

Our ref: H19010/ACV/JR/2019.05.01

Mr R Edis
Construction Project Manager
Princes Foods Ltd
Bridge Road
Long Sutton
Lincs.
PE12 9EQ

(by email only)

01 May 2019

Dear Richard

**PHASE 2 GEOTECHNICAL INTRUSIVE INVESTIGATION
PROPOSED REPLACEMENT HYDROSTAT, LONG SUTTON**

Patrick Parsons Ltd (PPL) are pleased to report on the recently completed intrusive ground investigation at the above site.

Proposals are to construct a new hydrostat as a replacement for an existing vessel at the site that is understood to be no longer viable. The cooker dimensions and loadings are unknown at this stage, however, it is anticipated that the new apparatus will subject the ground to high loadings.

PPL have previously undertaken several intrusive investigations at the Princes Ltd Long Sutton site and are familiar with the anticipated ground conditions in the locality.

The investigation comprised the drilling of 1 no. cable percussion borehole to 25.45m depth including in situ testing and sampling for geotechnical logging purposes. Limited soil samples were submitted primarily for geotechnical laboratory testing with a single sample submitted for chemical analysis. The purpose of the investigation was to confirm the nature and strength of the underlying shallow and deep soils and obtain quantitative geotechnical parameters to inform foundation design. At this stage, it is anticipated that a piled foundation solution is to be adopted.

Limitations

This report has been prepared for Princes Ltd (PL) and their appointed agents only and should not be relied upon by any third party without the written permission of PPL. It is presented in a letter report format, based on the information cited below. PPL cannot take responsibility for variations in ground conditions not revealed between exploratory holes.

If any unauthorised third party comes into possession of this report, they rely on it at their own risk and the authors do not owe them any Duty of Care or Skill.

Site Location and Description

The overall site is located immediately southeast of the junction of Bridge Road and Hundreds Lane, approximately 1.75km southeast of Long Sutton town centre. The setting of the replacement hydrostat is located at NGR 544979mE 322220mN, within the central part of the overall site and adjacent to the existing canning conveyor.

At the time of the site works, the area comprised an area of concrete hardstanding used for pedestrian and vehicular access with plant and buildings peripheral to the locality. Existing ground levels are approximately 3.5m AOD with a very slight fall in levels towards the east.

Summary of Geoenvironmental and Historical Setting

The salient points relating to the site's geoenvironmental and historical setting are presented below.

- The site was agricultural land and later an orchard until the late 1960s when it was developed with the existing premises.
- Published geological information indicates the site as being underlain by superficial soils comprising Tidal Flat deposits (silt and clay of the Terrington Beds with layers of sand, gravel and peat) underlain by solid strata of mudstone of the Jurassic Ampthill Clay Formation.
- Archive British Geological Survey (BGS) intrusive borehole data on and immediately adjacent to the site shows a cover of made ground overlying natural soils of either sands and gravels proved to 16.0m depth or firm clays with silty sands below 3.0m depth and in all cases deeper stiff clays proved below 16.0m (probable solid strata of the Ampthill Clay Formation).
- Recent intrusive investigations by PPL at the site record loose to medium dense silty sands to at least 5.45m below existing ground levels (begl). Free groundwater lies between 1.0 and 2.0m begl. Some made ground is anticipated due to the historical development of the site.

Fieldwork

The ground investigation was undertaken on the 11th March 2019 and comprised the drilling of 1 no. cable percussive borehole (BH01) to a depth of 25.45m below begl. Due to imposed access restrictions, the borehole was located approximately 15m east of the proposed new hydrostat location, on the opposite side of the can conveyor. In situ testing was undertaken during the advancement of the borehole to determine the strength and relative densities of the soils with depth. As a consequence of upwards hydrostatic pressure exhibited by the saturated granular soils with increasing depth, water was added to the borehole to equalise this pressure and facilitate progression of the boring. Ahead of the commencement of any intrusive works, surface scanning and detection of any potential underground utilities apparatus was undertaken. Prior to the advancement of the borehole, breaking out of the hardstanding was undertaken using mechanical means, followed by hand excavation of an inspection pit to 1.2m depth to clear any potential underground services apparatus. All intrusive works were undertaken under the supervision of a qualified geoenvironmental engineer.

An exploratory hole location plan, PPL Drawing No. H19010-701, is attached to this letter report.

