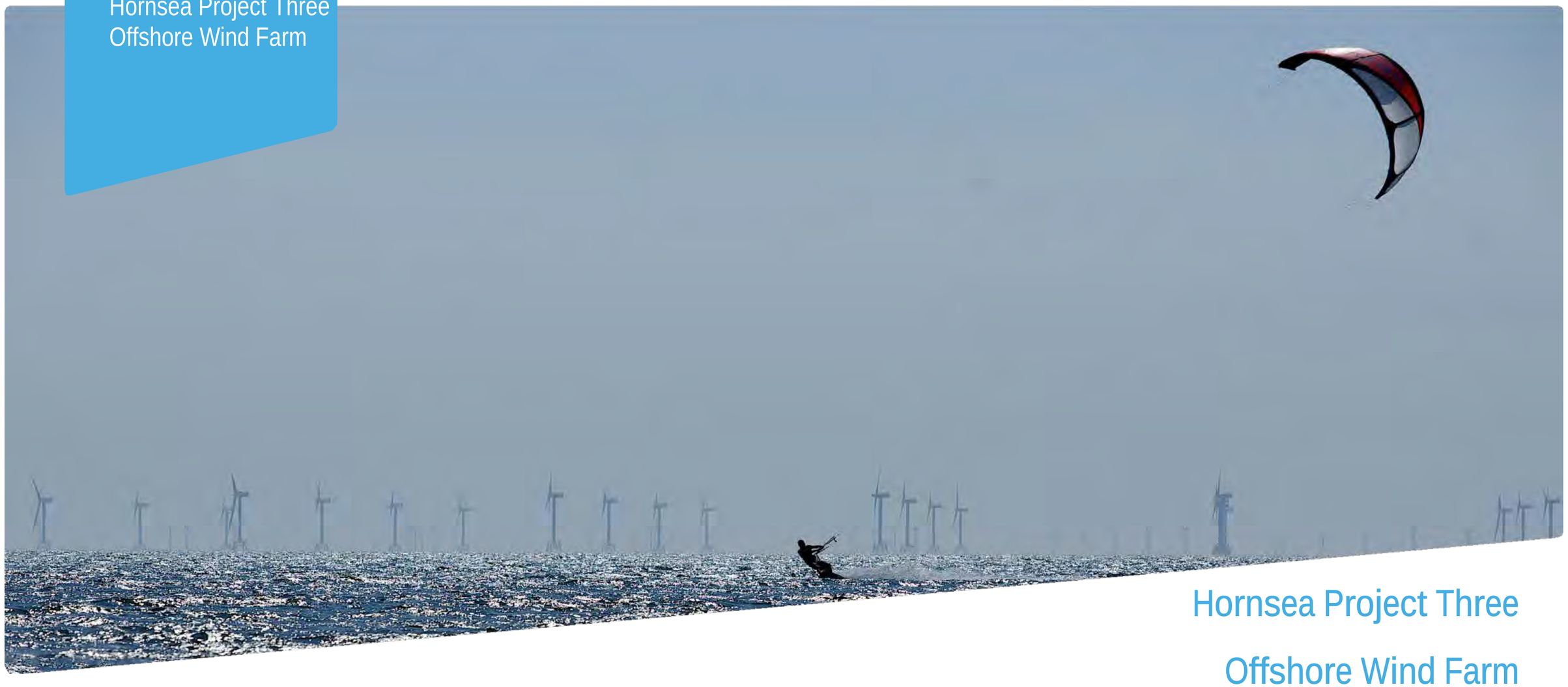
Hornsea Project Three
Offshore Wind Farm



Hornsea Project Three

Offshore Wind Farm

Preliminary Environmental Information Report:
Annex 1.1 – Borehole Logs (Part 3)

Date: July 2017

Hornsea 3
Offshore Wind Farm

DONG energy

Environmental Impact Assessment

Preliminary Environmental Information Report

Volume 6

Annex 1.1 – Borehole Logs

Report Number: P6.6.1.1

Version: Final

Date: July 2017

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

DONG Energy Power (UK) Ltd.

5 Howick Place,

London, SW1P 1WG

Front cover picture: Kite surfer near one of DONG Energy's UK offshore wind farms © DONG Energy Hornsea Project Three (UK) Ltd., 2016.

Prepared by: RPS

Checked by: Tracey Siddle and Jennifer Brack

Accepted by: Sophie Banham

Approved by: Sophie Banham

Additional Well Information:

- ☐ Well Loss Data: B..... C..... Efficiency.....
- ☒ Well Acidified NO
- ☐ Flow Logs
- ☐ Other Geophysical Logs
- ☐ Fissure Information: major inflows from.....to.....
  from.....to.....
  from.....to.....

Aquifer Parameters:

OBS 3 +?

Analysis Type: JACOB I
Transmissivity: 233 m^2/d 150m^2/d
Storage Coefficient: 3.32×10^{-4} 2.14×10^{-4}

Analysis Type:
Transmissivity:
Storage Coefficient:

Analysis Type:
Transmissivity:
Storage Coefficient:

Other Data:
Values used for assessment ~~&~~
$T = 233 m^2/d$
$S = 3.32 \times 10^{-3}$
Gave ddns close to those actually observed.

