










	Company Document ID	Sheet of Sheets 130 / 163	
	104900BLRV80010	Validity Status	Revision Number
		CD-FE	00

44.39
74.31 SJ47SW 118



BeWT		MACHINE EXCAVATED TRIAL PIT		Ground Level (m AOD)	Trial Pit No.												
Location Runcorn Industrial Supply		Job No. 8156/81	Project Ref 9-00-05-949	Co-ordinates E N	TP4												
  		Field Records	Samples	DESCRIPTION OF STRATA	Reduced Level m AOD												
		Cohesion(kN/m ²)	Depth (m) Type & No.		Strata Legend	Depth (Thickness) m											
  		140*	0.50 0.60	B 1	Grass over TOPSOIL with occasional fine to coarse gravel and cobbles	0.30 0.30											
			1.40	D 1	Very stiff dark brown/grey slightly sandy CLAY with a little fine to coarse gravel, occasional cobbles and sand partings		12.80										
		140*	2.00				1										
			2.40	D 2			2.50										
Scale 1:50		Trial Pit Complete															
Trial Pit excavated using a mechanical excavator. Remarks: 1) Land drain hit at 0.50m. 2) Slow progress below 1.50m due to stiffness of clay. 3) No groundwater encountered during excavation. 4) Sides of pit stable.		Plan 															
		<table border="1"> <tr> <td>Logged By</td> <td>GL</td> <td>DATE</td> </tr> <tr> <td>Checked By:</td> <td></td> <td></td> </tr> <tr> <td>Approved By:</td> <td></td> <td></td> </tr> <tr> <td colspan="3">FIG No.</td> </tr> </table>				Logged By	GL	DATE	Checked By:			Approved By:			FIG No.		
Logged By	GL	DATE															
Checked By:																	
Approved By:																	
FIG No.																	


SJ47SW118

 	Company Document ID	Sheet of Sheets 131 / 163	
	104900BLRV80010	Validity Status	Revision Number
		CD-FE	00



		ALLIED EXPLORATION & GEOTECHNICS LTD BOREHOLE RECORD		Status:- FINAL Date:- 07/03/96		
				BOREHOLE No BH-02		
Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56				Location: SJ4832 73060 SJ47SW		
Client: The Highways Agency				Date: 15-12-95		
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500				Sheet: 1 of 2		
SAMPLES & TESTS			STRATA			
Depth	Type No	Test Result	Reduced Level	Legend	DESCRIPTION	
1.10-1.50	B1		6.08		(1) MADE GROUND (Topsoil and hardcore fill).	
1.50-1.95	CB2	N7			MADE GROUND (Loose grey brown gravelly medium to coarse sand with some to many pockets of firm grey and red brown sandy clay with occasional gravel. Gravel is fine to medium occasionally coarse angular to subrounded and consists of sandstone, limestone and basalt. Occasional rootlets).	
2.00-2.40	B3					
2.50-2.95	CB4	N25	4.48		Medium dense orange brown gravelly coarse SAND with occasional pockets of firm thinly laminated clay. Gravel is fine to medium subangular to rounded and consists of sandstone, basalt and quartzite. (Fluvio-glacial)	
3.50-3.95	CB5	N11	3.08		Stiff occasionally thinly laminated red brown sandy CLAY with occasional to some gravel and occasional lenses of orange brown coarse sand. Gravel is fine to medium subangular to subrounded and consists of sandstone and basalt. (Glacial Till)	
4.10-4.50	B6					
4.50-4.95	U7	(45)	2.18		Firm thinly laminated brown CLAY with occasional thin laminae of brown fine sand and silt. (Glacio-lacustrine)	
5.00	J8		1.68		Very dense red brown silty fine SAND. (Fluvio-glacial)	
5.50-5.95	SJ9	50 for 275mm				
6.30-6.70	B10					
7.00-7.45	SJ11	50 for 210mm				
7.80-8.10	B12					
Boring Progress and Water Observations			Chiselling		Water Added	
Date	Depth	Casing	Casing Dia	Water Depth	From	To
15/12/95	0.00	0.00				
15/12/95	8.50	8.50	150mm	5.10		
18/12/95	8.50	8.50	150mm	4.30		
18/12/95	15.00	15.00	150mm	3.60		
All dimensions in metres Scale 1:50			For Explanation of Symbols and Abbreviations see Key Sheets		Contract No. 1568 Form AEG21/2	

SJ47SW133

 	Company Document ID	Sheet of Sheets 132 / 163	
	104900BLRV80010	Validity Status	Revision Number
		CD-FE	00

		ALLIED EXPLORATION & GEOTECHNICS LTD		Status:- FINAL	
		BOREHOLE RECORD		Date:- 07/03/96	
Project: NMCS2 Communications System In Cheshire - MS2 Cantilever Sites - M56				BOREHOLE No BH-03	
Client: The Highways Agency		Location: SS 4650 73445 53/7 +60B		SJ47SW/134	
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500			Ground Level(m(AOD)): 7.64	Date: 18-12-95	Sheet: 1 of 2
SAMPLES & TESTS			STRATA		
Depth	Type No	Test Result	Reduced Level	Legend	DESCRIPTION
			7.34		(1) TOPSOIL
0.80-1.20	B1				MADE GROUND (Yellow brown and grey brown silty fine to medium sand. Occasional rootlets).
1.50-1.95	SJ2	N5	6.14		Soft occasionally thinly laminated brown CLAY with occasional lenses of orange brown coarse sand. (Glacio-lacustrine)
1.51-1.90	B3		5.64		Firm to stiff brown sandy CLAY with some gravel. Gravel is fine to medium subangular to subrounded and consists of sandstone and basalt. (Glacial Till)
2.50-2.95	U4	(67)			
3.00	J5				
3.01-3.40	B6				
3.50-3.95	U7	(55)			
4.00	J8				
4.01-4.40	B9				
4.50-4.95	U10	(60)			
5.00	J11				
5.10-5.50	B12				
5.50-5.95	U13	(70)			
6.00	J14				
6.40-6.80	B15				
7.00-7.45	U16	(100)	0.34		
7.30-7.60	B18		0.14		Red brown slightly clayey fine to medium SAND with occasional pockets and bands of soft thinly laminated clay. (Fluvio-glacial)
7.50	J17				(As sheet 2 of 2)
7.60-7.90	SJ19				
7.61-7.90	B20	50 for 56mm			
Boring Progress and Water Observations			GENERAL REMARKS		
Date	Depth	Casing	Casing Dia	Water Depth	From To Hours
18.12.95	0.00	0.00	150mm	dry	7.90 8.20 0.75
18.12.95	2.00	1.65	150mm	dry	8.30 8.50 0.50
19.12.95	2.00	1.65	150mm	dry	8.50 8.80 1.00
19.12.95	9.00	9.00	150mm	8.30	
All dimensions in metres Scale 1:50			For Explanation of Symbols and Abbreviations see Key Sheets		
Date Printed:- 08/03/96			Contract No. 1588		

SJ47SW134_1

 	Company Document ID	Sheet of Sheets 133 / 163	
	104900BLRV80010	Validity Status	Revision Number
		CD-FE	00



ALLIED EXPLORATION & GEOTECHNICS LTD

BOREHOLE RECORD

Status:-
FINAL
Date:- 07/03/96

Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56		BOREHOLE No BH-03 134	
Client: The Highways Agency		Location: 53/7 +60B SJ47SW	
Method & Equipment: Cable Percussion using a Pilcon Wayfarer 1500		Ground Level(m(AOD)): 7.64	Date: 18-12-95
		Sheet: 2 of 2	

SAMPLES & TESTS			STRATA			
Depth	Type No	Test Result	Reduced Level	Legend	Depth (Thickness)	DESCRIPTION
8.50-8.70	SJ21	50 for 53mm	-0.86		8.50	Very dense slightly medium to coarse sandy fine to coarse subangular GRAVEL with some cobbles. Gravel and cobbles consist of sandstone and basalt. (Fluvio-glacial)
8.70-8.90	B22				(0.50)	
8.90-9.00	C23	50 for 47mm	-1.36		9.00	Grey and red brown medium grained poorly cemented slightly weathered SANDSTONE weak. (Bunter Sandstone)
Borehole complete at 9.00m BGL.						



Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Depth	Casing	Casing Dia	Water Depth		From	To	Hours	From	To	
18.12.95	0.00	0.00				7.90	8.20	0.75	7.30	9.00	1) Description derived from driller's daily report.
18.12.95	2.00	1.65	150mm	dry		8.30	8.50	0.50			
19.12.95	2.00	1.65	150mm	dry		8.50	8.80	1.00			
19.12.95	9.00	9.00	150mm	8.30							


All dimensions in metres Scale 1:50	For Explanation of Symbols and Abbreviations see Key Sheets	Contract No. 1568
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Date Printed:- 08/03/96

Form AEG21/2

SJ47SW134_2

 	Company Document ID	Sheet of Sheets 134 / 163	
	104900BLRV80010	Validity Status	Revision Number
		CD-FE	00



		ALLIED EXPLORATION & GEOTECHNICS LTD BOREHOLE RECORD		Status:- FINAL Date:- 07/03/96	
				BOREHOLE No	
Project: NMCS2 Communications System in Cheshire - MS2 Cantilever Sites - M56 Client: The Highways Agency				Location: SJ4713 73545 53/5 +55A	
Method & Equipment: Percussion/Rotary using a Pilcon Wayfarer 1500				Ground Level(m(AOD)): 7.99	Date: 13-12-95
				Sheet: 1 of 1	
SAMPLES & TESTS			STRATA		
Depth	Type No	Test Result	Reduced Level	Legend	DESCRIPTION
0.20-0.60	B1		7.29	(0.70)	MADE GROUND (Brown silty topsoil with occasional medium to coarse subangular limestone gravel).
0.80-1.20	B2				Stiff extremely closely fissured red brown sandy CLAY with occasional gravel and occasional lenses of sand. Gravel is fine subangular to subrounded and consists of sandstone, basalt and quartzite. Occasional shell fragments. (Glacial Till)
1.55-2.00	U3	(100)		(2.50)	
2.10	J4				
2.30	J5				
2.55-3.00	U6	(110)			
3.10	J7		4.79	3.20	
3.20	J8			(0.50)	Dense red brown clayey fine to medium SAND with some pockets (<100mm) of soft sandy clay. (Completely Weathered Bunter Sandstone)
3.21-3.60	B10		4.29	3.70	
3.30-3.75	SJ9			(0.30)	Red brown medium grained poorly cemented slightly weathered SANDSTONE weak. (Bunter Sandstone)
3.80	J11		3.99	4.00	
4.00	SJ12				Boring complete at 4.00m - continued by rotary coring
Boring Progress and Water Observations			Chiselling		Water Added
Date	Depth	Casing	Casing Dia	Water Depth	From To Hours From To
13/12/95	0.00	0.00			3.80 4.00 1.00 3.70 4.00
13/12/95	4.00	4.00	150mm	dry	
All dimensions in metres Scale 1:50			For Explanation of Symbols and Abbreviations see Key Sheets		Contract No. 1568
Date Printed:- 08/03/96					Form AEG21/2


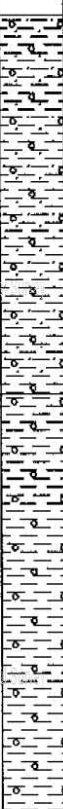
SJ47SW135





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 	Company Document ID 104900BLRV80010	Sheet of Sheets 136 / 163	
		Validity Status	Revision Number
		CD-FE	00

 Norwest Holst Soil Engineering Ltd.				BOREHOLE LOG		Borehole No. 12	
Contract No. F9626 Location 750mm Mickle Trafford to Deeside Pipeline Client British Gas Consultant		Method Cable Percussion Borehole Diam (mm) 150 Date 07/10/92		Sheet 1 of 1 Coords 4260 7149 Ground Level			
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Sampling & Insitu Testing		Ground Water	Piezometer/ Standpipe
				Depth (m)	(T) & N		
TOPSOIL		0.00		J 0.00	TCR		
Very stiff brown slightly sandy CLAY with some fine to coarse subangular gravel. ---below 2.00m subrounded gravel ---below 3.00m some grey fissures Stiff brown CLAY with a little fine subrounded gravel.		0.40		J 0.40	1.00	(88)	
				U 0.50			
				J 1.00			
				U 1.50	2.00	(47)	
				J 2.00			
				U 2.50	3.00	(49)	
				J 3.00			
				U 3.50	4.00	(38)	
				J 4.00			
				U 4.50	5.00	(33)	
		J 5.00					
		J 5.50					
		U 6.00	6.50	(30)			
		J 6.50					
		J 7.00					
		U 7.50	8.00	(62)			
		J 8.00					
Borehole Complete at 8.00m.		8.00					
Daily Progress Date 07/10/92 Final Depth (m) of: Borehole 8.00 Water Dry Casing 1.70		Hard Strata Depth (m) Time		Comments Borehole dry.		Logged by:	
Casing maintained just above base of borehole unless stated							
Sample and Test Key J Small Disturbed Sample B Bulk Disturbed Sample U Undisturbed U100 Sample W Water Sample N.R. No Recovery	S Standard Penetration Test C Core Penetration Test V Initial Vane Test P6 Permeability Test K Permeability Test Q Means to drive U100	S.P.T. 1/2 N in 100 C.P.T. 300mm penetration 1/200 For given penetration 1/250 Sealing blow only N.P. No Penetration	Rotary Core Run T.C.R. Total Core Recovery (%) S.C.R. Solid Core Recovery (%) R.Q.D. Rock Quality Designation (%)	Ground Water 1 -> First Water Strike 2 -> Subsequent Water Strike --- and/or Standing Level --- Level 20mins after strike --- Casing Depth	Piezometer --- Upper Seal --- Sand Cell --- Piezometer Tip --- Lower Seal --- Grout		

SJ47SW138

 	Company Document ID 104900BLRV80010	Sheet of Sheets 137 / 163	
		Validity Status	Revision Number
		CD-FE	00

 Norwest Holst Soil Engineering Ltd.				BOREHOLE LOG		Borehole No. 15		
Contract No. F9626 Location 750mm Mickle Trafford to Deeside Pipeline Client British Gas Consultant		Method Cable Percussion Borehole Diam (mm) 150 Date 07/10/92 08/10/92		Sheet 1 of 1 Coords 4222 7155 Ground Level		SJ47SW / 141		
Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)	Sampling & Insitu Testing		Ground Water	Piezometer Standpipe	
				Depth (m)	(1 & N) TCR S.C.R. R.Q.D.			
TOPSOIL.		0.20						
MADE GROUND: Dark brown silty clay with abundant ash, brick and glass.				B 0.60	1.00			
		1.00		S 1.00	1.45	"18"		
Stiff brown slightly silty CLAY with some fine subangular gravel.				J 1.80				
		2.20		U 2.00	2.50	(34)		
Stiff brown slightly sandy CLAY with occasional fine to coarse subangular of subrounded gravel with some fissuring.				J 2.60				
		3.00		J 2.80				
Firm brown SILT thinly laminated with fine sand.				S 3.00	3.45	"32"		
				J 3.60				
				U 4.00	4.50	(73)		
				J 4.60				
				J 4.80				
		5.40		6 5.00	5.45	"50"		
Brown silty fine and medium GRAVEL.				B 5.60	5.30			
		6.00						
Dense brown slightly silty fine SAND.				S 6.50	6.85	"38"		
				B 7.30	7.80			
				S 8.00	8.45	"39"		
Borehole Complete at 8.45m.		8.45						
Daily Progress Date 08/10/92 Final Depth (m) of: Borehole 8.45 Water Dry Casing 4.50		Hard Strata Depth (m) Time		Comments Borehole dry.		Logged by:		
Casing maintained just above base of borehole unless stated								
Sample and Test Key	J Small Disturbed Sample B Bulk Disturbed Sample U Undisturbed U100 Sample W Water Sample N.R. No Recovery		S Standard Penetration Test C Cone Penetration Test V Insitu Vane Test PR Piezometer Test K Permeability Test B Blows to drive U100		S.P.T. - 1" N/A full C.P.T. 300mm penetration .../200 For given penetration .../25 Sealing Holes only N.P. No Penetration		Rotary Core Run T.C.R. Total Core Recovery (%) S.C.R. Solid Core Recovery (%) R.Q.D. Rock Quality Designation (%)	
					Ground Water 1 → First Water Strike 2 → Subsequent Water Strike ———— sample Standing Level Level 20mins after strike Casing Depth		Piezometer Upper Seal Sand Seal Piezometer Tip Lower Seal Guard	

SJ47SW141



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Company Document ID

104900BLRV80010

Sheet of Sheets
138 / 163Validity
StatusRevision
Number

CD-FE

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SCHEME Gowy. Marshes

BH No. 1

CHESHIRE COUNTY COUNCIL
DEPT. OF HIGHWAYS & TRANSPORTATION
ENGINEERING SERVICES LABORATORY
BACKFORD HALL, NR CHESTER

Location

Depth 17.0m

Job No. 0175

Data Sheet 1

No. 1 of 2

SS47/70A
SS47SW/179DESCRIPTION OF
STRATA

Scale 1:100

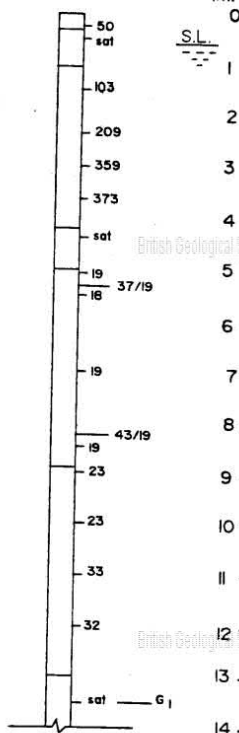
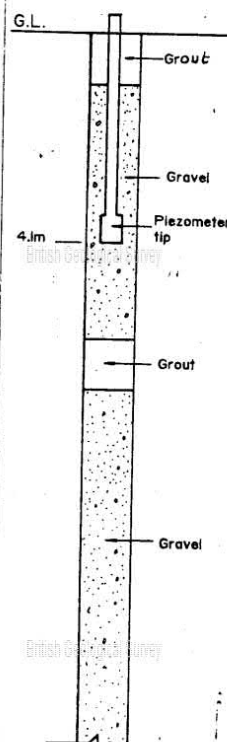
BH 1
G.L. 4.70m A.O.D.Stiff grey weathered silty clay
Fawn clayey sand with thin
layers of medium fine sandBlack amorphous peat with thin
layers of rotted stems and wood,
becoming fibrous locally, localised
concentrations of broken shell

Silty sand

Stiff brown silty sandy clay till
with fine to med gravel

Firm brown silty clay

Medium fine sand

Coefficient
of
Permeability
Cm/SecLoss
on
ignition
%DETAILS
OF
INSTALLATION

GROUNDWATER	C	D	W	SL	DEPTH (m)	SO3	pH	
2.11.83 am	3.9	3.9	3.9	3.8 After 15 minutes				
2.11.83 pm	7.8	8.0	-	NIL Sealed off by liners				
3.11.83 pm	7.5	13.0	13.0	4.1 After 30 minutes				
4.12.83 am	12.0	13.0	-	0.55 Overnight				
4.12.83 pm	15.0	17.0	-	NIL Sealed off by liners				

For Grading,
Compaction,
Consolidation &
Triaxial Curves
See attached sheets

BORING

BH commenced 1.11.83

Casing size 200mm

Shell & Auger
BoringRotary
Boring

Flush

Rotary
Coring

BH completed 5.11.83

Cased to 15.0m

From 0.0

To 17.0m

From

To

From

To

RECEIVED FROM

20 FEB 2003

ENVIRON AGENCY

SJ47SW179



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104900BLRV80010

Sheet of Sheets
139 / 163

Validity
Status

Revision
Number

CD-FE

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Location <u>BL 2</u>	Depth <u>18.0m</u>	ENGINEERING SERVICES LABORATORY BACKFORD HALL NR CHESTER	
Job No. <u>0175</u>	Date Sheet <u>3</u>	SS47/70R	
No. <u>1</u> of <u>2</u>	SS47SW/180		

DESCRIPTION OF STRATA	Coefficient of Permeability cm/sec	Loss on Ignition %	DETAILS OF INSTALLATION																																													
<p>Scale 1:100</p> <p style="text-align: center;">BH 2</p> <p style="text-align: center;">G.L. 5.39m A.O.D. (m)</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> <p>Dark brown organic sand with layers of clayey amorphous peat</p> <p>Black/brown saturated amorphous plastic peat with layers of fibrous peat and concentrations of stems and wood</p> <p>Sand and coarse gravel</p> <p>Firm to stiff brown silty sandy clay fill with fine to medium gravel</p> </div> <div style="width: 45%;"> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td>0</td><td>-9.36x10⁻⁷</td><td>-13</td></tr> <tr><td>1</td><td></td><td></td></tr> <tr><td>2</td><td>-2.13x10⁻⁴</td><td>-62</td></tr> <tr><td>3</td><td>-8.93x10⁻⁵</td><td>-58</td></tr> <tr><td>4</td><td>-4.23x10⁻⁵</td><td>-56</td></tr> <tr><td>5</td><td>-1.45x10⁻⁶</td><td>-73</td></tr> <tr><td>6</td><td>-2.79x10⁻⁵</td><td>-66</td></tr> <tr><td>7</td><td></td><td></td></tr> <tr><td>8</td><td>-1.34x10⁻⁷</td><td></td></tr> <tr><td>9</td><td>-6.05x10⁻⁷</td><td></td></tr> <tr><td>10</td><td></td><td></td></tr> <tr><td>11</td><td>-8.52x10⁻⁸</td><td></td></tr> <tr><td>12</td><td>-2.40x10⁻⁷</td><td></td></tr> <tr><td>13</td><td></td><td></td></tr> <tr><td>14</td><td></td><td></td></tr> </table> </div> </div> <div style="display: flex; justify-content: space-between; margin-top: 20px;"> <div style="width: 45%;"> </div> <div style="width: 45%;"> </div> </div>	0	-9.36x10 ⁻⁷	-13	1			2	-2.13x10 ⁻⁴	-62	3	-8.93x10 ⁻⁵	-58	4	-4.23x10 ⁻⁵	-56	5	-1.45x10 ⁻⁶	-73	6	-2.79x10 ⁻⁵	-66	7			8	-1.34x10 ⁻⁷		9	-6.05x10 ⁻⁷		10			11	-8.52x10 ⁻⁸		12	-2.40x10 ⁻⁷		13			14					
0	-9.36x10 ⁻⁷	-13																																														
1																																																
2	-2.13x10 ⁻⁴	-62																																														
3	-8.93x10 ⁻⁵	-58																																														
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8	-1.34x10 ⁻⁷																																															
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10																																																
11	-8.52x10 ⁻⁸																																															
12	-2.40x10 ⁻⁷																																															
13																																																
14																																																
<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>GROUNDWATER</th> <th>C</th> <th>D</th> <th>W</th> <th>SL</th> <th>DEPTH (m)</th> <th>SO3</th> <th>pH</th> </tr> </thead> <tbody> <tr> <td>5.11.82</td> <td>4.5</td> <td>5.7</td> <td>5.7</td> <td>2.9</td> <td>20 minutes</td> <td></td> <td></td> </tr> <tr> <td>5.11.82 pm</td> <td>7.0</td> <td>7.0</td> <td>-</td> <td>NI</td> <td>Sealed off by liners</td> <td></td> <td></td> </tr> <tr> <td>7.11.82 am</td> <td>7.0</td> <td>7.0</td> <td>-</td> <td>NI</td> <td>Sealed off by liners</td> <td></td> <td></td> </tr> <tr> <td>8.11.82 am</td> <td>9.0</td> <td>15.0</td> <td>-</td> <td>3.0</td> <td></td> <td></td> <td></td> </tr> </tbody> </table>	GROUNDWATER	C	D	W	SL	DEPTH (m)	SO3	pH	5.11.82	4.5	5.7	5.7	2.9	20 minutes			5.11.82 pm	7.0	7.0	-	NI	Sealed off by liners			7.11.82 am	7.0	7.0	-	NI	Sealed off by liners			8.11.82 am	9.0	15.0	-	3.0						<p>For Grading, Compaction, Consolidation & Triaxial Curves</p> <p>See attached sheets</p>					
GROUNDWATER	C	D	W	SL	DEPTH (m)	SO3	pH																																									
5.11.82	4.5	5.7	5.7	2.9	20 minutes																																											
5.11.82 pm	7.0	7.0	-	NI	Sealed off by liners																																											
7.11.82 am	7.0	7.0	-	NI	Sealed off by liners																																											
8.11.82 am	9.0	15.0	-	3.0																																												

BORING

BH commenced 5.11.82 Casing size 200mm Shell & Auger Rotary Flush Rotary Flush



BH completed 8.11.82 Cased to 9.0m From 0.0 To 18.0m From To From To

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ENVIRON AGENCY

SJ47SW180

 	Company Document ID		Sheet of Sheets 140 / 163	
			Validity Status	Revision Number
	104900BLRV80010		CD-FE	00

STRATA SURVEYS LTD., Telephone: 0606 84 4637 Fax: 0606 84 6657					Borehole Number : 5A Sheet 1 of 1.									
Job Number : 6104		Location : Golf Course, Northop			Dia. & Drilling Methods light cable percussion 150mm diameter								325471 367959	
Client : B.M.P.		British Geological Survey			British Geological Survey									
Description of Strata	Red. Level	Legend	Thick-ness	Depth m	Sample Depths	Sample Types	N Value	Cu	g	Water Level	Pie-zo	Daily Prog.		
TOPSOIL	98.00		(0.20)	0.00										
Soft to firm brown silty CLAY	97.80		(0.50)	0.20										
Firm grey/brown very silty CLAY	97.30		(1.70)	0.70										
Brown damp clayey medium SAND and GRAVEL	95.60		(0.30)	2.40										
Firm to stiff brown gravelly CLAY. (Boulder Clay)	95.30		(0.80)	2.70										
Stiff brown gravelly CLAY. (Boulder Clay)	94.50		(0.90)	3.50										
Brown wet clayey medium SAND AND GRAVEL.	93.60		(0.40)	4.40										
Fine to coarse SAND and GRAVEL. Blowing slightly.	93.20		(0.70)	4.80										
Borehole Completed	92.50			5.50								30/8		
General Remarks : Water struck at 4.4m rising to 3.2m after 20 minutes. 3 hours to conduct falling head test. Blowing back slightly at 4.8m. Drillers descriptions only.					Dates : 30/8/91 Driller : T.A.M. Engineer: A.M.									