Ground Conditions

Hardstanding

Surface reinforced concrete at 200mm thickness.

Made Ground

A limited thickness of made ground comprising reworked gravelly sand with concrete and sandstone content was proved to 0.6m depth.

Natural Granular Soils

Underlying the made ground, natural loose silty sand was present, becoming medium dense below 6.0m begl. At between 12.0 and 14.0m, gravelly sand with occasional clay bands was present and below 16.0m, gravelly sand becoming dense below 19.5m was proved to 21.0m begl.

Natural Cohesive Soils

Stiff becoming very stiff gravelly clay was encountered below the sands and proved to the base of the borehole to a maximum depth of 25.45m begl.

A summary of the results of the in situ testing (uncorrected SPT 'N' values and corrected 'N₆₀' values for granular soils together with correlated indicative shear strengths of cohesive soils) undertaken within the natural granular and cohesive strata is presented in the table below. Exploratory hole records and an SPT 'N₆₀' value versus depth graph are appended to this letter report.

Summary of Geotechnical Parameters

Strata	Depth (m) BEGL (Average)	Relative Density Range (SPT)			Undrained Shear Strength (C _u) (kN/m ²) Range	
		'N' Value Range	N ₆₀ Value Range	Field Classification (Consistency)	Indicative Shear Strength	Classification
Natural SANDS	1.2	4	5	Loose	-	-
	2	3	4	Loose	-	-
	3	8	11	Medium Dense	-	-
	4	7	9	Medium Dense	-	-
	5	8	11	Medium Dense	-	-
	6	12	16	Medium Dense	-	-
	7.5	14	19	Medium Dense	-	-
	9	25	33	Dense	-	-
	10.5	38	50	Dense	-	-
	12	10	13	Medium Dense	-	-
	13.5	17	22	Medium Dense	-	-
	15	13	17	Medium Dense	-	-
	16.5	12	16	Medium Dense	-	-
	18	26	34	Dense	-	-
	19.5	39	>50	Dense	-	-
Natural CLAYS	21	28	37	Stiff	185	Very high strength
	22.5	39	>50	Very stiff	250	Very high strength
	24	43	>50	Very stiff	250	Very high strength
	25	43	>50	Very stiff	250	Very high strength

Groundwater

No groundwater strike was recorded as such during the advancement of the borehole, however, standing groundwater is likely to be around 2.0m begl. Of note, is that the hydrostatic pressure of the groundwater increased significantly below approximately 6.0m depth with the requirement to add water to the borehole in order to maintain its stability.

Evidence of Contamination

No visual or olfactory evidence of significant or gross contamination was noted during the advancement of the borehole. In addition, no asbestos containing materials (ACMs) were observed during the intrusive investigation.

Laboratory Testing and Results

Geotechnical

A total of 4 samples of natural granular and cohesive soils were selected for determination of pH and water soluble sulphate concentration and 2 samples of the deeper natural cohesive soils for Atterberg limits classification testing.

The water soluble sulphate concentrations of the natural soils ranged between <0.01 and 0.27g/l with pH values of between 8.8 and 9.5 (moderately alkaline).

The results of the Atterberg limits tests classify the natural clays as being of low plasticity with modified plasticity indices of between 9 and 14% or low volume change potential.

Chemical and Contamination Assessment

The assessment involves the screening of the measured concentrations of contaminants of concern obtained during the investigations against published generic assessment criteria (GAC) values which are representative of a 'minimal' or 'tolerable' risk to human health. The assessment criteria adopted are the LQM/CIEH Suitable for Use Levels (S4ULs) for Human Health Risk Assessment (Copyright Land Quality Management Limited reproduced with permission; Publication Number S4UL3279; All rights reserved). Where no S4UL is available, reference is made to other relevant standards as appropriate. Based on the proposed end use, GACs for a commercial end use have been adopted. A conservative soil organic matter content of 1% has been adopted.

Metals, Metalloids, Non-metals

A single shallow made ground soil sample was analysed for metals and metalloids and recorded concentrations below their respective GAC values for a commercial end use.

Petroleum Hydrocarbons

A single sample of shallow made ground was tested for Total Petroleum Hydrocarbons (TPH) which recorded concentrations below the relevant GAC values for a commercial end use, all recorded at less than detection limit of the laboratory.