Confidence:

excellent ☐ ☐ ☐ ☐ ☑ very poor

Notes: Massive ddns recorded for v small yield
Initial Q reduced to prevent wl falling to pump inlet
Flow meter u/s after 5min - Q later reduced further
No recovery readings for first 5min complete recovery by ~~5min~~ 15hrs
Test bh data unusable for ddn etc.

DATA ACQUISITION SHEET

CSC/D/093

P15

NRA region: ANGLIAN (NORWICH)

File Number: Pump test file 34/6 (11)

TG02/95

Pump Well Identification:

NRA id No: 34/6/D/218
BGS (WL) No: TG02/95
NGR: TG 099 287
Elevation: c47m OD
Measuring Point: D.G. WILLIAMS
Site Name: RED PIT FARM
Locality: WOOD DALLING

Well details:

depth of pumping well: 61.0m
diameter: 200mm
casing details: plain steel to 35m
☑ observation boreholes
number of obs bhs: 4
obs bh details: NA

Aquifer Details:

confined / ~~unconfined~~ If confined, confining layer: Boulder clay

Aquifer Geology	from	to	Aquifer Geology	from	to
Clay 25.3 STG 30.0					
CHALK	30.0	61.0			

Pumping Test Details:

date of test: 28 MARCH 1988
length of test: 5 hours
RWL: 6.32m bgl
PWL: 31.26m bgl at end of test
pumping rate: Av. 1.96l/s; $169 m^3/d$ (max 2.2l/s min 1.7l/s) END OF TEST Q = 1.88l/s

RECORD OF WELL

For Institute use only Licence No.
E7|34|11|9|489

TG12SW/1
147/606

At .....
.....
Town or Village Booton
County Norfolk

EXACT SITE OF WELL

Six-inch National Grid sheet and reference TG.1237 2235 TG.12SW

For Booton Farms Ltd

State whether owner, tenant, builder, contractor, consultant, etc.: Owner

Address (if different from above) Oxnead House, Oxnead, Norwich.

.....

Level of ground surface above sea level (O.D.) ..... ft (.....m)

*DELETE AS NECESSARY

If well top is not at ground level state how far above:* / below: ..... ft (.....m)

SHAFT.....ft (.....m); diameter.....ft (.....m);

HEADINGS (please attach details—dimensions and directions)

BORE 250 ft (76.2 m); diameter: at top 12 in (.....mm);

at bottom.....in (.....mm)

Full details of permanent lining tubes (position, length, inner and outer diameters, plain slotted etc.):

LINED WITH 12" DIA. TUBES TO 109 ft

.....

.....

.....

Water struck at depths of ..... ft (.....m) below well top

TEST CONDITIONS

Rest level of water.....ft (.....m) above* / below well top. Suction at..... ft (..... m)

Yield on..... hours'* / days' test pumping at.....galls per ..... (..... l/s) with

depression to.....ft (.....m) below well top. Recovery to rest level in ..... mins* / hours

Capacity of pump.....g.p.h. (.....l/s)

Date of measurements.....

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type ..... Motive power.....

Capacity.....galls (.....m³) per hour. Suction at ..... ft (..... m)

below well top. Amount pumped.....galls (.....m³) per day. Estimated

consumption .....galls (.....m³) per week

Well made by T. W. PAGE & SON LTD. Date of sinking.....

ADDITIONAL NOTES ANALYSIS (please attach copy if available)

LOG OF STRATA OVERLEAF

Drillers log attached

Received from .....
.....
AWA.
.....
Date 19/8/83
Observation well.....
Recorder .....
ER log .....
Site marked on
1" map .....
6" map—Grid Sheet.....
(use symbol)
Copy to EA SE
.....
Date.....

INSTITUTE OF GEOLOGICAL SCIENCES
HYDROGEOLOGY UNIT
EXHIBITION ROAD
LONDON SW7 2DE

IGS 2494 10 000 7/79

RECORD OF WELL

For Institute use only Licence No.
E7|34|11|9|489

147/606
TG12/92

At .....
.....
Town or Village Booton
County Norfolk

EXACT SITE OF WELL

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State whether owner, tenant, builder, contractor, consultant, etc.: Owner

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*DELETE AS NECESSARY

If well top is not at ground level state how far above:* / below: ..... ft (.....m)

SHAFT.....ft (.....m); diameter.....ft (.....m);

HEADINGS (please attach details—dimensions and directions)

BORE 250 ft (.....m); diameter: at top 12 in (.....mm);

at bottom.....in (.....mm)

Full details of permanent lining tubes (position, length, inner and outer diameters, plain slotted etc.):

LINED WITH 12" DIA. TUBES TO 109 ft

.....

.....

.....

Water struck at depths of ..... ft (.....m) below well top

TEST CONDITIONS

Rest level of water.....ft (.....m) above* / below well top. Suction at..... ft (..... m)

Yield on..... hours'* / days' test pumping at.....galls per ..... (..... l/s) with

depression to.....ft (.....m) below well top. Recovery to rest level in ..... mins* / hours

Capacity of pump.....g.p.h. (.....l/s)

Date of measurements.....

NORMAL CONDITIONS

DESCRIPTION OF PERMANENT PUMPING EQUIPMENT:

Make and/or type ..... Motive power.....

