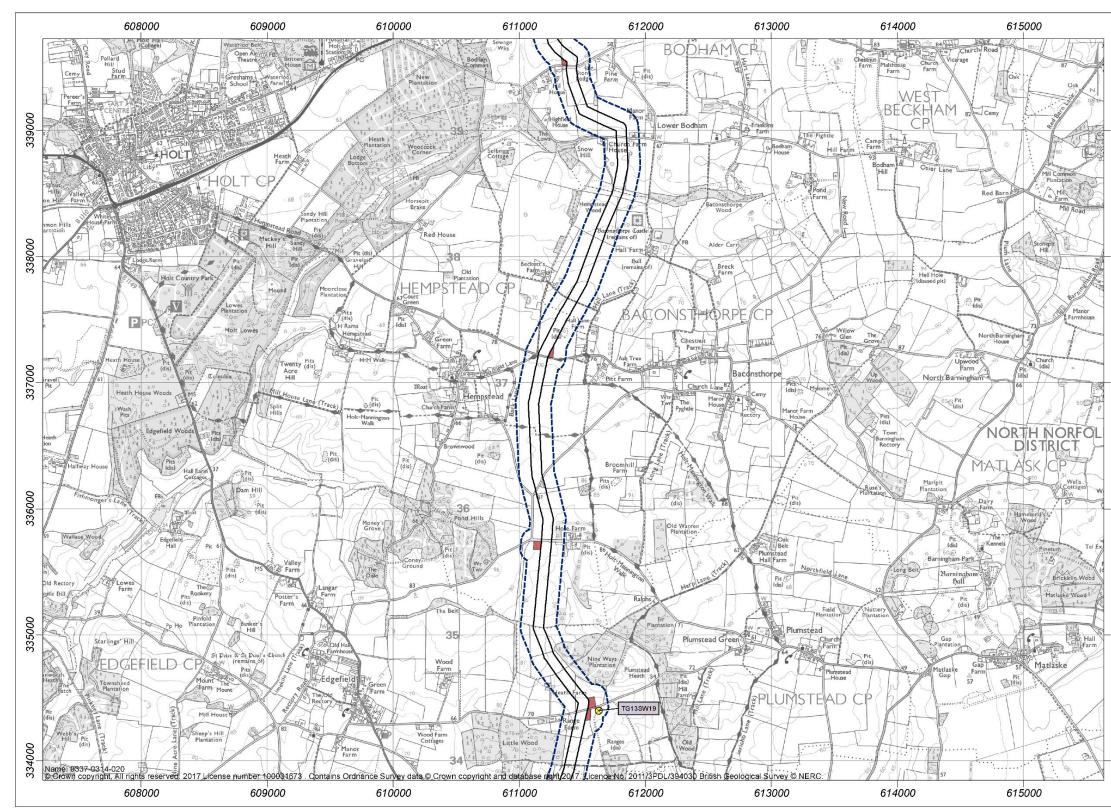


Figure 1.1: BGS Borehole Locations.



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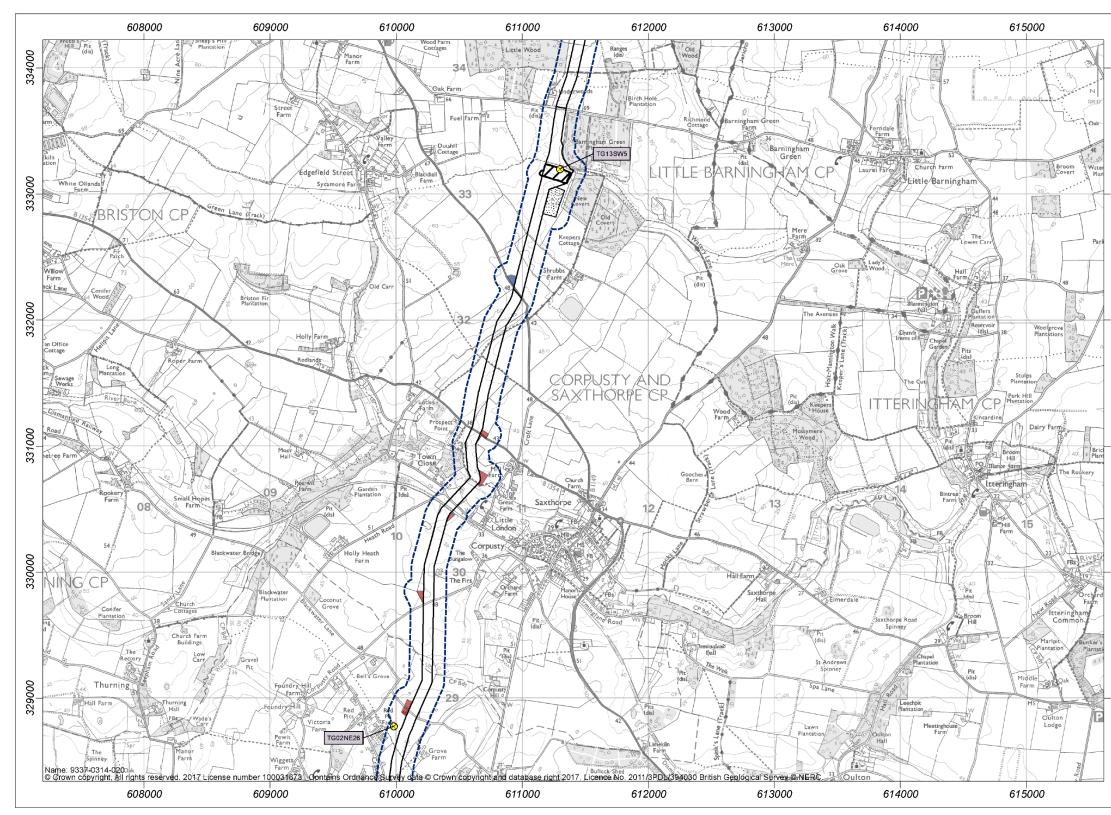


Figure1.1: BGS Borehole Locations.



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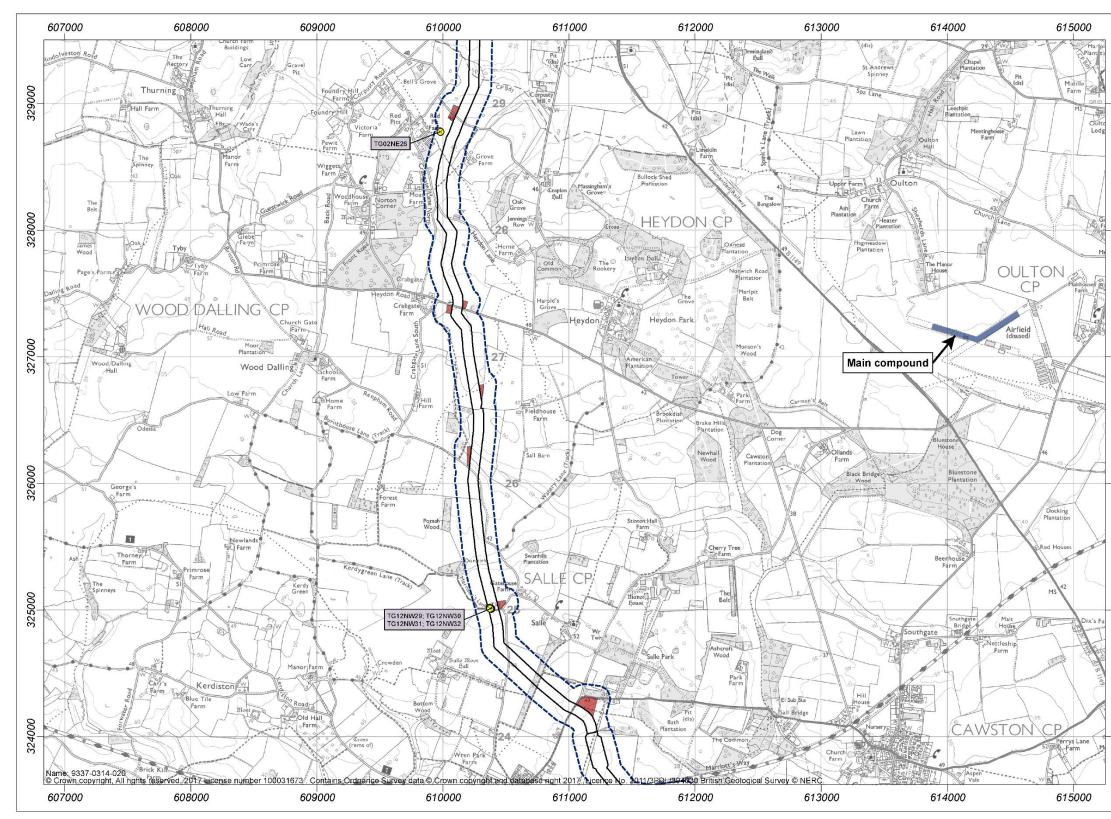


Figure 1.1: BGS Borehole Locations.



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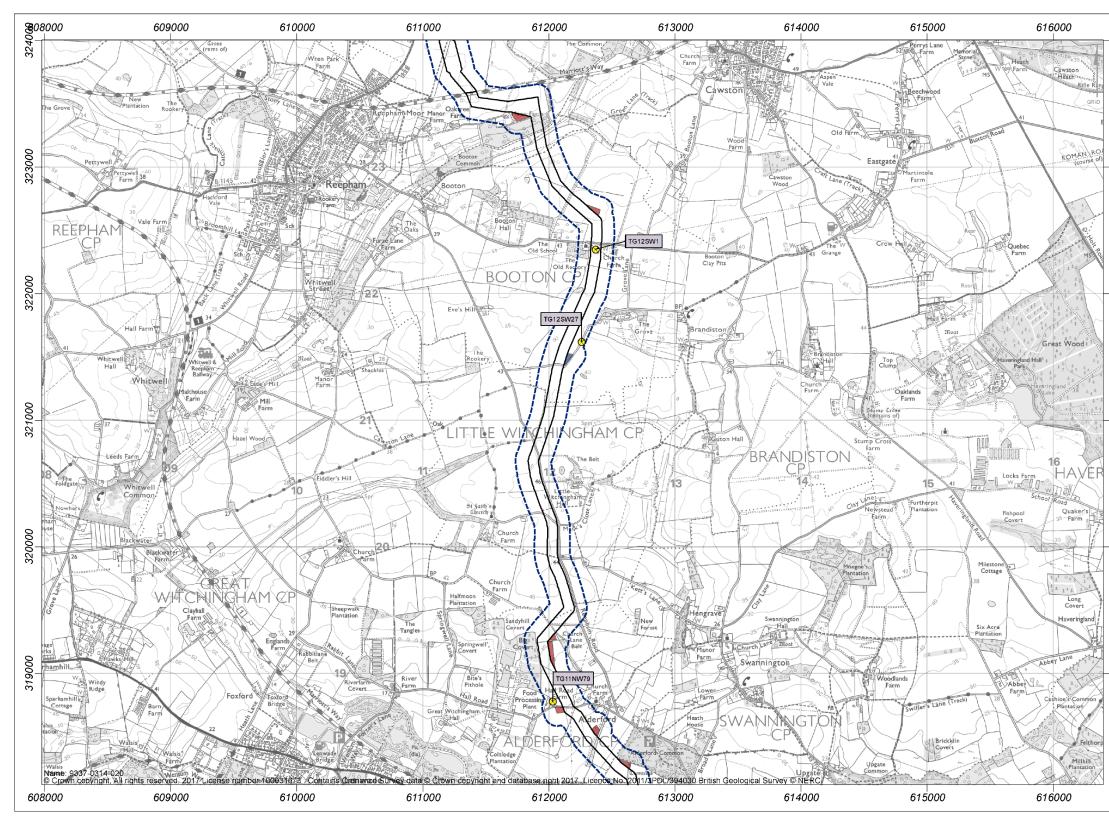


Figure 1.1: BGS Borehole Locations.



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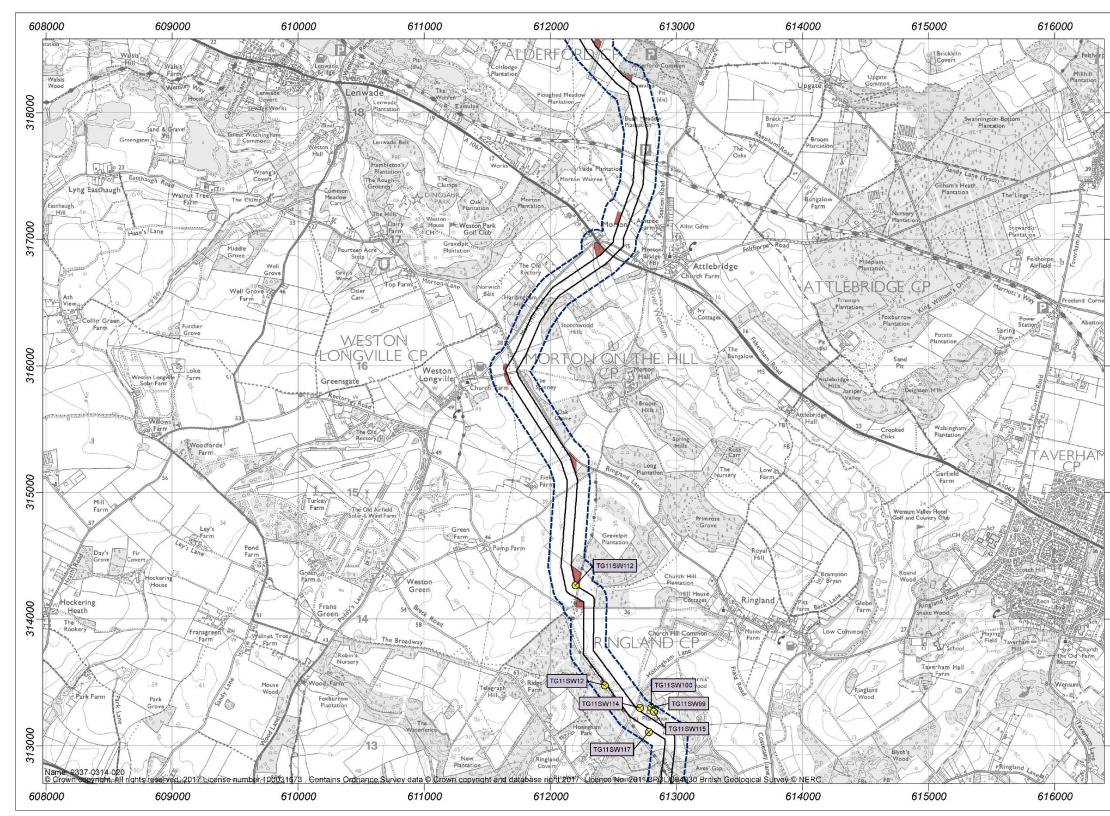


Figure 1.1: BGS Borehole Locations.



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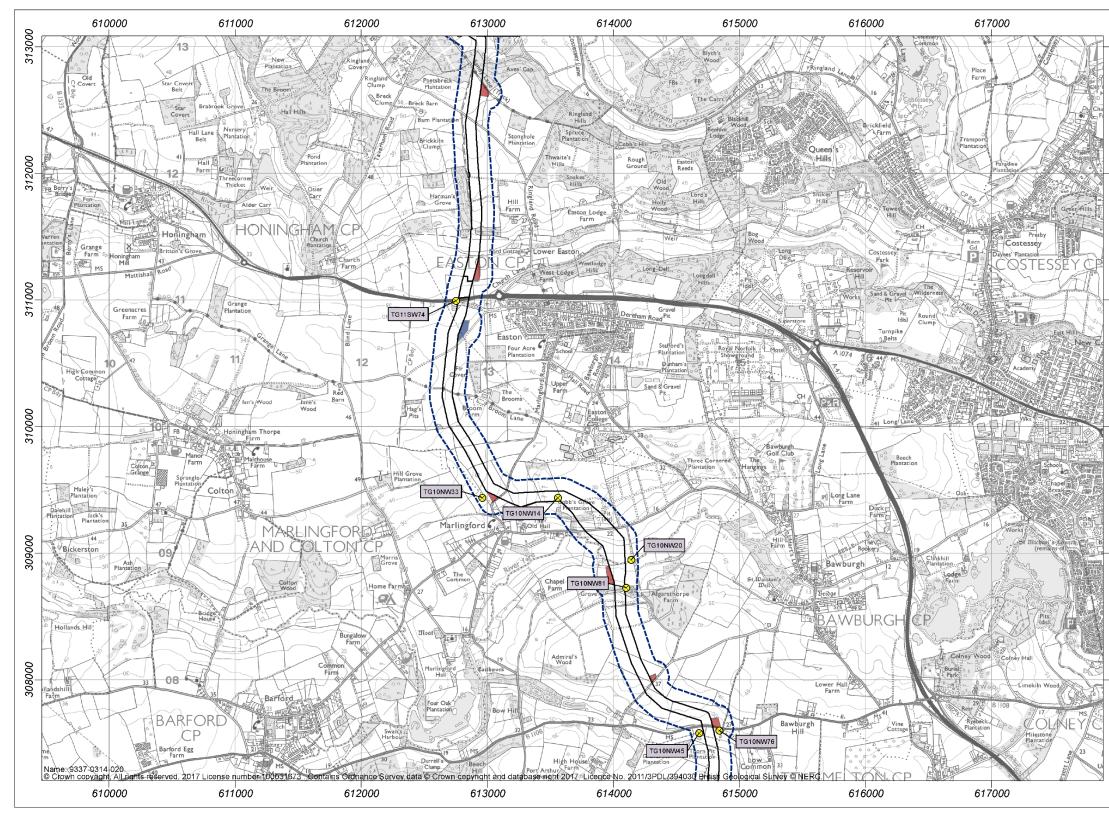


Figure 1.1: BGS Borehole Locations.