SJ26NE1464

 	Company Document ID		Sheet of Sheets 141 / 163	
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			CD-FE	00

Osiris Seaway Ltd SITE INVESTIGATION DIVISION				TRIAL PIT No. 8 REPORT No. D86136			
LOCATION A55, GATEWAY SERVICES, CLWYD Client SHELL UK OIL LIMITED				Ground Level 93.58m O.D. Coordinates 327759 356850			
Method/Dimensions of Pit Excavated using a backacting JCB 3CX with 0.8m bucket to a depth of 2.70m.						Pit Commenced 1/7/86 Pit Completed 1/7/86	
Ground Water observations are given at end of log		Remarks No water encountered. Pit walls stable.					
Description of Strata				Scale 1: 25		Samples	
				Depth (m)	Reduced Level	Ref. No.	Type
Dark brown organic clayey silty SAND with rootlets (TOPSOIL).				0.30	93.28		
						1	CBR
Firm to stiff orange brown gravelly very sandy silty CLAY.						2	D
Red brown f.m. SAND.				1.10	92.48	3	CBR
Stiff dark brown sandy silty CLAY with gravel and cobbles of sandstone and siltstone.				1.40	92.18	4	D
						5	B
				2.70	90.88		

Key: **SAMPLES:** U=Undisturbed. B=Bulk Disturbed. D=Disturbed. P=Piston. W=Water.
 Inclination of U Sample from vertical given in Notes. R=Refer to text or explanatory data sheet.
 CBR=Undisturbed California Bearing Ratio Test sample.
 f = fine. m = medium. c = coarse.

SJ26NE1483

 	Company Document ID 104900BLRV80010	Sheet of Sheets 142 / 163	
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TRIAL PIT RECORD

Project CHESTER ROAD EAST

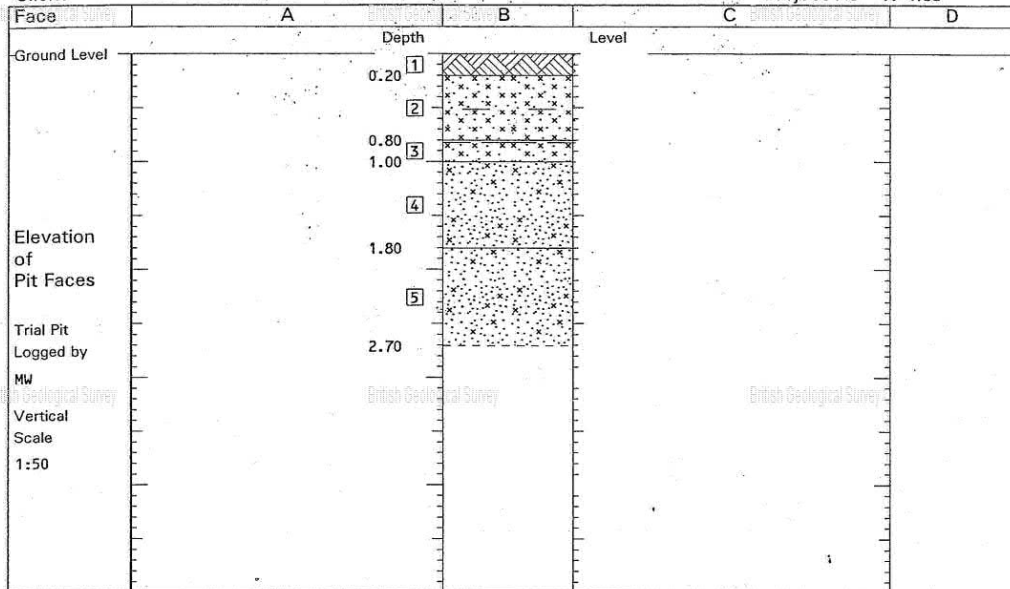
Engineer VERYARDS LTD.

Trial Pit TP15

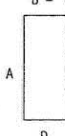
Coordinates

Client

Project No 99-1738



Samples and Tests			Strata			Geological Classification
Depth	Type	Strength kN/m ²	Face B Depth	Stratum Number	Description	
			0.20	1	Grass over dark brown sandy silty clayey TOPSOIL with rootlets	
0.40	B		0.80	2	Firm brown clayey fine sandy SILT with occasional rootlets. Occasional pockets, <90mm, of sandy silty clay.	
0.90	JV	50.58	1.00	3	Firm grey mottled orange-brown very clayey fine sandy SILT.	
0.90	V	62.0				
1.20	B		1.80	4	Pale brown silty fine and medium SAND. Locally slightly clayey.	
2.00	B		2.70	5	Brownish-grey silty fine and medium SAND with occasional shells and shell fragments	



Excavation				Dimensions		Groundwater	
Date Excavated	06/12/99	Date Backfilled	06/12/99			1.50m Damp 2.30m Seepage	
Plant	JCB 3CX						
Shoring	NONE						
Stability							

Remarks Pit sides collapsing below 0.9m.

Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres.

geotechnics

SJ36NW604

 	Company Document ID 104900BLRV80010	Sheet of Sheets 143 / 163	
		Validity Status	Revision Number
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BOREHOLE RECORD - Cable Percussion

Sheet 1 of 2

Project M56 Junction 14 Drainage Remedial Work

Engineer Atkins

Borehole BH101

Coordinates E346481.25 N274647.

National Grid

Project No PN030329

Client Highways Agency

Sampling				Properties			Strata			
Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m ²	M	SPT N	Description	Depth	Legend	Level
0.30	J						MADE GROUND: Firm brown slightly sandy clayey topsoil with many rootlets.	G.L.		7.96
0.50 - 1.00	B						Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium.	0.30		7.66
1.20 - 1.65	U(28)									
1.70	J									
2.00 - 2.45	SJB					15	From 2.00m occasional shell fragments.			
2.50	J						Firm brown locally thinly laminated CLAY/SILT with occasional bands of fine brown sand.	2.50		5.46
3.00 - 3.45	U(93)									
3.50	J						Medium dense brown slightly silty slightly gravelly fine to medium SAND. Gravel is subrounded and fine.	3.50		4.46
4.00 - 4.45	SJB	3.00	3.80			35				
5.00 - 5.45	SJB	4.50	1.00			16				
6.00 - 6.45	SJB	6.00	2.00			17	From 6.00m some coarse sand.			
7.50 - 7.95	SJB	7.50	1.50			27				
								8.00		-04

Boring				Progress				Groundwater			
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	am (A) Date	Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed
1.20	500x500	Inspection Pit	AW	Start 0.00			20/02/04	4.00	3.00	3.80	
12.50	150	Cable Percussion	AW	End 12.50	12.00	3.00	A20/02/04 P20/02/04 20/02/04				

Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 4.00m, seal 12.50-4.50m, filter 4.50-3.50m, seal 3.50-2.50m, concrete 0.50m-G.L, flush cover fitted.

geotechnics



Logged by: AG Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres.

Scale: 1:50

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BOREHOLE RECORD - Cable Percussion

Sheet 1 of 2

Project M56 Junction 14 Drainage Remedial Work

Engineer Atkins

Borehole BH102

Coordinates E346372.52 N374636.

National Grid



Project No PN030329

Client Highways Agency

Sampling				Properties			Strata					
Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m ²	W %	SPT N	Description	Depth	Legend	Level 00		
0.30 0.50 - 1.00	J B						MADE GROUND: Tarmac.	G.L.		7.92		
1.00	J						MADE GROUND: Grey locally red brown very sandy gravel. Gravel is subangular to subrounded fine to coarse including sandstone. (SUB-BASE).	0.30		7.62		
1.20 - 1.65	SJB					8	MADE GROUND: Red brown very sandy gravel. Gravel is subangular to subrounded fine to coarse of sandstone (SUB-BASE).	0.80		7.12		
2.00 - 2.45	SJB	1.50				19	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium.	2.20		5.72		
2.50	J											
3.00 - 3.45	U(100)	3.00	DRY									
3.50	J						Medium dense brown slightly clayey fine to medium SAND.	3.50		4.42		
4.00 - 4.45	SJB	4.00	2.50			13						
5.00 - 5.45	SJB	4.50	3.00			40	Dense brown slightly silty gravelly fine to medium SAND. Gravel is subangular and fine.	5.00		2.92		
6.00 - 6.45	SJB	6.00	3.50			20	Medium dense brown slightly gravelly fine to medium SAND. Gravel is subanglar to subrounded fine to medium. Occasional shell fragments.	6.00		1.92		
7.50 - 7.95	SJB	7.50	1.80			20						
								8.00		-0.08		
Boring				Progress				Groundwater				
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	am (A) Date	Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed	Remarks on Groundwater
1.20 12.00	500x500 150	Inspection Pit Cable Percussion	AW AW	Start 0.00 12.00 End	11.50	2.00	13/02/04 P13/02/04 A14/02/04 14/02/04	3.50	3.00	2.50		Fast inflow
Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 5.00m, seal 12.00-6.00m, filter 6.00-4.00m, seal 4.00-3.00m, backfill 3.00-0.50m, tarmac 0.50m-G.L, flush cover fitted.												
geotechnics												
Logged by: AG Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres. Scale: 1:50												

geotechnics

SJ47SE57

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			Validity Status	Revision Number
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BOREHOLE RECORD - Cable Percussion

Sheet 1 of 2

Project M56 Junction 14 Drainage Remedial Work

Engineer Atkins




Borehole BH103

Coordinates E346473.80 N374695.1

National Grid

Project No PN030329

Client Highways Agency



Sampling				Properties			Strata			
Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m ²	W %	SPT N	Description	Depth	Legend	Level m
0.30	J B						MADE GROUND: Soft brown clayey topsoil with many rootlets.	G.L.		8.09
0.50 - 1.00							Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded and fine.	0.30		7.79
1.20 - 1.65	SJB					12				
2.00 - 2.45	U(47)	1.50								
2.50	J						From 2.50m occasional fissures with grey silt infill.			
3.00 - 3.45	SJB	3.00				24	Medium dense orange brown fine to medium SAND.	3.00		5.09
							Firm to stiff brown very sandy CLAY.	3.20		4.89
4.00 - 4.45	U(100)	3.00								
4.50	J						Medium dense brown silty fine to medium SAND with occasional shell fragments.	4.50		3.59
5.00 - 5.45	SJB	4.50	4.00			17				
6.00 - 6.45	SJB	6.00	2.00			11				
7.50 - 7.95	SJB	3.50				17				
								8.00		1.09

Boring				Progress				Groundwater			
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	am (A) Date pm (P)	Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed
1.20 12.50	500x500 150	Inspection Pit Cable Percussion	AW AW	Start 0.00 End 12.50	12.00	3.00	18/02/04 A18/02/04 P18/02/04 18/02/04	4.50	4.50	4.00	

Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 6.00m, seal 12.50-6.50m, filter 6.50-4.50m, seal 4.50-3.50m, backfill 3.50m-GL, tarmac 0.50m-GL, flush cover fitted.											
Logged by: AG Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres. Scale: 1:50											

geotechnics

SJ47SE58

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			CD-FE	00

BOREHOLE RECORD - Cable Percussion

Sheet 1 of 2

Project M56 Junction 14 Drainage Remedial Work

Engineer Atkins

Borehole BH104

Coordinates E346528.29 N374720.

National Grid

Project No PN030329

Client Highways Agency

Sampling				Properties			Strata			
Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m ²	W %	SPT N	Description	Depth	Legend	Level
0.20	J						MADE GROUND: Topsoil. (**)	G.L.		7.59
0.50 - 1.00	B						Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium. Occasional shell fragments.	0.20		7.39
1.20 - 1.65	SJB					10				
2.00 - 2.45	U(40)	1.50								
2.50	J									
3.00 - 3.45	SJB	3.00				22	From 3.00m becoming stiff.			
4.00 - 4.45	U(50)									
4.50	J									
5.00 - 5.45	SJB	4.50				16	From 5.00m occasional lenses of orange brown fine to medium sand.			
6.00 - 6.45	SJB	6.00	5.70			14	Firm brown sandy CLAY with many lenses/bands of orange brown sand.	6.00		1.59
7.00	J						Very soft to soft grey locally black slightly sandy CLAY.	7.00		0.59
7.50 - 7.95	U(100)	7.50	DRY				Firm to stiff brown sandy CLAY.	7.40		0.19
8.00	J							8.00		- .41



Boring				Progress				Groundwater				Remarks on Groundwater
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	am (A) Date pm (P)	Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed	
1.20 11.00	500x500 150	Inspection Pit Cable Percussion	AW AW	Start 0.00 End 11.00	10.50	3.00	19/02/04 A19/02/04 P19/02/04 19/02/04	6.00 6.00 8.50	6.00 7.50	5.70 7.50	7.50 7.50	Slow inflow Slow inflow

Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 6.50m, seal 11.00-7.00m, filter 7.00-5.00m, seal 5.00-4.00m, backfill 4.00-0.50m, concrete 0.50m-G.L., flush cover fitted. (**denotes drillers description).

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SJ47SE59

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			CD-FE	00

BOREHOLE RECORD - Cable Percussion

Sheet 1 of 2

Project M56 Junction 14 Drainage Remedial Work

Engineer Atkins

Borehole BH105

Coordinates E346609.25 N374757.

National Grid

Project No. PN030329

Client Highways Agency

Sampling				Properties			Strata			
Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m ²	M	SPT N	Description	Depth	Legend	Level
0.20	J						MADE GROUND: Tarmac.	G.L.		6.98
0.50 - 1.00	B						MADE GROUND: Grey brown gravel. Gravel is subangular fine to coarse including sandstone and concrete (SUB-BASE).	0.10		6.88
							MADE GROUND: Red brown sandy gravel. Gravel is subangular fine to coarse of sandstone (SUB-BASE).	0.50		6.48
1.50	J						Firm brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded and fine. Occasional lenses of orange brown fine sand.	0.90		6.08
1.50 - 1.95	SJB	1.50				9				
2.50 - 2.95	U(51)	1.50								
3.00	J									
3.50 - 3.95	SJB	3.00				16	At 3.50m locally stiff and thinly laminated.			
4.50 - 4.95	U(40)	4.50								
5.00	J									
5.50 - 5.95	SJB	4.50				13				
6.50 - 6.95	U(49)	6.00								
7.00	J						From 7.00m becoming very gravelly.			
7.50 - 7.95	SJB	7.50				27	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium. Occasional shell fragments.	7.50		-0.52
								8.00		-1.02

Boring				Progress				Groundwater			
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	am (A) Date	Depth Struck	Depth Cased	Depth after 20 mins	Remarks on Groundwater
1.20 12.50	500x500 150	Inspection Pit Cable Percussion	AW AW	Start 0.00 12.50 End	12.00	3.00	14/02/04 P14/02/04 A15/02/04 15/02/04	9.00	9.00	7.50	Fast inflow

Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed at 10.50m, filter 12.50-9.00m, seal 9.00-8.00m, backfill 8.00-0.50m, tarmac 0.50m-G.L, flush cover fitted.

geotechnics



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Scale: 1:50

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BOREHOLE RECORD - Cable Percussion

Sheet 1 of 2

Project M56 Junction 14 Drainage Remedial Work

Engineer Atkins

Borehole BH106

Coordinates E346661.68 N374785.

Client Highways Agency

British Geological Survey



Project No. PN030329

Sampling				Properties			Strata					
Depth	Sample Type	Depth Cased	Depth to Water	Strength kN/m ²	W %	SPT N	Description	Depth	Legend	Level m		
0.30	J						MADE GROUND: Tarmac.	G.L.		6.88		
0.50 - 1.00	B						MADE GROUND: Grey locally black gravel. Gravel is subangular fine to coarse (SUB-BASE).	0.20		6.68		
1.00	J						MADE GROUND: Grey locally red brown gravel. Gravel is subangular fine to coarse of sandstone (SUB-BASE).	0.60		6.28		
1.50 - 1.95	U(20)	1.50					Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded and fine. Occasional shell fragments.	1.00		5.88		
1.50 - 2.00	B											
2.50 - 2.95	SJB	1.50				16	From 2.50m occasional lenses of orange brown fine sand.					
3.50 - 3.95	U(51)	3.00										
4.00	J											
4.50 - 4.95	SJB	4.50				21	Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium	4.50		2.38		
5.50 - 5.95	U(63)	4.50										
6.00	J						Stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium.	6.00		0.88		
6.50 - 6.95	SJB	6.00				18						
7.50 - 7.95	U(71)	7.50										
8.00	J							8.00		-1.12		
Boring				Progress				Groundwater				
Depth	Dia	Technique	Crew	Depth of Hole	Depth Cased	Depth to Water	am (A) Date	Depth Struck	Depth Cased	Depth after 20 mins	Depth Sealed	Remarks on Groundwater
1.20	500x500	Inspection Pit	AW	Start			16/02/04	11.00	10.50	4.90		Fast inflow
12.50	150	Cable Percussion	AW	0.00	12.00	DRY	16/02/04					
				12.50			16/02/04					
Remarks Inspection pit excavated to 1.20m. 19mm piezometer installed tip at 11.50m, filter 12.50-11.00m, seal 11.00-10.00m, backfill 10.00-0.50m, tarmac 0.50m-Gl, flush cover fitted.												
geotechnics												
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SJ47SE61

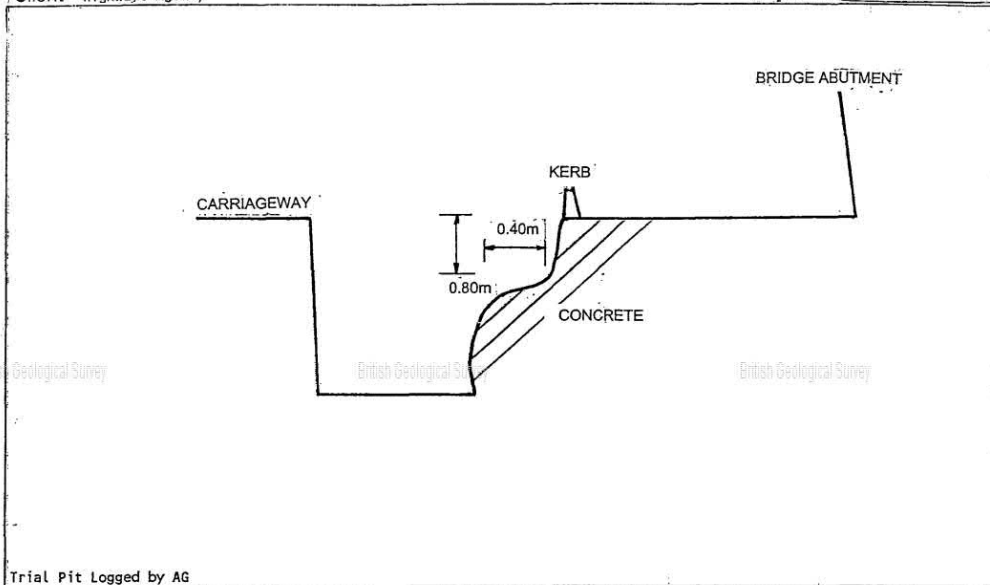
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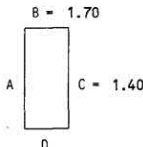
		Company Document ID		Sheet of Sheets 149 / 163	
		104900BLRV80010		Validity Status	Revision Number
				CD-FE	00

TRIAL PIT RECORD


Project M56 Junction 14 Drainage Remedial Work Engineer Atkins Trial Pit TP102
Coordinates E346553.06 N374727. National Grid
Client Highways Agency Project No PN030329



Samples and Tests			Strata				Geological Classification
Depth	Type	Strength kN/m ²	Face B Depth	Stratum Number	Description		
			0.40	1	MADE GROUND: Tarmac.	MADE GROUND	
			0.70	2	MADE GROUND: Grey slightly sandy gravel. Gravel is angular to subangular fine to coarse.	SUB BASE	
Geological Survey			1.30	3	MADE GROUND: Red brown slightly clayey slightly sandy gravel. Gravel is subangular fine to coarse.	SUB BASE	
			1.60	4	Firm becoming stiff brown slightly sandy slightly gravelly CLAY. Gravel is subangular to subrounded and fine.		