Capacity.....galls (.....m³) per hour. Suction at ..... ft (..... m)

below well top. Amount pumped.....galls (.....m³) per day. Estimated

consumption .....galls (.....m³) per week

Well made by T. W. PAGE & SON LTD. Date of sinking.....

ADDITIONAL NOTES ANALYSIS (please attach copy if available)

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AWA.
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Copy to EA SE
.....
Date.....

INSTITUTE OF GEOLOGICAL SCIENCES
HYDROGEOLOGY UNIT
EXHIBITION ROAD
LONDON SW7 2DE

IGS 2494 10 000 7/79

147/606

LICENCE No. E7/34/11/G/409 TG12SW/1

TELEPHONE: NORWICH 898071 N.G.R. TG 1237 2235

T. W. PAGE & SON LTD.

DIRECTORS: T. W. PAGE I. H. PAGE F. H. PAGE

Water Supply Engineers and Artesian Well Borers
Welding and General Engineers

BUXTON ROAD FRETTENHAM NORWICH, NR12 7NQ

Anglian Water Authority,
Norfolk & Suffolk Rivers Division,
Yare House,
62/64 Thorpe Road,
Norwich.

May 19th,
1976
GEB/MG

Dear Sirs,

Borehole Log : Booton Farms, Booton

Further to my discussion with Mr.Ashford regarding the bore sunk at the above, we have pleasure in forwarding details of same, as requested:-

Total depth of bore 250 ft.
Diameter 12"
Lined with 12" dia. tubes to 109 ft.

Details of strata	Depths in feet
Top soil..........	1 ft.
Brown clay.........	5 ft.
Brown sand.........	45 ft.
Sand and stones....	9 ft.
Grey clay..........	10 ft.
Stones.............	9 ft.
Chalk..............	163 ft.
	250 ft.

(margin annotations: C-STG + Till ? Lowestoft; uclk.; 7/Gly 9.3.84)

We trust these details meet with your requirements.

Yours faithfully,
T.W.PAGE & SON LTD.

G.E.Brooke

G.E.Brooke.

RIVER ... No. 2
19 MAY 1976
62 WK/16
Rec'd AWH.

147/606

ANGLIAN WATER AUTHORITY - NORFOLK AND SUFFOLK RIVER DIVISION

TG12/92

K.A. Buckley.
B.Sc. Tech, C.Eng.,
M.I.C.E., M.I.W.E.S.
Divisional Engineer.

Our Ref.

Your Ref.

P.O. Box 50,
Norwich.
NR1 1BR

- 7 DEC 1982

The Director,
Institute of Geological Sciences,
Exhibition Road,
South Kensington,
London. S.W.7

Notification of new wells and boreholes for water under the Water Resources Act, 1963

Licence Number E7: 34 : 11 : G : 409 dated the 31/1/77

Consent under Section 24(9) dated the 5/3/76

has been issued to Booton Farms Ltd
Oxnead House
Oxnead
Norwich

authorising the construction of a new ~~well~~/borehole at

Nat. Grid Ref: TG1237 2235 Depth 250 ft/~~m~~ Diameter 12 ins/~~mm~~

by the contractors Messrs T.W. Page & Son
Buxton Road
Frettenham

K A Buckley

DIVISIONAL ENGINEER

147/606 TGR/92

LICENCE No. E7/34/11/G/409

TELEPHONE: NORWICH 898071 N.G.R. TG 1237 2235

T. W. PAGE & SON LTD.

DIRECTORS: T. W. PAGE I. H. PAGE F. H. PAGE

Water Supply Engineers and Artesian Well Borers
Welding and General Engineers

BUXTON ROAD FRETTENHAM NORWICH, NR12 7NQ

Anglian Water Authority,
Norfolk & Suffolk Rivers Division,
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Sand and stones....	9 ft.
Grey clay.....	10 ft.
Stones.....	9 ft.
Chalk.....	163 ft.
	250 ft.

1-5-9 Till ? Lowestoft

UCHK

We trust these details meet with your requirements.

PP. FB 9.3.84

Yours faithfully,
T.W.PAGE & SON LTD.

G. E. Brooke

G.E.Brooke.

RIV... ...N No. 2
19 MAY 1976
62. WK/16
12 IF AWH.

Registered in England at 35 Exchange Street, Norwich. Registered No. 756534

V.A.T. Registered No. 105 6983 60

BGS 1835

NGRC
BOREHOLE RECORDS
ADJUSTMENT FORM

QUARTER SHEET TG12SW

BH REGISTRATION NUMBER 5-34

RECORDS ENTERED AND HELD BY WALLINGFORD

BH REGISTRATION NUMBER(S)

147/72 **The Grove, Booton** (formerly War Department). (? Filled in)
TG 1226 2162

Surface +140. Bore 4 in. Lining tubes: 134½. R.W.L. +124. Yield 600 g.p.h. (test).
Fake, May 1941.