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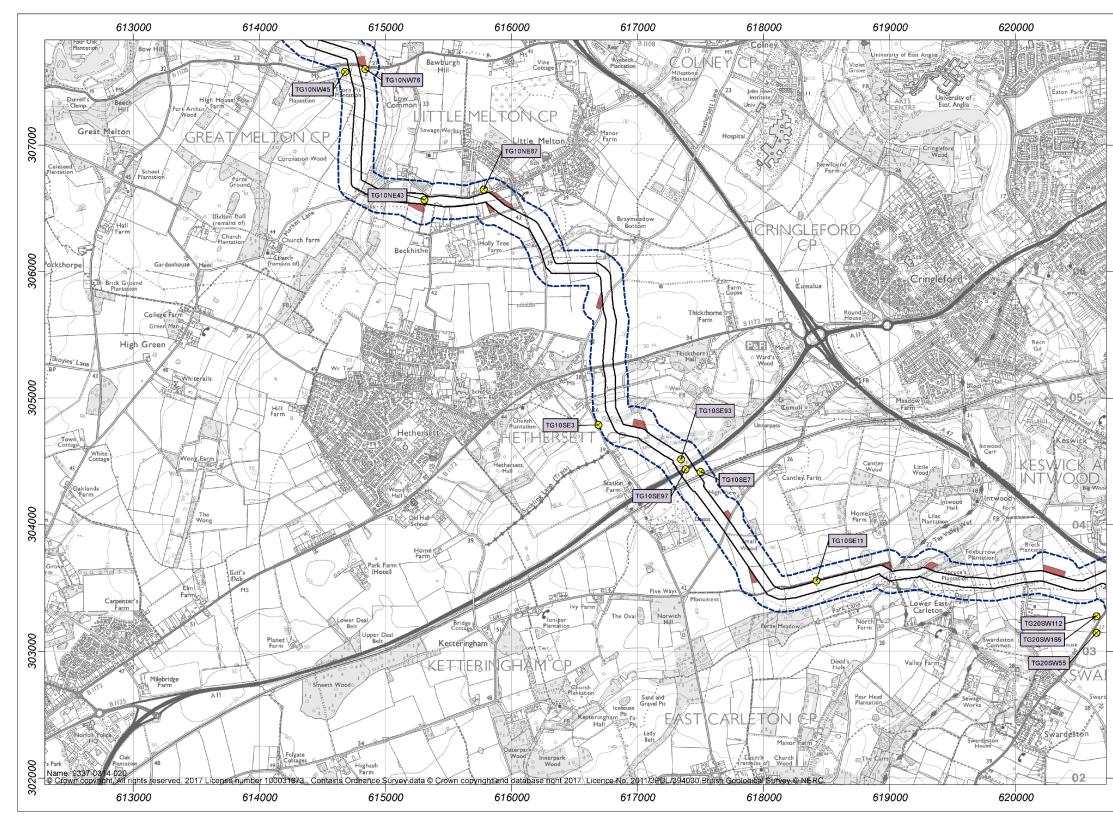


Figure 1.1: BGS Borehole Locations.



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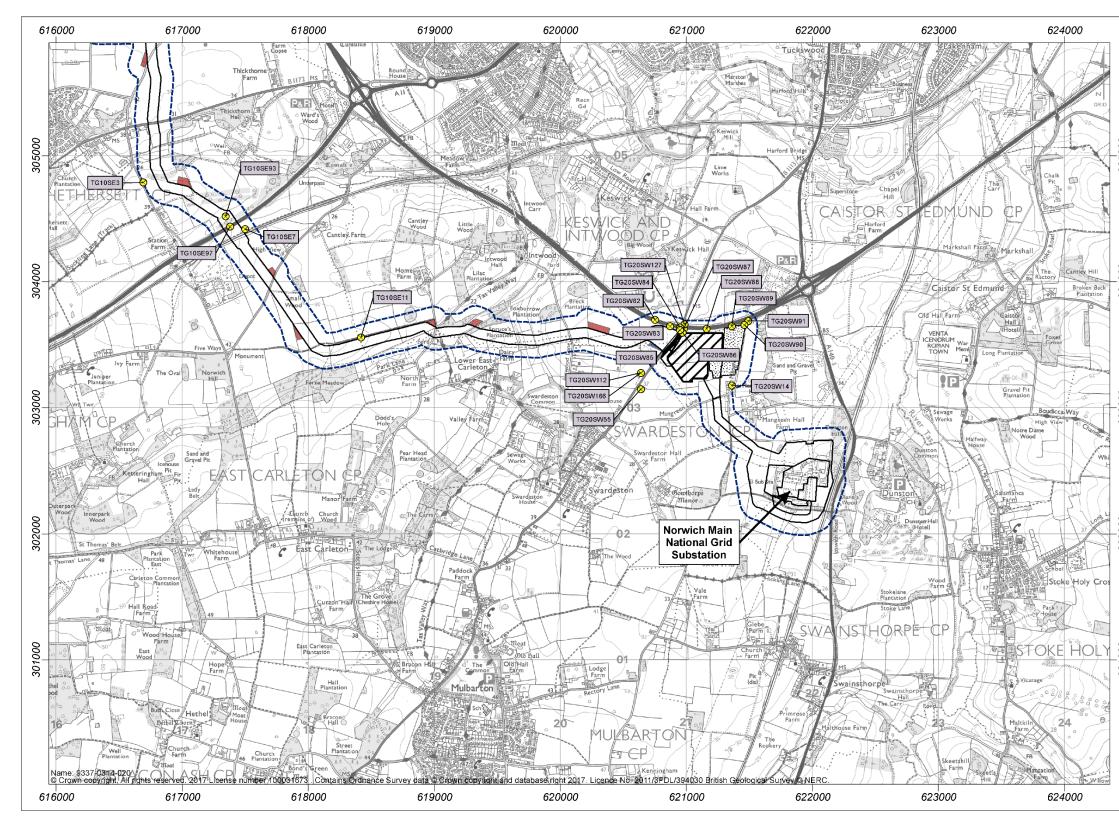


Figure 1.1: BGS Borehole Locations.



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Appendix A Borehole Logs

A.1.1 TG14SW23

British Geological Survey	British Geological Survey	British Geological Survey
British General 1855	British Geological Survey	British Geological Survey
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65 down. Ck - 55. R.W.L.	T39. DUCKINgham, 1987.	9 1039	(4344	
Yield 2,000 g.p.h. (7	2 h. test). Sand entered. 1938. ace +93. Bore 224. Lining tubes: 1	1074 × 6 1	n. Oz -89. 1	R.W.L.
(b) (Disused). Surf +25. Yield 2,350 g.p.h.	Buckingham, 1938. Bore 224. Enting tubes.	1 lo39	4333	
Viold 1 500 g.n.h.	410. 1947. R.W.L. +34%. P.W.L. +21%	4. Yield	2,500 g.p.h.	
Aug. 1953. R.W.L. +34. F	P.W.L. +7. Yield 1,666 g.p.h. Nov.	1956. R.	W.L. +38. P.	W.L.
Viald 2 600 / Oct.	1960.			
(c) (P) Disused). Su	irface +100. Bore 222 x o interior of the survey - o	1039 1039	4325	British Geological Survey
Yield 1,800 g.p.h. (test). Yield 600 g.p.h. Aug	6. 1947.		-	
(d) Surface +100. I	Lining tubes: 153% × 6 in. Ck -22.	Water str	ruck at -40.	R.W.L.
10 R.E. Mar. 1947.	D 79 (036	4517	
Viald 1 200 g.p.h.	Aug. 1947. R.W.L. +32. P.W.L. +194	. Yield 4	4,500 g.p.h.	Uct. 1952.
R.W.L. +38. P.W.L. +19%.	Yield 4,000 g.p.h. Oct. 1960. R. pore 250 × 10 in reduced to 8 in at d	W.L. +44. enth. 1.i	ning tubes: X	15 in
(e) Surface +45. B	x 10 in to 182 ¹ / ₄ ; 76 x 8 in from 1 ¹	74 down (1	perforated).	Ck -73.
Billian Ocological Sarrey	-166 PWT -10 PWL -40 , Res	covered to	0 - 10 m 03 m	
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R.W.L13. P.W.L.	-21. Yield 6,300 g.p.h. Nov. 1956.	R.W.L.	-7½. P.W.L	12%.
Yield 6,000 g.p.h. Oct.	1960.			
(đ)	Topsoil	2	2	
(4)	release -	_		
Boulder Clay	Rubble sandy chalk and flints	8	10	
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British Geological Survey	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones	8	10	British Geological Survey
British Geological Sulvey British Geological Sulvey (Buried channel	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk	8 14 41	10 24	British Geological Survey
British Geological Sulvey British Geological Sulvey (Buried channel	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones	8 14	10 24 65	British Geological Survey
British Geological Sulvey British Geological Sulvey (Buried channel	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints	8 14 41	10 24 65 75 121%	British Geological Survey
British Gelbould Gerry Clay (Buried channel 75	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints Sand (blowing) and gravel	8 14 41 10	10 24 65 75	British Geological Survey
British Ge Boulder Clay (Buried channel 75 Sand and Gravel (Buried channel 47	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints Sand (blowing) and gravel) Flints	8 14 41 10 46%	10 24 65 75 121½ 122	
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British Geological Survey UCk	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints Sand (blowing) and gravel) Flints Britsh Geological Survey Chalk and flints (top 25 ft	8 14 41 10 46% 34	10 24 65 75 1214 122 Brittsh Geological	
British Geological Survey British Geological Survey British Geological Survey UCk 128	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints Sand (blowing) and gravel) Flints Britsh Geological Survey Chalk and flints (top 25 ft very soft)	8 14 41 10 46%	10 24 65 75 121½ 122	
British Geological Survey British Geological Survey British Geological Survey UCk 128	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints Sand (blowing) and gravel) Flints Britsh Geological Survey Chalk and flints (top 25 ft	8 14 41 10 46% 34	10 24 65 75 1214 122 Brittsh Geological	
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British Geological Survey British Geological Survey British Geological Survey UCk 128 PP. W.M. ECLIMAR GEOLOGICAL	Rubble sandy chalk and flints) Sandy chalk flints and stones Grey chalk flints and stones Light brown clay, chalk stones and flints Sand (blowing) and gravel) Flints Britsh Geological Survey Chalk and flints (top 25 ft very soft)	8 14 41 10 46% 34	10 24 65 75 121½ 122 British Geological 250	Survey
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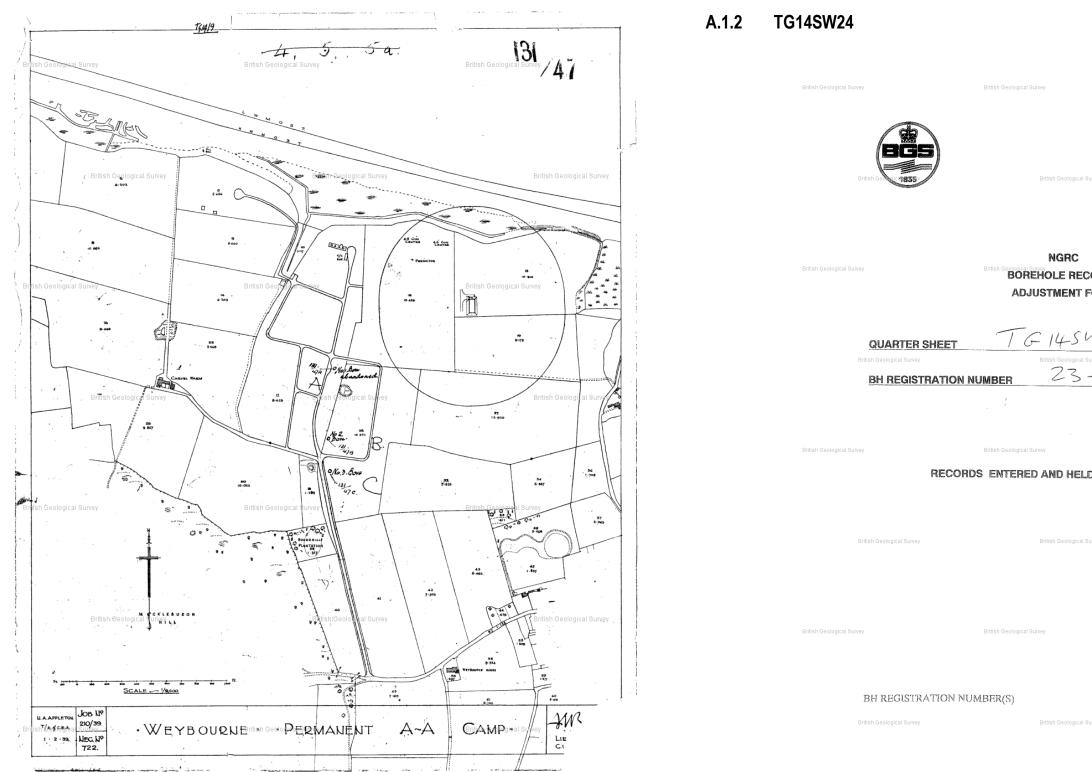


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Hornsea 3 Offshore Wind Farm