Excavation				Dimensions	Groundwater
Date Excavated	14/02/04	Date Backfilled	14/02/04		None encountered
Plant	JCB 3CX				
Shoring	None				
Stability	Stable				

Remarks Concrete encountered at 0.80m depth, extending 0.40m into trial pit.
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Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres.

geotechnics


Symbols and abbreviations are explained on the accompanying key. All linear dimensions are in metres.

SJ47SE63

 	Company Document ID	Sheet of Sheets 150 / 163	
	104900BLRV80010	Validity Status	Revision Number
		CD-FE	00

Window Sampler Hole Log



Drilled RT Logged DAS Checked NH	Start 26/03/2010 End 26/03/2010	Equipment, Methods and Remarks Competitor 130 Hand Dug Inspection Pit to 1.20m. Windowless Sampling to 5.00m	Depth from to Diameter Casing Depth	Ground Level Coordinates National Grid Chainage	+4.70 mOD E 347294 54 N 376030 83
Samples and Tests Depth Type & No Records Date Casing Time Water			Strata Description Depth, Level (Thickness) Legend Backfill/ Instruments		
			Grass onto dark brown slightly sandy clayey TOPSOIL (0.70) Firm brown mottled grey orange and red slightly sandy CLAY with occasional pockets (50mm) of fine sand. Firm grey mottled orange brown slightly sandy silty CLAY. Sand is fine. 1.50 m Becoming grey Firm spongy black and red brown fibrous PEAT with frequent wood fragments. Strong organic odour. (3.05) EXPLORATORY HOLE ENDS AT 5.00 m 5.00 -0.30 SP		
Groundwater Entries No. Struck Post strike behaviour 1 3.00 -			Depth Related Remarks * From to (m)		
Notes: For explanation of symbols and abbreviations see key sheet. All depths and reduced levels in metres. Stratum thickness given in brackets in depth column. Scale 1:50 (c) ESGL www.esgl.co.uk 048 94 28550210 12.10.18 			Project Ince Marshes Project No. F0604-10 Carried out for Entec UK Ltd Borehole DP2 Sheet 1 of 1		

SJ47NE96



104900BLRV80010

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DRAGON DRILLING (WATER & ENERGY) LIMITED

RUTHIN

TEL: 01824 707777

SITE BH NUMBER: 1

BGS No: SN15/312 GRID REF: SJ41447128



DATE: 25/11/2015

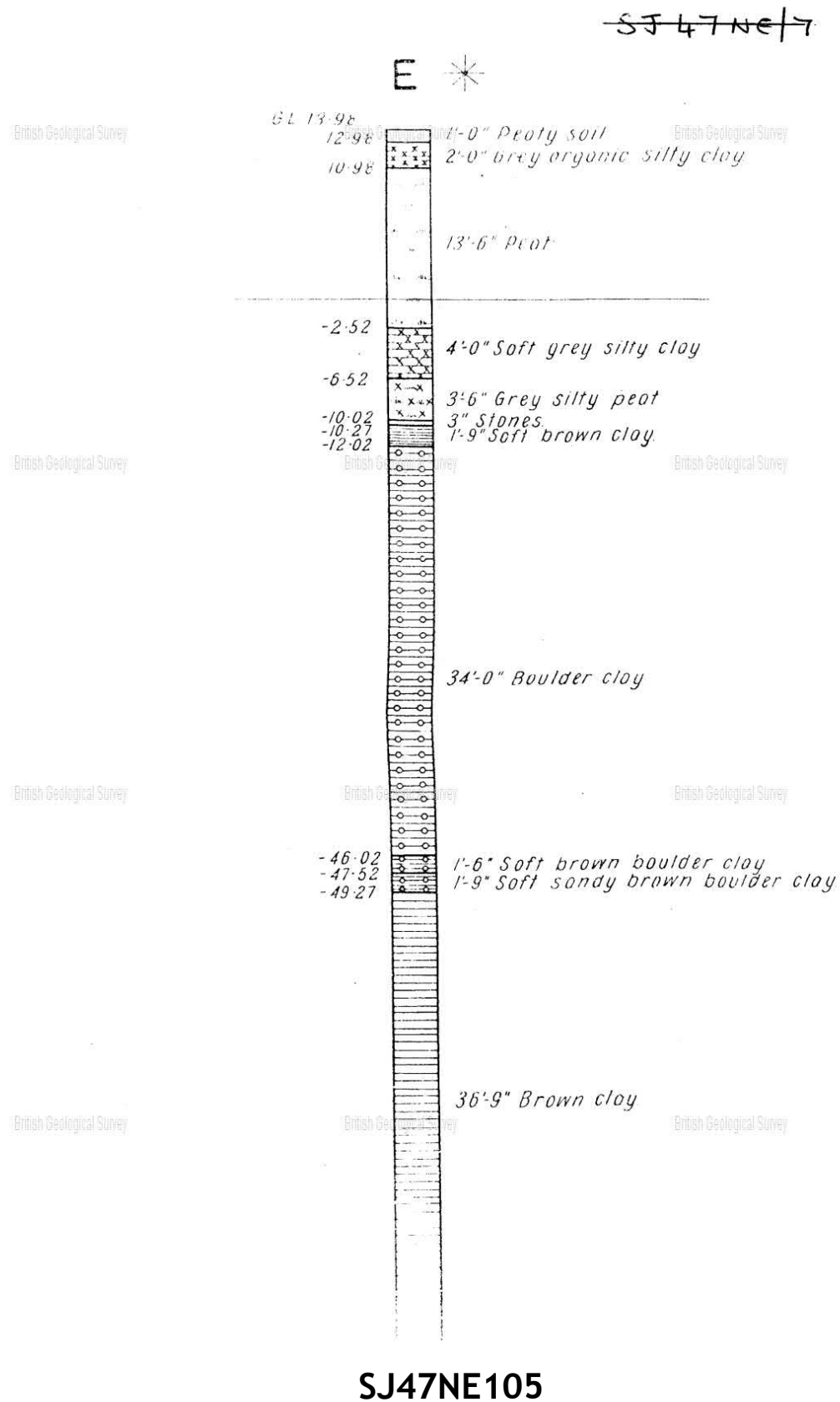
[illegible]



PREDICTED DEPTH (M)	ACTUAL DEPTH (M)	WATER STRIKE (MBGL)	LITRES PER MINUTE	SLOTTED (M)	PLAIN (M)	END CAP	STONE (MBGL)	BENTONITE (MBGL)
30	30	12 + 20	50	21	9	Yes	6 - 30	GL - 6

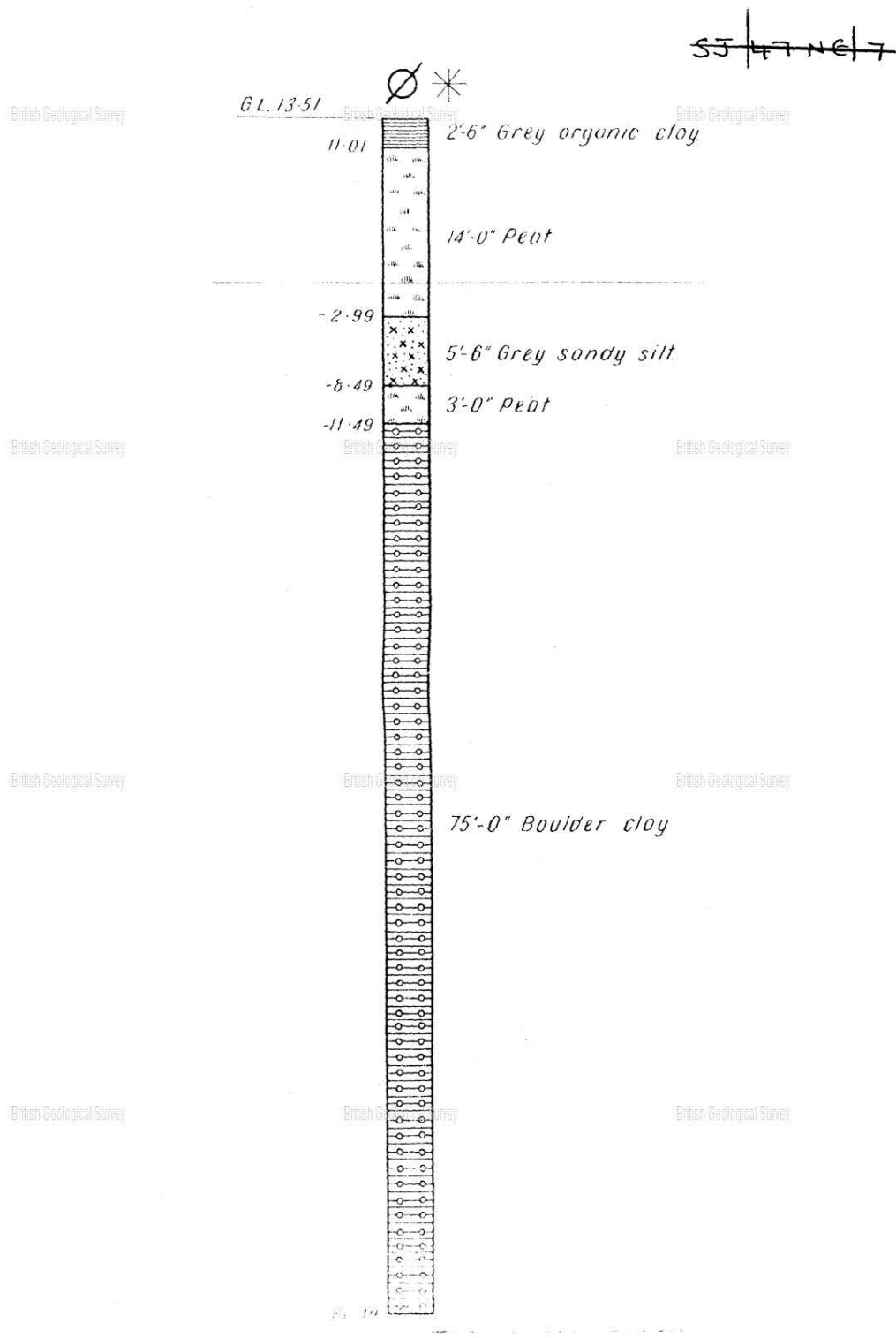
NAME: MARK BATHO (LEAD DRILLER)

SJ47SW303



  progetti	Company Document ID		Sheet of Sheets 152 / 163	
	104900BLRV80010		Validity Status	Revision Number
			CD-FE	00

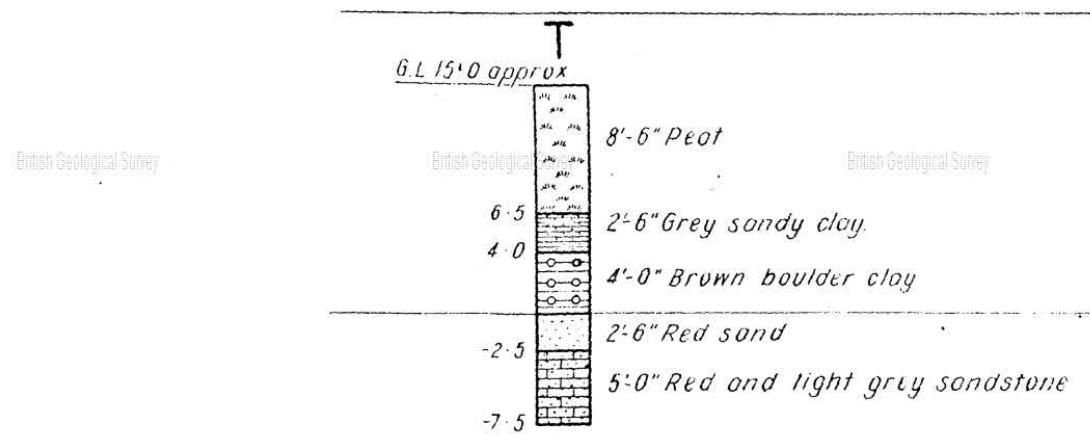


  progetti	Company Document ID 104900BLRV80010	Sheet of Sheets 153 / 163	
		Validity Status	Revision Number
		CD-FE	00

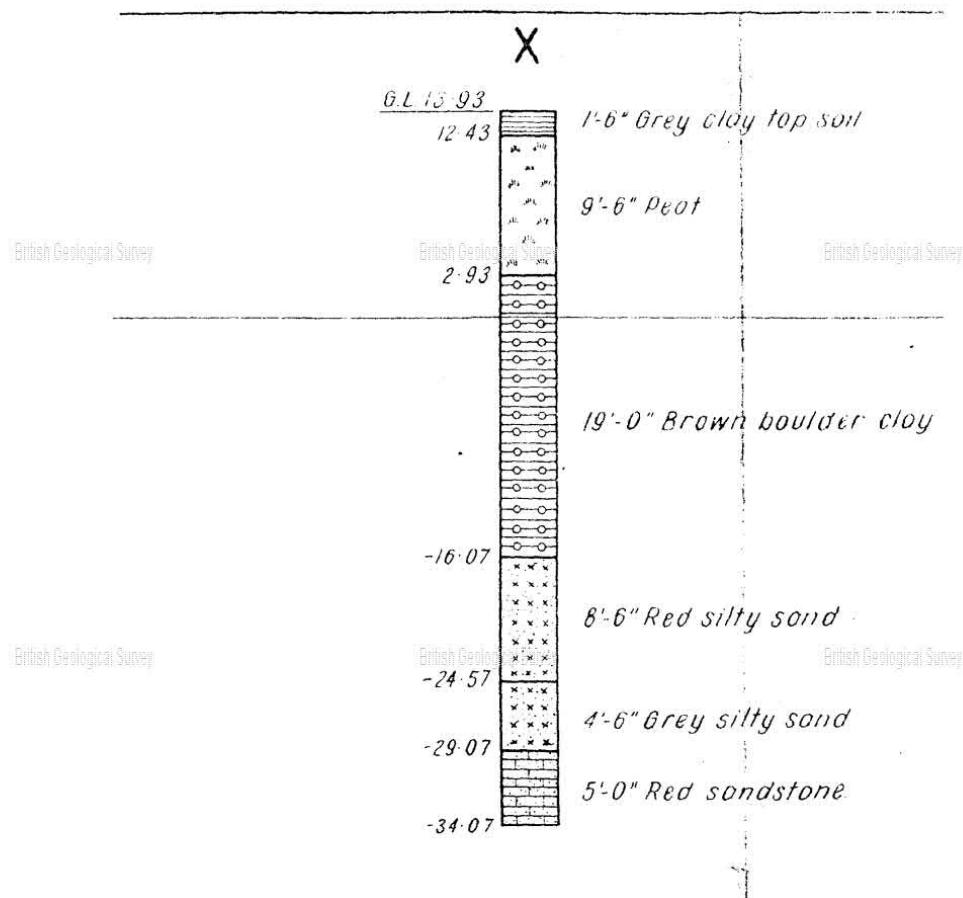


SJ47NE119

 	Company Document ID 104900BLRV80010	Sheet of Sheets 154 / 163	
		Validity Status	Revision Number
		CD-FE	00





SJ47NE124



SJ47NE128

APPENDIX B – SUMMARY DATA OF GATHERED BOREHOLES

The following tables summarize the borehole data obtained from the interpretation of their logs, as collected from the BGS website (Appendix A).

Id:	working identifier colored according to the availability of water-table elevation data (cyan: yes, yellow no data, thus, likely but not sure, dry well).
BGS_ref and BGS_id:	two codes identifying the borehole according to BGS identifiers.
Chainage:	distance in meters from the starting point
Elevation:	ground elevation a.s.l. of the borehole read on the 10 m DTM and verified on the 2 m DSM.
Easting, Northing:	coordinates according to the British National Datum and Grid (OSGB 1936, EPSG 27700) They have been obtained by georeferencing each borehole in the GIS, so they do not necessarily correspond to official coordinates in the BGS database. The expected difference should be within a meter or so.
Depth:	bottom depth of the boring, converted in meters if given in yards or feet.
Abs depth:	elevation a.s.l. (ground elevation minus total depth)
Water level:	depth in meters of the water-table, where provided.
Litho/depth (1 to 4):	up to four stratigraphic/lithologic units (description and depth), as interpretable in the log.
Bedrock true depth:	absolute elevation with respect to mean sea level.
Distance:	shortest distance in meters of the borehole from the pipeline route.
Bearing:	direction of the shortest path to go from the pipeline route to the borehole.
	presence of water in the BH
	dry BH or no data



Company Document ID

104900BLRV80010

Sheet of Sheets
156 / 163

Validity
Status

Revision Number

CD-FE

00

ROUTE OPTION 5A																				
id	BGS_ref	BGS_id	Chainage	Elevation (from DTM)	Easting	Northing	Depth	Abs depth	Water level (depth)	litho1	depth1	litho2	depth2	litho3	depth3	litho4	depth4	bedrock true depth	Distance (from pipeline)	Bearing (toward borehole)
1	SJ47NW25	163383	1045	17.5	344991.3433	375512.499	152.40	-134.90	10?	red stony clay	1.52	fine to coarse even grained sandstone with scattered quartzite pebbles	152.40					15.98	94.00	W
72	SJ47NW24	163382	1650	11.2	344690.6495	375020.234	152.40	-141.20	14.50	drift	1.52	hard sandstone with quartzite pebbles (first pebbles at 60.96, very abundant from 91.44)	152.40					9.68	440.00	WSW
2	SJ47SE18	163547	1850	11.8	345201.5974	374581.7104	2.20	9.60		very stiff slightly sandy clay with some gravel and sand	2.20					\			220.00	SE
3	SJ47SW118	163698	2600	14.4	344390.7111	374311.8905	2.50	11.90		very stiff lightly sandy clay, with a little fine to coarse gravel	2.50								75.00	W
4	SJ47SW14	163588	2790	11.6	344270.8821	374081.1917	152.40	-140.80	11.70	brown clay (soil?)	0.76	sandstone with marl beds below 33.5 m	152.40					10.84	230.00	W
5	SJ47SW135	163715	3450	11.5	344715.7365	373545.7144	4.00	7.50		stiff fissured sandy clay, with occasional gravel and sand (glacial till)	3.20	dense fine to medium sand with some clay (completely weathered Bunter Sandstone)	3.70	weak poorly cemented Bunter Sandstone	4.00			7.80	44.00	NE
6	SJ47SW134	163714	3840	11.7	344549.8044	373447.9739	7.50	4.20	8.30	made groud, silty fine to medium sand	1.50	soft clay with some coarse sand (glacio-lacustrine, down to 2.0m), and firm to stiff sandy clay with some gravel (glacial till, down to 7.50m)	7.50	sandy to coarse gravel with some cobbles	8.50	weak, weathered, sandstone Bunter Sandstone?	9.00	3.20	93.00	NNW
7	SJ47SW16	163590	3945	6.8	344489.6037	373282.5975	125.00	-118.20	4.10	Brown sand	1.07	Clay, boulder clay, sandy clay with pebbles	10.00	Sandstone, red marl at 55 m and bh bottom	125.00			-3.20	28.00	SE
8	SJ47SW133	163713	4745	6	343832.3917	373061.8972	8.00	-2.00	3.60	made soil, medium to coarse sand with occasional fine to medium gravel	2.70	medium dense coarse sand, with occasional laminated clay (fluvio-glacial)	4.10	stiff sandy clay (glacial till up to 5m) and firm clay with some sand and silt (glacio lacustrine up to 5.50)	5.50	very dense silty fine sand (fluvio-glacial)	8.00		54.00	NNW
9	SJ47SW78	163658	5070	5	343449.7167	372899.3778	5.70	-0.70	0.20	very soft fibrous peat	5.70								143.00	WNW
10	SJ47SW180	163760	5145	4.5	343680.9884	372761.3481	14.00	-9.50	3.00	organic sand and clayey peat	1.70	peat	5.30	sand and coarse gravel	6.90	firm to stiff silty sandy clay till with fine to medium gravel	14.00		117.00	ESE
11	SJ47SW179	163759	5445	4.7	343580.1758	372412.1274	14.00	-9.30	0.55	silty clay and clayey sand	1.00	peat, locally fibrous and with localized broken shells	4.20	silty sand, stiff sandy clay with some gravel, firm silty clay, medium fine sand	14.00				158	ESE
12	SJ47SW137	163717	5810	23.7	342629.801	371452.0888	8.00	15.70		very stiff slightly sandy clay, with some fine gravel and some organic speaking	8.00								111.00	W
13	SJ47SW138	163718	5815	23.7	342600.0362	371452.5051	8.00	15.70		very stiff slightly sandy clay, with some coarse gravel	4.00	stiff clay with little fine gravel	8.00						141.00	WNW
14	SJ47SW3	163577	7430	28.4	342200.235	371011.5379	19.81	8.59	14.30	clay (5.94) and sand (6.89)	6.89	soft sandstone	8.23	clay	11.58	hard to mild sand	19.81		255.00	SSW
15	SJ47SW141	163721	7500	24.4	342219.3732	371552.1031	9.45	14.95		made ground, with silty clay	1.00	stiff silty and sandy clay, with fine to coarse gravel	3.00	firm laminated silt (up to 5.40m), fine and medium gravel (up to 6m) and dense silty fine sand (down to 9.45)	9.45				280.00	NNE
16	SJ47SW303	19916607	8200	14	341439.9027	371281.8384	30.00	-16.00	20.00	sandy soil	3.00	sandstone	30.00					11.00	221.00	SW
17	SJ37SE33	157192	9830	19.2	339954.9492	371123.9837	7.92	11.28		firm to stiff silty clay with some sand	1.30	dense, fine to medium sand	7.92						12.00	NW
18	SJ37SE32	157191	9865	24.1	339896.8013	371164.4913	8.69	15.41		sand with occasional pieces of clay and gravel	7.62	weak to medium hard fine grained sandstone	8.69					16.48	73.00	NW