TG12/53

Boulder Clay	5½	5½
Sand and Gravel... ...	53	58½
Boulder Clay	26	84½
Uck	68¾	152¾

BOULDER CLAY 5½'	TOP SOIL	1' 6"	1' 6"
	BRICK EARTH	4' 0"	5' 6"
SAND AND GRAVEL 53'	LOAM SAND	4' 6"	10' 0"
	LIGHT GREY CLAY	8' 0"	18'
	FINE LIGHT GREY SAND	25' 0"	43'
	LIGHT BROWN SAND	12' 6"	55' 6"
	SAND AND SHINGLE	3' 0"	58' 6"
BOULDER CLAY 26	GREY CLAY	3' 6"	62' 0"
	BLUE CLAY	22' 6"	84' 6"
U. CHALK 68¼	SOFT CHALK (TUBED)	50' 1"	134' 7"
	HARD CHALK	18' 3"	152' 10"

RECORD OF WELL (SHAFT OR BORE)

47/72
TG12/53

now property of The Grove
At Searchlight to R.E.
Town or Village Booton.
County Norfolk Six-inch quarter sheet 38 SE/W.
For Mr. War Office.
Exact site of well 700 yds SSW of church. (Attach a tracing from a map, or a sketch-map, if possible.)

Level of ground surface above sea-level (O.D.) + 140 feet.

Is well-top at ground level? ____ If not, state how far above; below; ____ feet.

Shaft ____ ft., diameter ____ ft. Details of headings ____

Bore 152' 10" ft.; diameter of bore: at top 4 ins.; at bottom ____ ins.

Lengths, diameters, perforations, etc., of lining tubes ____

Water struck at depths, below well-top, of (feet) ____

TEST DETAILS — Month May, Year 1941
Rest-level of water 16 ft. above/below well-top. Suction at ____ ft. Yield on ____ hours'/days'
pumping 600 gallons per hour (max. capacity of pump ____ g.p.h.),
with depression of ____ feet. Recovery to ____ in ____ mins./hours.

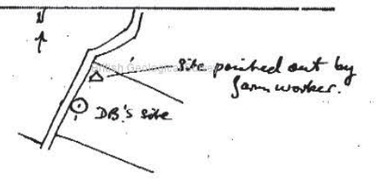
WORKING CONDITIONS
Rest-level of water in ____ (month), ____ (year), ____ ft. above/below well-top.
Highest " in ____ (month), ____ (year), ____ ft. above/below "
Lowest " in ____ (month), ____ (year), ____ ft. above/below "
Suction at ____ ft. Rate of pumping ____ galls. per ____ for ____ hours per day.
with average depression of ____ ft. Recovery to ____ in ____ mins./hours

Quality of water (*attach copy of analysis if available*) ____

Well made by W. & G. Fake, Ipswich Date of well May 1941.
Information from Do.

ADDITIONAL NOTES.

Site visited 20/6/47 DAB.
Discussed.
Surface + well top c + 140.
Sited on Norfolk 38 SE/W.
Visited. Belongs to The Grove, Booton. Site of bore indicated by farmworker slightly north of site given on 6" map. Which is beside the former buildings. No trace of bore now — ? filled in. Site not altered.
(2.7.60 ASR.



LOG OF STRATA OVERLEAF.

GEOLOGICAL SURVEY AND MUSEUM, SOUTH KENSINGTON, LONDON, S.W.7.

Date received.	G.S.M. Office File No.	1" N.S. Map No.	1" O.S. Map No.	Site marked (use symbol) on 1" Map.	on 6" Map.
May 1941		147		⊙	⊙

(17208) Wt.42901/0877 10,000 2/41 A.& E.W.Ltd. Gp.686

2

(For Survey use only)
GEOLOGICAL CLASSIFICATION

NATURE OF STRATA (If measurements start below ground surface, state how far...)	Thickness Feet	Thickness Inches	Depth Feet	Depth Inches
Boulder Clay 5½ — Top soil	1	6	1	6
Brickearth	4	.	5	6
Sand and Gravel 53 — Loam sand	4	6	10	-
Light grey clay	8	.	18	-
Fine light grey sand	25	.	43	-
Light brown sand	12	6	55	6
Sand & shingle	3	.	58	6
Boulder Clay 26 — Grey Clay	3	6	62	-
Blue Clay	22	6	~~84~~ 155½	6
Lick 68¼ — Soft Chalk (tubed)	50	1	134	7
Hard Chalk	18	3	152	10

RA/1965

3

RECORD OF WELL (SHAFT OR BORE)

147/72

TG12/58

At

Town or Village Booton, 1¼ m. S.E. of Fakenham

County Six-inch quarter sheet

For Mr.

Exact site of well See tracing

Attach a tracing from a map, or a sketch-map, if possible.

Level of ground surface above sea-level (O.D.) 130 (140) feet.

Is well-top at ground level? If not, state how far above; below; feet.

Shaft ft., diameter ft. Details of headings

Bore 153 ft.; diameter of bore: at top ins.; at bottom ins.

Lengths, diameters, perforations, etc., of lining tubes 134½ ×

Water struck at depths, below well-top, of (feet)

TEST DETAILS — Month — Year

Rest-level of water 16 ft. above/below well-top. Suction at ft. Yield on hours'/days' pumping 570 gallons per hour (max. capacity of pump g.p.h.), with depression of feet. Recovery to in mins./hours.

WORKING CONDITIONS

Rest-level of water in (month), (year), ft. above/below well-top.