Annex 1.1 – Borehole Logs Environmental Statement May 2018

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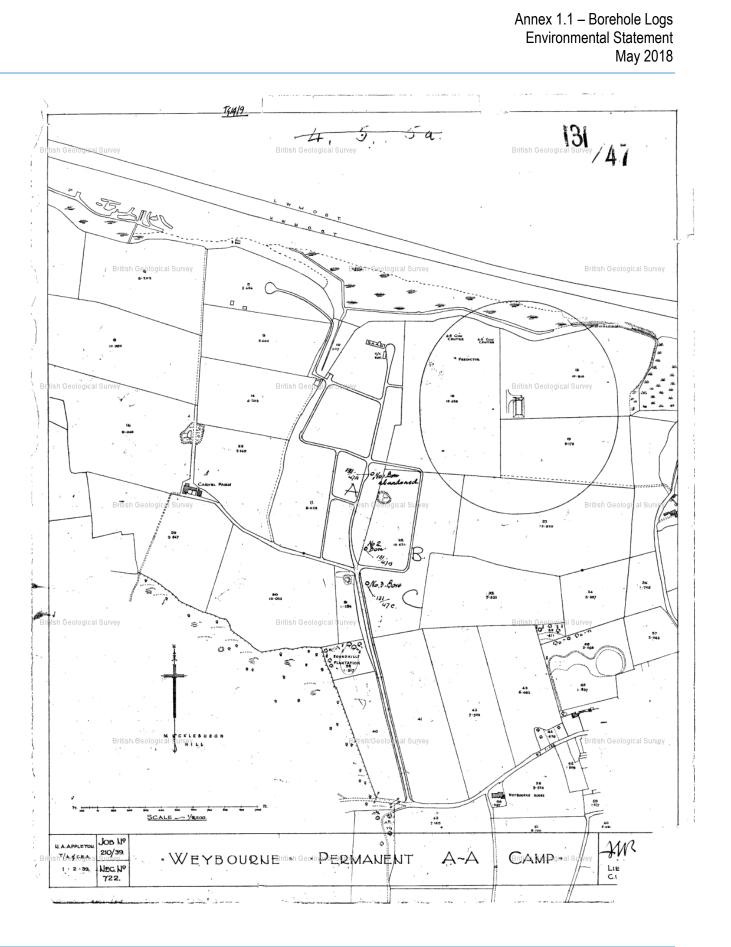
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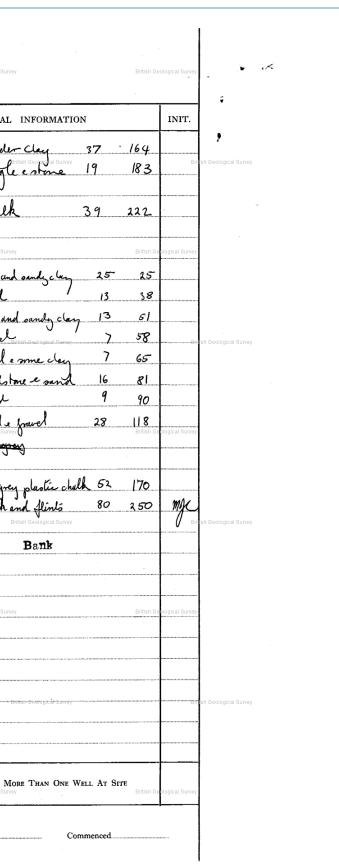
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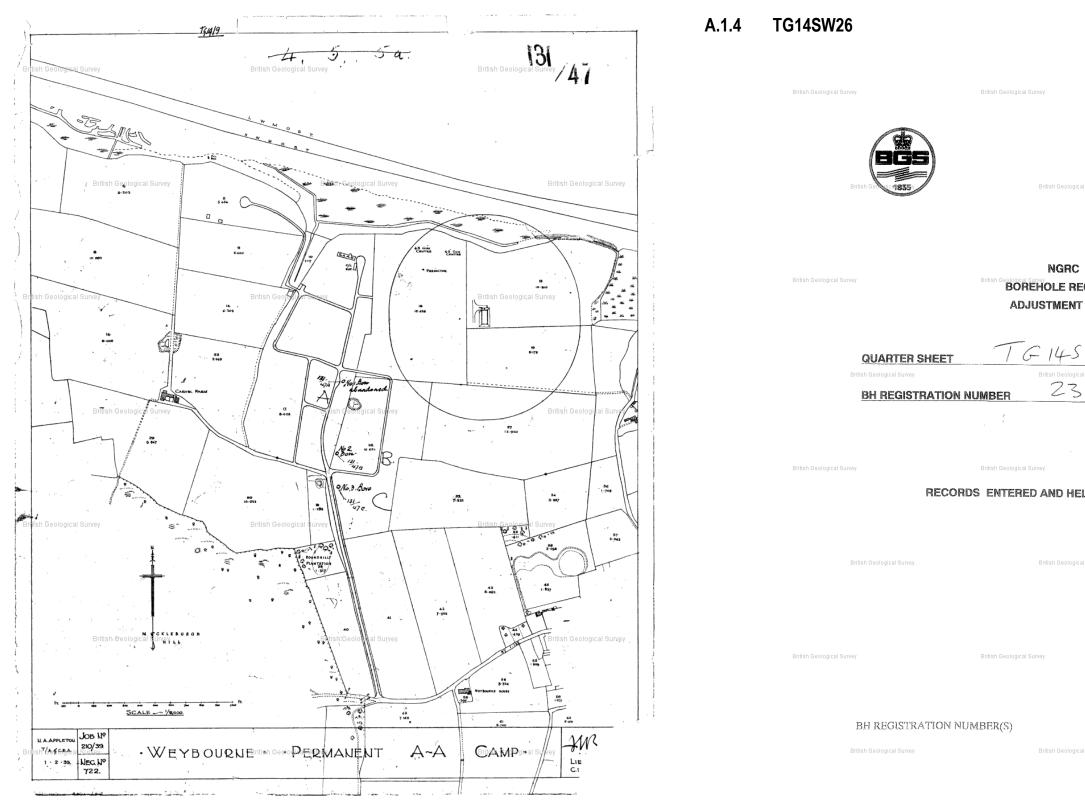
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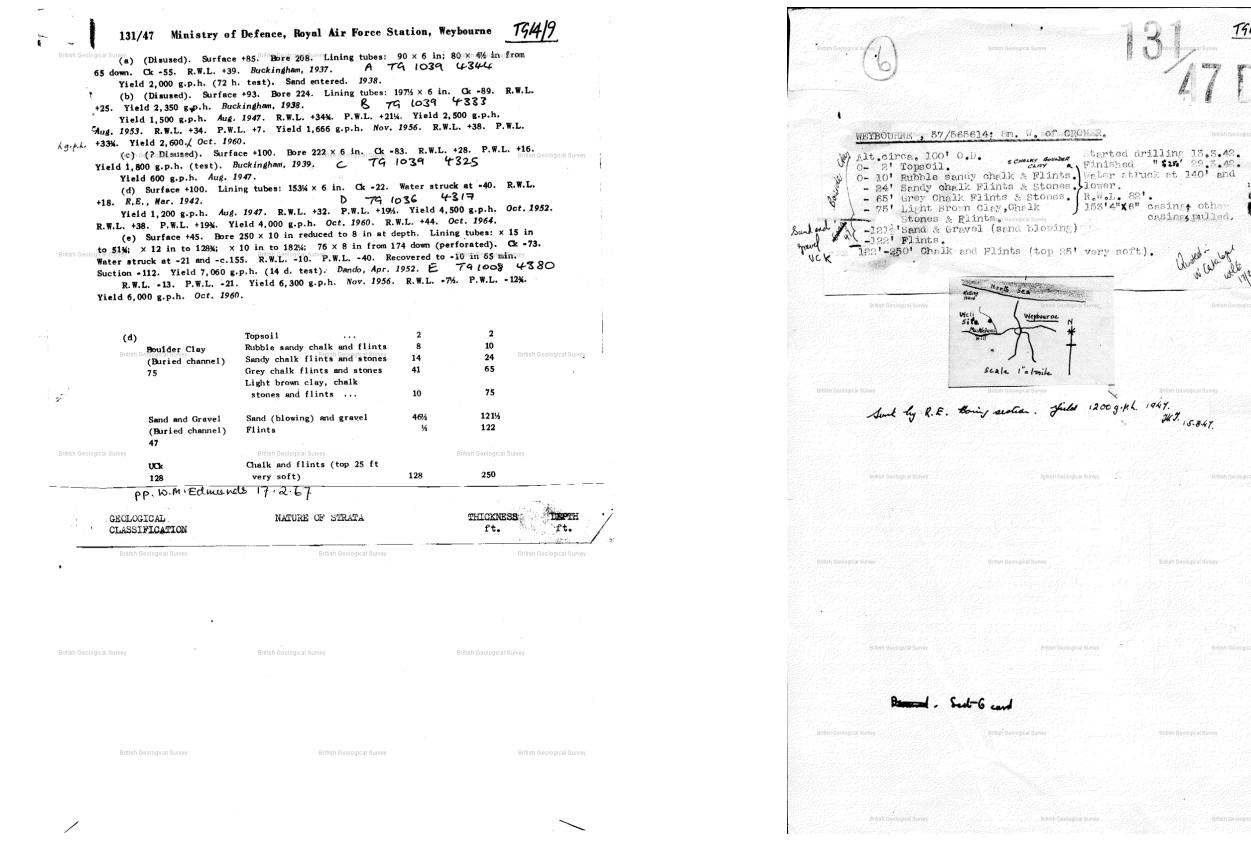
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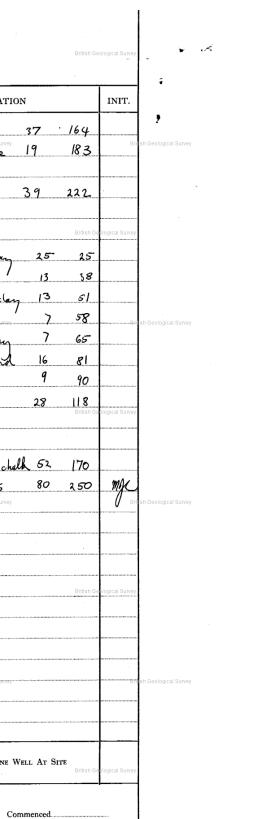
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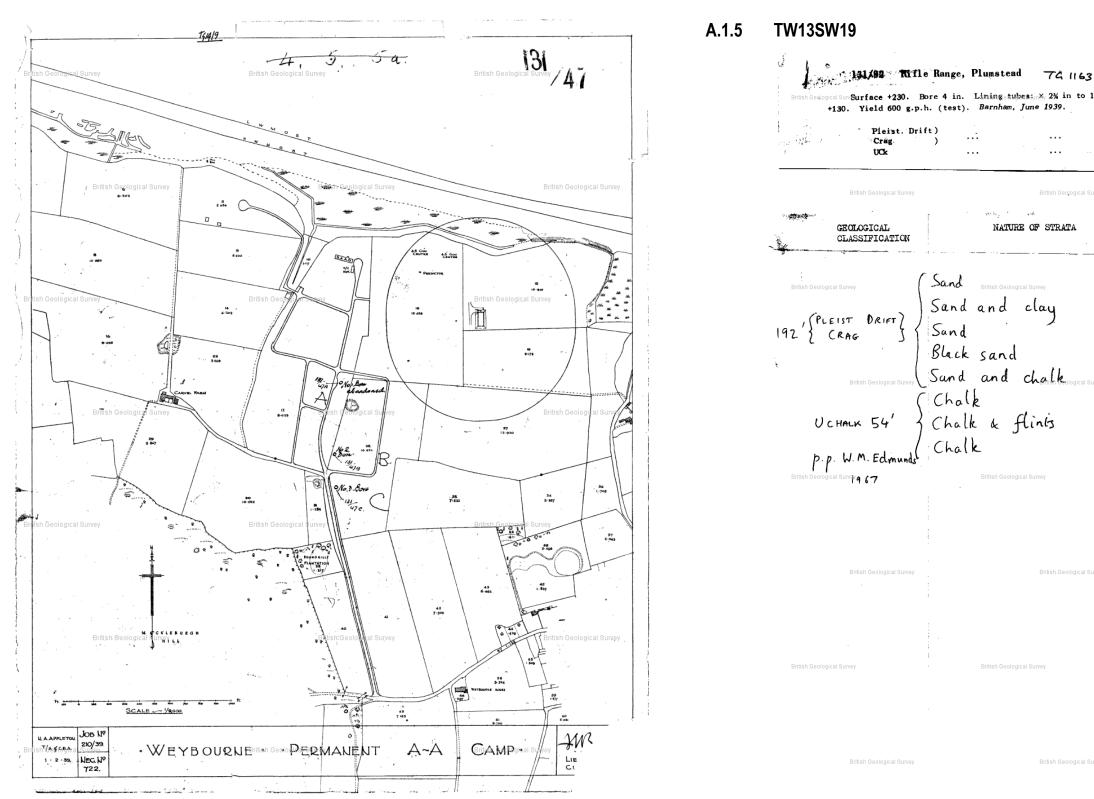
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Hornsea 3 Offshore Wind Farm





Annex 1.1 – Borehole Logs Environmental Statement May 2018

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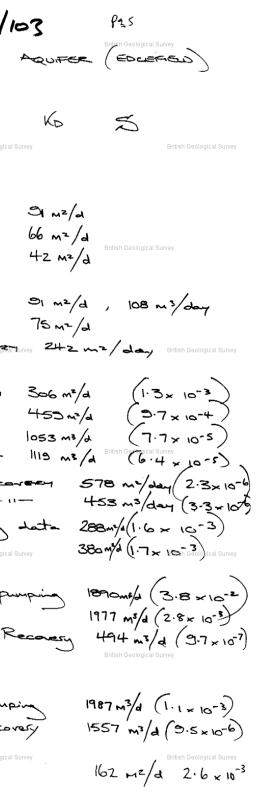
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H. J. RYAN Assistant Secretary

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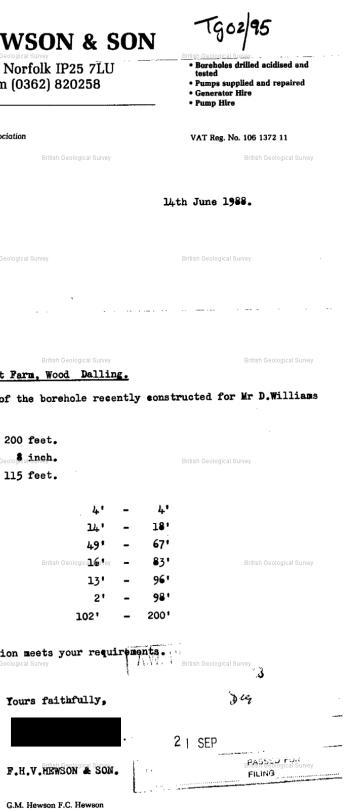




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	Grey Clay	49
	Sandy Clay vey	British Geologica
	Green Sand	13
	Green Sand and Gravel	21
	Calk.	102'
British Geological S	We trust the above infor	mation meets your rea
		Yours faithfully,









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T. W. PAGE & DIRECTORS: Y. W. PAGE INST.			.I.C.E., M.I.W.E.S. Your Ref. ivisional Engineer.
Water Supply Engineers and			ne Director, British Geological S
Welding and Gener	ral Engineers		nstitute of Geological Sciences, xhibition Road,
BUXTON ROAD FRETTENHAM	M NORWICH, NR12 7NQ		outh Kensington, ondon. S.W.7
Anglian Water Authority, Norfolk & Suffolk Rivers Division,	May 19th, 1976		
Bittish Geological Survey Yare House, Bittish Geological Survey 62/64 Thorpe Road,	British Geological Survey GEB/MG		Notification of new wells
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Borehole Log : Booto	n Farms, Booton	c	onsent under Section 24(9)
British Geological Support Further to my discussion with Mr at the above, we have pleasure in for	Ashford regarding the bore sunk warding details of same, as requested:-		as been issued to Booton Hamo
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Diameter 12" Lined with 12" dia. tubes to 109) ft.		
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Yours fai	thfully, & SON LTD.		Buxton
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SUFFOLK RIVER DIVISION P.0. Box 50, TG12 92 Norwich. NR1 1BR British Geological Survey

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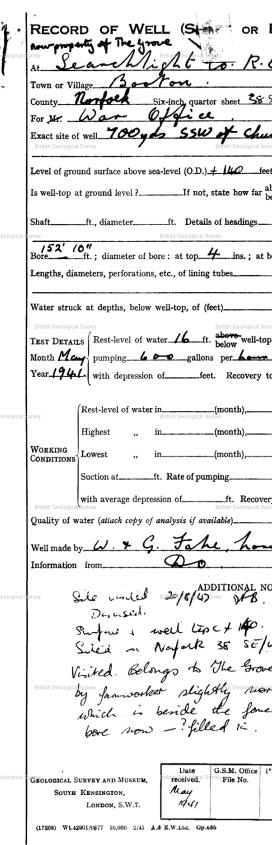
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U 9.	ater Supply Engineers and Artesia Welding and General Engin			British General 1835	British Geological Survey	British Geological Survey
	IXTON ROAD FRETTENHAM NORW	VICH, NR12 7NQ				
Anglian Wat Norfolk & S British Geological Survey Yare House, 62/64 Thorp Norwich.		May 19th, British Geold 926 Survey GEB/MG		British Geological Survey		British Geological Survey
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British Geological Survey	Borehole Log : Booton Farms, British Geological Survey er to my discussion with Mr.Ashford	British Geological Survey		QUARTER SHEET	Taizsw	
at the abov	ve, we have pleasure in forwarding d	regarding the bore sunk etails of same, as requested:-		British Geological Survey	British Geological Survey	British Geological Survey
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British Geological Survey	British Geological Survey ust these details meet with your req	250 ft. British Geological Survey		British Geological Survey	British Geological Survey	British Geological Survey
PP.FB	Yours faithfully,					
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Hornsea 3 Offshore Wind Farm

* (* L I 147/72 The Grove, Booton (formerly War Department). (? Filled in) 79 1226 2162 Bittish Surface +140. Bore 4 in. Lining tubes: 134%. R.W.L. +124. Yield 600 g.p.h. (test). 4 Fake, May 1941. TG12/53 5% Boulder Clay ... 5½ ... 58½ 84½ Sand and Grave1... 53 ... Boulder Clay ... 26 ... UCk ... ••• 68% 152% Elitish Ge6gi 1'6 British Geological Survey TOP SOIL BOUDER CLAY 55 5 6 4'0" BRICK PARTH 4 6" 10 0 LOAM SAND and the second sec 18 ۵" LIGHT GREY CLAY 25'0" 43 FINE LIGHT GREY SAND SAND AND GRAVEL 12' 6" 55' 6 LIGHT BROWN SAND 53 3 ŏ 58 6 LAND AND SHINGLE 62' 0" 6" 3' GREY CLAY 84' 6" 6" BOULDER CLAY 22' BLUE CLAY 26 Br(134) ogical S 1" 50 (SOFT CHALK (TUBED) 18' 3" 152 10 U. CHALK 684 HARD CHALL

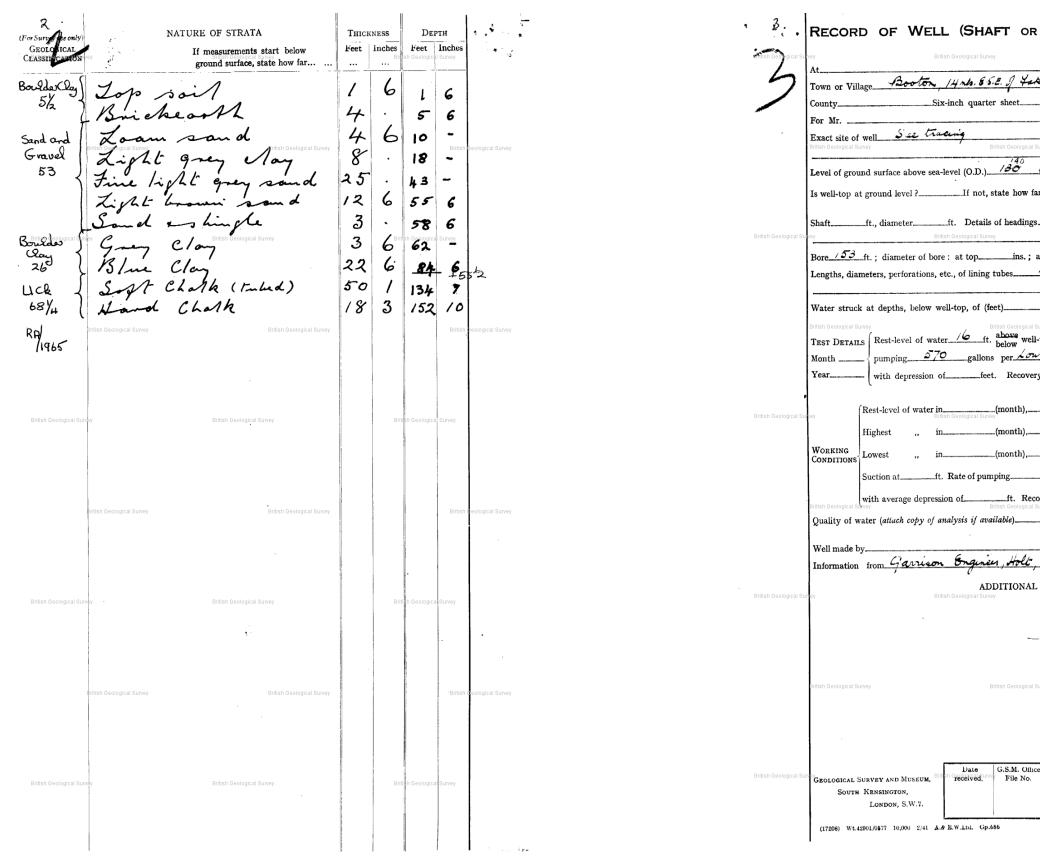




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Hornsea 3 Offshore Wind Farm