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Company Document ID

104900BLRV80010

Sheet of Sheets
157 / 163

Validity
Status

Revision Number

CD-FE

00

ROUTE OPTION 5A																				
id	BGS_ref	BGS_id	Chainage	Elevation (from DTM)	Easting	Northing	Depth	Abs depth	Water level (depth)	litho1	depth1	litho2	depth2	litho3	depth3	litho4	depth4	bedrock true depth	Distance (from pipeline)	Bearing (toward borehole)
19	SJ37SE34	157193	9880	10.2	339953.6251	370970.1868	6.55	3.65	9.00	silty sandy clay, sand and some gravel	2.29	sand and sandstone gravel (weathered sandstone)	4.57	weak to medium hard fine grained sandstone	6.55			7.91	128.00	SE
20	SJ37SE6	157165	12230	31.3	337919.8198	370712.5014	106.68	-75.38		boulder clay with sand and gravel pastings	22.86	soft Red Sandstone	27.43	hard Red Sandstone	106.68			8.44	376.00	NW
21	SJ36NE8	155885	15890	4.9	335700.1715	368401.5651	120.00	-115.10	overflowing at t	sand and clay	60.00	soft sandstone	120.00					-55.10	80.00	ESE
	SJ36NE160	156037	16050	5.1	336316.2	367843.9	128.02	-122.92		drift	21.34	sandstone	128.02					-16.24	879.00	ESE
	SJ36NW6	156059	16430	4.3	334889.13	368272.01	421.00	-416.70		sea sand	13.11	sand and gravel, boulder clay from 22.4	24.20	Red sandstone, Upper coal measures	421.00			-19.90	548.00	WNW
22	SJ36NW22	156075	16870	5.1	334839.599	367772.6947	91.44	-86.34	2.40	alluvial sands and gravels	31.40	clay, sandstones with marls pockets	91.44					-26.30	365.00	NW
23	SJ36NW23	156076	17750	5.2	334400.2024	367102.3748	166.73	-161.53		sand gravel and clay	30.48	stiff clay (30.48- 53.64), sandy clay, sand and gravel	117.35	sandstone and marls	166.73			-112.15	400.00	NW
24	SJ36NW29	156082	18170	5.4	334660.2541	366301.5386	51.82	-46.42		sand gravel and clay	50.90	sand and sandstone	51.82					-45.50	332.00	SE
25	SJ36NW13	156066	19670	4.9	333379.076	366701.5094	92.68	-87.78		sandstone, siltstone and mudstone, with coal seams	72.90	Banded siltstone (Linstey), fireclay and dolerite boulders (Blue metal), hard	92.68			Old borehole Drift not differentiated	4.90	165.00	NE	
26	SJ36NW169	156292	19740	5	333310.167	366741.3404	166.42	-161.42		sand and gravel	47.55	coal	166.42			Old borehole Drift not differentiated		-42.55	141.00	NE
27	SJ36NW398	156521	20290	5.3	332920.3255	367131.333	6.00	-0.70	1.80	firm sandy clay and clayey sand	2.45	soft clayey peat	3.70	silty clay and silty sand	5.30	stiff silty clay with pebbles	6.00		105.00	ENE
28	SJ36NW397	156520	20300	5.5	332869.618	367171.7367	20.50	-15.00	1.70	clay and silt (firm to soft)	3.00	soft peat	4.25	silty and stoney clay, with silty sand	8.50	stiff silty clay with pebbles	20.50		175.00	NE
29	SJ36NW266	156389	21060	5.3	332710.0649	367412.1358	9.30	-4.00	3.00	silt, clay and sand	2.44	Firm peat (2.44- 3.20) and silty clay with band of peat	5.79	silty and stoney clay, (and sand and gravel 7.16- 7.80)	9.30				67.00	NE
30	SJ36NW604	15988283	21570	4.7	332260.803	367751.6876	2.70	2.00	2.30	firm clayey fine sandy silt	1.00	silty fine and medium sand, with occasional shell fragments	2.70						201.00	N
31	SJ36NW246	156369	22000	7.5	331820.2571	367531.669	11.10	-3.60		stiff to very soft brown clay (with rock fragments 0.4- 3.8 and 6.3-9.0)	11.10								153.00	NW
32	SJ36NW475	156598	22195	13.5	331700.1905	367402.2719	7.92	5.58		drift	7.92								47.00	N
33	SJ36NW19	156072	22230	14.5	331650.1567	367402.1445	71.53	-57.03		alternation of fireclay, sandstone,black slag, metal and coal	60.66	alternation of fireclay, sandstone and purple metal	71.53					14.50	60.00	NW
34	SJ36NW215	156338	22820	30.3	331290.4718	366991.6174	92.35	-62.05		coal	92.35							30.30	99.00	SE
36	SJ36NW45/33	156147	23820	52	330480.3228	367041.811	9.45	42.55		clay with sand layers. Boulder clay at bottom	9.45								116.00	NE
35	SJ36NW45/31	156145	23840	53.4	330450.2685	367021.5567	10.36	43.04		clay with sand layers, gravel 9- 9.45 m	10.36								85.00	NE



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Company Document ID

104900BLRV80010

Sheet of Sheets
158 / 163



Validity
Status

Revision Number

CD-FE



00

ROUTE OPTION 5A																				
id	BGS_ref	BGS_id	Chainage	Elevation (from DTM)	Easting	Northing	Depth	Abs depth	Water level (depth)	litho1	depth1	litho2	depth2	litho3	depth3	litho4	depth4	bedrock true depth	Distance (from pipeline)	Bearing (toward borehole)
38	SJ36NW45/18	156132	23950	72.2	330389.9876	366791.2592	4.57	67.63		sand and boulders	4.57								105.00	SE
37	SJ36NW45/15	156129	23960	75	330350.0226	366831.0993	75.83	-0.83		sand, boulders, clay and gravel, with 6 soils	75.83								49.00	SE
39	SJ36NW45/12	156126	24025	65	330290.3728	366912.15	75.83	-10.83		sand, boulders, clay and gravel, with 6 soils	75.83								30.00	NE
40	SJ36NW69	156184	24030	68.5	330240.1975	366872.3295	10.00	58.50	2.00	Stiff to very stiff silty/sandy clay, bands of sands, with occasional stones and pieces of coal (prevailing sands 1.9-5.7 and 9-10)	10.00								32.00	SW
41	SJ36NW45/13	156127	24050	71.5	330229.5818	366881.9882	75.83	-4.33		sand, boulders, clay and gravel, with 6 soils	75.83								32.00	SW
42	SJ36NW45/14	156128	24195	76.4	330140.4012	366891.5047	75.83	0.57		sand, boulders, clay and gravel, with 6 soils	75.83								6.00	SE
44	SJ36NW45/6	156120	24270	81.5	330069.6799	366831.2969	84.12	-2.62		sand, clay, gravel and boulders, with 9 soils	84.12								55.00	SW
45	SJ26NE21	146990	25370	78.6	329139.2351	367031.6148	12.20	66.40	2.30	compact to very stiff clayey sand to sandy clay with stone inclusions	10.00	red sandstone	12.20					68.60	32.00	NW
46	SJ26NE745	147721	26290	96	328450.0675	366241.5595	30.75	65.25	11.00	Boulder clay	2.00	Mudstone, siltstone	30.75					94.00	238.00	SW
47	SJ26NE744/A	147719	26320	92	328429.8937	366321.7484	18.00	74.00		Boulder clay	1.30	sandstone, mudstone, siltstone, coal bands	18.00					90.70	202.00	SW
48	SJ26NE31	147000	26580	91.1	328249.3984	366461.757	15.30	75.80		Glacial till: mainly clay, red-brown due to alteration down to 8 m	8.80	Glacial: very clayey gravel or sand	14.80	Mudstone (coal measures)	15.30			76.30	238.00	SW
49	SJ26NE22	146991	26950	92.6	327979.8453	366671.8567	9.00	83.60	4.40	Firm to very stiff, brown, locally loose, sandy to silty clay with stone inclusions from 2.4 m	7.10	stiff gray shaly clay with ore stained fissures	9.00						235.00	SW
58	SJ26NE732	147707	27020	93	327929.2702	366721.769	15.00	78.00		Clay to boulder clay, brown to yellow	2.50	sandstone, mudstone, siltstone, some coal	15.00					90.50	225.00	SW
50	SJ26NE731	147706	27120	93.1	327870.5598	366781.3054	17.00	76.10	at 6.0 m and	Clay (gravel (2.5-2.9), soft to hard	4.70	Siltstone, sandstone, mudstone	17.00					88.40	210.00	SW
51	SJ26NE730	147705	27140	93.1	327840.2449	366801.5767	22.00	71.10		Sand, boulder clay, sandstone (3.8-4.7)	4.70	clay sandy brown	8.10	Mudstone	22.00			85.00	210.00	SW
56	SJ26NE1483	15628155	27250	95	327759.4909	366851.911	2.70	92.30		firm to stiff gravelly sandy silty clay	1.10	sand	1.40	stiff sandy silty clay, with gravel of sandstone and siltstone	2.70				215.00	SW
52	SJ26NE725	147700	27420	93.2	327608.5898	366971.8653	15.70	77.50		Boulder clay, firm, silty, locally sandy,	7.00	Grey mudstone and siltstone	15.70					86.20	202.00	SW
55	SJ26NE723	147698	27430	90.2	327630.1014	367002.1629	10.00	80.20		Boulder clay, firm, silty, locally sandy,	7.00	Gravel, clayey	8.90	Grey mudstone and siltstone	10.00			81.30	166.00	SW
57	SJ26NE728	147703	27430	91	327570.4171	367021.6043	22.00	69.00		Boulder clay, shale	3.00	Mudstone, siltstone, sandstone	22.00					88.00	184.00	SW
53	SJ26NE727	147702	27500	90	327530.4519	367061.4447	15.10	74.90	Asian water at	Mudstone-siltstone, local coal	11.60	Sandstone (anche 10.5-10.8)	15.10					90.00	174.00	SW
54	SJ26NE1317	148296	27840	93.9	327369.0996	367232.4046	189.71	-95.81		Clay (gravel 6.85-8.28)	12.85	Fired clay, sandstone (very hard), shale	54.86	Shale, light rock with band of metal	110.05	Banded siltstone (Linstey), dolerite boulders (Blue metal) and coal (hard to very hard)	189.71	81.05	126.00	SW

<div></div> <div></div>	Company Document ID															Sheet of Sheets 159 / 163			
	104900BLRV80010															Validity Status	Revision Number		
																CD-FE	00		

ROUTE OPTION 5A																				
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59	SJ26NE1	146963	28000	92.8	327260.9664	367572.1518	136.00	-43.20		clay	11.90	mostly coal	136.00					80.90	195.00	NNE
60	SJ26NE27	146996	29065	91.3	326310.0934	367642.5074	13.60	77.70		Glacial till- Diamicton clay red-brown, pebbly	6.30	Glacial sand and gravel	13.10	Mudstone (coal measures	13.60			78.20	28.00	N
61	SJ26NE1464	15044499	29850	98	325470.0697	367951.9659	5.50	92.50	3.20	soft to firm silty clay	2.40	clayey medium sand and gravel	2.70	firm to stiff gravelly clay (Boulder Clay)	4.40	fine to coarse clayely sand and gravel	5.50		236.00	WSW
62	SJ26NE44	147013	29880	96.8	325490.607	368001.2978	5.00	91.80	2.10	Glacial till: firm to stiff brown sandy to silty clay with some fine gravel	3.30	brown sand grading downward to sandy gravel	5.00					198.00	WSW	
63	SJ26NE26	146995	30370	101.1	325589.6789	368521.7395	17.10	84.00		Glacial till- Diamicton clay and sand, pebbly	17.10							22.00	WSW	
64	SJ27SW249	151390	32580	69.6	324950.1185	370570.0267	11.20	58.40		Clay and sand with abundant pebbels	5.40	Clayey sand to sands	9.50	Clayey sands and gravel to firm boulder clay	11.20			42.00	WSW	
65	SJ27SW437	151586	32990	49.7	324990.3611	371082.1945	12.19	37.51		clay with stones (soft)	12.19							225.00	NW	
99	SJ27SW3	151107	32500	74.1	324680	370361.78	21.34	52.76	5.50	clay and sand	12.31	sand and gravel	21.34					48.10	375.00	WSW
100	SJ27SE177	150914	33010	56.8	325450.1	370721.76	17.10	39.70		Brown clayey sand with some pebbles	5.00	Boulder clay with lenses of clayey sand and gravel	17.10				33.80	358.00	SE	
101	SJ27SW436	151585	33050	42.8	324990	371201.8	15.24	27.56		Red clay with stones	15.24						22.80	309.00	NW	
24	SJ36NW29	156082	18170	5.4	334660.2541	366301.5386	51.82	-46.42		sand gravel and clay	50.90	sand and sandstone	51.82					-45.50	332.00	SE
43	SJ36NW45/5	156119		74.7	330180.2275	366841.7427	84.12	-9.42		sand, clay, gravel and boulders, with 9 soils	84.12									
69	SJ47NE124	20292741		7.7	346246.1162	376293.2629	6.89	0.81		peat	2.59	sandy clay (<3,35) and Boulder Clay	4.57	red sand	5.33	Red sandstone	6.89	2.37		
70	SJ47NE128	20292745		6.5	346341.5668	376200.135	14.36	-7.86		peat	3.35	Boulder clay	9.14	red and gray silty sand	13.11	Red sandstone	14.36	-6.61		
67	SJ47NE15	163281		8.6	345790.907	376502.238	100.50	-91.90		made ground	3.50	fluvioglacial sand and gravel	10.00	Triassic sandstone (P- T)	100.50			-1.40		
68	SJ47NE16	163282		10.9	346060.2043	376422.3891	17.00	-6.10		brown alluvial clay	4.50	fluvioglacial sand	6.00	Triassic sandstone	17.00			4.90		
66	SJ47NE2	163246		14.1	345360.0542	376501.6522	18.29	-4.19		drift on Bunter Sandstone	18.29						9.10			
90	SJ47NE91	163357		4.7	346916.7456	376649.3126	12.10	-7.40		soft silty clay and clayeay silt, with soft fibrous peat levels (1.80-2.90 and 9.10-10.80)	2.90	loose fine to medium sand	12.10							
71	SJ47NW20	163378		10.2	344409.8516	375012.5057	45.72	-35.52		rather hard sandstones, even grained with scattered quarzite pebbles	45.72						10.20			
74	SJ47SE21	163550		10.8	345172.3853	374007.816	5.75	5.05	4.00	stiff sandy clay with some fine to medium gravel	3.75	highly weathered sandstone	5.00	medium grained slightly weathered sandstone, weak	5.75		7.05			
	SJ36NE12	155889	12750	25.4	338769.961	369411.768	60.9	-35.5	21.3	Brown clay	20.10	soft sandstone	27.4	hard sandstone	60.9			4.4	907.00	SE

Figure B-0-1 – Option 5A



<div></div> <div></div>		Company Document ID 104900BLRV80010														Sheet of Sheets 160 / 163			
																Validity Status	Revision Number		
																CD-FE	00		

SOUTHERN ROUTE A																				
id	BGS_ref	BGS_id	Chainage	Elev. (from DTM)	Easting	Northing	Depth	Abs depth	Water level (depth)	litho1	depth1	litho2	depth 2	litho3	depth 3	litho4	depth 4	bedrock elev.	Distance (from pipeline)	Bearing (toward borehole)
71	SJ47NW20	163378	0	10.2	344409.9	375012.506	45.72	-35.52		rather hard sandstones, even grained with scattered quartzite pebbles	45.72							10.2	127	w
72	SJ47NW24	163382	5	11.2	344690.6	375020.234	152.40	-141.20	14.50	drift	1.52	hard sandstone with quartzite pebbles (first pebbles at 60.96, very abundant from 91.44)	152.40					9.68	154	E
2	SJ47SE18	163547	1020	11.8	345201.6	374581.71	2.20	9.60		very stiff slightly sandy clay with some gravel and sand	2.20								185	NE
73	SJ47SE22	163551	1460	10.6	345654.1	374261.565	7.80	2.80	4.85	made soil medium dense, occasionally coarse gravel	2.30	firm to stiff sandy clay with occasional gravel (sandstone, basalt and quartzite), below c. 7.0m very stiff	7.80						246	SE
75	SJ47SE19	163548	1770	13.1	345789.4	374721.403	1.60	11.50		very stiff slightly sandy clay with some gravel and sand	1.60								112	NW
84	SJ47SE23	163552	2070	13.1	346143.9	374661.83	7.90	5.20		stiff sandy clay with occasional gravel (sandstone and quartzite)	1.70	loose silty fine sand, fluvio-glacial	3.80	medium dense fine to medium sand, fluvio-glacial	7.90				92	SE
80	SJ47SE57	18118094	2260	8	346372.2	374638.001	8.00		2.50	made ground, very sandy gravel	2.20	stiff sandy gravelly clay (<3.50m) and medium dense clayey fine to medium sand (<5m)	5.00	dense and medium dense gravelly fine to medium sand	8.00				211	SE
81	SJ47SE58	18118096	2270	8	346473	374696.608	8.00		4.00	firm to stiff sandy gravelly clay (medium dense sand at 3-3.20 m)	4.50	medium dense fine to medium sand	8.00						238	SE
76	SJ47NE42	163308	2425	15.5	346238.9	375009.93	2.50	13.00		sandy clay with some medium gravel	2.50								100	WNW
87	SJ47NE105	20292722	3370	4.5	346821.4	375730.923	27.40	-22.90		organic silty soil	0.90	peat	5.00	soft silty clay and silty peat	10.00	Boulder Clay (10 to 15.60) and brown clay (15.60 to 27.40)	27.40	-25.00	72	WNW
88	SJ47NE119	20292736	3475	3.8	346809.8	375850.713	30.33	-26.53		soil (0.7m) and peat	4.88	sandy silt	6.55	peat	7.45	Boulder Clay	30.33	-30.00	116	WNW
89	SJ47NE21	163287	3950	5.3	346599.9	376029.754	85.00	-79.70		fill and silty clay (alluvium)	3.00	peat	5.00	soft clay (glacial till or alluvium)	18.50	Triassic sandstone	85.00	-13.20	232	SW
83	SJ47SE59	18118097		7.2	346529	374722.047	8.00		7.50	firm sandy gravelly clay (lenses of fine to medium sand below 5m)	6.00	sany clay with lenses of sand (firm at 6-7m, very soft to soft at 7-7.40m, firm to stiff 7.4-8m)	8.00							
86	SJ47SE60	18118099		7	346607.6	374758.435	8.00		7.50	made ground, fine to coarse gavel and sandy gravel	0.90	firm slightly sandy and gravelly clay, occasional lenses of sand, stiff at 3.5m, from 7m very gravelly	8.00							
85	SJ47SE61	18118101		7	346660.4	374786.772	8.00		4.90	made ground, fine to coarse gravel	1.00	stiff slightly sandy and gravelly clay, with occasional lenses of fine sand	8.00							
79	SJ47SE63	18118107		7	346552.9	374728.81	1.60			made ground, sligtly sandy and clayey fine to coarse gravel	1.30	firm to stiff slightly sandy and gravelly clay	1.60							

Figure B-0-2 – Southern route A

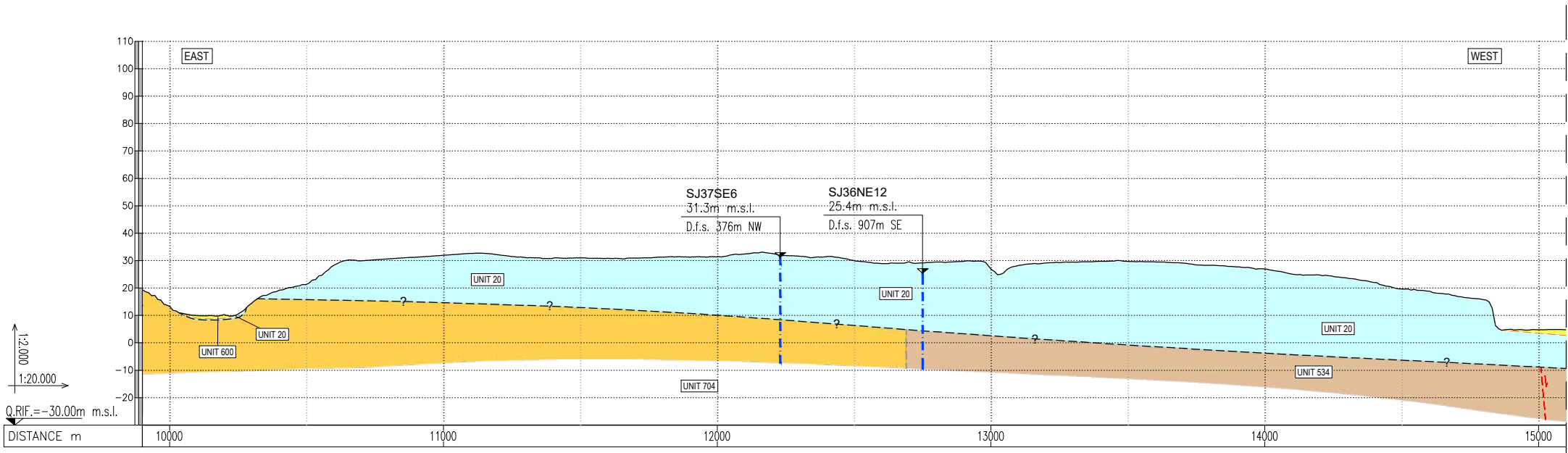
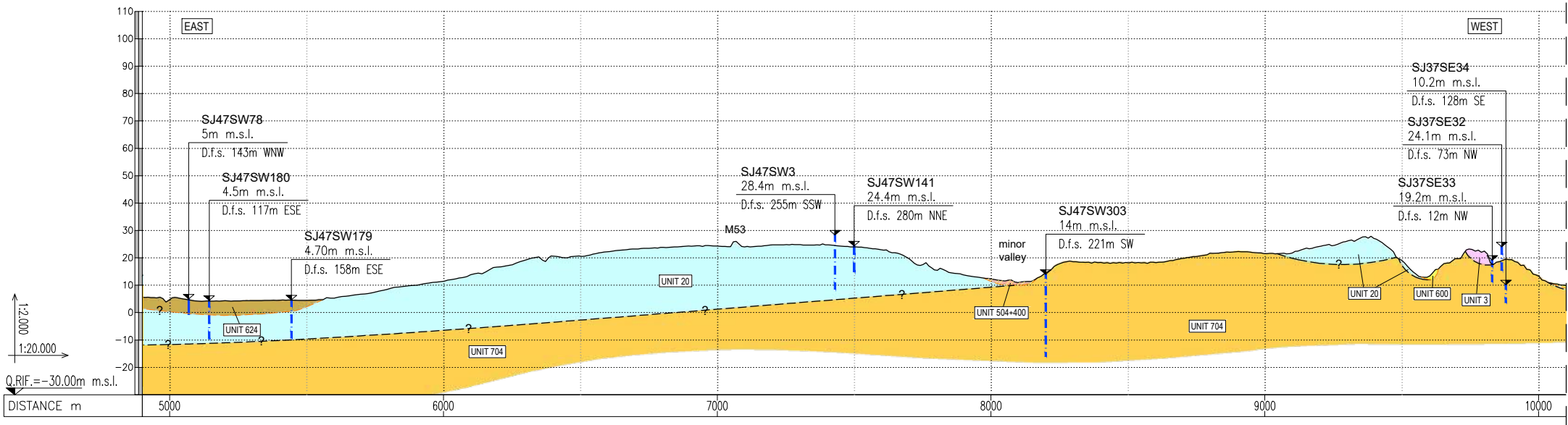
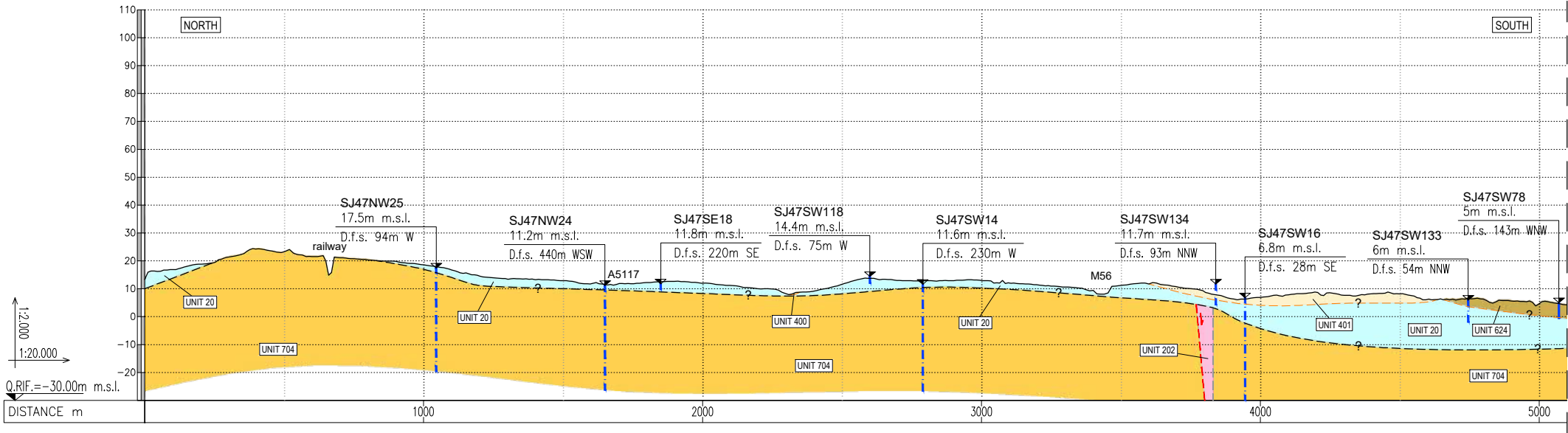
SOUTHERN ROUTE B																						
id	BGS_ref	BGS_id	Chainage	Elevation (from DTM)	Lon	Lat	Easting	Northing	BH depth	Abs. elev.	Water level (depth)	litho1	depth1	litho2	depth2	litho3	depth3	litho4	depth4	bedrock elev.	Distance (from pipeline)	Bearing (toward borehole)
71	SJ47NW20	163378	0	10.2	-2.83498	53.26917	344409.8516	375012.5057	45.72	-35.52		rather hard sandstones, even grained with scattered quartzite pebbles	45.72							10.2	118	W
72	SJ47NW24	163382	5	11.2	-2.83077	53.26927	344690.6495	375020.234	152.40	-141.20	14.50	drift	1.52	hard sandstone with quartzite pebbles (from 60.96, very abundant from 91.44)	152.40					9.68	164	E
3	SJ47SW118	163698	500	14.4	-2.83514	53.26288	344390.7111	374311.8905	2.50	11.90		very stiff lightly sandy clay, with a little fine to coarse gravel	2.50								280	SW
2	SJ47SE18	163547	1050	11.8	-2.82303	53.26539	345201.5974	374581.7104	2.20	9.60		very stiff slightly sandy clay with some gravel and sand	2.20								230	NNE
73	SJ47SE22	163551	1700	10.6	-2.81619	53.26255	345654.1212	374261.5645	7.80	2.80	4.85	made soil medium dense, occasionally coarse gravel	2.30	firm to stiff sandy clay with occasional gravel (sandstone, basalt and quartzite), below ca. 7.0m very stiff	7.80						101	NNW
82	SJ47SE56	18118090	2570	7.9	-2.80386	53.26612	346481.3801	374648.6277	8.00	-0.10	3.80	firm sandy slightly gravelly (fine to medium) clay, occasional shell fragments	2.50	firm laminated clay-silt, occasional bands of fine sand	3.50	medium dense silty slightly gravelly fine to medium sand	8.00				279	NNW
77	SJ47SE20	163549	3360	3.9	-2.79748	53.26898	346909.9833	374962.2712	3.10	0.80		firm fibrous peat with wood fragments (up to trunk size)	1.20	very soft peaty clay	2.20	very stiff sandy clay, with a little gravel	3.10				200	NW
78	SJ47NE43	163309	3700	4.1	-2.79106	53.27153	347341.4846	375241.781	3.30	0.80	0.80	fibrous peat	2.20	soft sandy peaty clay, with some sand band	2.40	stiff sandy clay with occasional sand bars	3.30	Boulder Clay (10 - 15.6) and brown clay (15.6 - 27.4)	27.40		213	ENE
87	SJ47NE105	20292722	4310	4.5	-2.79894	53.27588	346821.4289	375730.9232	27.40	-22.90		organic silty soil	0.90	peat	5.00	soft silty clay and silty peat	10.00	Boulder Clay	30.33		142	WNW
88	SJ47NE119	20292736	4450	3.8	-2.79913	53.27695	346809.8363	375850.7131	30.33	-26.53		soil (0.7m) and peat	4.88	sandy silt	6.55	peat	7.45				172	W
91	SJ47NE96	18642025	4550	3.9	-2.79187	53.27864	347296.4024	376032.6521	5.00	-1.10	3.00	Firm slightly sandy clay, with some pockets of fine sand	1.95	firm spongy fibrous peat, with frequent wood fragment	5.00			Triassic sandstone	85.00	-13.20	340	E
89	SJ47NE21	163287	4900	5.3	-2.80231	53.27854	346599.8819	376029.754	85.00	-79.70		fill and silty clay (alluvium)	3.00	peat	5.00	soft clay (glacial till or alluvium)	18.50	Triassic sandstone	85.00	-13.20	250	SW