Highest „ in (month), (year), ft. above/below „

Lowest „ in (month), (year), ft. above/below „

Suction at ft. Rate of pumping galls. per for hours per day.

with average depression of ft. Recovery to in mins./hours

Quality of water (*attach copy of analysis if available*)

Well made by Date of well ? 1941.

Information from Garrison Engineer, Holt, per Lt. W.H. MacFadyen, R.E.

ADDITIONAL NOTES.

LOG OF STRATA OVERLEAF.

GEOLOGICAL SURVEY AND MUSEUM, SOUTH KENSINGTON, LONDON, S.W.7.

Date received.	G.S.M. Office File No.	1" N.S. Map No.	1" O.S. Map No.	Site marked (use symbol) on 1" Map.	on 6" Map.

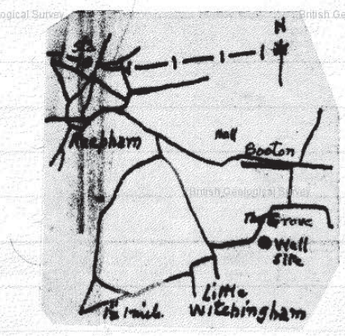
(17208) Wt.42901/0877 10,000 2/41 A.& E.W.Ltd. Gp.686

4

For Survey use only Geological Classification	NATURE OF STRATA If measurements start below ground surface, state how far... ...	Thickness Feet ...	Thickness Inches ...	Depth Feet	Depth Inches	
Boulder Clay 5½	Topsoil	1	6			
	Brickearth	4	0	5	6	
Sand and Gravel 53	Loam sand	4	6	10	0	
	Light grey clay	8	0	18	0	
	Light grey sand	25	0	43	0	
	Light loam sand	12	6	55	6	— 54½
	Sand and shingle	3	0	58	6	+81½ 322
Boulder Clay 26	Grey clay	3	6	62	0	+78
	Blue clay	22	6	84	6	— +55½
Uck	Soft chalk	40	0	124	6	
	Hard chalk	28 ~~27~~	4 ~~6~~	152	10	

RA/1965

DATA Bank



LE GRAND ADSCO LIMITED

RECORD OF TEST BORING No. 7 **at** Morton Estate.

TQ15SW/112

For Mr. J.V. Berney.

1220 1427

O/No. 2374 **Boring Completed on** 12.11.62. **O.D. Level**

Boring lined to a Depth of 17'6" **Diameter** 7¼"

BORING FOREMAN'S STRATA RECORD	THICKNESS Ft	THICKNESS Ins	DEPTH Ft	DEPTH Ins	WATER OBSERVATIONS Date	Time	W.S.	SWL
Sand & stones.	5	0	5	0				
Sand & gravel.	7	6	12	6				
Mottled clay.	1	0	13	6			Nil.	
Sand.	4	0	17	6				
TOTAL DEPTH	17	6						

SAMPLING DETAILS

Lab Location No.

Undisturbed Core Samples Taken at

2 Bulk samples taken.

Disturbed Jar Samples Taken at – 2', 7', 12', 17'6".

Water Samples Taken ~~YES~~/NO

Standard Penetration Tests Carried Out

From	To	Blows
From	To	Blows
From	To	Blows

Boring Foreman's Remarks

Signed L. Thredgold
For LE GRAND ADSCO LIMITED

LE GRAND ADSCO LIMITED

RECORD OF TEST BORING No. 5 **at** Morton Estate.

TQ15SW/114

For Mr. J.V. Berney.

1271 1330

O/No. 2374 **Boring Completed on** 2.11.62. **O.D. Level**

Boring lined to a Depth of 23'0" **Diameter** 7¼"

BORING FOREMAN'S STRATA RECORD	THICKNESS Ft	THICKNESS Ins	DEPTH Ft	DEPTH Ins	WATER OBSERVATIONS Date	Time	W.S.	SWL
Loamy sand.	5	0	5	0	1.11.62.		12'0"	
Brown clay.	2	3	7	3				
Sand & gravel.	10	0	17	3				
Loamy sand.	4	9	22	0				
Chalk.	5	0	27	0				
TOTAL DEPTH	27	0						

SAMPLING DETAILS

Lab Location No.

Undisturbed Core Samples Taken at

Disturbed Jar Samples Taken at – 3', 6'6", 7'6", 12'6", 18', 27'.

Two bulk samples taken.

Water Samples Taken ~~YES~~/NO

Standard Penetration Tests Carried Out

From	To	Blows
From	To	Blows
From	To	Blows

Boring Foreman's Remarks

Signed L. Thredgold
For LE GRAND ADSCO LIMITED

LE GRAND ADSCO LIMITED

RECORD OF TEST BORING No. 6 **at** Moreton Estate.

For Mr. J.V. Berney.

TG11SW/115
1282 1327

O/No. 2374 **Boring Completed on** 7.11.62. **O.D. Level**

Boring lined to a Depth of 15'0" **Diameter** 7¼"

BORING FOREMAN'S STRATA RECORD	THICKNESS Ft	THICKNESS Ins	DEPTH Ft	DEPTH Ins	WATER OBSERVATIONS Date	Time	W.S.	SWL
Sand & stones.	2	0	2	0				
Sand.	14	0	16	0				
TOTAL DEPTH	16	0						

SAMPLING DETAILS

Lab Location No.