Annex 1.1 – Borehole Logs Environmental Statement May 2018

Bore)	
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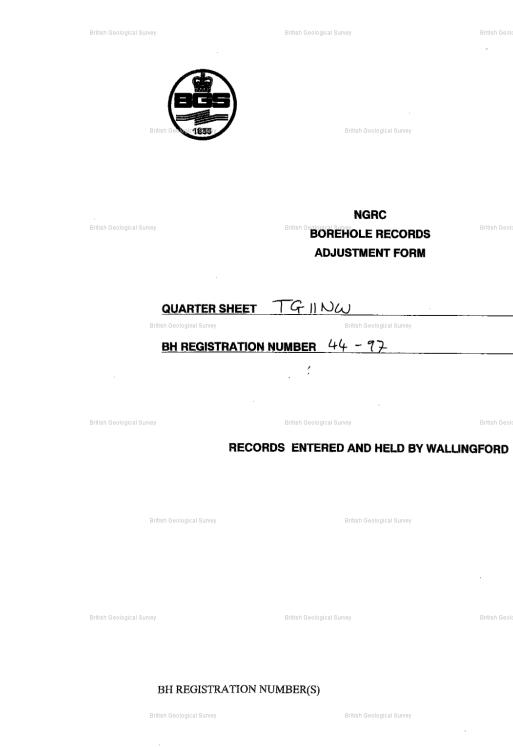
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Hornsea 3 Offshore Wind Farm

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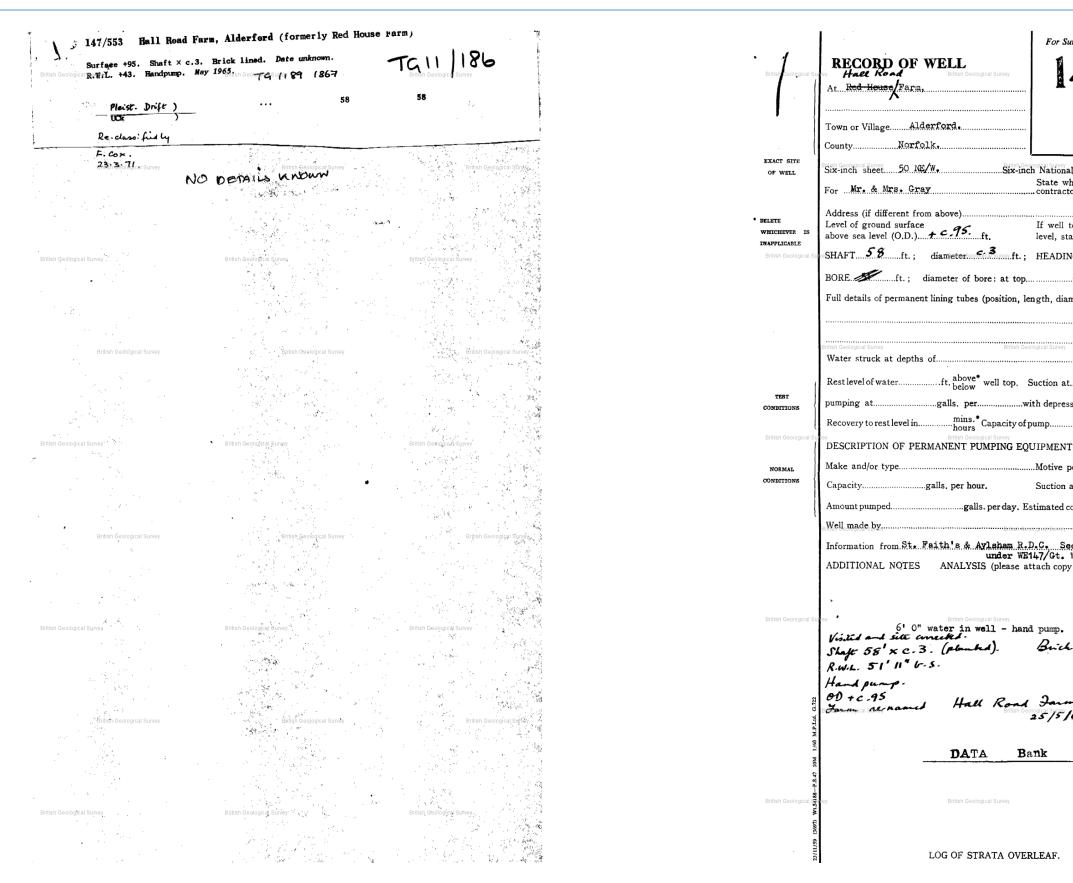


Annex 1.1 – Borehole Logs Environmental Statement May 2018

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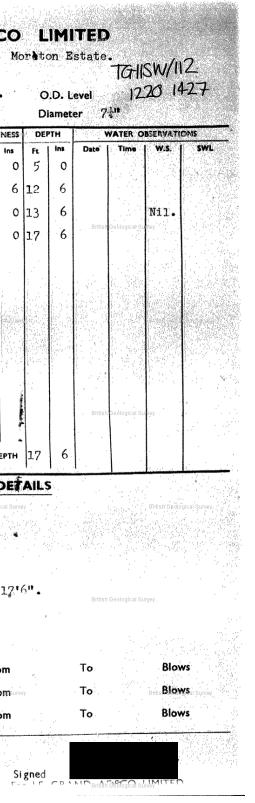
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A.1.13 TG11SW12

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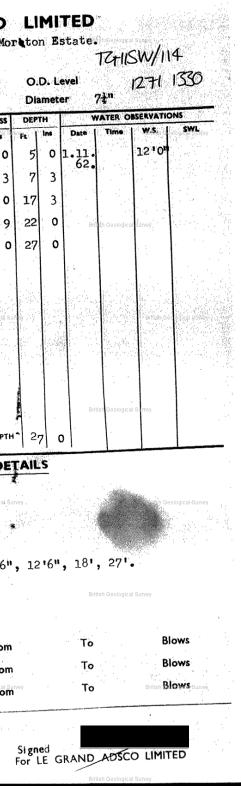
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opper onlin	Chark.				(18.6)	61
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A.1.14 TG11SW114

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Hornsea 3 Offshore Wind Farm

A.1.15	TG11SW99	Eastern L.S. Anglian Water 900066
	Anglian Josef Aggin, MA Tailibu 99 118-133 ** GEORGE STOW & CO LTD ** Gode: AW016 Reading Road - Henley-on-Thames - RG9 1DX Reading Road - Henley-on-Thames - RG9 1DX BOREHOLE RECORD Borehole No: RW 1 <u>LG1</u> <u>LG1</u> <u>LG1</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG2</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u> <u>LG3</u>	Art CEORGE STOW & COLLED ** Code: AW0.6 Reading Road - Henley-on-Thanes - R69 10X If 160 Barehole No: RV 1 Date completed: 24-09-90 Barehole No: RV 1 Date completed: 24-09-90 Interdence Parent Second Interdence Interdence Parent No. R. A. Anglian Region Exact Site: RW 1 - Ringland (NGR: TG 128 133) Date completed wave Depth of Bore: 65 m Diameter: At Top 450 mm. Bottom 300 mm Date completed wave Diameter Length Inserted 13 m B.G.L. Mon marent 1 m S.S. Interdence 13 m B.G.L. 300 mm 8 m " m " " 57 m B.G.L. 300 mm & 8 m " m " " 57
	Remarks: Defendences	STRATA_RECORD NATURE STRATA_RECORD METRES THICKNESS DEPTH METRES Light brown sand & stones 2 2 SAND & CHALK 2 4 CLASSIFICATION 1 1 Light brown sand & stones 2 2 SAND & CHALK 2 4 CLAY / CHALK with flints 2 8 creamy soft CHALK 7 15 soft CHALK with flints 24 39 firm CHALK_with_flints 26 6 brown 1 1 1 Method and and and and and and and and and an

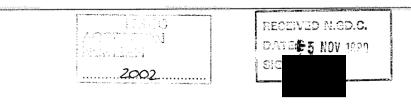
Annex 1.1 – Borehole Logs Environmental Statement May 2018





A.1.16 TG11SW100	Eastern L.S. Anglian Water. 900066
Euskern L.S. Anglian Water. Regim, NRA British Geological Survey TGIISW 100 128-133 ** GEORGE STOW & CO LTD ** Code: AW017 Reading Road - Henley-on-Thames - RG9 1DX TGIISW	British Geological Survey British Geological Survey British Geological Survey ** GEORGE STOW & CO LTD ** Code: AW017 Reading Road - Henley-on-Thames - RG9 1DX BOREHOLE RECORD Borehole No: RW 2 Date completed: 4-09-90 British Geological Survey
BOREHOLE RECORD Borehole No: RW 2 Borehole No: R	All depths to be measured below Ground Level Client: N.R.A. Anglian Region
All depths to be measured below Ground Level Client: N.R.A. Anglian Region Exact Site: RW 2 - Ringland (NGR: TG 128 133) British Geological Survey Ground Level (O.D.):	Exact Site: RW 2 - Ringland (NGR: TG 128 133) Ground Level (O.D.):m British Geological Survey Depth of Bore: 65 m Diameter: At Top 450 mm. Bottom 300 mm
Depth of Bore: 65 m Diameter: At Top 450 mm. Bottom 300 mm Details of Permanent Lining Tubes	Details of Permanent Lining Tubes Diameter Length Inserted
Diameter Length Inserted Britsh Geological Survey Britsh Geological Survey Britsh Geological Survey 450 mm 20.5 m Plain m Slotted Top At 0.5 m A.G.L. 300 mm 8 m " m " 17 m B.G.L. 300 mm m " 36 m " 25 m B.G.L. 300 mm 4 m " m " 61 m B.G.L.	450mm20.5 m Plain m SlottedTop At 0.5 m A.G.L.300mm8 m"m""17 m B.G.L.300mmm"36 m"m"300mm4 mm"36 m300mm4 mm"61 m B.G.L.300mm4 mm"18.86 m
Rest Level of Water below Ground Level: 18.86 m	Yield on test 8 hours Pumping: 55 litres/sec Date: 4-09-90
British Geologic Vield on test 8 hours British Geologic State: 4-09-90	Pumping Water Level: 22.11 m below G.L. British Geological Survey British Geological Survey Time of Recovery: Time of Recovery:
Pumping Water Level: 22.11 m below G.L. Time of Recovery: Remarks: Prior to acidising gave 8.6 l/sec with 5m drawdown. Following acidising gave 55 l/sec with 3.25m drawdown.	Remarks: Prior to acidising gave 8.6 l/sec with 5m drawdown. Following acidising gave 55 l/sec with 3.25m drawdown.
British Geological Survey British Geological Survey British Geological Survey GEOLOGICAL CLASSIFICATION STRATA NATURE OF STRATA THICKNESS METRES DEPTH METRES "Glainal form and Mart" - prasidy Normath British Geological Survey brown sandy soil 2 2 British Geological Survey 2 2 British Geological Survey 4 6 British Geological Survey 20 20 CHALK with flints 45 65	GEOLOGICAL CLASSIFICATION STRATA NATURE RECORD OF THICKNESS DEPTH METRES brown sandy soil 2 2 brown clay 4 6 grey-brown sandy CLAY 4 10 puggy CHALK, flints at base 10 20 CHALK with flints 45 65

Inm 17/4/91



British Geological Survey

Annex 1.1 – Borehole Logs Environmental Statement May 2018

British Geological Survey

British Geological Survey

British Geological Survey





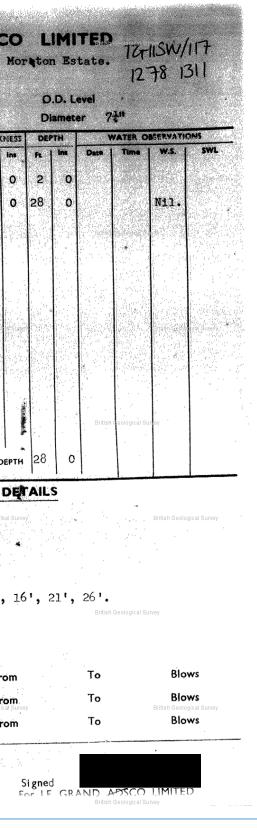
A.1.17 TG11SW115

A.1.18 TG11SW117

For Mr. J.V. Berney. O/No. 2374 Boring Completed on 7.13	1.62.			이번에서	.evel	۲۵ ار	FIISU 182	1/115 1327	
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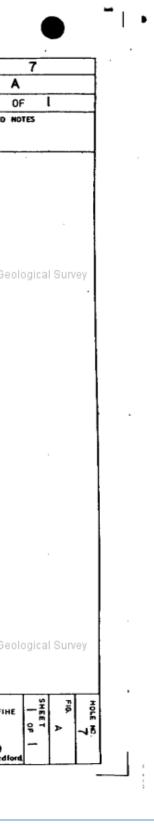




A.1.19 TG11SW74

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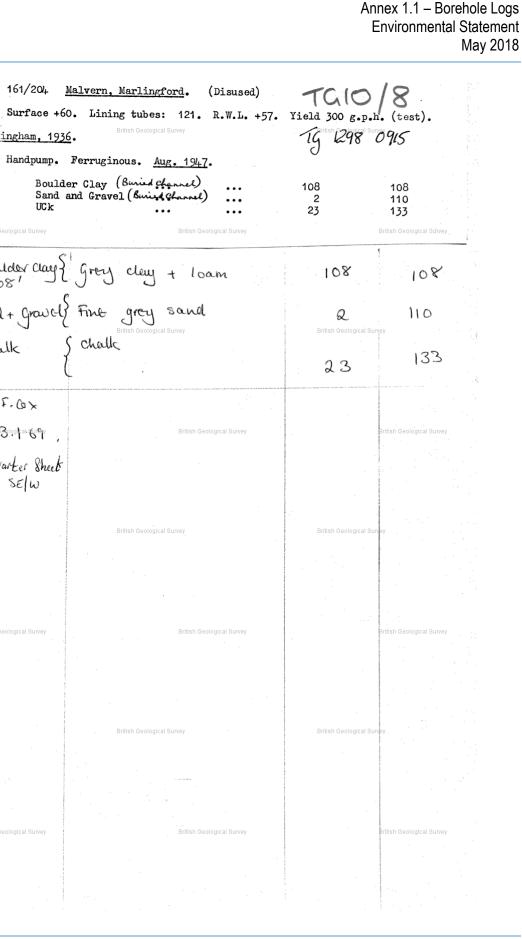






A.1.20 TG10NW33 161/204 Malvern, Marlingford. (Disused) TGIONW/33 161/204 Malvern, Marlingford. (Disused) Buckingham, 1936. 1296.0944 13.267 IZ96 0744 Surface +60. Lining tubes: 121. R.W.L. +57. Yield 300 g.p.h. (test). Handpump. Ferruginous. Aug. 1947. Buckingham, 1936. Boulder Clay (Buried channel) Sand and Gravel (Buried channel) Handpump. Ferruginous. Aug. 1947. UCk ... Boulder Clay (Buried Channel) ... Sand and Gravel (Buried Channel) ... 108 108 2 23 110 UCk ... 133 ... (challey Boulder Clay { Grey cley + loam (glacical Sand + Gravel Fine grey sand (challey Boulder Clay) Grey clay 108 108 + loam Glacial Sand + Gravel Fint grey British Geological Signer v.D sand 110 challe 2 upper chalk 23' challe upper chalk 133 23 23' pp. F. Ox British Blogloal gurley pp. F. Ox Brill 3Geological Survey 62 selw 62 selw