Polycyclic Aromatic Hydrocarbons

A single sample of shallow made ground was tested for Polycyclic Aromatic Hydrocarbons (PAH) which recorded concentrations below the relevant GAC values for a commercial end use, the majority recorded below the detection limit of the laboratory.

Asbestos

The shallow made ground soil sample was screened for the presence of asbestos. Asbestos was not confirmed as present within the sample of made ground.

The geotechnical and chemical testing certificates as received from the laboratory, together with a GAC summary assessment table, are appended to this letter report.

Recommendations

Foundations

It is proposed to construct a replacement hydrostat at the site. High loadings are anticipated from the structure, which will require transferring to deeper more competent strata.

The intrusive investigation has proved reinforced concrete at 200mm thick directly underlain by reworked granular made ground to 0.6m begl. Beneath these materials, natural loose silty sand was proved, becoming medium dense generally below 6.0m and dense below 19.5m depth. At 21.0m, stiff becoming very stiff gravelly clay was present and proved to a maximum depth of 25.45m begl. Free groundwater was generally encountered below 2.0m begl.

The shallow and intermediate underlying granular strata are not considered as suitable bearing strata for the proposed structure due to their low relative densities and the presence of a relatively high groundwater table. As such, the use of a piled foundation solution is appropriate with loadings transferred to the underlying medium dense and dense granular soils and/or stiff/very stiff clays, generally at depths of between 15.0 and 20.0m begl. The use of a bored/CFA or driven pile type may be suitable, subject to specialist advice.

Concrete Design

For sub surface concrete in contact with all soil types, a concrete design sulphate classification DS-1 and ACEC classification of AC-1 is considered appropriate, in accordance with BRE SD-1 (2005) and assuming mobile groundwater conditions, with concrete designed accordingly.

Contamination and Remediation

Based upon the chemical laboratory testing results, the limited thickness of made ground materials (construction build up) together with the presence of total final hardcover, these soils are not considered as potentially presenting a significant risk to end-users and no remediation is considered necessary. If during construction potential exposure to unexpected made ground materials occurs, it is recommended that good practice and appropriate hygiene measures are followed (following established guidance) during these activities, to mitigate any potential risk to construction personnel. Should gross contamination be encountered, then the advice of a geoenvironmental engineer should be sought.

The findings and recommendations within this report are considered appropriate to the proposed development. However, if proposals change significantly, further consultation should be made with PPL.

We trust this report is satisfactory, however, if you have any comments or require further clarification on any matters please do not hesitate to contact the undersigned.