Figure B-0-3 – Southern route B

 	Company Document ID		Sheet of Sheets 162 / 163	
	104900BLRV80010		Validity Status	Revision Number
			CD-FE	00

APPENDIX C – GEOLOGICAL PROFILES

Geological profiles - Option 5A



NOTES:

- * Fault dip angles are unknown. For present scope, sub-vertical normal faults, with constant dip angle, are shown in the profiles
- ** Due to lack of data the lithological contact has been assumed as vertical
- *** Geologic contact depths might vary considerably, being poorly constrainable due to the lack of sufficient borehole control. Please refer to the discussion in the main text

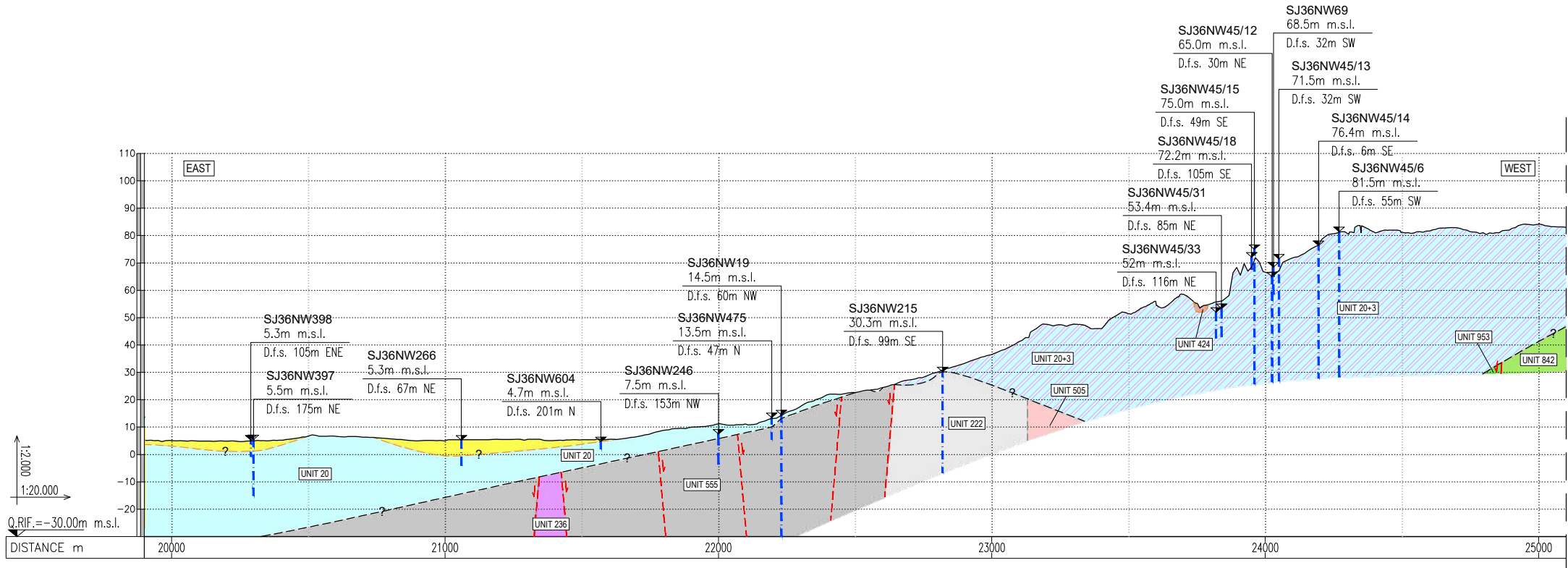
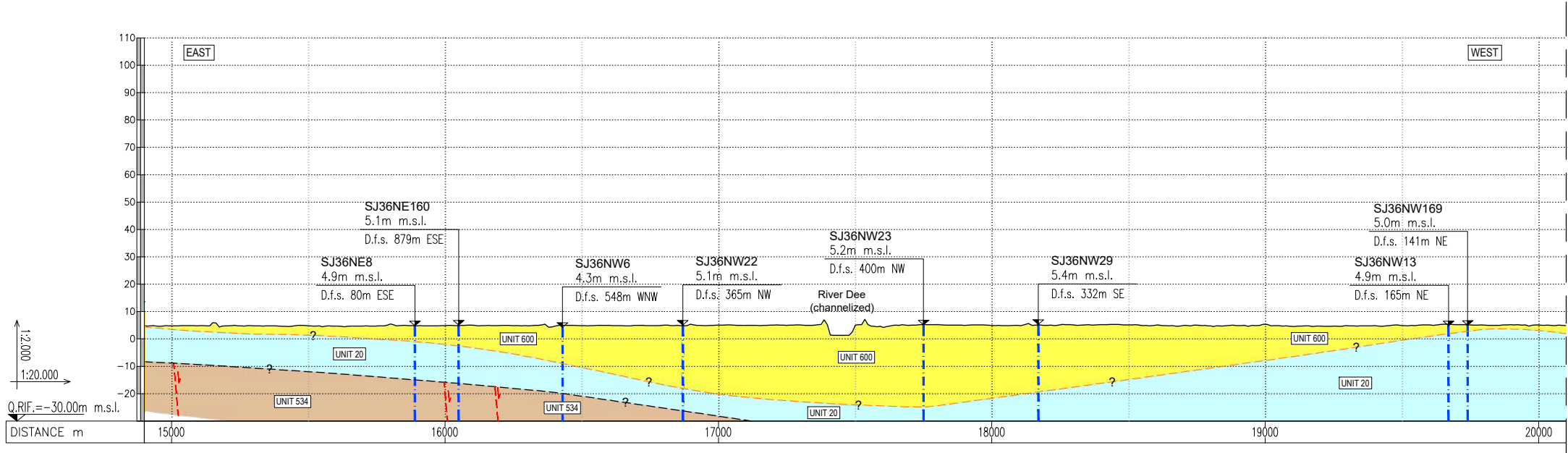
GEOLOGICAL UNITS

- 400 Holocene floodplain alluvium: variable sediment of mud, sand and gravel with some peat in places
- 600 Holocene Tidal flat deposits (shorelines): clay, silt and sand
- 3 Quaternary (Devensian) outwash glacio-fluvial deposits (ice age): sand and gravel
- 20 Quaternary (Devensian) glacial till deposits (ice age): diamicton (unsorted sediment with gravel in a fine mud matrix)
- 624 Quaternary lacustrine-palustrine organic accumulations: peat
- 424 Quaternary Subaerial fan and downslope deposits: unsorted mud sediment (clay, silt) with sand and gravel clasts
- 401 Quaternary wind blown deposits, often forming dunes: sand
- 504 Quaternary alluvial fan deposits: sand and gravel
- 513 Quaternary lacustrine deposits: clay and silt
- 1000 Quaternary undifferentiated continental deposits
- 20+3 Undifferentiated deposits of Unit 20 and Unit 3
- 504+400 Undifferentiated deposits of Unit 504 and Unit 400

BEDROCK UNITS

- 202 Triassic Wilmslow sandstone Fm., fluvial-lacustrine, marine deposits in hot climate: sandstone
- 534 Early Triassic Kinnerton sandstone Fm., fluvial-lacustrine deposits in hot deserts: sandstone
- 704 Triassic (Olenekian) Chester Fm., river setting: sandstone pebbly
- 934 Carboniferous (Westphalian) – Etruria Fm., continental coastal deposits (fluvial): sandstone
- 236 Carboniferous (Westphalian) – Etruria Fm., continental coastal deposits (fluvial): mudstone, sandstone, conglomerate
- 953 Carboniferous (Bolsovian) – Hollin Rock Fm. continental coastal deposits (swamps, estuaries and deltas): sandstone
- 842 Carboniferous (Duckmantian-Bolsovian) – Pennine Middle Coal Measures Formation, continental coastal deposits (swamps, estuaries and deltas): sandstone
- 555 Carboniferous (Duckmantian-Bolsovian) – Pennine Middle Coal Measures Fm., continental coastal deposits (swamps, estuaries and deltas): mudstone, siltstone, sandstone
- 833 Carboniferous (Langsettian) – Pennine Lower Coal Measures Fm., continental coastal deposits (swamps, estuaries and deltas): sandstone
- 222 Carboniferous (Langsettian) – Pennine Lower Coal Measures Fm., continental coastal deposits (swamps, estuaries and deltas): mudstone, siltstone, sandstone
- 505 Carboniferous (Langsettian) – Gwespys Sandstone Fm., continental coastal deposits (swamps, estuaries and deltas): sandstone, argillaceous rocks
- 630 Carboniferous (Yeadonian) – Bowland Shale Fm., open sea pelagic deposits: mudstone

- normal fault (*)
- Lithological contac (**)
- contact between bedrock and quaternary deposit (***)
- contact between quaternary and holocenic deposit (***)
- SJ47NW25 17.5m m.s.l. D.f.s. 94m E BOREHOLE NAME
- GROUND ELEVATION
- DISTANCE FROM PIPELINE



NOTES:

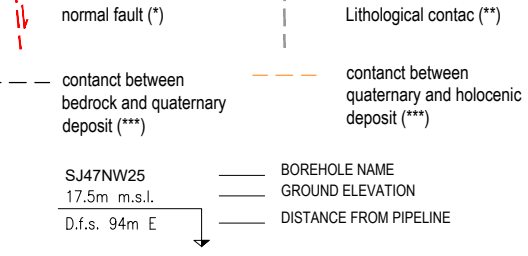
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GEOLOGICAL UNITS

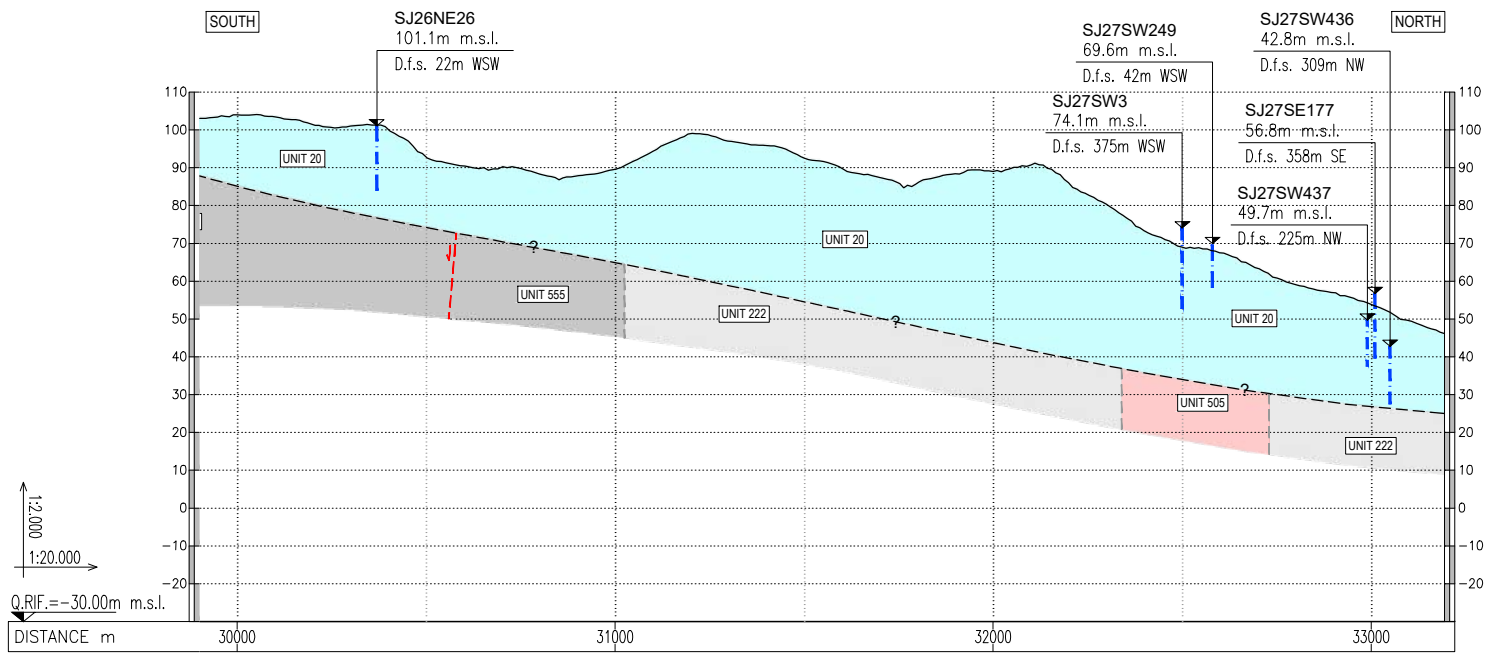
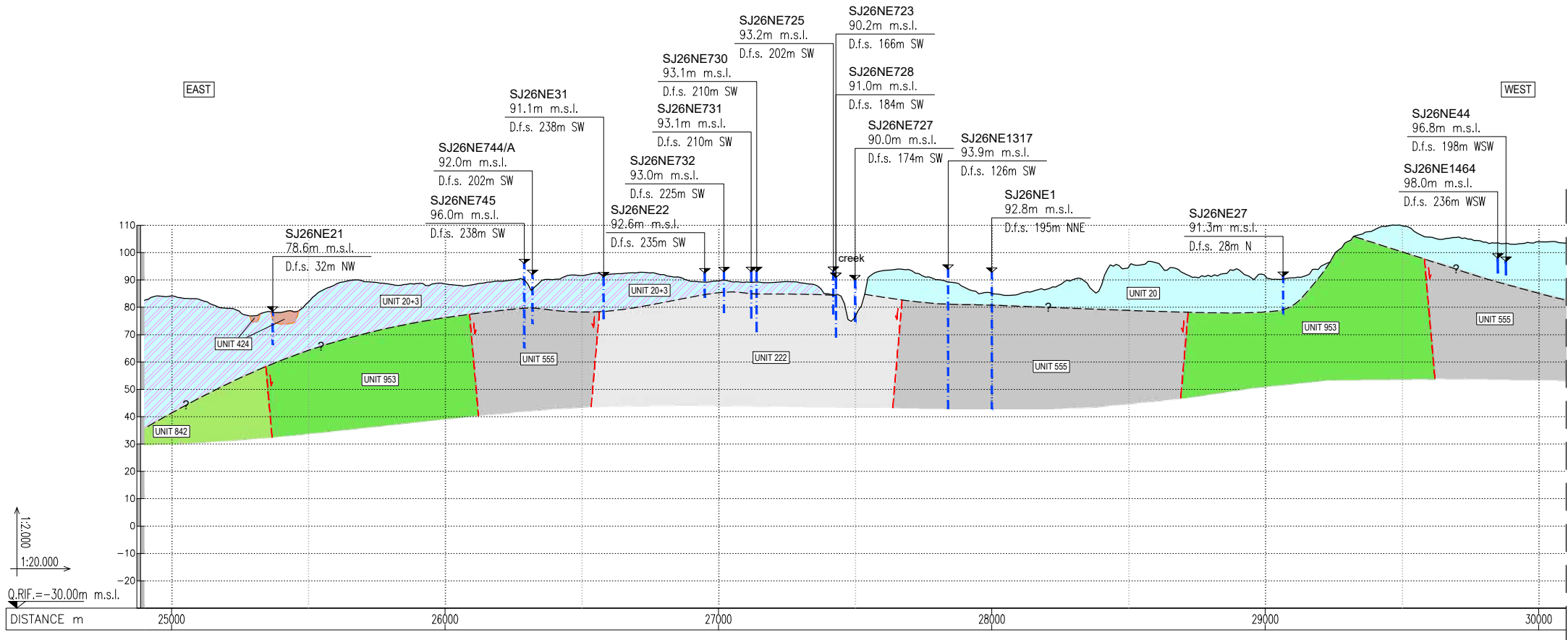
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- 600 Holocene Tidal flat deposits (shorelines): clay, silt and sand
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BEDROCK UNITS

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- 704 Triassic (Olenekian) Chester Fm., river setting: sandstone pebbly
- 934 Carboniferous (Westphalian) – Etruria Fm., continental coastal deposits (fluvial): sandstone
- 236 Carboniferous (Westphalian) – Etruria Fm., continental coastal deposits (fluvial): mudstone, sandstone, conglomerate
- 953 Carboniferous (Bolsovian) – Hollin Rock Fm. continental coastal deposits (swamps, estuaries and deltas): sandstone
- 842 Carboniferous (Duckmantian-Bolsovian) – Pennine Middle Coal Measures Formation, continental coastal deposits (swamps, estuaries and deltas): sandstone
- 555 Carboniferous (Duckmantian-Bolsovian) – Pennine Middle Coal Measures Fm., continental coastal deposits (swamps, estuaries and deltas): mudstone, siltstone, sandstone
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- 505 Carboniferous (Langsettian) – Gwespys Sandstone Fm., continental coastal deposits (swamps, estuaries and deltas): sandstone, argillaceous rocks
- 630 Carboniferous (Yeadonian) – Bowland Shale Fm., open sea pelagic deposits: mudstone



Geological profiles - Option 5A



NOTES:

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GEOLOGICAL UNITS

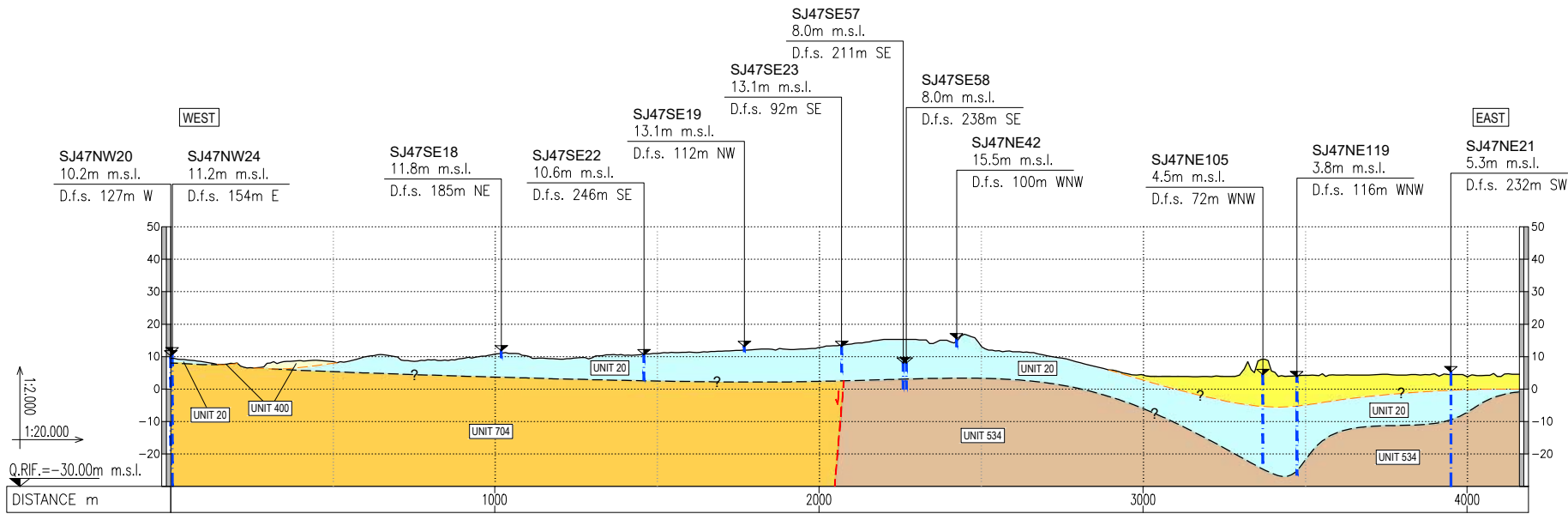
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- 1000 Quaternary undifferentiated continental deposits
- 20+3 Undifferentiated deposits of Unit 20 and Unit 3
- 504+400 Undifferentiated deposits of Unit 504 and Unit 400

BEDROCK UNITS

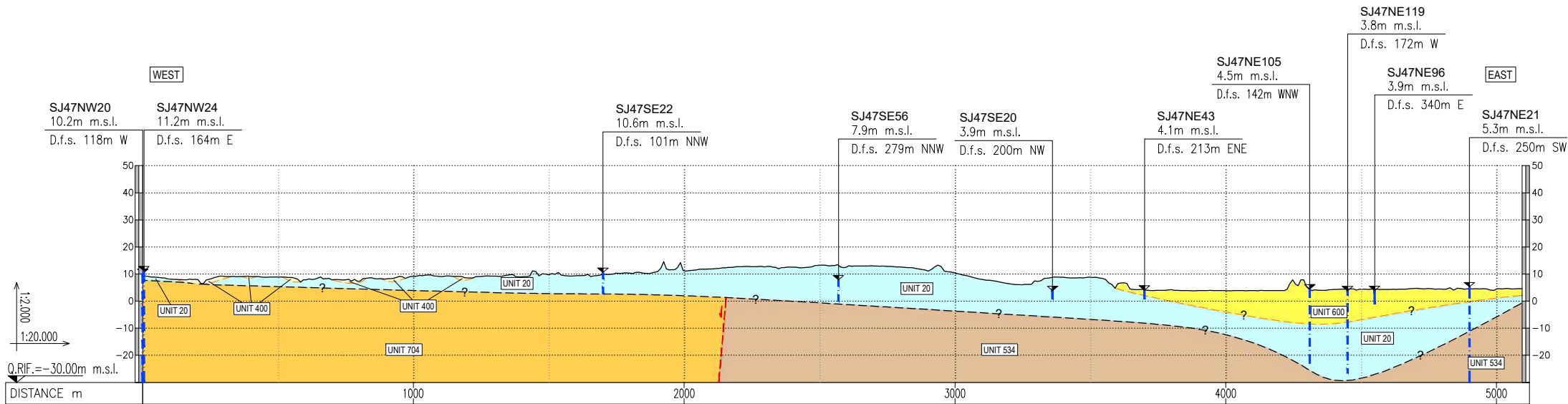
- 202 Triassic Wilmslow sandstone Fm., fluvial-lacustrine, marine deposits in hot climate: sandstone
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- 953 Carboniferous (Bolsovian) – Hollin Rock Fm. continental coastal deposits (swamps, estuaries and deltas): sandstone
- 842 Carboniferous (Duckmantian-Bolsovian) – Pennine Middle Coal Measures Formation, continental coastal deposits (swamps, estuaries and deltas): sandstone
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- 222 Carboniferous (Langsettian) – Pennine Lower Coal Measures Fm., continental coastal deposits (swamps, estuaries and deltas): mudstone, siltstone, sandstone
- 505 Carboniferous (Langsettian) – Gwespysr Sandstone Fm., continental coastal deposits (swamps, estuaries and deltas): sandstone, argillaceous rocks
- 630 Carboniferous (Yeadonian) – Bowland Shale Fm., open sea pelagic deposits: mudstone

- normal fault (*)
- Lithological contac (**)
- contact between bedrock and quaternary deposit (***)
- contact between quaternary and holocenic deposit (***)
- SJ47NW25 17.5m m.s.l. D.f.s. 94m E
- BOREHOLE NAME
- GROUND ELEVATION
- DISTANCE FROM PIPELINE

Geological profile - Southern route A



Geological profile - Southern route B



NOTES:

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BEDROCK UNITS

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- SJ47NW25 17.5m m.s.l. D.f.s. 94m E
- BOREHOLE NAME
- GROUND ELEVATION
- DISTANCE FROM PIPELINE

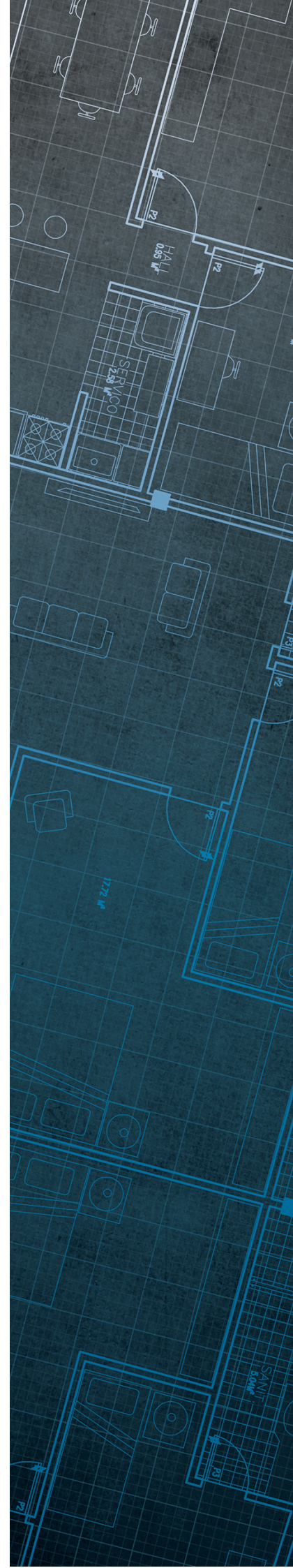
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	104900BLRV80010		Validity Status	Revision Number
			CD-FE	00

APPENDIX D – COAL AUTHORITY REPORTS



Liverpool Bay Ccs
Flintshire

Our reference: 51002524473001
Your reference: Liverpool Bay G&G Desk
Study 1



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

ENI ENGINEERING

Enquiry address

Liverpool Bay Ccs
Flintshire


How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

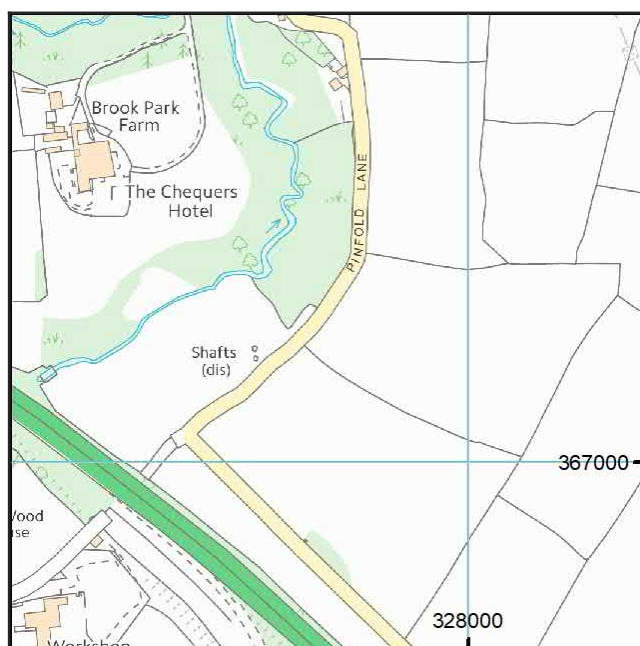
www.groundstability.com

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Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	PREMIER (LOWER FOOT)	Coal	3CQN	6	Beneath Property	11.0	South-East	120	1937
unnamed	HALF YARD / QUEEN	Coal	3CRW	12	Beneath Property	11.0	South-East	50	1939
unnamed	QUEEN (BYCHTON 2 YD)	Coal	3CRW	12	Beneath Property	11.0	South-East	50	1939
unnamed	HALF YARD / QUEEN	Coal	3CRX	12	Beneath Property	11.0	South-East	50	1927
unnamed	QUEEN (BYCHTON 2 YD)	Coal	3CRX	12	Beneath Property	11.0	South-East	50	1927
unnamed	PREMIER (LOWER FOOT)	Coal	3CQM	14	Beneath Property	14.0	East	140	1949
unnamed	PREMIER (LOWER FOOT)	Coal	3CR7	26	South-West	14.0	East	140	1949
unnamed	HOLLIN	Coal	37YM	58	Beneath Property	4.0	South	180	1914
unnamed	PREMIER (LOWER FOOT)	Coal	3CRB	68	South-East	8.1	East	130	1906
unnamed	MAIN	Coal	7H1P	91	Beneath Property	10.3	South	250	1845
unnamed	HOLLIN	Coal	37YO	99	Beneath Property	8.0	South	180	1914
unnamed	MAIN	Coal	37WS	106	South-West	10.3	South	250	1845
unnamed	MAIN	Coal	37W7	107	Beneath Property	8.0	South	200	1800
unnamed	MAIN	Coal	37WX	111	Beneath Property	8.1	South-East	250	1886
unnamed	HOLLIN	Coal	37YP	114	Beneath Property	8.0	South	180	1800
unnamed	HOLLIN	Coal	7906	121	Beneath Property	8.1	South-East	180	1886
unnamed	MAIN	Coal	37WT	124	Beneath Property	4.0	South	250	1914
unnamed	MAIN	Coal	7H1O	128	Beneath Property	10.3	South	250	1845
unnamed	YARD	Coal	37T9	153	South	8.1	East	90	1906
unnamed	HOLLIN	Coal	37YK	170	South	5.7	East	180	1920

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	PREMIER (LOWER FOOT)	Coal	3CRA	182	South	8.1	East	130	1906
unnamed	MAIN	Coal	7H1S	198	South	11.3	East	200	1909
unnamed	MAIN	Coal	7H1T	213	South-West	11.3	East	200	1914
unnamed	HOLLIN	Coal	37YL	214	South	8.0	East	180	1903
unnamed	PREMIER (LOWER FOOT)	Coal	3CQP	302	South-West	12.5	East	140	1897

Probable unrecorded shallow workings

None.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	326367-040	326685 367701		Coal	
Shaft	326367-041	326721 367641		Coal	
Shaft	326367-042	326969 367637		Coal	
Adit	327366-235	327856 366901		Coal	
Shaft	327366-236	327869 366871		Coal	
Shaft	327367-043	327023 367627	Mine entry treated under Permit 8903, by Drillquest Limited under the supervision of Robert E Fry & Associates Limited acting on behalf of Anwyl Construction Company Limited. The shaft was located following the removal of surface waste material. The location works confirmed that the mine entry was filled to ground level with no visible surface voiding with the site investigations also demonstrating that rock material lay at shallow depth (approx. 2.5m) which could be used for the support of a reinforced concrete cap and therefore the drilling and grouting of the shaft was not undertaken. A 6.2m x 6.2m concrete cap was the constructed comprising a minimum 450mm thick reinforced concrete slab containing 2 layers of 40mm diameter bars at 100mm centres in both directions at the top and bottom of the slab	Coal	
Shaft	327367-044	327048 367642	Mine entry treated under Permit 8903, by Drillquest Limited under the supervision of Robert E Fry & Associates Limited acting on behalf of Anwyl Construction Company Limited. The shaft was located following the removal of surface waste material. The location works confirmed that the mine entry was filled to ground level with no visible surface voiding with the site investigations also demonstrating that rock material lay at shallow depth (approx. 2.5m) which could be used for the support of a reinforced concrete cap and therefore the drilling and grouting of the shaft was not undertaken. A 6.2m x 6.2m concrete cap was the constructed comprising a minimum 450mm thick reinforced concrete slab containing 2 layers of 40mm diameter bars at 100mm centres in both directions at the top and bottom of the slab.	Coal	
Adit	327367-048	327737 367118	The adit was filled to an unknown specification pre 1968 with a surface settlement crater filled in February 1969.	Coal	

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Adit	327367-049	327751 367133	The adit was filled to an unknown specification pre 1968 with a surface settlement crater filled in February 1969.	Coal	
Adit	327367-050	327803 367168		Coal	
Shaft	327367-051	327868 367175		Coal	
Adit	327367-052	327809 367098		Coal	
Adit	327367-053	327801 367079		Coal	
Adit	327367-234	327797 367156		Coal	
Shaft	327367-358	327012 367636	Mine entry treated under Permit 8903, by Drillquest Limited under the supervision of Robert E Fry & Associates Limited acting on behalf of Anwyl Construction Company Limited. The shaft was located following the removal of surface waste material. The location works confirmed that the mine entry was filled to ground level with no visible surface voiding with the site investigations also demonstrating that rock material lay at shallow depth (approx. 2.5m) which could be used for the support of a reinforced concrete cap and therefore the drilling and grouting of the shaft was not undertaken. A 6.2m x 6.2m concrete cap was the constructed comprising a minimum 450mm thick reinforced concrete slab containing 2 layers of 40mm diameter bars at 100mm centres in both directions at the top and bottom of the slab.	Coal	
Shaft	328366-179	328576 366489		Coal	
Shaft	328366-223	328487 366599		Coal	
Shaft	328366-224	328689 366626		Coal	
Shaft	329367-062	329363 367202		Coal	
Shaft	329367-063	329444 367019		Coal	
Shaft	329367-268	329246 367039		Coal	
Shaft	329367-269	329286 367029		Coal	

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

12970	3384	13434
NW741	10867	6281
13433	R328	11222

Our records show we have more plans than those shown above which could affect the enquiry boundary.

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
MAIN	Coal	Yes	Within	N/A	257

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Faults under or close to the property recorded.

Opencast mines

Please refer to the "Summary of findings" map (on separate sheet) for details of any opencast areas within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

Distance to site investigation (m)	Direction
48.4	East

See Section 4 for further information.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is in an area where a notice to withdraw support was given in 1944.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

Site investigations

The site is within an area of previous interest. It is close to where the Coal Authority has received information relating to past site investigations.

The site requires further investigation and may influence how you approach your risk assessment.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

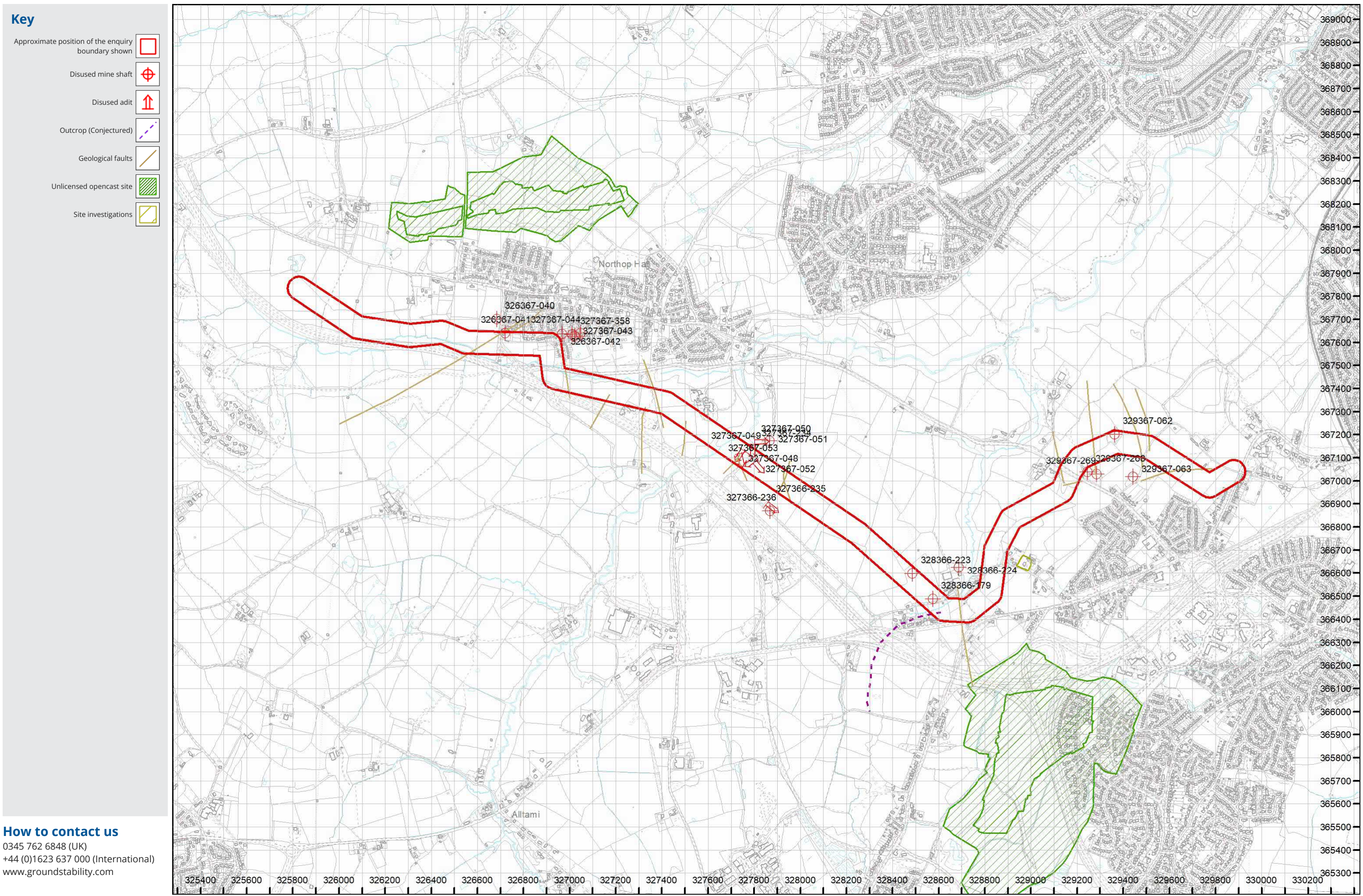
Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

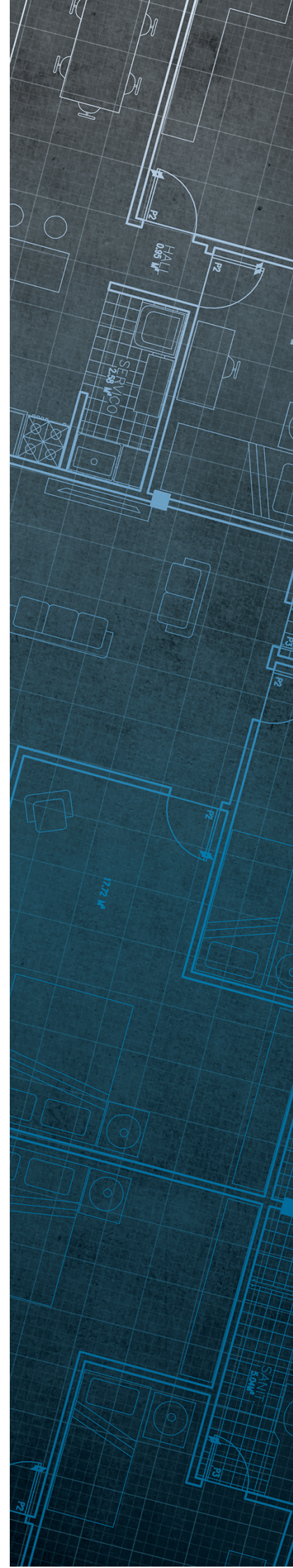
The map highlights any specific surface or subsurface features within or near to the boundary of the site.





Liverpool Bay Ccs
Cheshire

Our reference: 51002513967001
Your reference: Liverpool Bay G&G Desk
Study 1



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

ENI ENGINEERING

Enquiry address

Liverpool Bay Ccs
Cheshire

How to contact us

0345 762 6848 (UK)
+44 (0)1623 637 000 (International)

200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

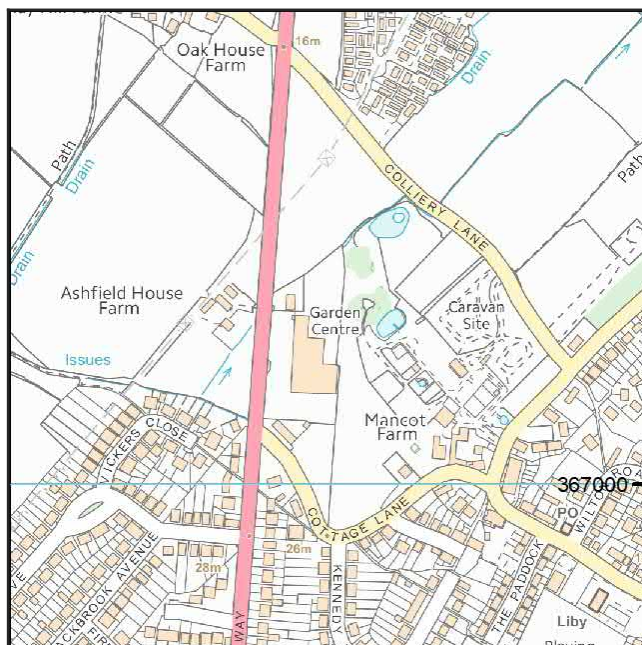


 @coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /thecoalauthority



Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

Colliery	Seam	Mineral	Coal Authority reference	Depth (m)	Direction to working	Dipping rate of seam worked (degrees)	Dipped direction of seam worked	Extraction thickness (cm)	Year last mined
unnamed	BRASSEY	Coal	37SR	41	Beneath Property	11.3	East	200	1870
unnamed	MAIN	Coal	37WQ	53	Beneath Property	15.0	East	200	1876
unnamed	MAIN	Coal	7H1K	70	Beneath Property	15.0	East	200	1876
unnamed	MAIN	Coal	7NX5	73	South	15.0	East	200	1895
unnamed	PREMIER (LOWER FOOT)	Coal	3CQW	138	North-West	15.0	North-East	120	1913

Probable unrecorded shallow workings

Yes.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

Entry type	Reference	Grid reference	Treatment description	Mineral	Conveyancing details
Shaft	331366-009	331287 366990	The shaft was filled to an unknown specification by the NCB in 1951. The fill was drilled and grouted with 182 tons in May 1975 followed by inserting a 9m x 9m x 1.5m thick reinforced concrete plug at Rockhead some 6m below ground level.	Coal	
Shaft	331367-005	331649 367405		Coal	
Shaft	331367-006	331646 367399		Coal	
Shaft	331367-036	331675 367392	This entry was filled to an unknown specification in July 1951.	Coal	
Shaft	331367-046	331824 367263		Coal	
Shaft	331367-047	331843 367272		Coal	
Shaft	331367-057	331353 367392	This shaft is located in an area that has been worked by opencast mining operations. There are no details of any treatment but it is likely that shaft has been partially or totally removed.	Coal	
Shaft	331367-058	331372 367327	This shaft is located in an area that has been worked by opencast mining operations. There are no details of any treatment but it is likely that shaft has been partially or totally removed.	Coal	
Shaft	331367-059	331391 367315	This shaft is located in an area that has been worked by opencast mining operations. There are no details of any treatment but it is likely that shaft has been partially or totally removed.	Coal	
Shaft	331367-060	331391 367426	This shaft is located in an area that has been worked by opencast mining operations. There are no details of any treatment but it is likely that shaft has been partially or totally removed.	Coal	

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

16138	NW1531	0
PO0	543	

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

Seam name	Mineral	Seam workable	Distance to outcrop (m)	Direction to outcrop	Bearing of outcrop
BRASSEY	Coal	Yes	Within	N/A	161
MAIN	Coal	Yes	Within	N/A	150

Geological faults, fissures and breaklines

Please refer to the 'Summary of findings' map (on separate sheet) for details of any geological faults, fissures or breaklines either within or intersecting the enquiry boundary.