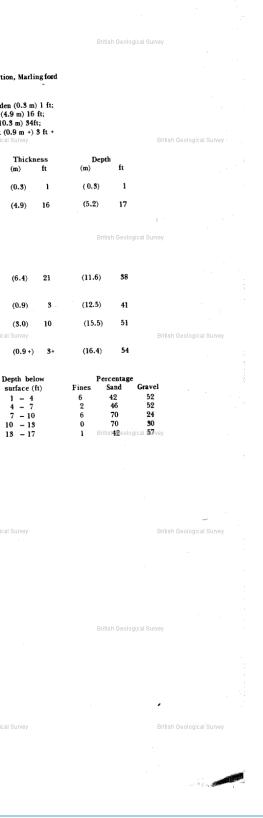


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Town or Village Exact site	marlingford County horfolk.	Six-inch	- 6			2
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Level of ground s	surface above sea-level (O.D.) <u>60</u> . ft. If well starts belo	w ground surface,				
Shaftft.	diameterft. Boreft. Diameter of bore	: at topin	s.; at bo	ottom	ins,	
Details of permar	nent lining tubes (internal diameters preferred) 131 ft					
Water struck at o	lepths of (feet)					
Rest-level of wat	er above_top of well_ <u>3</u> feet. Suction at	feet. Yiel	1 on	ho	urs' test	
30-0 gallons	s per	; depressing wate	level to		feet	
sh below c top vey Ti	me of recoveryhrs. Geol Amount normally pumpe	d daily	g.p.h. for	unay	hours.	
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Information from		Date (WCII			
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CLASSIFICATION	(and any additional remarks).	Feet.	Inches.	Feet.	Inches.	
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A.1.21 TG10NW14

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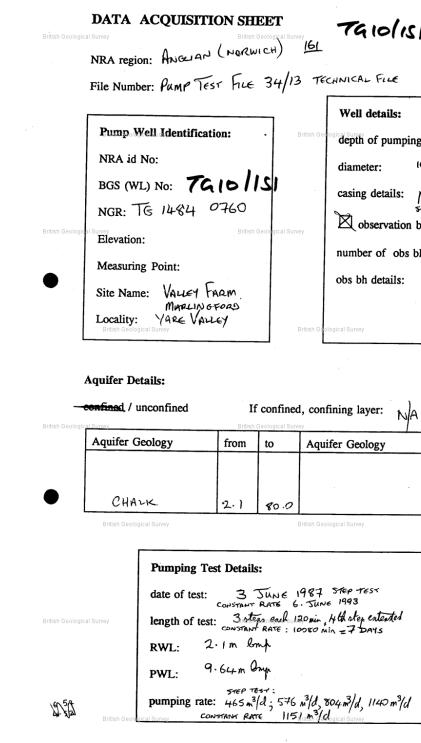






A.1.22 TG10NW20 TG 10 NW 20 1414 0895 North of Algarsthorp Surface level (+14.1 m) + 46 ft Water struck at (+13.1 m) + 49 ft Shell and auger, 8 inch diam., December 1969^{al Survey} Overburden (2.4 m) 8 ft; Mineral (6.4 m) 21 ft; Bedrock (0.9 m +)3 ft + Thickness Depth (m) (m) (2.4)Alluvium Soil and brown silty and peaty (2.4)8 clay. Gravel. 21 (8.8) 29 Sub-alluviur (6.4)gravel Gravel: fine to coarse subangular flint, with traces of subrounded brown flint and traces of fine subrounded quartz. Sand: medium and coarse subangular flint with subrounded quartz and chalk. Grey and brown. (0.9+) 3+ (9.7) 32 Upper Chalk Chalk. Percentage 33 32 27 34 36 32 33 8 38 Depth below surface (ft) 8 - 11 11 - 14 Gravel 64 66 71 62 59 67 66 8 Fines Gravel 65 3 2 + 16:30 14 - 17 17 - 20 20 - 23 23 - 26 264 : 35 - 16 + 2 Sand 32 26 - 29 Fines 3 - 1/16 : 3 41

A.1.23 TG10NW76





csc/0/138 TGIOLISI P21 TG10 NU /76 Well details: depth of pumping well: 80.0m 100mm diameter: casing details: plain range to 30.0m slottet to 50.0m Deservation boreholes number of obs bhs: NA obs bh details:

Geology	from	to	
Survey		British C	eological Survey
p Test 193 alon catended 7 Days	Britist Geolog	ical Survey	
3/d, 1140 m ³ /d 1	av. 747	m ³ /d	
Survey		British C	eological Survey





			A.1.24	TG10NW45	
sh Geological Survey British Geolog	ical Survey British G	eological Survey		V Ref: A/S_40/91	TG 1465
Additional Well Information:					SMLTH & SON (GRIMSBY) L
U Well Loss Data: B	C Efficiency			Water Abstr	762mm (30") nominal dia raction borehole drilled td Histon Cambridge
Flow Logs No	British Geological Survey	British Geological Survey		VALLEY FARM	Nr BARFORD NORLK NG
Conter Geophysical Logs No	a a b			British Geological Survey	British Geological S
Bullet Gallet	Iflows fromtototo			Top soil Grey and brown sandy clay Dry White chalk Firm and soft yellow chalk wi Firm and soft yellow chalk Harder chalk and flint	UPPER
Aquifer Parameters:	··· ·	•		Hard chalk and flint Hard chalk and flint with soft Hard chalk and flint with soft	British Geological Survey (UP PE t Seams t sticky seams
Andreis The American State					
Analysis Type: Reaver JACOR S British Geological Survey	Analysis Type:	British Geological Survey		WATER	3-2
Transmissivity: $208 m^2/d$	Transmissivity:			RWL 2.81m bg1, reading taken (5 December 1991 Dittish Geological S
Storage Coefficient:	Storage Coefficient:				
]			LINING TUBE	
Analysis Type: Burlush Geolog Fransmissivity: Storage Coefficient:	ical Bunny Other Data: British G	eological Survey		 a) 25.50m x 762mm OD plain mil 25m BGL. the top being fitt b) 87.5 x 600mmOD steel casing left flush with head flange 1) Perforated from base of b 1) Plain from 24m BGL to top 11) Slotting pattern: 	ed with a weld - on fla installed to base of b drilled NP16 casing co prebole to 24m PCL (62)
confidence:	British Geological Survey	British Geological Survey		Rings of 10 No x 300mm lo rings adjacent rows of sl Total No of slots 1773.	ng x 12.5 wide slots wi ots staggered. British Geological S
	very poor			<u>Stabiliser Pack</u>	
Notes: Boreholi colapoed on pr ical survey to carry out geophysica	completion of juinjung bence an Der Cogging British G	t possible eological Survey		The annular space between the between the 600mm OD lining natural shingle.	e 600mm OD lining and a and 762mm OD lining way
				British Geological Survey	
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British Geological Survey	British Geological Survey	Brittish Geological Survey		British Geological Survey	British Geological S



TG 10 NW / 4.5 1468 0758 SBY) LIMITED al dia x 87m deep drilled for Anglian Water ge	June 92 10/136 161
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200 Hundi 32-93	
i Geological Survey	British Geological Survey
ube installed to a depth of on flange drilled NP16 se of borehole the top bein sing column made up as foll GL (63")	logical Survey
lots with 50mm plain tube b	etween
Geological Survey	British Geological Survey
g and the borehole wall and ing was packed with 40mm	1
∴ . British Geot	logical Survey
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Ref:A/S 40/91				June 92	
Geological Survey	British Geological Survey F SML'IH & SON (GRIMS	BY) LIMITED	Britishering		in san san
			C .	1.01.00	
	Record of 762mm (30") nomina. Water Abstraction borehole d Services Ltd Histon Cambridge	rilled for Angli		161	
		146	8 0758	TGIONW	115
British Geological	ALLEY FARM Nr BARFORD NOR Survey British Ga			Editish Geological	Survey
STRATA		Thick	ess M.	Depth M.	
	Quaterary		0.50	0.50	
Top soil Grey and brown s	Li Li Li			1.70	
Dry White chalk		2 has chalk		3.50	
Firm and soft ye. Firm and soft ye.	llow chalk with flints	Uppur Chalk Uppur)Cretaceous		4.50 8.00	
Harder chalk and		Unper		0.00	
Chalk and flint				8.00	
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rafil yr shaerrarkin		J 4 - 1 J		A.S. M. MARK	
WATER	성 방법철원은 실망한 관계에서 가지 가격해졌다. 또는 것 같은 것은 것은 것은 것이 있는 것이 같은 것이 같이 있는 것이다.				
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RWL 2.81m Dg1, r	eading taken 6 December 1991				
				Stand Street	
LINING THE					
LINING TUBE					
Geological Survey	British Geological Survey		British Geolog	ical Survey	
	m OD plain mild steel lining t			ical Survey	
a) 25.50m x 762m 25m BGL. the		on flange drill	ed NP16.		
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Grouting

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The annulor space between the 762mmOD lining and the wall of the borehole was packed with stabiliser gravel and smaller grit to make grout retaining seal at 18.50m BGL and the remaining space filled with cement and grout to

Brițish Geological Survey

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GL.

TEST PUMPING Seological Survey

The borehole was clearance pumped, step tested and yield tested for a period of 14 days approximately 23.31/sec from approx 21m BGL.

DATES

Commenced: drilling October 1991 Completed: Pumping June 1992

DRILLING MACHINE

Ruston Erie 291/S Cable Percussion Rig.

British Geological Survey

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and and DRILLER

C Billings

Pumping J.Best



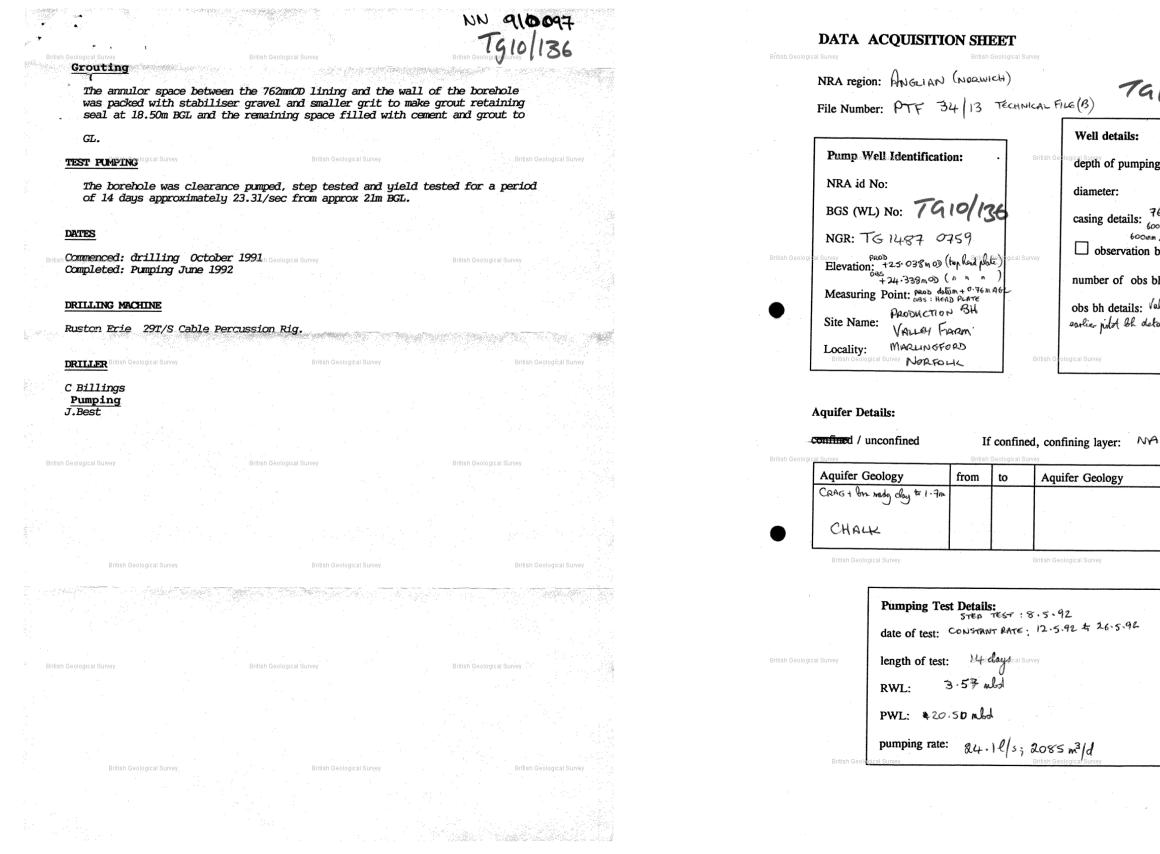
Annex 1.1 – Borehole Logs **Environmental Statement** May 2018

Tg10/136

British Geological Survey









Annex 1.1 – Borehole Logs
Environmental Statement
May 2018

CSC/D/140
B) 7910/136 P21
Vell details:
epth of pumping well: 87 h British Geological Survey
iameter: 762mm
asing details: 762mm plain steel to 25m byl 600mm plain steel to 24m byl 600mm soldtet steel 24 to 87m byl observation borcholes
umber of obs bhs: 9
is bh details: Vally farm do bh $r = 37 m$ liz pidot bh detail $csc/D/138$
Survey British Geologica Survey

	British Geolo	gical Survey	_
Geology	from	to	
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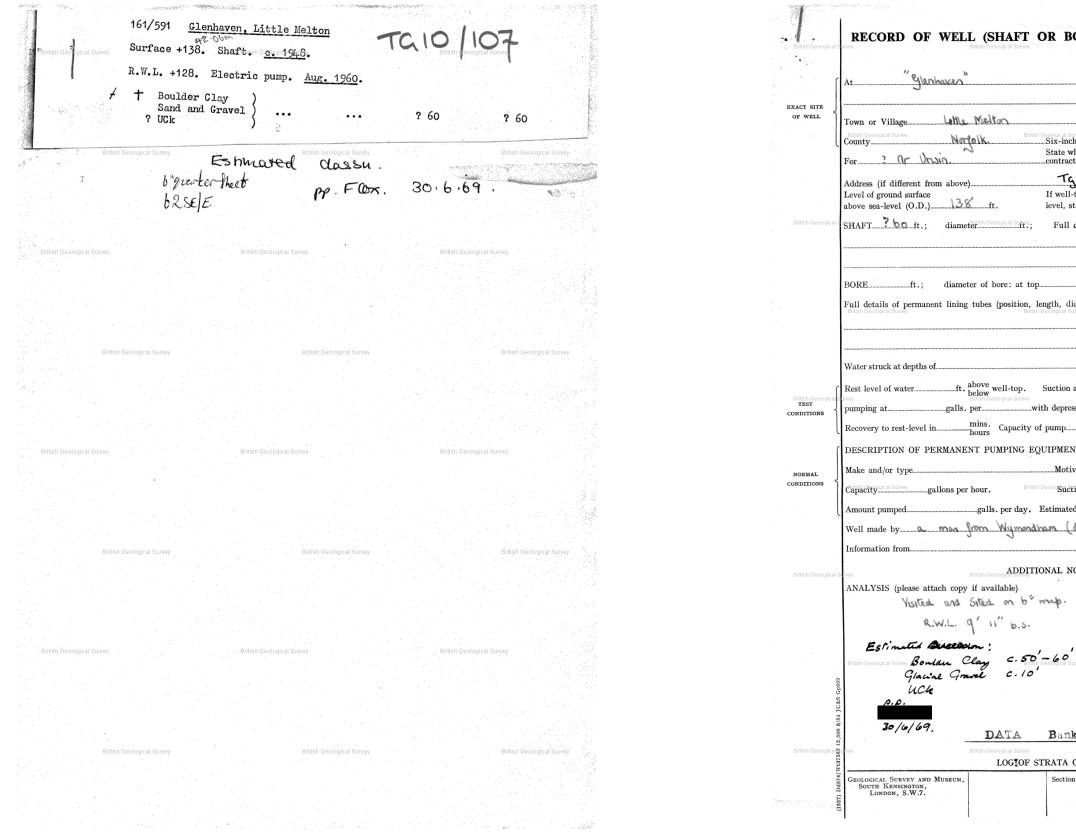
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British Geological Survey British Geological Survey British Geological Survey	Survey			
Additional Well Information:			British Geological Survey	British Geological Survey
Well Loss Data: B C Efficiency	British Geological Survey			61/591 <u>Glenhavon, Little Melton</u> (4-2-06r) Surface +138. Shaft. <u>c. 1948</u> . .W.L. +128. Electric pump. <u>Aug.</u>
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	n-ja		British Geological Survey	British Geologica
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			British Geological Survey	British Geological
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Notes: Not acidised because Chalk not stable ealos there is a fish point new	l.			
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STEP TEST. Q(m3/d) Dusten/min Drawdam (m) 656 120 1.93			British Geologica, Survey	British Geological Survey
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2505 h 17.57				
Constant rate test - Quas not constant - first 60min Q= 1726 mild before being unerees	ed.			
- increased again during 22 has before and of tert. Cooper Sacob recovery gives different T from din - may be better of recovery data correcter	British Geological Survey			
Their curve fitting probably "mulgicet I? nigrificant errors"			Briti sk-Quole gical-Surve y scy	annin ar in ann an ann an ann an ann an ann a' ann a' ann a' ann an ann an
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pump. Aug. 1950.	
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Hornsea 3 Offshore Wind Farm