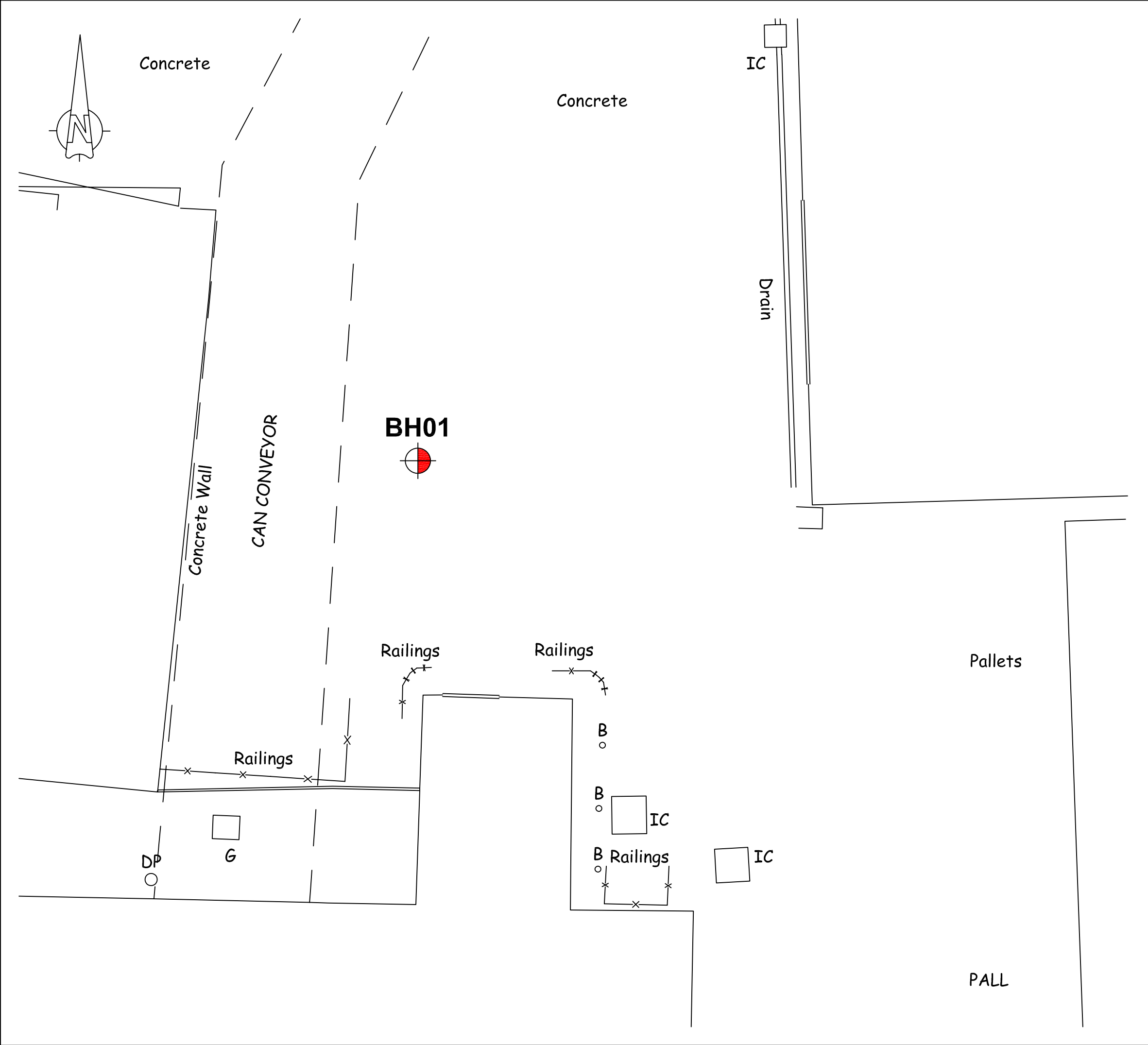
Yours sincerely



Jonny Roberts

Senior Geoenvironmental Engineer

Encl. Drawings & Figures
 Exploratory Hole Records
 Laboratory Testing Certificates
 GAC Summary Table



GENERAL NOTES
1.1. THIS DRAWING IS COPYRIGHT AND SHOULD NOT BE REPRODUCED IN WHOLE OR PART WITHOUT THE WRITTEN CONSENT OF PATRICK PARSONS LTD.
1.2. DO NOT SCALE FROM THIS DRAWING.