Faults under or close to the property recorded.

Opencast mines

Please refer to the "Summary of findings" map (on separate sheet) for details of any opencast areas within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

Distance to site investigation (m)	Direction
Within	N/A

See Section 4 for further information.

Remediated sites

Distance to site remediation (m)	Direction
Within	N/A

See Section 4 for further information.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

The following potential risks have been identified and as part of your risk assessment should be investigated further.

Development advice

The site is within an area of historical coal mining activity. Should you require advice and/or support on understanding the mining legacy, its risks to your development or what next steps you need to take, please contact us.

Site investigations

The site is within an area of previous interest. It is close to where the Coal Authority has received information relating to past site investigations.

The site requires further investigation and may influence how you approach your risk assessment.

Remediated sites

The site is within an area of previous interest. It is close to where the Coal Authority has investigated and where necessary remediated mine entries and/or shallow coal mine workings following specific reported hazards.

The site requires further investigation and may influence your risk assessment. We recommend that you order the Coal Authority **Surface Hazards Incident Report**, which will include more information about the hazard.

For further information on specific site or ground investigations in relation to any issues raised in Section 4, please call us on 0345 762 6848 or email us at groundstability@coal.gov.uk.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

The map highlights any specific surface or subsurface features within or near to the boundary of the site.



Annex E

GENERAL LIMITATIONS

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

GENERAL

1. WSP UK Limited has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed and outlined in the body of the report.
2. Unless explicitly agreed otherwise, in writing, this report has been prepared under WSP UK Limited standard Terms and Conditions as included within our proposal to the Client.
3. Project specific appointment documents may be agreed at our discretion and a charge may be levied for both the time to review and finalise appointments documents and also for associated changes to the appointment terms. WSP UK Limited reserves the right to amend the fee should any changes to the appointment terms create an increase risk to WSP UK Limited.
4. The report needs to be considered in the light of the WSP UK Limited proposal and associated limitations of scope. The report needs to be read in full and isolated sections cannot be used without full reference to other elements of the report and any previous works referenced within the report.

PHASE 1 GEO ENVIRONMENTAL AND PRELIMINARY RISK ASSESSMENTS

Coverage: *This section covers reports with the following titles or combination of titles: phase 1; desk top study; geo environmental assessment; development appraisal; preliminary environmental risk assessment; constraints report; due diligence report; geotechnical development review; environmental statement; environmental chapter; project scope summary report (PSSR), program environmental impact report (PEIR), geotechnical development risk register; and, baseline environmental assessment.*

5. The works undertaken to prepare this report comprised a study of available and easily documented information from a variety of sources (including the Client), together with (where appropriate) a brief walk over inspection of the Site and correspondence with relevant authorities and other interested parties. Due to the short timescales associated with these projects responses may not have been received from all parties. WSP UK Limited cannot be held responsible for any disclosures that are provided post production of our report and will not automatically update our report.
6. The opinions given in this report have been dictated by the finite data on which they are based and are relevant only for the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in this report, WSP UK Limited reserves the right to review such information and, if warranted, to modify the opinions accordingly.
7. It should be noted that any risks identified in this report are perceived risks based on the information reviewed. Actual risks can only be assessed following intrusive investigations of the site.
8. WSP UK Limited does not warrant work / data undertaken / provided by others.

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

INTRUSIVE INVESTIGATION REPORTS

Coverage: *The following report titles (or combination) may cover this category of work: geo environmental site investigation; geotechnical assessment; GIR (Ground Investigation reports); preliminary environmental and geotechnical risk assessment; and, geotechnical risk register.*

9. The investigation has been undertaken to provide information concerning either:
 - i. The type and degree of contamination present at the site in order to allow a generic quantitative risk assessment to be undertaken; or
 - ii. Information on the soil properties present at the site to allow for geotechnical development constraints to be considered.
10. The scope of the investigation was selected on the basis of the specific development and land use scenario proposed by the Client and may be inappropriate to another form of development or scheme. If the development layout was not known at the time of the investigation the report findings may need revisiting once the development layout is confirmed.
11. For contamination purposes, the objectives of the investigation are limited to establishing the risks associated with potential contamination sources with the potential to cause harm to human health, building materials, the environment (including adjacent land), or controlled waters.
12. For geotechnical investigations the purpose is to broadly consider potential development constraints associated with the physical property of the soils underlying the site within the context of the proposed future or continued use of the site, as stated within the report.
13. The amount of exploratory work, soil property testing and chemical testing undertaken has necessarily been restricted by various factors which may include accessibility, the presence of services; existing buildings; current site usage or short timescales. The exploratory holes completed assess only a small percentage of the area in relation to the overall size of the Site, and as such can only provide a general indication of conditions.
14. The number of sampling points and the methods of sampling and testing do not preclude the possible existence of contamination where concentrations may be significantly higher than those actually encountered or ground conditions that vary from those identified. In addition, there may be exceptional ground conditions elsewhere on the site which have not been disclosed by this investigation and which have therefore not been taken into account in this report.
15. The inspection, testing and monitoring records relate specifically to the investigation points and the timeframe that the works were undertaken. They will also be limited by the techniques employed. As part of this assessment, WSP UK Limited has used reasonable skill and care to extrapolate conditions between these points based upon assumptions to develop our interpretation and conclusions. The assumption made in forming our conclusions is that the ground and groundwater conditions (both chemically and physically) are the same as have been encountered during the works undertaken at the specific points of investigation. Conditions can change between investigation points and these interpretations should be considered indicative.
16. The risk assessment and opinions provided are based on currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values. Specific assumptions associated

REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

with the WSP UK Limited risk assessment process have been outlined within the body or associated appendix of the report.

17. Additional investigations may be required in order to satisfy relevant planning conditions or to resolve any engineering and environmental issues.
18. Where soil contamination concentrations recorded as part of this investigation are used for commentary on potential waste classification of soils for disposal purposes, these should be classed as indicative only. Due consideration should be given to the variability of contaminant concentrations taken from targeted samples versus bulk excavated soils and the potential variability of contaminant concentrations between sampling locations. Where major waste disposal operations are considered, targeted waste classification investigations should be designed.
19. The results of the asbestos testing are factually reported and interpretation given as to how this relates to the previous use of the site, the types of ground encountered and site conceptualisation. This does not however constitute a formal asbestos assessment. These results should be treated cautiously and should not be relied upon to provide detailed and representative information on the delineation, type and extent of bulk ACMs and / or trace loose asbestos fibres within the soil matrix at the site.
20. If costs have been included in relation to additional site works, and / or site remediation works these must be considered as indicative only and must be confirmed by a qualified quantity surveyor.

EUROCODE 7: GEOTECHNICAL DESIGN

21. On 1st April 2010, BS EN 1997-1:2004 (Eurocode 7: Geotechnical Design – Part 1) became the mandatory baseline standard for geotechnical ground investigations.
22. In terms of geotechnical design for foundations, slopes, retaining walls and earthworks, EC7 sets guidance on design procedures including specific guidance on the numbers and spacings of boreholes for geotechnical design, there are limits to methods of ground investigation and the quality of data obtained and there are also prescriptive methods of assessing soil strengths and methods of design. Unless otherwise explicitly stated, the work has not been undertaken in accordance with EC7. A standard geotechnical interpretative report will not meet the requirements of the Geotechnical Design Report (GDR) under Eurocode 7. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. The report is likely to represent a Ground Investigation Report (GIR) under the Eurocode 7 guidance.

DETAILED QUANTITATIVE RISK ASSESSMENTS AND REMEDIAL STRATEGY REPORTS

23. These reports build upon previous report versions and associated notes. The scope of the investigation, further testing and monitoring and associated risk assessments were selected on the basis of the specific development and land use scenario proposed by the Client and may not be appropriate to another form of development or scheme layout. The risk assessment and opinions provided are based on currently available approaches in the generation of Site Specific Assessment Criteria relating to contamination concentrations and are not considered to represent a risk in a specific land use scenario to a specific receptor. No liability can be accepted for the retrospective effects of any future changes or amendments to these values, associated models or associated guidance.



REPORT LIMITATIONS - GROUND RISK AND REMEDIATION

- 24. The outputs of the Detailed Quantitative Risk Assessments are based upon WSP UK Limited manipulation of standard risk assessment models. These are our interpretation of the risk assessment criteria.
- 25. Prior to adoption on site they will need discussing and agreeing with the Regulatory Authorities prior to adoption on site. The regulatory discussion and engagement process may result in an alternative interpretation being determined and agreed. The process and timescales associated with the Regulatory Authority engagement are not within the control of WSP UK Limited. All costs and programmes presented as a result of this process should be validated by a quantity surveyor and should be presumed to be indicative.

GEOTECHNICAL DESIGN REPORT (GDR)

- 26. The GDR can only be prepared following confirmation of all structural loads and serviceability requirements. All the relevant information needs to be provided to allow for a GDR to be produced.

MONITORING (INCLUDING REMEDIATION MONITORING REPORTS)

- 27. These reports are factual in nature and comprise monitoring, normally groundwater and ground gas and data provided by contractors as part of an earthworks or remedial works.
- 28. The data is presented and will be compared with assessment criteria.

Annex F

CIRIA C552

RISK APPRAISAL

RISK APPRAISAL METHODOLOGY

The CSM identifies potential contaminants, receptors and exposure pathways that may be present based on the selected end use (i.e. Residential, Commercial or Public Open Space etc).

The identification of potential “contaminant linkages” is a key aspect of the evaluation of potentially contaminated land. An approach based on the UK CIRIA report C552 (Contaminated Land Risk Assessment: A Guide to Good Practice, 2001) has been adopted within this report. For each of the contaminant linkages, an estimate is made of;

- The potential severity of the risk; and
- The likelihood of the risk occurring.

Table 1 presents the classification of the severity of the risk:

TABLE 1 SEVERITY OF RISK

Severe	Acute risks to human health; Major pollution of controlled waters (watercourses or groundwater)
Medium	Chronic (long-term) risk to human health; Pollution of sensitive controlled waters (surface waters or aquifers)
Mild	Pollution of non-sensitive water resources.
Minor	Requirement for protective equipment during site works to mitigate health effects; Damage to non-sensitive ecosystems or species

The probability of the risk occurring is classified by criteria given in Table 2.

TABLE 2 PROBABILITY OF RISK OCCURRING

High Likelihood	Contaminant linkage may be present, and risk is almost certain to occur in the long term, or there is evidence of harm to the receptor.
Likely	Contaminant linkage may be present, and it is probable that the risk will occur over the long term.
Low Likelihood	Contaminant linkage may be present and there is a possibility of the risk occurring, although there is no certainty that it will do so.
Unlikely	Contaminant linkage may be present but the circumstances under which harm would occur are improbable.

An overall evaluation of the level of risk is gained from a comparison of the severity and probability as presented in Table 3.

TABLE 3 COMPARISON OF SEVERITY AND PROBABILITY

		Severity			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very high risk	High risk	Moderate risk	Moderate / low risk
	Likely	High risk	Moderate risk	Moderate/ low risk	Low risk
	Low Likelihood	Moderate risk	Moderate/ low risk	Low risk	Very low risk
	Unlikely	Moderate / low risk	Low risk	Very low risk	Very low risk

Table 4 then provides a description of the typical consequences and potential actions required following each risk definition.

TABLE 4 QUALITATIVE RISK ASSESSMENT - CLASSIFICATION OF CONSEQUENCE

Classification	Definition
Very High Risk	Severe harm to a receptor may already be occurring, or a high likelihood severe harm will arise to a receptor, unless immediate remedial works / mitigation measures are undertaken.
High Risk	Harm is likely to arise to a receptor, and is likely to be severe, unless appropriate remedial actions / mitigation measures are undertaken. Remedial works may be required in the short-term, but likely to be required over the long-term.
Moderate Risk	Possible that harm could arise to a receptor, but low likelihood that such harm would be severe. Harm is likely to be mild. Some remedial works may be required in the long-term.
Moderate / Low Risk	Possible that harm could arise to a receptor, but where a combination of likelihood and consequence results in a risk that is above low, but is not of sufficient concern to be classified as mild. Limited further investigation may be required to clarify the risk. If necessary, remediation works are likely to be limited in extent.
Low Risk	Possible that harm could arise to a receptor. Such harm, at worst, would normally be mild.
Very Low Risk	Low likelihood that harm could arise to a receptor. Such harm is unlikely to be any worse than mild.

It should be noted that the identification of potential contaminant linkages does not indicate that they are significant. The risk to ground workers during any redevelopment has not been assessed as part of these works. It is recommended that a task specific risk assessment, which may include stipulations with regards to appropriate work control procedures and personal protective equipment (PPE), is completed prior to any future construction works.

Annex G

CONSULTEE RESPONSES SUMMARY

Statutory Body	Topic	Comments
Planning Inspectorate	Contaminated Soil Leading to Effects on Human Health (Operation)	Assuming that any contamination is addressed during construction, the matter can be scoped out.
	Contaminants Reaching Controlled Water Receptors (Operation)	Contaminants reaching Controlled Water Receptors to be assessed.
	Study Area for Impacts on Lands and Soils	Detail to be provided on the buffer zone selected for the study area and how this accurately captures any potential effects from the Proposed Development.
	Possible Old Coal Mining Works	Assessment of any risk associated with coal mining structures / voids that would be affected by the Proposed Development is required.
	Remediation Strategy	A minimum of an outline proposed remediation strategy would need to be produced to demonstrate the feasibility of the remediation of the proposed development.
	Baseline Data Gathering	Target Agricultural Land Classification Surveys are proposed. As such rationale behind any targeted surveys should be clearly outlined.
	Mineral Safeguarding	An assessment of effects on all mineral safeguarding Areas affected by the Proposed Development should be undertaken including those identified by Flintshire County Council.
	Disposal of Excavated Materials	Details on any effects of material excavation associated with the Proposed Development should be undertaken.
Public Health England (PHE)	Water	PHE suggests that assessments of potential impacts on human health should be undertaken, which should identify and consider all routes by which emissions may lead to population exposure, including any potential impacts on groundwater and surface water, and consideration of potential impacts on recreational users.
	Land Quality	PHE would expect details of any hazardous contamination present on site to be present within a Site Condition Report with an associated Risk Assessment. All public health impacts associated with ground contamination should be assessed in accordance with the Environment Agency publication on Land Contamination: Risk Management, which would include the assessment of potential impacts on nearby receptors, and any control and mitigation measures.
	Waste	PHE suggest that any waste associated with the Proposed Development is handled in compliance with the Waste Hierarchy, with any due care given to the assessment of implications, wider environmental and public health impacts of different waste disposal options, including disposal routes, transport methods, waste delivery and acceptance procedures both on and off site.
Natural Resources Wales	Potential Sources of Contamination	NRW suggests assessment of the following additional sources of contamination are required for the Proposed Development: <ul style="list-style-type: none"> Oil/fuel/diesel leakage from heavy construction equipment Possible water quality degradation associated with the use of chemicals such as bentonite as part of the environmental mitigation/management of the Proposed Development, and from any sediment impacts associated with storm runoff.
	Materials and Waste	<ul style="list-style-type: none"> Any contaminated materials revealed on site should be moved (on or off site) in consultation with NRW; The location of historic Landfills should be checked prior to works; Any facilities for the storage of oils, fuels or chemicals should be sited on impervious bases and surrounded by impervious bund walls. The bunded

		compound should be 110% of the capacity of the tank with all filling points, gauges, vents and sight glasses located within the bund. Associated pipework should be located above ground and protected from accidental damage. All filling points and tank overflow pipe outlets should be detailed to discharge downwards into the bund, refuelling should be supervised at all times and preferably on an impermeable surface.
	Hydrology	<p>Construction Phase</p> <ul style="list-style-type: none"> Further details on dewatering is needed, including any impacts on potential eco systems. NRW suggest a Dewatering Management Plan is drafted to include details on groundwater management and monitoring. This should also include assessment on any private water supplies that might be affected by the Proposed Development. <p>Operational Phase</p> <p>NRW believe that the Proposed Development needs further assessment of potential long-term effects such as the potential change in surface water regime as a result of the Proposed Development, due to the pipeline acting as a preferential pathway. This could lead to implications for groundwater and potential ecosystems. The impacts of the Proposed Development on soil (notable compaction due to heavy plant use) also needs further assessment.</p>
Coal Authority	Coal Risk	A Coal Mining Risk Assessment or similar report should be undertaken where sections of the Proposed Development fall within the Development High Risk Area as defined by the Coal Authority.
Natural England	Land and Soil	<ul style="list-style-type: none"> Assessment on how any soils will be temporarily and/or permanently disturbed/damaged as part of the Proposed Development including if any 'Best and Most Versatile' (BMV) land is affected; Appropriate soil surveys to be undertaken to cover the full extent of the study area if no information is readily available. Surveys should ideally cover one auger boring per hectare supported by pits dug in each main soil type to confirm physical characteristics of the full depth of soil resource Assessment to detail how any adverse impacts on agricultural land and soils can be avoided/mitigated, and demonstration on how soils will be sustainably managed during construction and operation of the Proposed Development. Preparation of the Construction Environmental Management Plan (CEMP) is welcomed to outline specific details; Development of a methodology and assessment of whether soils are in a suitable condition to be handled; and <p>Assessment of the effect on land drainage, agricultural access and water supplies, including other agricultural land in the vicinity.</p>
Flintshire Council	Land and Soil	<ul style="list-style-type: none"> FCC Contamination Officer is satisfied that the scoping report has identified that land contamination will be a particular concern associated with the Proposed Development however due consideration must be given to the difference in policy between England and Wales. Contamination in Wales should be dealt with in accordance with the Welsh Government Contaminated Land Statutory Guidance, Planning Wales (edition 11, 2021), the Contaminated Land (Wales) Regulations 2001 and any other local council plans that may be available. Assessment of gas, vapour, groundwater monitoring and landfills should be undertaken for the Proposed Development with attention to the former MOD munitions factory in Deeside and lead mines in particular. <p>Engagement with FCC's Contamination Officer during the progress of the Proposed Development would be welcomed.</p>
	Mineral Safeguarding	<ul style="list-style-type: none"> The Flint AGI possible site locations are within a Mineral Safeguarding Area, Flint AGI (B) and Flint AGI (C) sit atop superficial glaciofluvial sand and gravel which would effectively be sterilised if either route option selected. Flint AGI (A) is the preferred route option of FCC as this would not affect a mineral resource. If either Flint AGI (B) or Flint AGI (C) are selected, then evidence would need to be provided outlining why the Proposed Development is of overriding importance and if prior extraction should be considered. Policy MIN8 or EN23 of

		<p>the Flintshire Unitary Development Plan would also need to be considered if Flint AGI (B) or Flint AGI (C) were selected.</p> <p>Other areas along the Proposed Development are situated within existing or potential Mineral Safeguarding Areas and therefore sections of the Proposed Development within this area would need to demonstrate compliance with the Mineral Safeguarding Policy.</p>
Environment Agency	Permitting	Environmental Permitting may be required during construction works, which may include abstraction licences or Regulatory Positions Statements required such as 'temporary dewatering from excavations to surface water'. Early engagement with the EA is recommended
	Water Quality and Groundwater	<p>Any development along a watercourse could be subject to a Water Framework Directive (WFD) Assessment.</p> <p>The 'Environment Agency's Approach to Groundwater Protection' should be given due consideration during progress of the Proposed Development.</p>
	Contaminated Land and Waste	<p>Due to the potential for contamination on site it is recommended that the following guidance is followed during any further assessment and the assessment is carried out by a suitably qualified professional in accordance with British Standard (BS) 10175 (2001) Code of Practice:</p> <p>Guidance on Land Contamination Risk Management (LCRM), with future assessments including a Preliminary Risk Assessment, a Site Investigation Scheme, and Options Appraisal and Remediations Strategy and a Verification Plan;</p> <ul style="list-style-type: none"> EA's Guiding Principles for Land Contamination; National Quality Mark Scheme for Land Contamination Management; and Any other relevant guidance listed on the Government's Contaminated Land website. <p>Any waste on site should be handled in accordance with the CL:AIRE Definition of Waste (Development Industry Code of Practice (version 2), with all contaminated materials adequately characterised both chemically and physically (in accordance with BS EN 14899:2005), with the permitting status of any proposed on-site operations made clear. If any waste is to be taken off-site then it must be subject to management legislation which includes the following:</p> <ul style="list-style-type: none"> Duty of Care Regulations 1991; Hazardous Waste (England and Wales) Regulations 2005; Environmental Permitting (England and Wales) Regulations 2016; and The Waste (England and Wales) Regulations 2011.
Chester West and Chester Council	Contamination	<p>As sections of the Proposed Development are located within previously developed areas, contamination risks should be suitably assessed, with consideration given to the assessment of any preferential pathways of contamination as a result of the Proposed Development.</p> <p>A methodology of the handling of excavated materials should be included within any further assessment.</p>
Canal & River Trust (C&RT)	Geology, Land Contamination and Soils	<p>Any Contamination Risk Assessment should consider the canal network as a sensitive receptor</p> <p>Potential Contaminations Pathways should be updated to include potential contamination of waterways from wind blow and the creation of dust and debris from construction activity</p> <p>Any Assessment of ground conditions should consider the structural integrity of the canal as set out in the National Planning Policy Framework (NPPF)</p> <p>If the Proposed Development is to cross the canal network then the depth of the pipeline would need to be agreed with the C&RT to ensure structural integrity of the canal network, along with agreement on the construction technique and method of works. Any works would have to be carried out in accordance with the Canal & River Trust Code of Practice.</p>
	Water Resource and Flood Risk	Water capture, treatment and disposure should be adequately assessed as part of the Proposed Development, especially where in close proximity to the canal

		<p>corridor or any watercourse which interacts with the canal. This assessment should also consider potential spillage or run-off directly into the canal during construction works.</p> <p>Silt discharge into the canal (or associated watercourses) would not be favourable, mechanisms to prevent and mitigation any silt discharge should be detailed within further assessment.</p> <p>Any water abstraction would need formal consent from the C&RT.</p>
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Annex H

GEOLOGICAL SUMMARY



















It should be noted that this annex was produced at a point in time during the development of the Basic Design of the DCO Proposed Development. Therefore, the design information presented herein may be different to the final Basic Design which is described in **Chapter 3 – Description of the DCO Proposed Development (Volume II)**. However, this annex remains applicable to informing the Environmental Impact Assessment and any associated limitation or assumptions are discussed in the respective Environmental Statement Chapter and Appendix.