	NATURE OF STRATA		Тню	KNESS	DEI	PTH	10 Sec.		TG10NE43
For Survey use only) Geological Classification		British Geological Survey If measurements start below ground surface, state how far		Inches 	British (Seningical S Inches	ney		κ, ·
	n an		107						British Geological Survey British Geological Survey
									(TG 10 NE 43 1581 0657) Church Farm
	British Geological Survey	British Geological S	urvey				British Geological Survey		
									Surface level ($+$ 37.5 m) $+$ 123 ft Water struck at ($+$ 34.4 m) $+$ 113 ft
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	· · · ·		· .						
British Geological Sur -	vey .	British Geological Survey	. *		British	Seological S	nvey	2 2	Chalky Boulder Soil and slightly sandy brown
									Clay clay with a little chalk. Light grey chalky clay with
									Light grey charky clay with traces of gravel British Geological Survey British Geological Survey
ñ		v			-				Dark grey chalky clay.
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A.1.27	TG10NE49			A.1.28 TG10SE3	
	Brititer Geological Survey	British Geological Survey	British Geological Survey	Bhitsh Geological Survey	British Geological Survey
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	Surface level (+ 41 Water struck at (+ 2 Wirth B 1, 8 inch di Blecember 1969	35.6 m) + 117 ft	British Geological Survey	Wa Wir	face level (+ 36.9 m) + 121 ft Waste (16.4 m) 5 ter not struck Bedrock (0.9 m the B O, 8 inch diam uary 1970 ^{urvey} British Geological St
		Thickness (m) ft	Depth (m) ft		1 (m
	Chalky Boulder Clay	Soil. (0.6) 2 Brown clay with traces of medium (4.6) 15 sand and fine gravel towards the base. British Geological Survey	(0.6) 2 (5.2) 17 British Geological Survey	: Ch Cla : British Geological Survey	alky Boulder Soil and brown clay with traces of (3 sy Sand and gravel. Light brown to grey chalky clay (13 with occasional flint.gebbleStrey
	British Geological Survey	Brown chalky clay. (13.1 +) 13 -	(18.3) 60		per Chalk Chalk. (0.
	British Geological Survey	British Geological Survey 51 British Geological Survey	British Geological Survey British Geological Survey	British Geological Survey	Geological Survey British Geological Su British Geological Survey
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British Geological Survey

) 54 ft; m +) 3 ft +

Survey

British Geological Survey

Thickne		Dept	h	
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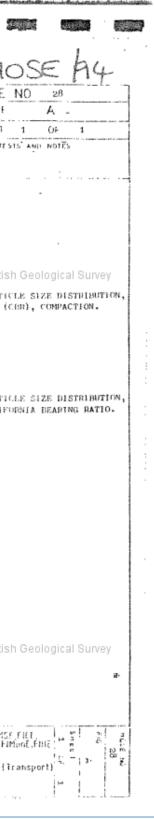
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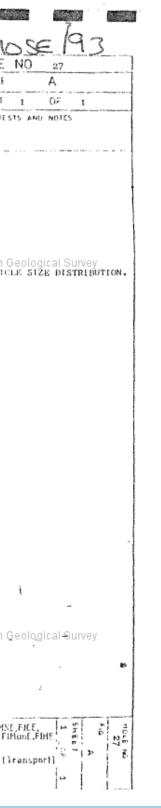
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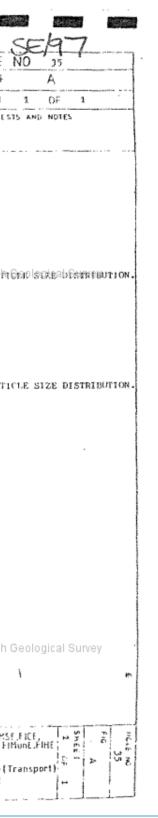




A.1.31 TG10SE97

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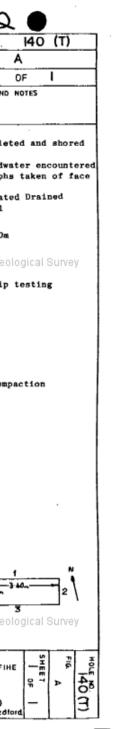
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				British Geological S	urvey					в	itish G	eologia	al Sun	rey.									British Geo
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				becoming grey			x x x x x		1.50	6	1.60	D				24							-
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-	. 			gravel and organic rea Firm to stiff brown v to medium rounded to gravel and orange bro (Boulder Clay)	ery silty CLJ angular chall	and flint,	x xo x o x o		+	1 14 2	0.40 0.50 0.60	D CBR B				17 29	16	42	*				2)No groundwa 3)Photographs 2 Consolidate Triaxial
30.3.82			F	TOPSOIL (Dark brown si medium sand with fine	to medium su		\boxtimes	30.7	0.30	T													l)Pit complet to 3.50m
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Annex 1.1 – Borehole Logs Environmental Statement May 2018

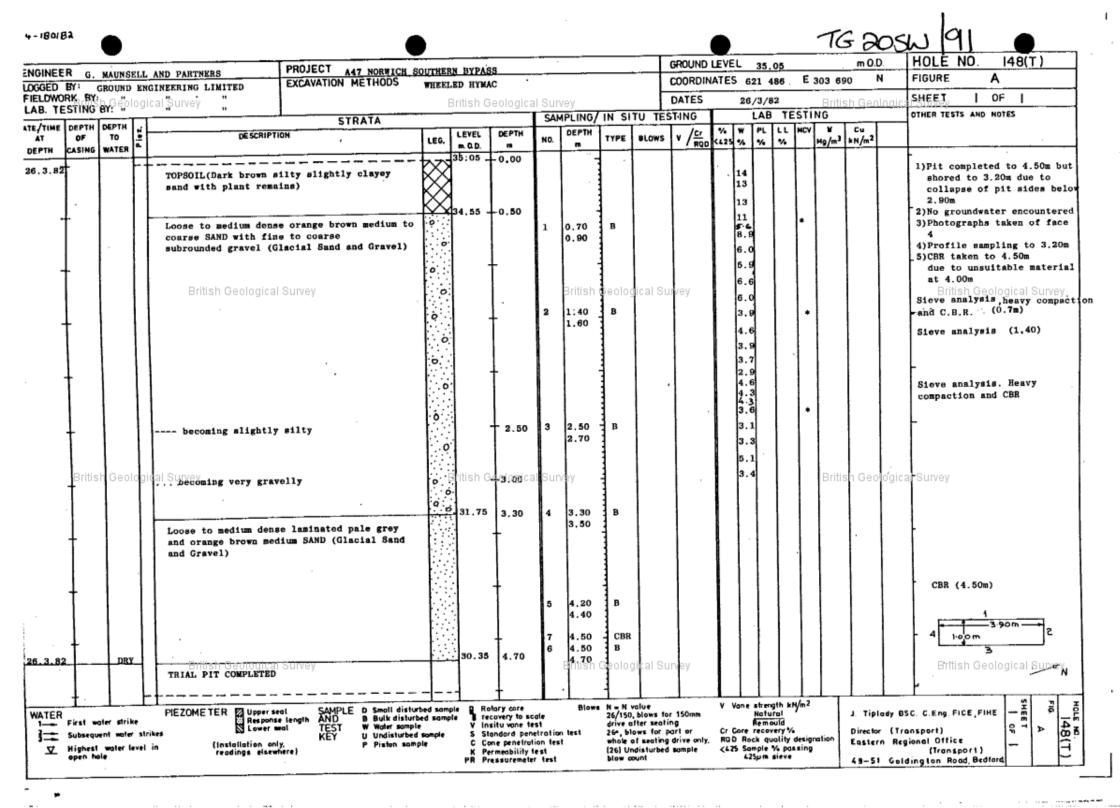
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A.1.34 TG20SW91









A.1.35 TG20SW127

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	,		_		Level	L	(Thick)	Depth	7/2*		Test		<425	**.	**	<u>*</u>	Mg	/m ³	kN/m ²	HUV	
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				CLAY, gravel angular to subrounded chalk with a little flint. With rare orange brown and black andy partings. Avgular flint withle (GLACIAL TILL)		• 	(5.70 pan)	3.30 3.50 - 3.95 3.50 - 4.00	0 D 8	10 11 12	¥⊷17									-	PSD
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		ater str	***5	PIEZOMETER SAMPLE Tubing a Concrete D Small o Porous D Sand B Buik d element C Gravel W Water Tubing d Bentonite seal P Piston Perforated f Back Hill	disturbed sturbed sample turbed s	sample		totary core ecovery to scale nsitu vane test itandord penetration ermeability tes 'ressuremeter t	test t		(26) N	I value lumber of blows where full Odown penetration not achieve lumber of blows where 150mm eating drive not achieved	d Cr RQQD	Core I Rock	<u>Natu</u> Rema recove quality ple %	uld ry % design			MI Struc Director Eastern	t, E , FII (Trans Regional Soldingto	(Diffice (Transpo



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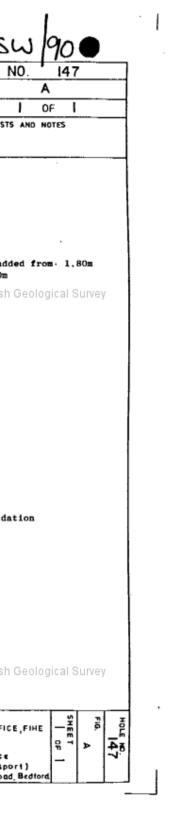




A.1.36 TG20SW90

NEER	G. MAI	NSE	LL AND PARTNERS	PROJECT A47 NORWICH	SOUT	HERN BY	PASS					GROUND	LEVE	EL	35.	20		m (0.D.	HOLE N
ED BY:			NGINEERING LIMITED		-	SSIVE (I		AYFAR	ER)			COORDIN			621		E 303		N	FIGURE
	f Geolo	gic	al Survey		В	ritish Ge	ological	Surve	y		H	DATES						sh Geo	logical	SHEET
TESTIN	GBY:			200mm casing to 6.25m						IN CI	TU TE		<u> </u>	8/4,		TE	STING			OTHER TESTS
IME DEPT	H DEPTH	Ľ	DESCRIPT	STRATA	T	1.5751	DEPTH	SAM	PLING	114 51								Cu	1	I THER LESIS
			DESCRIPT		LEG.	m.O.D.	m	NO.	m	TYPE	BLOWS	v / <u>Cr</u> RQD	×425		7	%	Hg/r	3 KN/m	2	
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			TOPSOIL		\mathbb{K}	34.80	0.40	1	0.45	в.				15						
1	1			d dark brown silty sandy medium subrounded to sub-	×				0.80		1			<u> </u>					1	1
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T	1		with chalk fra	gments and cobbles	Ĕ	33.95	1.25	3	1.00		(49		70	15	16	30	1.9	3 20		
	1.		Medium dense orange br	own fine to medium SAND			1	Ι.	1.45									gu=		
				ravel (Glacial Sand and			1.90		1.45	•			1					30*		Water add
+			Gravel		+		2.00		2.00											to 6.00m
	1		Britistte pockets o	Lubrown clay and fine to ded to subangalar gravel	•	9		ľВ	ritish 6	ol8gii	cai Still	₩ey.								British
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t	1		becoming brow coarse SAND an	d fine to medium sub-	0		- 5.00	9	5.00	BC	N=1	6								Г
1				angular GRAVEL	0	3	1		1	1										
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-	Beold	giu		CLAY with some fine to	0 ⊟ ×		1.61,001	10	6.10	D				14			1 III	siloeu	rugical	Survey
				el and chalk fragments	L.		1			1				-					1	
			(Boulder Clay)		¥-	4		11	6.50	U	(45)		87	14	11	25	2.	23 42		Consolida
1			becoming green	ish brown with brown		:	6.95	12	6.95	1.	1									Ļ
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						2		13	7,50	Ь				1						
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†			becoming firm	to stiff	V_	1	T °. W	1	8.45	1	(02)	'l	87	12	12	24	2.	20 78		[
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		1			\square	26.60	8.60				1					1				
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	1.	1.										1								
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🗕 First v	ater strik		Response	tol TEST W Water sample		V Ins	overy to so itu vane te	st		drive at	blows for ter seatin	19		Ā	toture le mou	ld				C. C.Eng.FIC
••••••••••••••••••••••••••••••••••••••	uent water t water le			KEY U Undisturbed t			ndard pen e penetrat		test	26°, bio whole o	f sealing	drive only.			ecove k qua		ignation			ional Office
7 Highes		vel i	readings elsewt	r riston samp			meability t				disturbed					possi		FORIS	IN HEG	









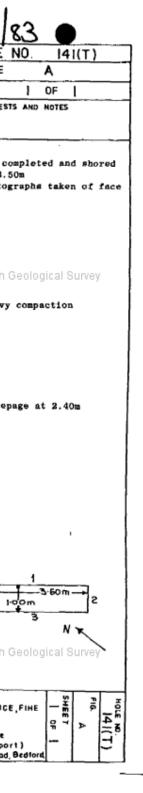
A.1.37 TG20SW83

1=	First wo' Subseque Highest open hol	nt water water le	strik		KEY	D Small disturbes B Bulk disturbed W Woler sample U Undisturbed so P Piston sample	somple mple	V ins S Sto C Cox	ary core overy to scal itu vane tes ndord penet meability te ssuremeter	t ration h test st	lest	drive after 26°, blow whole of	lows for 19 er seating rs for part seating driv sturbed son	or reonly,	Cr Corr RGD R <425 S	Rem reco lock q	ould very % uality de % pass	esignati		irector	(Trans	C.Eng.F sport) nal Offic (Trans)
_ ^				British Geological St	irvey •					Br	tish Ge	ologica	l Surver									4 Britis
0 <u>.3.8</u> 2	3.50	DRY		TRIAL PIT COMPLETED			×	24.55	-3,50	12 10 11	3.40 3.40 3.50 3.60	W D B										
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	ł						X.		ł	6	1.90	D			80	21 1	6 40					-
	ļ			and flint gravel and pockets (5001der		e sand	∘ <u>∧</u> \\\		+ .	Br 4 5	tish Ge 1.40 1.50 1.60	D	al Survey		68	22 2	0 44	12				Briti He
	ł			Firm to stiff fissured with fine to medium ro	unded to ang	ilar chalk	×. ×. V	27.15	0,90	13 3	0.70	U38			85	18	28 42	2	2.01	60 9u=9		-
	ł.			firm to stiff fissured fine to medium rounded			XX • X	27.65	0.40	1 2	0.50 0.60 0.70	в			94		18 46	6.0				to 2)Phc 4
DEPTH 0.3.82		WATE		TOPSOIL(Dark brown cla gravel)	yey silty sa	nd with flint	xx	m.0.D. 28.05	0.00		-		BCONS	v / <u>Cr</u> RQD	<425	*	<u>~ ~</u>	+	м9/m ³	kN/m ²		1)P1
ĂŤ	E DEPTH	TO	1.2	DESCRIPT		TRATA	LEG.	LEVEL	DEPTH	SAI	DEPTH	IN SI	BLOWS		%		AB T	NCY	¥	C.	1	OTHER
IELDV	PESTING	r G er ilog	pical	Survey .			Briti	sh Ge	ological S					DATES		/3/8				Geolog		SHE
LOGGE	ER BY:	GROU		LL AND PARTNERS	PROJECT EXCAVATION	METHODS	WHEEL							COORDIN	_		28,05		303	0 654		HOI FIGU

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Annex 1.1 – Borehole Logs Environmental Statement May 2018

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A.1.38 TG20SW89

計 又 Hi	irst wote ubsequen ighest v pen hole	t woter s noter leve		PIEZOME TER Upper seal Response Lower seal (Installation only, readings elsewher	rigth AND TEST KEY	O Small disturbed B Bulk disturbed W Water sample U Undisturbed sa P Piston sample	Sample mple	Y Insit S Ston C Cone K Perm	ry core wery to scale u vane test dard penetration penetration eability tes suremeter	otion to test	es1	drive afte 26*, blows whole of s	ows for 1 r seating s for part seating dri turbed so	or (ve only, i	Cr Core ROD A (425 Se	Nate Rem reco ock q omple		nsignat	0	irector	(Trans	C.Eng. I sport) nal Offic (Trans
				British Geological					-		ŧritish (eologi	cal Sun									B
13.00 26.3.82		DRY		TRIAL PIT COMPLETED			× • ×	19,95 .	_3.50	4	3.40 3.50	B										
	British	Geolo	gica	Firm to stiff brown sandy CLAY with fine and the flint gravel	rounded to a	ty slightly ngular chalk er Clay)	0 X 0 X	20.85 itish G	2.60 ological	3 Gurve	2.60 2.70	B			82	16 1	3 24		Britis	1 Geol	, ogica	- Surve
-				Loose to medium dens SAND with rare round medium gravel and sm pockets (Glacial San	ed to subroun all brown sil	ded fine to.	0 8 0 0		1.05	2	ritish (1.50 1.60	eologi B	cal Surv	ey		12		•				-Sieve
		-		medium sand with fin sugangular gravel) Loose brown slightly SAND with fine to me rounded gravel (Glac	silty fine (to medium to sub~	× 0 0 × × 0		0.40	1	0.50 0.60	В				14						no col 2)No 3)Pho 4 Sleve
DEPTH 26.3.82 11.00	CASING	WATER		TOPSOIL (Dark brown	layey silty	fine to	LEG.	m.Q.D.	- 0.00	ND.	m	TYPE	BLOWS	v / <u>sr</u> Rgd	% <425	*	PL L1		Hg/m ³	Cu kN/m ²		1)P11
TE/TIME		_		DESCRIPT		TRATA		LEVEL	DEPTH	SA	PLING	/ IN SI	TU TES	STING	I .,	L	/3/82 AB 1	_				SHE
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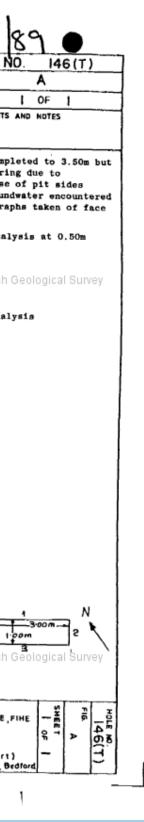