LEGEND
BH01 CABLE PERCUSSIVE BOREHOLE

P1	INITIAL ISSUE.	11.11.11	AAA
Rev.	Amendments	Date	By

Revisions



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United Kingdom

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W. www.patrikparsons.co.uk

Client
PRINCES LIMITED

Project
HYDROSTAT REPLACEMENT,
LONG SUTTON

Drawing
EXPLORATORY BOREHOLE
LOCATION PLAN

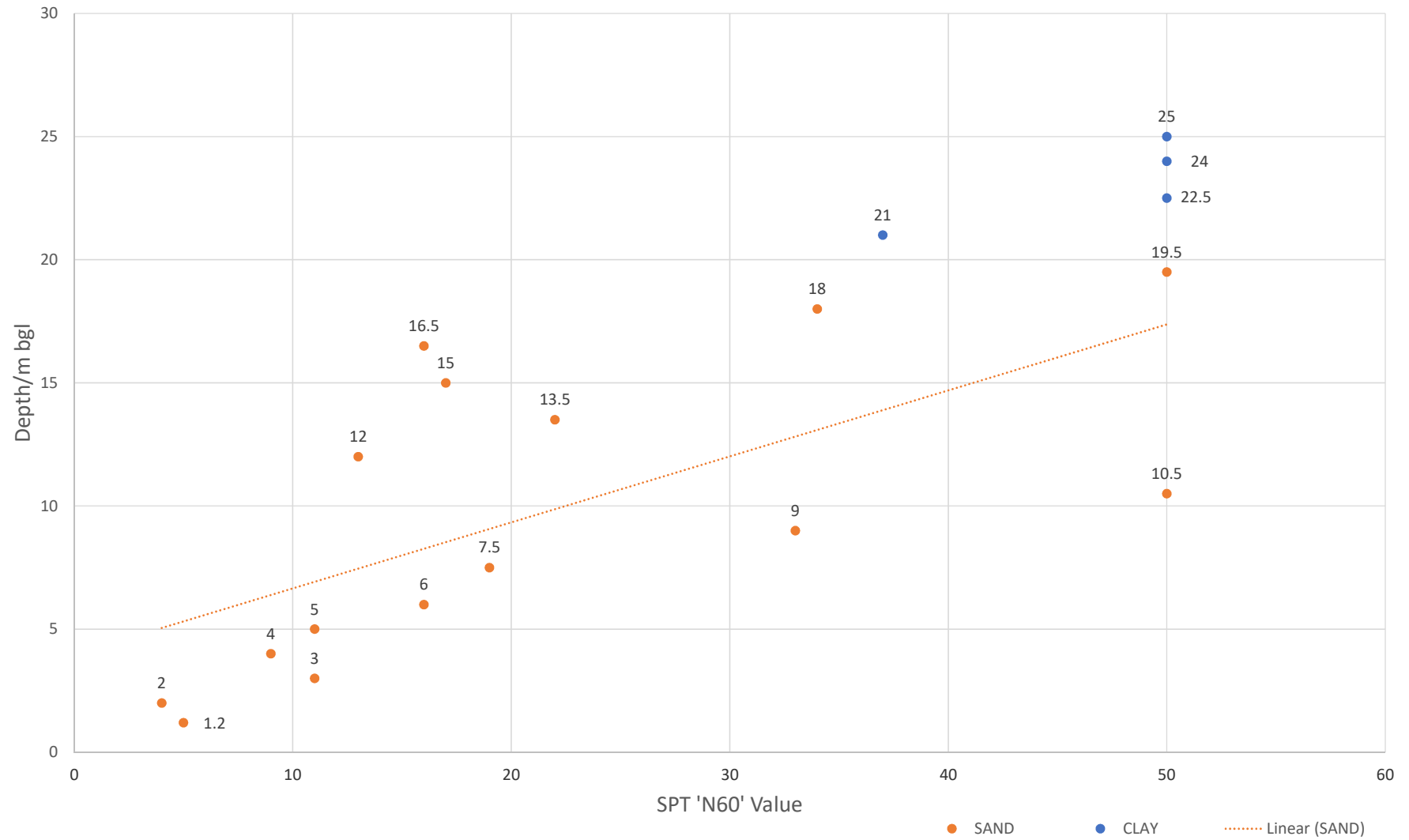
Scales NTS At original size A3

Drawn	ACV	Checked	JR
Date	MARCH 2019		

Status PRELIMINARY

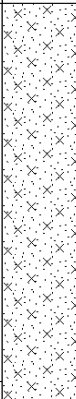
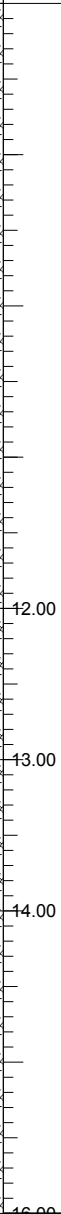
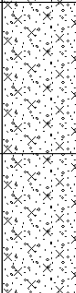
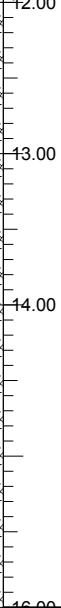
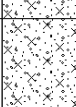
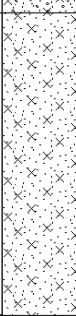
Drawing No. H19010 - 701 Rev. P1

H19010 Replacement Hydrostat, Long Sutton: SPT vs Depth Plot

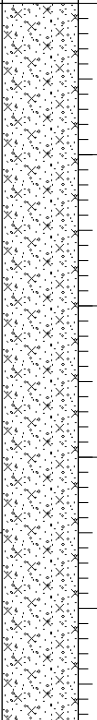
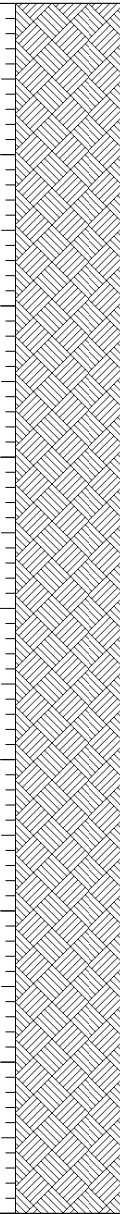