Undisturbed Core Samples Taken at

Disturbed Jar Samples Taken at - 1', 6', 11', 16'.

Water Samples Taken ~~YES~~/NO

Standard Penetration Tests Carried Out

	From	To	Blows
	From	To	Blows
	From	To	Blows

Boring Foreman's Remarks

Signed L. Tindall
For LE GRAND ADSCO LIMITED

LE GRAND ADSCO LIMITED

RECORD OF TEST BORING No. 4 **at** Moreton Estate.

For Mr. J.V. Berney.

TG11SW/117
1278 1311

O/No. 2374 **Boring Completed on** 5.11.62. **O.D. Level**

Boring lined to a Depth of 28'0" **Diameter** 7¼"

BORING FOREMAN'S STRATA RECORD	THICKNESS Ft	THICKNESS Ins	DEPTH Ft	DEPTH Ins	WATER OBSERVATIONS Date	Time	W.S.	SWL
Sand & stones.	2	0	2	0				
Sand.	26	0	28	0			Nil.	
TOTAL DEPTH	28	0						

SAMPLING DETAILS

Lab Location No.

Undisturbed Core Samples Taken at

Disturbed Jar Samples Taken at - 1', 6', 11', 16', 21', 26'.

Water Samples Taken ~~YES~~/NO

Standard Penetration Tests Carried Out

	From	To	Blows
	From	To	Blows
	From	To	Blows

Boring Foreman's Remarks

Signed L. Tindall
For LE GRAND ADSCO LIMITED

Eastern L.S. Anglian Water Region, NRA

900066

TG11/212A

TG11SW 99 128-133

** GEORGE STOW & CO LTD ** Code: AW016

Reading Road - Henley-on-Thames - RG9 1DX

TG11SW

BOREHOLE RECORD

Borehole No: RW 1 Date completed: 24-09-90

161

All depths to be measured below Ground Level

Client: N.R.A. Anglian Region

Exact Site: RW 1 - Ringland (NGR: TG 128 133)

Ground Level (O.D.): .....m

Depth of Bore: 65 m Diameter: At Top 450 mm. Bottom 300 mm

Details of Permanent Lining Tubes

Diameter		Length Inserted							
450	mm	15.5	m	Plain	.....	m	Slotted	Top At 0.5	m A.G.L.
300	mm	8	m	"	.....	m	"	" 13	m B.G.L.
300	mm	.....	m	"	36	m	"	" 21	m B.G.L.
300	mm	8	m	"	.....	m	"	" 57	m B.G.L.

Rest Level of Water below Ground Level: 18.10 m

Yield on test 18 hours Pumping: 48 litres/sec Date: 22-09-90

Pumping Water Level: 23 m below G.L.

Time of Recovery: .....

Remarks: .....

STRATA RECORD

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS METRES	DEPTH METRES
? Glacial Sand and Gravel	light brown sand & stones	2	2
	SAND & CHALK	2	4
	CLAY / CHALK with flints	2	6
Upper Chalk	brown puggy CHALK with flints	2	8
	creamy soft CHALK	7	15
	soft CHALK with flints	24	39
	firm CHALK with flints	26	65

SMM 17/4/91

2001

RECEIVED N.G.D.C.
DATE: 5 NOV 1990
SIG:

Eastern L.S. Anglian Water

900066

TG11/212A

** GEORGE STOW & CO LTD ** Code: AW016

Reading Road - Henley-on-Thames - RG9 1DX

TG11SW

BOREHOLE RECORD

Borehole No: RW 1 Date completed: 24-09-90

161

All depths to be measured below Ground Level

Client: N.R.A. Anglian Region

Exact Site: RW 1 - Ringland (NGR: TG 128 133)

Ground Level (O.D.): .....m

Depth of Bore: 65 m Diameter: At Top 450 mm. Bottom 300 mm

Details of Permanent Lining Tubes

Diameter		Length Inserted							
450	mm	15.5	m	Plain	.....	m	Slotted	Top At 0.5	m A.G.L.
300	mm	8	m	"	.....	m	"	" 13	m B.G.L.
300	mm	.....	m	"	36	m	"	" 21	m B.G.L.
300	mm	8	m	"	.....	m	"	" 57	m B.G.L.

Rest Level of Water below Ground Level: 18.10 m

Yield on test 18 hours Pumping: 48 litres/sec Date: 22-09-90

Pumping Water Level: 23 m below G.L.

Time of Recovery: .....

Remarks: .....

STRATA RECORD

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS METRES	DEPTH METRES
	light brown sand & stones	2	2
	SAND & CHALK	2	4
	CLAY / CHALK with flints	2	6
	brown puggy CHALK with flints	2	8
	creamy soft CHALK	7	15
	soft CHALK with flints	24	39
	firm CHALK with flints	26	65

Eastern L.S. Anglian Water. Region, NRA

900066

TG11SW 100 128-133

TG11/212B

* * GEORGE STOW & CO LTD * * Code: AW017

Reading Road - Henley-on-Thames - RG9 1DX

TG11SW

BOREHOLE RECORD

Borehole No: RW 2 **Date completed:** 4-09-90

161

All depths to be measured below Ground Level

Client: N.R.A. Anglian Region

Exact Site: RW 2 - Ringland (NGR: TG 128 133)

Ground Level (O.D.): c30m .....m

Depth of Bore: 65 m **Diameter: At Top** 450 mm. **Bottom** 300 mm

Details of Permanent Lining Tubes

Diameter		Length Inserted							
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.