Annex 1.1 – Borehole Logs Environmental Statement May 2018

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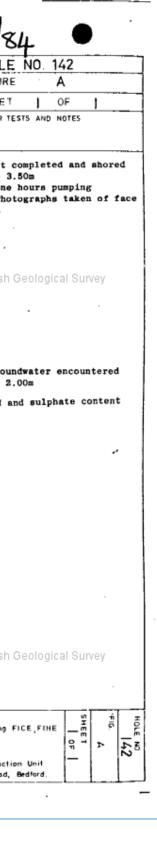




A.1.39 TG20SW84

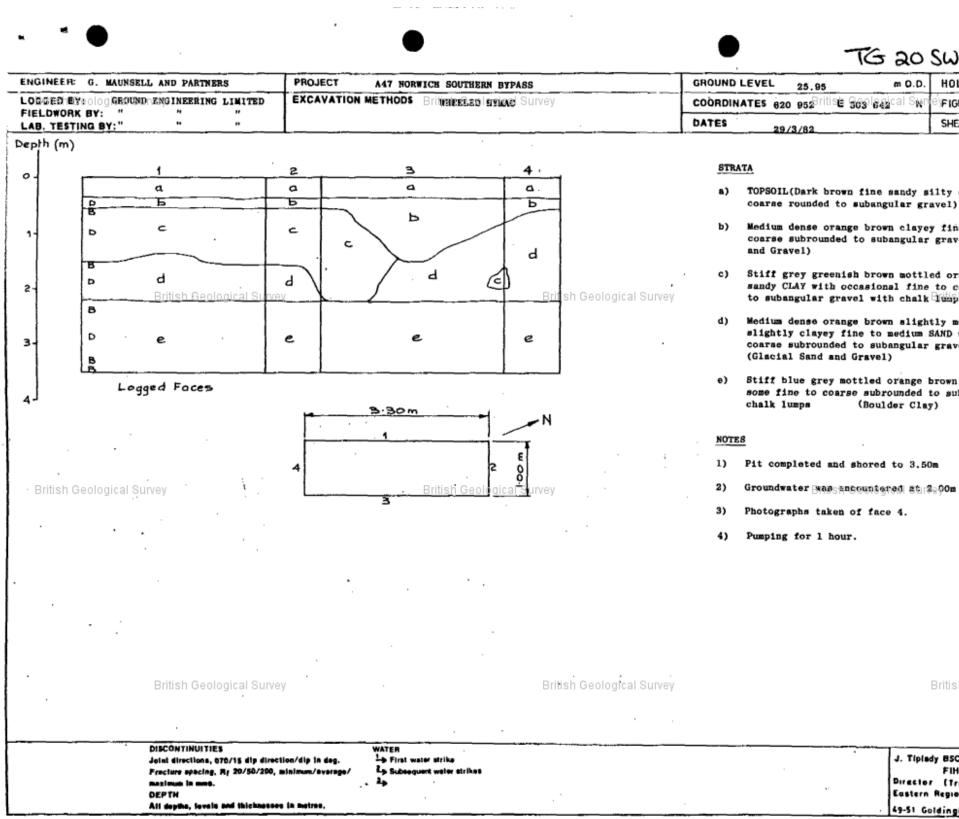
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<u> </u>	irst wate ubsequer	t water s			KĒY	U Und sturbed	sample	S Sta	itu vone tes ndord penel	t ration t	est	drive aff 26°, blo	ter seatin ws for pa	9 rtor	Cr Core RGD Ro	Remou	id 'y %		Director	
<u>ъ</u> н	ighest v pen hole	oter leve	i in	(Installation only readings elsewhe	re)	P Piston sam	ple	K Per	ne penetrotio meability te ssuremeter	st			seating d		<425 So		passing		Eastern 59/63 G	Read Constr













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clay with fine to
e SAND with fine to cl (Glacial Sand
ange brown silty coarse subrounded h Geologi (Boulder) Clay)
nottled grey brown with abundant fine to with chalk lumps
silty CLAY with bangular gravel with
,
h Geological Survey
C. C.Eng. FICE. 위 관 품
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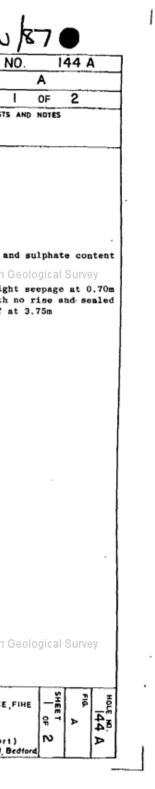
A.1.40 TG20SW87

NGINE				AND PARTNERS	PROJECT	A47 NORWICH	SOUTHE	RN BYP	SS					GROUND	LEVI	EL 2	6.2				TG m O.D.	HOLE NO
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4.82				Firm brown silty very	sandy CLAY	with fine to	₩	25.95	0.30	1	0.50	р		{								
				medium subrounded to s	ubangular gr	ravel		25.50	0.75					1				1				
-	- ·			Stiff grey-brown silty	CLAY with i	tine to	┦×—	1	ł	3	0.85	DU	(71)	}	70	13	16	32		14 1	05	ł
				medium subrounded chal	k gravel (Bo	oulder Clay)	6_	1			1.45	ь				15	-•		1.	1	ýu=	
				becoming firm to a			⊢×	ļ		Γ.	1.00	1)					ļ	1	9.	
-	.			Seconding 111m co i				1	2.00	5	2.00	U	(59)		77	17	16	28	2.		80	pH and
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		1		with pare brown c.	ay		5_	í	2.50	6	2.50	D	1			10						Slight
-	-						x		ł	7	3.00	υ	(32)									with n off at
				with nockets of a				1			3,45											
				sand	range brown	clayey	x-	1	3.50	18	3.50	D		ļ		17		-]				
-	.			becoming stiff			F_		4.00	9	4.00	U	(37)		83	16	18	29	2.	14 1	32	
							- ×	1			4,45											
								21.45	1	10	4.50	D			1							
-	.			Stiff dark grey silty (LAY with ch	alk gravel	×	21,45	4.80	12	5.00	υ	(58)							ł		L
				(Boulder Clay)			1-2		1		5.45						1					F
							×			13	5.50	D										
4	British	Geolo	jic	al Survey			0-BT	itish Ge	ological	i unve	6.00	D							Briti	sh Ge	eologic	al Survey
							×	1)	15	6.50	U	(81)									ſ
				becoming firm to	stiff				6.50	1.0	6.95	ľ	(51)	•	82	14	14	19	2.1	1 7	75	
4.82 30	6.00		1	Stiff grey-brown silty	sandy CLAY	with chalk	F-×	19.45	6.80	16	7.00	D				- 1		1				
4.82	0.00	DRY		gravel (Boulder Clay)				1	1		1.00					1						ſ
30							×	ł		17	7.50	D										
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							⊢×	1	Į –	18	8.00 8.45	U	(47)									T I
							-0	1	1	19	8.50	D										
	.]			Firm cream-white lumps	of financed	CHAIN	IF .	17.40	8.85	20	8,90	D					[([(1	1
				in a remoulded chalk ma	trix with f]	lints	e l		ſ	21	9.00	U	(37)			- 1	- 1	í	1	1		Dettine to C
•				(UppenBichalth) e ologiands	urvey		1-T	1	1	22	9.50	t b	al Surv	ey								British Ge
							LĄ															
TER				PIEZOMETER Upper seal	SAMPLE	D Small disturber	d sample	Roto	ry core		Blows M	i n N vol			V Vor		l	.kN/m2	4			<u> </u>
- Fi	st water bsequent		trike	PIEZOMETER Upper seal Response la Lower seaf	TEST	W Water sample		Teco	very to scal		2	26/150, b	lows for 1 or seating	50mm		Na	tural			л 1	iplady B	SC. C.Eng.FICE,Fi
V Hi	nest w			(Installation only,	KEY	U Undisturbed so P Piston sample	mple	C Cohe	dard penetration	test (est 2	hole of	s for part seating dri	ve only		e rec Rock	quali	y desig				ansport)
ep	en hole			readings elsewhere		-			reability tes				sturbed so					assing		E.051	ern Reg	ional Office

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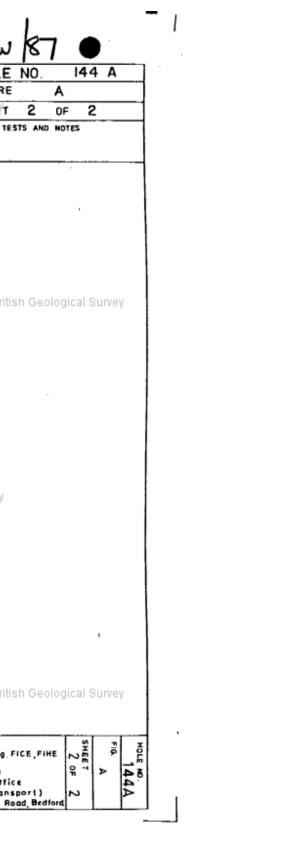






INGINE	R	G. MA	INSPI	LL AND PARTNERS	PROJECT	47 NORWICH SOU	THE	IN RVP	455					GROUND	LEVE	L	24	8.25		m 0.	.D.	HOLE
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A.1.41 TG20SW88

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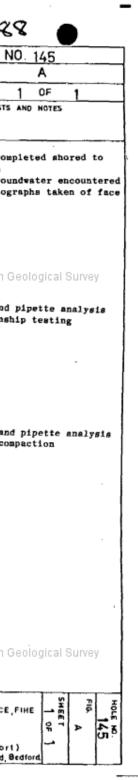


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Annex 1.1 – Borehole Logs Environmental Statement May 2018

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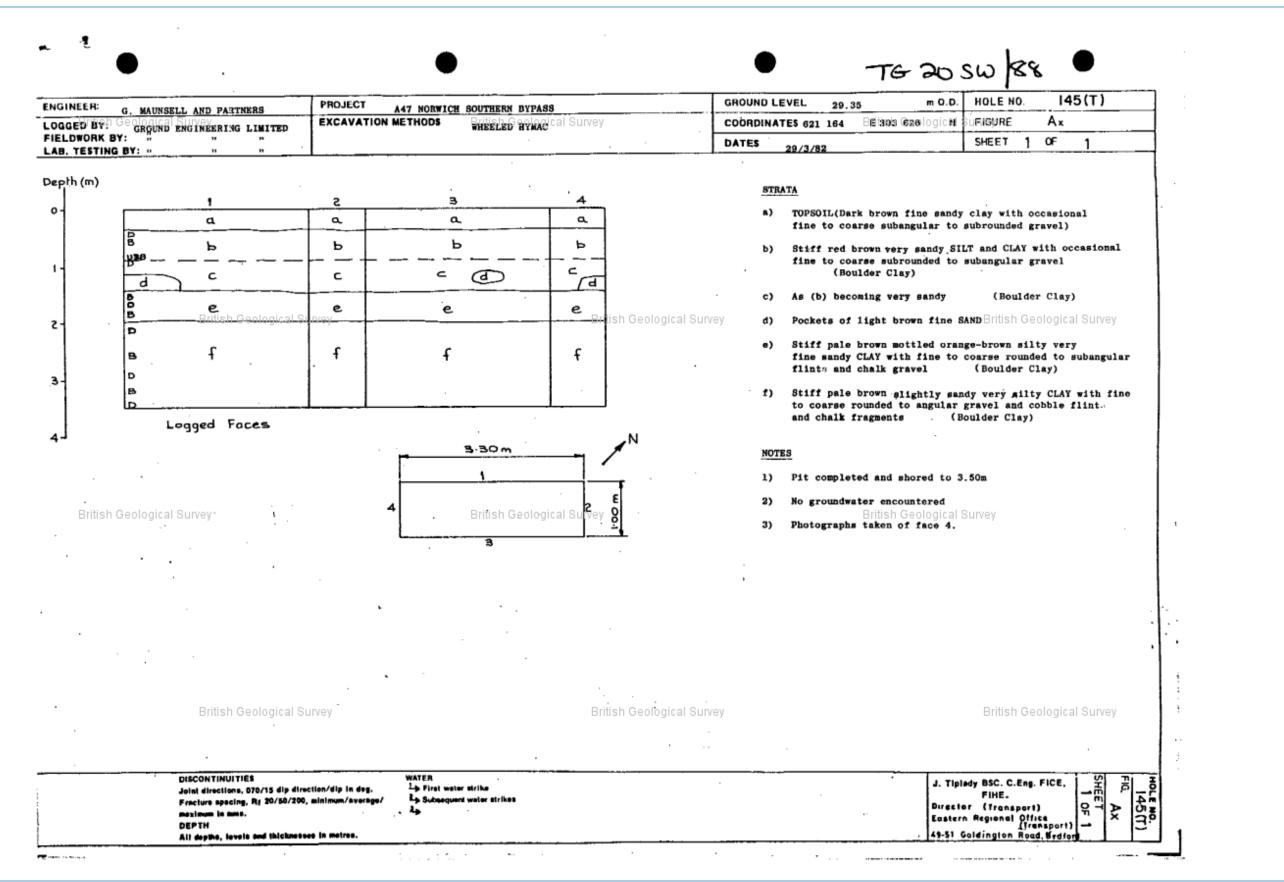
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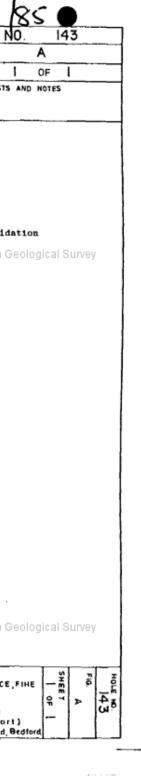
A.1.42 TG20SW85

DEPTH C	ASING	WATER		TOPSOIL Firm brown silty sand medium subrounded to				m.Q.D. 26,75 26,40		NO.	m 0.60	D	BLOWS	v / <u>Cr</u> RQD	<425	•%	PL %	*	MCV	/ Cu m ³ kN/r	,2	
ļ			11	(Boulder Clay) Firm to stiff greenish with chalk fragments with rust brown mottl:	and some fine roo	t fibres	x x	25.50	1.25	2 3 4	1.00 1.45 1.50	U D U	(12)			14	10	21				- Consolida
				British Geological S	urvey		× : : : : : : : : : : : : : : : : : : :			5Bi 6	2.45 13150 3.00. 3.45		(61)	ey .		16		26		21 40 Ø2 18 1 2 Øu=	,• 0	British G
87.4.82 17.30 18.4.82 08.30	2.95	DRY			mottled grey-gre silty CLAY with c		· · × *		3.50	7 8	3.50 4.00 4.45 4.50	U U D	(68)							jou-		1
Br	•	eolog	ica.	becoming stiff weathered chall Survey	grey-green with the fragments	partly	× × ×	sh Ger	5.50	10 11	5.00- 5.45 5.50]	(59)			16	-			16 105 9u= 15	.5	Survey
8.4.82 0,30	2.95			becoming stiff	dark grey		×	19.75	6.90 7.00	12 13 14	6.00 6.40 6.85 6.90	D	(71)									
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ł				British Geological S	Survey	-			ł	Bi	tish Ge	plogic:	I Surve	ev								British G



Annex 1.1 – Borehole Logs Environmental Statement May 2018

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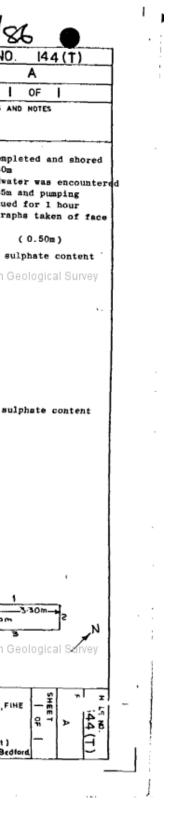