 GROUND TECHNOLOGY Victory Park, Attleborough Norfolk, NR17 1ZA Tel: 01953 459462 www.groundtechnology.co.uk			Borehole Record				BH01		Sheet 1 of 4	
Project: Proposed Hydrostat, Long Sutton			Project ID: GTS-19-190							
Client: Princes Ltd			Engineer: Patrick Parsons				Ground Level: Coordinates:			
Description	Legend	Depth (m)	O.D. Level (m)	Sample Test		SPT/CPT		Remarks and Test Results		Installations
				Type	Depth Top (m)	Depth Base (m)	Casing Depth	Water Depth	SPT/HV/PP	
Concrete. [MADE GROUND]		0.20		B1	0.20	0.60				
Orangish brown silty very gravelly medium and coarse SAND. Gravel is angular to subangular fine to coarse carstone and concrete. [MADE GROUND]		0.60		B2	0.60	1.00				
Orangish brown slightly silty very gravelly medium and coarse SAND, with low cobble content. Cobbles are subangular carstone. Gravel is angular to subrounded fine to coarse carstone. [TIDAL FLAT DEPOSITS]		1.20		B4 D3	1.20 1.20	1.70 1.65	0.00	Dry	N=4 (1,1,1,1,1) (S)	
Loose brownish grey silty fine SAND. [TIDAL FLAT DEPOSITS]										
				B6 D5	2.00 2.00	2.50 2.45	1.70	Dry	3 (1,1,1,1) (S)	
				B8 D7 W39	3.00 3.00 3.00	3.50 3.45 3.45	3.00	Dry	N=8 (1,2/2,2,2,2) (S)	
				B10 D9	4.00 4.00	4.50 4.45	4.00	Dry	N=7 (1,2/2,1,2,2) (S)	
			B12 D11	5.00 5.00	5.50 5.45	5.00	4.50		N=8 (1,2/2,2,2,2) (S)	
			B14 D13	6.00 6.00	6.50 6.45	6.00	4.20		N=12 (1,2/2,3,3,4) (S)	
			B16 D15	7.50 7.50	8.00 7.95	7.50	4.50		N=14 (1,2/2,3,4,5) (S)	

Hole Diameter Detail			Chiselling		Water Strike - General					
Diameter (mm)	Hole Depth (m)	Casing Depth (m)	Depth Top (m)	Duration (mins)	Date	Water Strike (m)	Standing Time (mins)	Standing Level (m)	Casing Depth (m)	Depth Sealed (m)
150mm	25.45m	21.00m								
200mm	11.00m	10.50m								
					Remarks: 1. Inspection pit hand dug to a depth of 1.20m. 2. Depth of groundwater strike not recorded. 3. Water added to assist progress below 6.45m. 4. Bentonite seal from 11m to 9m. 5. Borehole backfilled with arisings and reinstated at surface.					
Dates: Start: 11/03/2019 End: 13/03/2019 Plant: Dando 2000 Drilled By: S. Whiteman Logged By: J. Tomalin Status: FINAL Checked By: M. Smith Rev: R1										

 GROUND TECHNOLOGY Victory Park, Attleborough Norfolk, NR17 1ZA Tel: 01953 459462 www.groundtechnology.co.uk			Borehole Record				BH01		Sheet 2 of 4		
Project: Proposed Hydrostat, Long Sutton			Project ID: GTS-19-190								
Client: Princes Ltd			Engineer: Patrick Parsons				Ground Level: Coordinates:				
Description	Legend	Depth (m)	O.D. Level (m)	Sample Test			SPT/CPT		Remarks and Test Results		Installations
				Type	Depth Top (m)	Depth Base (m)	Casing Depth	Water Depth	SPT/HV/PP	PID (ppm)	
...below 10.50m, becoming dense.				B18	9.00	9.50	9.00	3.00	N=25 (1,2/3,6,8,8) (S)		
				D17	9.00	9.45					
				D19	10.50	10.95	10.50	2.30	N=38 (2,2/6,9,10,13) (S)		
				D20	11.50	11.60					
Medium dense greyish brown slightly silty gravelly fine to coarse SAND. Gravel is angular to subangular fine to medium flint. Some shell debris. [TIDAL FLAT DEPOSITS]				D21	12.00	12.45	12.00	3.00	N=10 (1,1/2,3,2,3) (S)		
D22				13.00	13.10						
D23				13.50	13.95	13.50	3.20	N=17 (1,2/3,4,4,6) (S)			
D24				14.50	14.60						
Medium dense greyish brown slightly silty slightly gravelly medium SAND. Gravel is angular to subangular fine to medium flint. Some shell debris and rare thin clay bands. . [TIDAL FLAT DEPOSITS]				D25	15.00	15.45	15.00	2.00	N=13 (1,2/3,3,3,4) (S)		
D26				16.00	16.10						
Medium dense greyish brown slightly silty fine and medium SAND. [TIDAL FLAT DEPOSITS]				D25	15.00	15.45	15.00	2.00	N=13 (1,2/3,3,3,4) (S)		
D26				16.00	16.10						