Rest Level of Water below Ground Level: 18.86 m

Yield on test 8 hours **Pumping:** 55 litres/sec **Date:** 4-09-90

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.

STRATA RECORD

GEOLOGICAL CLASSIFICATION	NATURE OF STRATA	THICKNESS METRES	DEPTH METRES
"Glacial loam and Marl" - possibly Norwich Brickearth	brown sandy soil	2	2
	brown clay	4	6
	grey-brown sandy CLAY	4	10
Upper Chalk	puggy CHALK, flints at base	10	20
	CHALK with flints	45	65

MRM 17/4/91

Eastern L.S. Anglian Water. Region, NRA

900066

TG11SW 100 128-133

TG11/212B

* * GEORGE STOW & CO LTD * * Code: AW017

Reading Road - Henley-on-Thames - RG9 1DX

TG11SW

BOREHOLE RECORD

Borehole No: RW 2 **Date completed:** 4-09-90

161

All depths to be measured below Ground Level

Client: N.R.A. Anglian Region

Exact Site: RW 2 - Ringland (NGR: TG 128 133)

Ground Level (O.D.): c30m .....m

Depth of Bore: 65 m **Diameter: At Top** 450 mm. **Bottom** 300 mm

Details of Permanent Lining Tubes

Diameter		Length Inserted							
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.

Rest Level of Water below Ground Level: 18.86 m

Yield on test 8 hours **Pumping:** 55 litres/sec **Date:** 4-09-90

Pumping Water Level: 22.11 m **below G.L.**

Time of Recovery: .....

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MRM 17/4/91

BGS MICROFILMED 2002

RECEIVED N.S.D.C. DATE 5 NOV 1990 SIG. N Jones

-180/82

TG 11 SW/74

ENGINEER G. MAUNSELL AND PARTNERS	PROJECT A47 NORWICH SOUTHERN BYPASS	GROUND LEVEL 34.95 m O.D.	HOLE NO. 7
LOGGED BY: GROUND ENGINEERING LIMITED	EXCAVATION METHODS PERCUSSIVE (DANDO 150)	COORDINATES 612 750 E 312 695 N	FIGURE A
FIELDWORK BY: " " "	200mm casing to 1.40m	DATES 17/5/82	SHEET 1 OF 1
LAB. TESTING BY: " " "			

DATE/TIME AT DEPTH	DEPTH OF CASING	DEPTH TO WATER	Backfill	STRATA DESCRIPTION	LEG.	LEVEL m O.D.	DEPTH m
						34.95	0.00
17.5.82				TOPSOIL		34.65	0.30
1630				Very stiff greenish brown silty sandy CLAY with chalk gravel (Boulder Clay)			
				becoming stiff grey brown and very sandy			1.90
				becoming firm green-grey-brown silty CLAY with chalk gravel and orange-brown silty clay pockets			2.90
17/5/82 1130	1.40	DRY				27.95	7.00
				BOREHOLE COMPLETED			

SAMPLING/ IN SITU TESTING					LAB TESTING							OTHER TESTS AND NOTES
NO.	DEPTH m	TYPE	BLOWS	V / Cr RQD	% <425	W %	PL %	LL %	MCV	γ Mg/m³	Cu kN/m²	
1	0.35	D										
2	0.40	U	(20)		78	12	19	33	9.3			
	0.85											
3	0.90	D										
4	1.40	U	(60)		69	17	7	35		2.11	157	
	1.85											
5	1.90	D										
6	2.40	U	(60)									
	2.85											
7	2.90	D										
8	3.40	U	(71)		83	20	17	36		2.07	65	
	3.85											
9	3.90	D										
10	4.40	U	(82)									
	4.85											
11	4.90	D										
12	6.20	U	(38)									
	6.65											
13	6.70	D										
14	7.00	D										

WATER
1 First water strike
2 Subsequent water strikes
3 Highest water level in open hole
▽ Highest water level in open hole

PIEZOMETER
Upper seal
Response length
Lower seal
(Installation only, readings elsewhere)

SAMPLE AND TEST KEY
D Small disturbed sample
B Bulk disturbed sample
W Water sample
U Undisturbed sample
P Piston sample
R Rotary core
recovery to scale
V Insitu vane test
S Standard penetration test
C Cone penetration test
K Permeability test
PR Pressuremeter test

Blows N = N value
26/150, blows for 150mm drive after seating
26*, blows for part or whole of seating drive only.
(26) Undisturbed sample blow count

V Vane strength kN/m²
Natural
Remould
Cr Core recovery %
RQD Rock quality designation
<425 Sample % passing 425μm sieve

J. Tiplady BSC. C.Eng. FICE, FIHE
Director (Transport)
Eastern Regional Office
(Transport)
49-51 Goldington Road, Bedford