A.1.43 TG20SW86

GINEER GED BY: LDWORK B B. TESTING /TIME DEPTH AT OF	GROU Y: " GiBY≩eolo	ND	L AND PARTNERS ENGINEERING LIMITED al Survey "		A47 NORWICH METHODS	WHEE	led Hym British G	eologica		MPLING	IN SI		1		5 9/3/	620 82 LAB	TES	E 303 Brit	ish Geo	N	HOLE N FIGURE SHEET OTHER TESTS
PTH CASING		Ē				LEG.	M. Q.D.	рертн т	NO.	DEPTH	TYPE	BLOWS	V / Cr RQD	×42	s %	PL %	%	HCV V Mg/m	3 KN/m2	2	
3.82	00 fine to coarse subrou and occasional rootic Firm silty sandy CLA with occasional fine subangular gravel wit ments (Bou Stiff pale greenish b fine to medium subang Clay) British Geologic: Stiff orange brown sa (Boulder Clay)	TOPSOIL (Dark brown fine to coarse subround and occasional rootlet: Firm silty sandy CLAY with occasional fine to subangular gravel with	ded to subang s) o medium subr	gular gravel		28.90	0.00	1 13 2	0.45 0.50 0.50 0.60	D CBR B										1)Pit con to 3.56 2)Ground at 2.89 continu 3)Photogr	
+		lar gravel (I Survey	Boulder	0_X	25.60	0.75	3 4 5 6	0.90 1.00 1.10 1.30 1.30	D B D D B	ical Su	rvey		17						2 CBR pH and British		
			becoming clayey SAN Stiff grey mottled orar CLAY with abundant chal	ND nge brown sil		×	24.90	1.70	14 7 8	1.60 1.60 1.80 1.95 2.05	U38 D B			64	20		NP	2.0	68		-
ļ	12+	G	Goulder Clay)			x	-		9 10	2.50 2.80 2.90	DB			85	17	16	27				_ pH and
30 3.82	sh Geola 2.85		RIAL PIT COMPLETED			-	23.40 .	eologica .3.50	31n 12	3.40 3.50	в			78	18	16	25	Brit	ish Ge	dogica	l Survey
-			British Geological	Survey						British I	©eolo <u>c</u>	ical Su	ivey								4 to Britis









م.1.44	TG10SE11			A.1.45 TG20SW166	
	British Geological Survey	British Geological Survey	British Geological Survey	British Geological Survey	British Geological Survey
National Party - Na	Billish Geological Suivey	British Geological Survey	oniisii Osofogical ouriey	Eman Geological Cartey	Dinian Obological oursey
ingin websiti	TG 10 SE 11	1842 0356 South-west of Hall Farm, Intwood			
Sanggangangan ang Kang Sang Sang Sang Sang Sang Sang Sang S	Surface level (+ 31.5 Water not struck Wirth B O. 8 inch dia January 1970	Mineral (0.9 m) 3 ft;		BGS	5)
annaichte an staite	British Geological Survey	British Geological Survey Thicknes (m)	s Depth British Geological Survey ft (m) ft	British Gertanica 1835	British Geological Sun
		Soil. (0.9)	3 (0.9) 3		
	Glacial Sand and Gravel	Gravel. (0.9)	3 (1.8) 6		
	British Geological Survey	Gravel: coarse with fine, subangular flint with some subrounded quartz. British Geological Survey Sand: medium with coarse, subangular, Brown.	British Geological Survey	British Geological Survey	NGRC British Geological Survey BOREHOLE REC
		Very 'clayey' pebbly sand (0.9)	3 (2.7) 9		ADJUSTMENT F
		Gravel: fine to coarse, mainly subangular to subrounded flint.			
	British Geological Survey	Sand: fine to coarse, subangular. Light brown. British Geological Survey	British Geological Survey	QUARTER British Geological Survey	SHEET TG 205W British Geological Sur
	Chalky Boulder Clay		25 (10.4) 34	BH REGIST	TRATION NUMBER 164 -172.
		Light brown chalky clay. (3.0)	10 (13.4) 44		/
		Brown sandy clay with thin (1.8) sand bands.	6 (15.2) 50		
	British Geological Survey	Light brown-orange clay, slightly (3.0+) sandy, with occasional quarty and chalk pebbles.	10+ (18.2) 60 British Geological Survey	British Geological Survey	British Geological Survey
		Depth below	Percentage		RECORDS ENTERED AND HEL
	-	$\begin{array}{cccccccccccccccccccccccccccccccccccc$	Fines Sand Gravel 7 32 61		
	British Geological Survey -	- 4 + 1 : 8 - 1 + ½ : 21 British Geological Survey - ¼ + ¼ : 3	British Geological Survey	British Geological Survey	British Geological Sun
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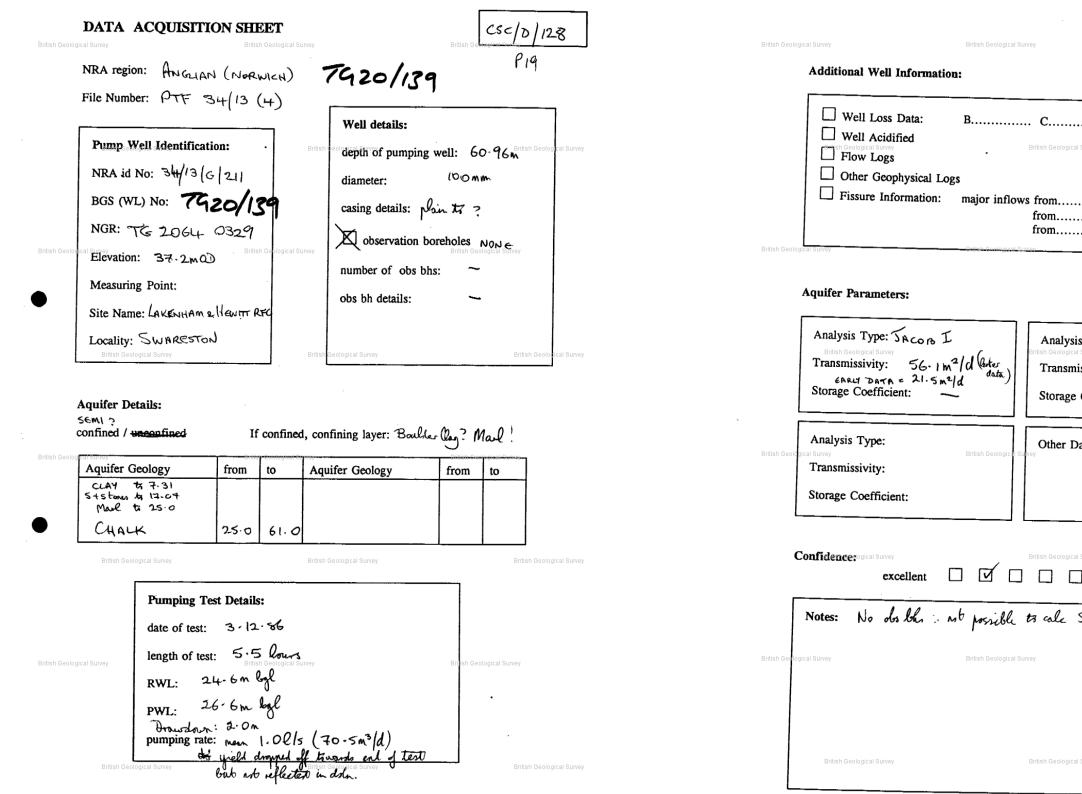
		For Institute use only Licence No.		
	RECORD OF WELL	N	For Institute use on	'y
British Geologica	a Survey British Geological Survey At	British Geological Survey	GEDLOCKER Survey	NATURE OF STRATA British Geological Survey
	Laken Rams Hewitt.	TG 20/139	CLASSIFICATION	If measurements start below ground surface, state how for
	Town or Village Swardeston			Tipsoil
L	County Norfolk			Hard brown clay
EXACT SITE	British Geological Survey Britis	161 sh Geoleadal Survey British Geological Survey	British	er Softer yellow sand / day British Geological Sur
OF WELL		sh Drugeral Surva 2064 03.2.8 British Geological Survey		Small stones
		4 Club and C.E.Y.M.S.		
		onsultant, etc.: Liunu No. E7:34:13:6:211		Yellow sand
	Address (if different from above)			Yellow mull
British Geologica	Priliph Gaalaataal Summu	Driffels Conclusion Country	British Geological Survey	Good hard chalk
		ft (British Geological Surveym)	Bittish Geological Survey	Good hard chath with fints
DELETE		ve:		Good hard chalk
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NECESSARY	HEADINGS (please attach details-dimensions and			• • • • • • • • • • • • • • • • • • • •
		ameter: at top nk in (mm);		
	at: bottom:gical @urveyin (British	eological Survey British Geological Sur
		length, inner and outer diameters, plain slotted etc.):		
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British Geologica	a Survey British Geological Survey	British Geological Survey	British Geological Survey	British Geological Survey
	-	ft (m) below well top		
ſ	Rest level of water	we well top. Suction at ft ($\dots \dots \dots \dots m$)		
TEST				
CONDITIONS	depression toft (m) below	w well top. Recovery to rest level in mins* hours		
	Capacity of pumpg.p.h. (l/s) sh Geological Survey British Geological Survey	Pritich (nalaalad Suway British Goolagical Suw
L	British Geological Survey British Date of measurements	an deprovincer primary British deprovincer primary		Kondiral Shirak Dunsu Gaologiral Shir
ſ	DESCRIPTION OF PERMANENT PUMPING EQ	QUIPMEN'T:		
NORMAN	Make and/or type	Motive power		
NORMAL	Capacitygalls (m ³) per he	our. Suction at ft (m)		
CONDITIONS	below well top. Amount pumped	galls (m ³) per day. Estimated		
British Geologica	Consumption		British Geological Survey	British Geological Survey
	Well made by T. W. Page . E Son . Ltd	Date of sinking?. 11/1286		
	ADDITIONAL NOTES ANALYSIS (please atta	ach copy if available)		
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10	GS 2494 10 000 7/79	Date		



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	2		0-61	26		7.92
	30	.	9.15	57	-	17.07
	26		7-92	82		24 .99
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	RECORD OF WELL	N		^B GEOLOGICAL ^{IVEY} CLASSIFICATION	
h Geological Surv	At Sports Ground British Geological Survey	British Geologic Marve O SW 112		• ·	If measurements start below ground surface, state hou
	Laken Rams Hewitt	TG 20/139	,		. Tipsoil
	Town or Village Swardeston			(
	County Norfelk		K,		Hard brown clay
	- county	161	BUR	Glacia	of Soft yellow sand / day British Geological Sur
XACT SITE	Latting and the second sheet and reference British Geol	British Geological Survey	- <u> </u>	Deposits 5	Hard brown clay Soft yellow sand / clay British Geological Surv Smull stones
OF WELL		4 Club and C. 5. Y. 17. 5 .	DUKTZEUKEY	1	Yellow rand
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			Svatation		
	· · · · · · · · · · · · · · · · · · ·		le la		Good hard chalk chalk
sh Geological Surv	Level of ground surface above sea level (O.D.)	\mathbf{f} đini sh Geolopical Survey	K	alle	Good hard chalk with flints
DELETE		/e:	2677	L'halle	Yellow sand Yellow mull Good hast chilk Good hast chalk with fluits Good hast chalk
AS	SHAFTft (m); diameter		Č Č	(
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	at bottom			British Geo	pgical Survey British Geological Surv
		length, inner and outer diameters, plain slotted etc.):			
	not known				1
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Geological Surv	y British Geological Survey	British Geological Survey			
r	Rest level of waterft (ft (well top. Suction at ft (
	Yield on hours'* test pumping at	w			[······
TEST	days for the depression to				
NDITIONS	Capacity of pumpg.p.h. (nouis			a diana a mana
L	nitish Geological Survey British Geolo Date of measurements	gical Survey British Geological Survey			Burnan Geological Sulv
Г	DESCRIPTION OF PERMANENT PUMPING EQ	QUIPMENT:			
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Annex 1.1 – Borehole Logs Environmental Statement May 2018

DEPTH THICKNESS Feet Inches Metre how far. Feet Inches Metres <u>.</u> 0.3C . ! . . _ 0.30 0.61 3 0.91 2 -. 7-32 6.41 B**⊋4t** oe ological Si A .. Survey -. .-. . . 26 7.9: 0-61 56 -9.15 17.0 30 7-92 82 26 -24.9 _ 36-5 11-59 120 38 Bht 15-85 172 -524 52 -. 8-53 200 -60.5 28 -. • • • • • • • • . |. 1.1.1 b. Survey Survey

TGZOSWIIZ 2064 0328





TG20	0SW14			A.1.48 TG20SW55	
Beish G	Seological Survey	British Geological Survey	Brits 10 Gara 300 SW/14	161/403 Police House, Swardeston. (Sealed) Tc-20 Sw Surface +116. Shaft 87; rest bore. Lining tubes: 70 x 4 in. R.W.L British Baological Survey +34. P.W.L4. Yield 600 g.p.h. (8 h. test). Buckingham, Mar. 1950.	0315
	TG 20 SW 14 213	6 0318 Near Mangreen Hall, Swardeston		Handpump. <u>1953</u> . Hardness: total 400. Anal. <u>Before 1960</u> .	
	Surface level (+ 41.6 Wirth B 1, 8-in diamet	m) + 136 ft Water struck at (+ 36.9 m) + 121 ft er, February 1969	Waste (17.2 m +) 56 ft +	T Boulder Clay c.30 c.30 UCk c.140 170	:
	British Geological Survey	British Geological Survey	Thickness Depth (m) ft (m) ft	British Geological Survey British Geological Survey British Geological Survey British Geo	ological Survey.
	Boulder Clay	Soil on orange to brown sandy clay with flint pebbles.	(2.7) 9 (2.7) 9	pp. P.N. Hildreth 18.6.69.	
		Grey and brown clay with abundant chalk and occasional sandy lenses.	(12.5) 41 (15.2) 50	6"Quarter Sheet	-
British G	Geological Survey	Slightly sandy light brown clay. British Geological Survey	(2.0+) 6.5+ (17.2) 56 British Geological Sulvey	British Geological Survey TSSWE, British Geological Survey British Geological Survey	
	Borehole abandoned b	because of obstruction.			
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	1 600 g.p.h. (8 h. test). <u>Buck</u> Hardness: total 400. Anal.	Before 1960.	At Police Aleure
UCk		c.30 c.30 c.140 170	County <u>Marfork</u> Six-inch quarter sheet <u>75</u> SW Sites General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State Whether owner, tenant, builder, British Geological 2019; for Mr. General State St
Bittan Geological Sulvey	ted log 79 2066	Butter Geological Survey	Address (il different from above) <u>Jhorph Bady</u> Morunich Level of ground surface If well-top is not at ground fabove;
6"Zuarter Shee	PP.	18.6.69	above sca-level (O.D.)ft. level, state how far (below;ft.; BHAFTft.; diameterft.; Details of headings
TS See E	Pritish Geological Survey	British Geological Survey	British Geological Survey BORE 22 it. ; diameter of bore : at top ins. ; at bottom ins. Details of permanent lining tubes $70' \times 4''$
			Water struck at depths of
British Geological Survey	British Geological Survey	British Geological Survey	Painping atgais. pergais. perwith depression toCtt. below well-top. Recovery to rest-level inhours Capacity of pumpg.p.h. Date of measurements Description of permanent pumping equipment : British Geological Survey Make and/or type
ritish Geological Survey	British Geological Survey	Pritish Geological Survey	Capacitygallous per hour. Suction atft. Amount pumped galls. per day. Estimated consumptiongalls. per Well made by J.M. Buckingham. Date of well Image f.
British Geological Survey	British Geological Survey	British Geological Survey	Information from Enter Record Lance Police house visited - no one in Site marked of Randpump outside back dog,
			O.D. 116 British Geological Survey British Geological Survey British Geological Survey British Geological Survey British Geological Survey British Geological Survey British Geological Survey
itish Geological Survey	British Geological Survey	British Geological Survey	British Geological Survey British Geological
British Geological Survey	British Geological Survey	British Geological Survey	m- bhambet and turning LOG OF STRATA OVERLEAF.





Hornsea 3 Offshore Wind Farm

9	NATURE OF STRATA If measurements start below ground surface, state how far	THICKNESS		DI	Дейтн		A.1.49	TG10SE18					
or Survey use only) GEOLOGICAL CLASSIFICATION		Feet Inch		hes is Feet ical Inche		5							
17-	- Brick shaft .	84						British Geological Survey		British Geological Survey			British Geological Survey
uck. {	Char.	83		170		и.,							
ł	ingical Survey. British, Genological Survey.				Rriti	Geological Survey			 A provide processing of the second sec				
766ac	Estimated log:							• • ••• • •••••••••••••••••••••••••••	10 SE 18	1957 0233 South-west of Ho	spital Farm, Sv	wardeston	
10 - 1 - 69	BC to c. 30' UCK to 170'							Wate	face_lexel.6.et 33.2 n eer not struck th B O, 8 inch diam. wary 1970	Bedrock	545gm;) 5tlinft; (0.9 m +) 3 ft	. +	British Geological Su
Geological Survey	P.N. EM'sh Geological Survey		Brit	sh Geologia	cal Survey	· · ·					Thicknes (m)	ss ft	Depth (m) ft
										Made ground and soil.	(1.2)	4	(1.2) 4
	DATA Bank							British Geological Survey Glav and	cial Sand Gravel	Very clayey Buland.colraces uper	(0.6)	21	(155) Geological Survey
	elogical Survey British Geological Survey				Briti:	n Geological Survey				Gravel: fine, subangular traces subrounded, mainly flint, some quartz.			
					-					Sand: medium and fine, subangular. Light brown.			
								British G Car	a lky Boulder Seorogical Sulvey	Brown sandy clay with some gravel, Ge	ologic <mark>(2</mark> 3Dvey	7	(3.9) 13 British Geological Su
						•				Gravel: mainly fine, subangular flint.			
Geological Survey	Guillaite Gerola ginaite Garray			sh Geologia	ch Burvey-					Sand: medium and coarse.			
										Light brown clay with traces of chalk.	(11.6)	38	(15.5) 51
					•			Upp British Geological Survey	per Chaik	Chalk. British Geological Survey	(0.9 +)	3 +	(16.4) 54 British Geological Survey
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