1 GEOLOGICAL SUMMARY

1.1 PUBLISHED GEOLOGY AND BGS BOREHOLES

A geological strata key is included at as Table 1-1 and an overview of each sections superficial and bedrock geology is provided after.

Table 1-1 - Geological Key

Key					
Superficial		Bedrock			
	Glacial Till (Secondary Undifferentiated Aquifer)		Chester Sandstone Formation (Principal Aquifer)		Gwespyr Sandstone (Secondary A Aquifer)
	Glaciofluvial Deposits (Secondary A Aquifer)		Kinnerton Sandstone Formation (Principal Aquifer)		Bowland Shale (Secondary Undifferentiated Aquifer)
	Tidal Flats Deposits (Secondary Undifferentiated Aquifer)		Wilmslow Sandstone (Principal Aquifer)		Hollin Rock (Secondary A Aquifer)
	Head Deposits (Secondary Undifferentiated Aquifer)		Etruria Formation Mudstone, Sandstone and Conglomerate (Secondary A Aquifer)		Cefn Mawr Limestone (Principal Aquifer)
	Peat (Secondary Undifferentiated Aquifer)		Pennine Middle Coal Measures (Secondary A Aquifer)		Loggerheads Limestone (Principal Aquifer)
	Alluvial Fav Deposits (Secondary A Aquifer)		Pennine Lower Coal Measures (Secondary A Aquifer)		Llanarmon Limestone (Principal Aquifer)

Section 1

Insert 1-1 - Superficial Geology



Insert 1-2 - Bedrock Geology



Boreholes for Section 1

BGS Ref:	Location	Log
SJ47SE23	NGR: 346146E, 374659N North of M56	Made Ground to 0.4m. Glacial Till to 1.7m. Fluvio-Glacial Deposits to 11.90m. Glacial Till to 15m. No groundwater encountered within this borehole.
SJ47SE19	NGR: 345790E, 375020N North of the A5117	Topsoil to 0.40m. Sandy Clay to 1.60m. No groundwater encountered within this excavation.
SJ47NW24	NGR: 344690E, 374720N North of M56	Drift deposits to 1.52m. Hard sandstone to 152.40m. Water Leve at 14.50m.
SJ47NW19	NGR: 344440E, 375480N North of M56	Sandy clay and pebbles to 0.61m. Sandstone to 49.07. Conglomerates and sandstone to 82.75m. Marl and sandstone to 97.38m. Sandstone to 142.10m. Water Level at 7.31m.
SJ47NE91	NGR: 346920E, 376650N North of Marsh Lane	Soft silty clay and clayey silt with soft fibrous peat to 2.90m. Sand 12.10m. No groundwater encountered within this borehole.
SJ47NE42	NGR: 346240E, 375010N North of A5117	Sandy clay with some gravel to 2.50m. No groundwater encountered within this borehole.
SJ47NE79	NGR: 347020E, 376740N North of Marsh Lane	Disturbed ground to 0.17m. silt and clay with peat and occasional wood fragments to 8.70m. No groundwater encountered within this borehole.
SJ47NE105	NGR: 346822E, 375730N North-east of Elton	Organic Silty Soil to 0.90m. Peat to 5m. Soft silty clay and silty peat to 10m. Boulder clay to 27.40m. No groundwater encountered within this borehole.
SJ47NE119	NGR: 346810E, 375850N North-east of Elton	Soil and peat to 4.88m. Sandy silt to 6.55m. Peat to 7.45m. Boulder Clay to 30.33m.
SJ47NE141	NGR: 346895E, 375967N North-east of Elton	Topsoil to 0.15m. Clay to 0.66m. Peat to 4.30. Sandy silt to 8.50m. Peat to 9.50m. Silty sand to 12.55m. Boulder clay to 14.70m. Clayey silt to 21.10m. Silty clay to 24.55m. Boulder clay to 29.09m. Laminated silts to 36.55m. Clayey sandy silt to 44.05m. Silty sand to 51.70m. Sandstone to 117.10m. No groundwater encountered within this borehole.
SJ47NE142	NGR: 346944E, 375978N North-east of Elton	Clay to 1.30m. Fibrous peat to 1.60m. Clay to 7.50m. Fibrous peat to 10.50m. Sand to 12.30m. Clay to 19.50m. Silt to 22.10m. Clay 34.50m. Glacial Till to 39m. Clay 40m. Groundwater encountered at 2.50m

Section 2

Insert 1-3 - Superficial Geology



Insert 1-4 - Bedrock Geology



Boreholes for Section 2

SJ47SW118	NGR: 344390E, 374310N South of Thornton-le-Moors	Topsoil to 0.30m Very stiff clay to 2.90m. No groundwater encountered within this borehole.
SJ47SW135	NGR: 344715E, 373545N, South of the M56, east of Thornton Green Lane	Made Ground to 1m. Glacial Till to 3.20m. Weathered Bunter Sandstone to 3.70m. Bunter Sandstone to 4m. No groundwater encountered within this borehole.
SJ47SW16	NGR: 344490E, 373280N, South of the M56, west of Thornton Green Lane	Topsoil to 0.46m, sand and clay to 10m, sandstone to 53.3m, Red Marl to 54.56m, Sandstone to 121.31m, Hard Red Marl to 124.9m. Water encountered at 4.10m.
SJ47SW133	NGR: 343832E, 373060N, North of the M56	Made Ground to 2.70m. Sand with laminated clay to 4.10m. Clay to 5.50m. Sand to 15m. Water encountered at 3.60m.
SJ47SW180	NGR: 343680E, 372760N South of the M56, within Gowy Marshes	Amorphous peat to 5.50m. Sand and gravel to 7.0m. Firm to stiff clay to 16.0m. Firm clay to 18.0m Water encountered at 3m.
SJ47SW137	NGR: 342630E, 371450N East of the M53	Topsoil to 0.30m. Very stiff clay to 8.0m No groundwater encountered within this borehole.
SJ47SW303	NGR: 341440E, 371280N East of the M53, along Croughton Road Caughall.	Topsoil to 3m. Sandstone to 30m. Water strikes 12m and 20m. Groundwater Level at 20m.

Section 3

Insert 1-5 - Superficial Geology



Insert 1-6 - Bedrock Geology



Boreholes for Section 3

BGS Ref:	Location	Log
SJ37SE33	NGR: 339954E, 371122N Along the A41	Topsoil to 0.30m. Sandy Clay to 1.3m. Sand to 7.9m. No water encountered within the borehole.
SJ37SE6	NGR: 337920,370710 Mollington Farm	Boulder Clay with sand to 22.86m. Sandstone to 27.43m. Pebbly soft red sandstone to 47.24m. Hard red sandstone to 106.68m. No water encountered within the borehole.

Section 4

Insert 1-7 - Superficial Geology



Insert 1-8 - Bedrock Geology



Boreholes for Section 4

BGS Ref:	Location:	Log:
SJ36NE8	NGR: 335700E, 368400N Northeast of Colliery Lane, southwest of Deeside.	Sand and clay to 60m. Soft Sandstone to 120m. Water overflowing at the surface at a gallon per minute
SJ36NW19	NGR: 331650E, 367400N Northeast of Colliery Lane, southwest of Deeside.	Topsoil to 7.2m. Pennine Coal Measures to 147.84m. No water encountered within the borehole.
SJ36NW475	NGR: 331700E, 367400N Northeast of Colliery Lane, southwest of Deeside.	Superficial Drift deposits to 7.9m. Coal Measures to 8.71m. No water encountered within the borehole.

Section 5

Insert 1-9 - Superficial Geology



Insert 1-10 - Bedrock Geology



Boreholes for Section 5

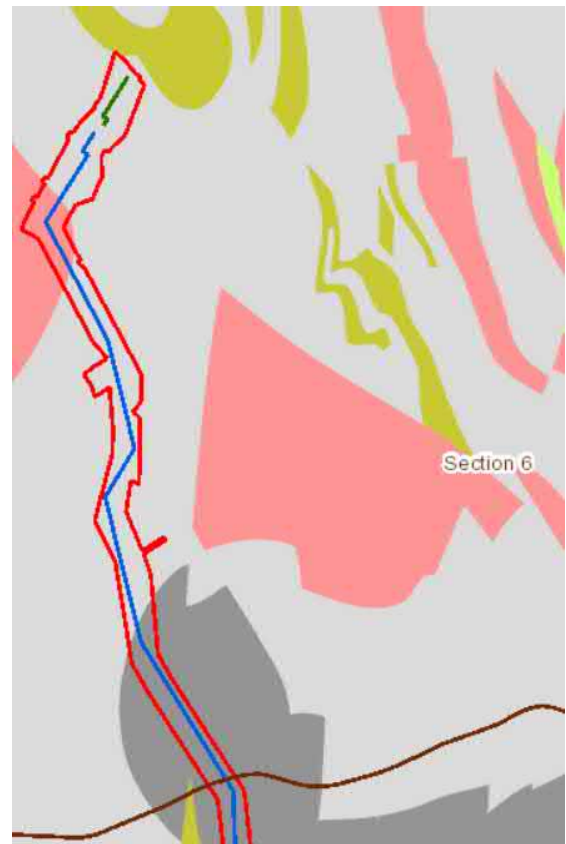
BGS Ref:	Location:	Log:
SJ36NW45/14	NGR: 330140E, 366890 NA494, south of Church Lane	Sand, boulders, clay and gravel with soils to 75.83m. No groundwater encountered within the Borehole
SJ36NW45/12	NGR: 330140E, 366890 N A494, south of Church Lane	Sand, boulders, clay and gravel with soils to 75.83m. No groundwater encountered within the Borehole
SJ36NW45/15	NGR: 330140E, 366890 N A494, south of Church Lane	Sand, boulders, clay and gravel with soils to 75.83m. No groundwater encountered within the Borehole
SJ36NW45/6	NGR: 330140E, 366890 N A494, south of Church Lane	Sand, clay, gravel and boulders with soils to 84.12m. No groundwater encountered within the Borehole
SJ26NE27	NGR: 326310E, 367640 N East of the A55, Northwest of Northop Hall	Glacial Till to 6.30m. Glacial sand and gravel to 13.10m. Mudstone (as part of the coal measures) to 13.60m. No groundwater encountered within the Borehole
SJ26NE21	NGR: 329140E, 367030N Holywell Road, South of Castle Hill Farm.	Fill material present to 0.50m. Sand and gravel to 3.90m. Stiff to very stiff clay to 5.20m. First to very stiff clay to 7.30m. Clay with sandstone to 10.0m. Sandstone to 12.20m. Groundwater Encountered at 2.30m.
SJ26NE32	NGR: 329150E, 367010N Holywell Road, South of Castle Hill Farm.	Glacial Till to 11.90m. Sandstone (as part of the Coal Measures) to 12.1m.

Section 6

Insert 1-11 - Superficial Geology



Insert 1-12 - Bedrock Geology



Boreholes for Section 6

BGS Ref:	Location:	Log:
SJ26NE26	NGR: 325590E, 368520N Along Connah's Quay Road (B5126)	Till and Glacial Sands and Gravel to 17.1m. Borehole abandoned due to obstruction.

Annex I

SITE WALKOVER

It should be noted that this annex was produced at a point in time during the development of the Basic Design of the DCO Proposed Development. Therefore, the design information presented herein may be different to the final Basic Design which is described in **Chapter 3 – Description of the DCO Proposed Development (Volume II)**. However, this annex remains applicable to informing the Environmental Impact Assessment and any associated limitation or assumptions are discussed in the respective Environmental Statement Chapter and Appendix.

HyNet CO2 Pipeline: Section 1 Proposed AGI→ CF Fertilisers UK Ltd

Site is located at CF Fertilisers UK Ltd and comprises a lorry park to the south, a small concrete surfaced storage area to in the northeast and two car parks; 'Car Park Pass C' a disused car park located in the northwest and 'CF Staff Car Park' located in the centre of the site and used by CF personnel, their visitors and those holding authorisation to park from CF (according to signage). The land surrounding the parking areas comprises overgrown vegetation including brambles, shrubs and semi and mature trees. A series of drainage channels are located on site and along the western site boundary. Additionally, a small plastic lined pond is located in the northeastern corner of the site.

Open access to CF Staff car park with crash guard barriers at its entrance. Ground cover is composed of asphalt, which appears to be in good condition (painted bays with no potholes observed). At time of walkover the car park was approximately 60% full in capacity.

Access to Car Park Pass C is temporarily blocked by a large concrete block. A drain is culverted below the access to this car park and metal fencing is located on either side of the access road to prevent vehicles entering drain. Ground cover is composed of asphalt. At the time of the walkover the car park was empty and ground condition difficult to observe due to thick ice.

Open access to the lorry park with a small portacabin identified as a 'dispatch office', allowing access to the wider site, located at the eastern limit of the site boundary. The lorry park contains a sheeting gantry and associated electrical station, a storage area (approx. 17no. drums stored on wooden pallets (contents and capacity unknown), tonne bags of aggregate, wooden planks, metal structures likely use at gantry), 2no. portaloos, several grit bins and a Veolia general waste bin. Wooded area was observed along the southern perimeter of the lorry park, beyond heras and concrete pillar and metal fencing. Ground cover is composed of asphalt, which appears to be in good condition (painted bays with speed ramps and no potholes observed).

There is restricted access to the small concrete surfaced storage area located in the northeast of the site and at the time of the walkover the surveyors were unable to access this area (access to this area requires full induction to be given by CF Fertilisers Ltd). However, surveyors were able to view this area at a distance, from the wooded northern perimeter. The storage area is enclosed by concrete post and metal wire fencing and is occupied by several shipping containers and grit bins, an old trailer, a raised concrete slab, wooden pallets and a drain (indicated by reeds).

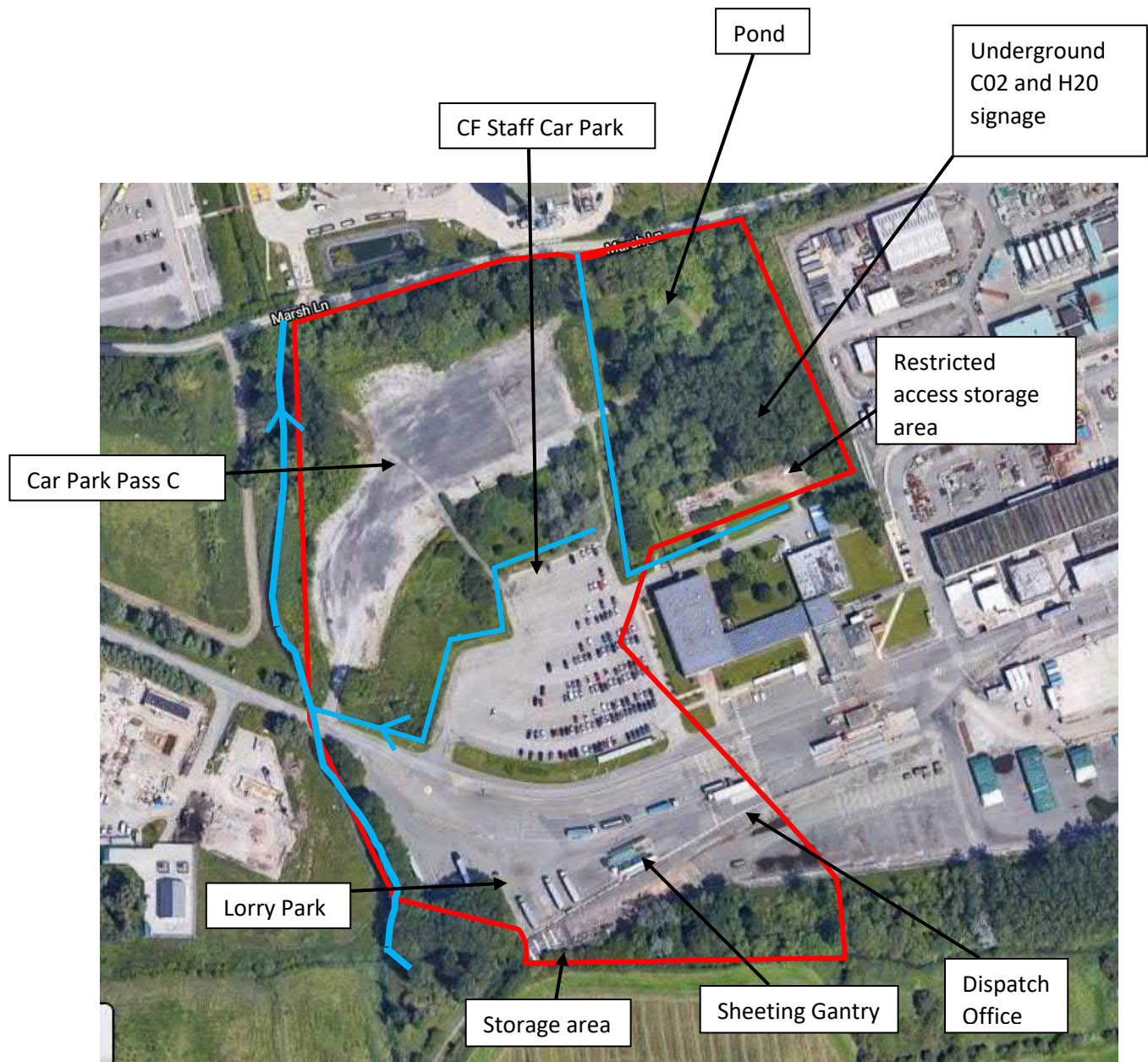
The vegetated banks along the drains are generally overgrown and very minimal litter was observed. The onsite drains fed the offsite drainage channel, located to the west, which was observed to flow towards the north. However, no flow was observed at the drain to the east of the site. Additionally, the drain located alongside the access road presented an obvious iridescent sheen indicating hydrocarbon impact.

Ground levels across the site were generally flat, with hummocky, uneven ground confined to the areas of overgrown vegetation.

Housekeeping on site generally very good with minimal litter and designated bins for waste observed. Although, plastic piping, chapter 8 barriers and dumped concrete bollards and slabs were observed at Car Park Pass C. Additionally a wheelbarrow and tyre were observed at the pond in the northeast of the site.

In the heavily wooded northeastern corner of the site, signage for underground carbon dioxide and water pipelines was observed.

HyNet CO2 Pipeline: Section 1 Proposed AGI→ CF Fertilisers UK Ltd



Red – approximate site boundary

Blue – drains (arrow in direction of flow)

Hynet North West: Former Thornton Green Landfill

Due to herd of cattle the site was not entered. Instead, the following observations were taken from the access gate along Thornton Green Lane;

- Site comprises pastureland, grazed by domestic cattle.
- Site is access via gate at Thornton Green Lane, opposite the Thornton Manor Nursing Home.
- Surrounding land use is agricultural, with a nursing home and a residential building located within 100m of the site to the southwest, both accessed via Thornton Green Lane.
- An area of woodland and the M56 motorway bound the southern and eastern limits of the site (respectively).
- An unnamed drainage channel runs adjacent to the western site boundary. The banks are heavily vegetated and wooded. Channel orientated approximately northeast – southwest. No water was observed in the channel.
- Site is irregular in shape and the topography appears to be slightly elevated in the centre, sloping gently east and west (towards the M56 and drainage channel, respectively).
- A heras fenced area, with Fugro signage indicating 'site investigation' was observed, although no materials / equipment was enclosed within the structure.
- Site boundaries consisted of vegetation (hedgerows, shrubs and mature trees) wooden fencing and wooden post and barbed wire fencing.
- There was no evidence of fly-tipping and no built structures on site.
- An overhead power line trending north – south, over centre of the site was observed. One pylon located within the red line boundary.
- Three grid interceptor located along Thornton Green Lane.



Hynet North West: Former Spring Farm Landfill

- Site contains arable land (no evidence indicating pastureland).
- Site is accessed via a gate at Thornton Green Lane.
- Surrounding land use is agricultural with neighbouring farms and few residential buildings.
- Wood Farm and Spring Farm are located within 100m of the site to the east and south (respectively).
- The M56 motorway is located immediately adjacent to the northwestern site boundary.
- An unnamed drainage channel runs adjacent to the western site boundary, orientated approximately northwest – southeast. Where the drainage channel is culverted beneath the motorway the banks are constructed of concrete slabs. However, away from the motorway, the banks are unsupported, and the natural clay superficial deposits are observed. During the walkover the channel contained very shallow water, which appeared to flow north (fast flowing). No evidence of litter or sheen / odour at drainage channel.
- A pond containing very shallow water is located along the southern site boundary. Does not appear to be lined.
- Two heras fenced areas, without signage were observed; one adjacent to Thornton Green Lane and the other at the western limits of the site. All materials and equipment relating to ground drilling were observed at these locations including metal casing, wooden pallets, wooden core boxes, 5no. IBCs (Intermediate Bulk Containers), bentonite and gravel bags, casing stand etc. Additionally, an installed monitoring point with a blue metal cover (top hat) was identified at the western limit within the heras fenced area.
- Site boundaries consisted of vegetation (hedgerows, shrubs and mature trees) and wooden fencing.
- Topography slopes gently to the southwest from the northeast, with the eastern portion of the site lying generally flat.
- There was no evidence of fly-tipping, no built structures and no overhead power lines on site.



Area 4 A (land parcel 2385)

The River Gowy flows north along the western boundary of the site and is fast flowing. The northern boundary along the motorway is lined by wooden fencing. A wooded area runs east-west through the centre of the site and is enclosed with a wooden post and barbed wire fence. The southernmost drain of the site had a frozen surface and the water level was high, almost at ground level (approximately 0.2m bgl). A concrete drainage channel is orientated north-south cutting through the centre of the site (where the site width narrows). It is approximately 4m wide. The water had no flow and appeared stopped by a concrete bank at the northern end. There was vegetation growing around the banks of the drainage channel and it was giving off an odour. A small amount of scattered plastic from the motorway was seen across the site. There were no built structures other than the drainage channels visible on maps, no evidence of fly-tipping and no overhead power lines.

Area 4 B (land parcel 10975)

Accessed via footbridge from Site 4A (parcel 2385). Site boundaries consisted of wooden fencing and wooden post and barbed wire fencing. The river Gowy flows fast in a northerly direction and is located along the northeastern site boundary. To the northeast the land consisted of grass fields used for cattle grazing. To the southwest were ploughed fields and a field of planted trees. The Mill Brook was observed from a distance as the banks were vegetated. In the centre of the site was a sinuous depression (approximately 0.3m bgl) orientated north-south. There was no evidence of fly-tipping, no built structures and no overhead power lines.