SHEET 1 OF 1 | FIG. A | HOLE NO. 7

TG 10 NE 49 1644 0581 **Burnthouse Lane, Hethersett**

Surface level (+ 41.0 m) + 134 ft
Water struck at (+ 35.6 m) + 117 ft
Wirth B 1, 8 inch diam.,
December 1969

Waste (18.3 m +) 60 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
	Soil.	(0.6)	2	(0.6)	2
Chalky Boulder Clay	Brown clay with traces of medium sand and fine gravel towards the base.	(4.6)	15	(5.2)	17
	Brown chalky clay.	(13.1 +)	43 +	(18.3)	60

TG 10 NW 14 1356 0944 **Cobb's Grove Plantation, Marlingford**

Surface level (+ 37.9 m) + 124 ft
Groundwater conditions not recorded
Shell and auger, 8 inch diam.,
December 1969

Overburden (0.3 m) 1 ft;
Mineral (4.9 m) 16 ft;
Waste (10.3 m) 34ft;
Bedrock (0.9 m +) 3 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
	Soil.	(0.3)	1	(0.3)	1
Glacial Sand and Gravel	Sandy gravel. Gravel: fine to coarse subangular flint, with traces of fine subrounded quartz. Sand: medium with coarse, mainly subangular flint. Brown.	(4.9)	16	(5.2)	17
Chalky Boulder Clay	Slightly sandy brown clay with traces of gravel.	(6.4)	21	(11.6)	38
	Light brown chalky clay.	(0.9)	3	(12.5)	41
	Sandy brown clay with traces of gravel.	(3.0)	10	(15.5)	51
Upper Chalk	Chalk.	(0.9 +)	3+	(16.4)	54

	%		mm			%
Gravel	44	+	64		:	0
		−	64	+ 16	:	23
		−	16	+ 4	:	21
Sand	53	−	4	+ 1	:	14
		−	1	+ ¼	:	33
		−	¼	+ 1/16	:	6
Fines	3	−	1/16		:	3

Depth below surface (ft)	Fines	Sand	Gravel
1 − 4	6	42	52
4 − 7	2	46	52
7 − 10	6	70	24
10 − 13	0	70	30
13 − 17	1	42	57

TG 10 NW 20 1414 0895 North of Algarsthorpe

Surface level (+ 14.1 m) + 46 ft
Water struck at (+ 13.1 m) + 43 ft
Shell and auger, 8 inch diam.,
December 1969

Overburden (2.4 m) 8 ft;
Mineral (6.4 m) 21 ft;
Bedrock (0.9 m +)3 ft +

		Thickness (m)	Thickness ft	Depth (m)	Depth ft
Alluvium	Soil and brown silty and peaty clay.	(2.4)	8	(2.4)	8
Sub-alluvium gravel	Gravel.	(6.4)	21	(8.8)	29
	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.				
Upper Chalk	Chalk.	(0.9 +)	3 +	(9.7)	32

	%		mm		%
Gravel	65	+	64	:	0
		–	64 + 16	:	30
		–	16 + 4	:	35
Sand	32	–	4 + 1	:	13
		–	1 + ¼	:	14
		–	¼ + 1/16	:	5
Fines	3	–	1/16	:	3

Depth below surface (ft)	Percentage Fines	Sand	Gravel
8 – 11	3	33	64
11 – 14	2	32	66
14 – 17	2	27	71
17 – 20	4	34	62
20 – 23	5	36	59
23 – 26	1	32	67
26 – 29	1	33	66

Ref:A/S 40/91

TG10NW/45
1468. 0758.

June 92

TG10/136

161

F SMITH & SON (GRIMSBY) LIMITED

Record of 762mm (30") nominal dia x 87m deep Water Abstraction borehole drilled for Anglian Water Services Ltd Histon Cambridge

1468 0758

VALLEY FARM Nr BARFORD NORLK NGR TG ~~148 076~~

TG10NW

STRATA

		Thickness M.	Depth M.
Top soil	QUATERNARY ALLUVIUM	0.50	0.50
Grey and brown sandy clay		1.20	1.70
Dry White chalk	UPPER CHALK (UPPER CRETACEOUS)	1.80	3.50
Firm and soft yellow chalk with flints		1.00	4.50
Firm and soft yellow chalk		3.50	8.00
Harder chalk and flint		2.00	10.00
Chalk and flint		18.00	28.00
Hard chalk and flint with soft seams		49.00	77.00
Hard chalk and flint with soft sticky seams		10.00	87.00

R&O Hamilton 3-2-93

WATER

RWL 2.81m bgl, reading taken 6 December 1991

LINING TUBE

a) 25.50m x 762mm OD plain mild steel lining tube installed to a depth of 25m BGL. the top being fitted with a weld - on flange drilled NP16.
b) 87.5 x 600mmOD steel casing installed to base of borehole the top being left flush with head flange drilled NP16 casing column made up as follows:-
1) Perforated from base of borehole to 24m BGL (63")
11) Plain from 24m BGL to top flange.
111) Slotting pattern:
Rings of 10 No x 300mm long x 12.5 wide slots with 50mm plain tube between rings adjacent rows of slots staggered.
Total No of slots 1773.

Stabiliser Pack

The annular space between the 600mm OD lining and the borehole wall and betwwen the 600mm OD lining and 762mm OD lining was packed with 40mm natural shingle.

12th January 93
Jones

9656