Hole Diameter Detail			Chiselling		Water Strike - General					
Diameter (mm)	Hole Depth (m)	Casing Depth (m)	Depth Top (m)	Duration (mins)	Date	Water Strike (m)	Standing Time (mins)	Standing Level (m)	Casing Depth (m)	Depth Sealed (m)
150mm	25.45m	21.00m								
200mm	11.00m	10.50m								
Remarks: 1. Inspection pit hand dug to a depth of 1.20m. 2. Depth of groundwater strike not recorded. 3. Water added to assist progress below 6.45m. 4. Bentonite seal from 11m to 9m. 5. Borehole backfilled with arisings and reinstated at surface.										
Dates: Start: 11/03/2019 End: 13/03/2019										
Plant: Dando 2000										
Drilled By: S. Whiteman										
Logged By: J. Tomalin Status: FINAL										
Checked By: M. Smith Rev: R1										

 GROUND TECHNOLOGY Victory Park, Attleborough Norfolk, NR17 1ZA Tel: 01953 459462 www.groundtechnology.co.uk			Borehole Record				BH01		Sheet 3 of 4		
Project: Proposed Hydrostat, Long Sutton Project ID: GTS-19-190											
Client: Princes Ltd			Engineer: Patrick Parsons				Ground Level: Coordinates:				
Description	Legend	Depth (m)	O.D. Level (m)	Sample Test			SPT/CPT		Remarks and Test Results		Installations
				Type	Depth Top (m)	Depth Base (m)	Casing Depth	Water Depth	SPT/HV/PP	PID (ppm)	
Medium dense greyish brown slightly silty gravelly medium and coarse SAND. Gravel is angular to subrounded fine to medium flint and quartz. Some shell debris. [TIDAL FLAT DEPOSITS]				D27	16.50	16.95	16.50	2.50	N=12 (2,2/3,3,3,3) (S)		
				D28	17.50	17.60					
				D29	18.00	18.45	18.00	3.00	N=26 (2,3/5,5,8,8) (S)		
				D30	19.00	19.10					
				D31	19.50	19.95	19.50	3.00	N=39 (4,7/8,8,10,13) (S)		
...below 19.50m, becoming dense.											
Stiff becoming very stiff grey slightly gravelly CLAY. Gravel is subangular to subrounded fine to medium chalk. [TIDAL FLAT DEPOSITS]			20.80	D32	20.80	20.90					
				D33	21.00	21.45	21.00	3.00	N=28 (3,4/5,7,7,9) (S)		
				D34	22.00	22.10					
				D35	22.50	22.95	21.00	3.00	N=39 (3,6/7,9,9,14) (S)		
			D36	23.50	23.60						
			D37	24.00	24.45	21.00	3.00				

Hole Diameter Detail			Chiselling		Water Strike - General					
Diameter (mm)	Hole Depth (m)	Casing Depth (m)	Depth Top (m)	Duration (mins)	Date	Water Strike (m)	Standing Time (mins)	Standing Level (m)	Casing Depth (m)	Depth Sealed (m)
150mm	25.45m	21.00m								
200mm	11.00m	10.50m								
					Remarks: 1. Inspection pit hand dug to a depth of 1.20m. 2. Depth of groundwater strike not recorded. 3. Water added to assist progress below 6.45m. 4. Bentonite seal from 11m to 9m. 5. Borehole backfilled with arisings and reinstated at surface.					
Dates: Start: 11/03/2019 End: 13/03/2019 Plant: Dando 2000 Drilled By: S. Whiteman Logged By: J. Tomalin Status: FINAL Checked By: M. Smith Rev: R1										



BH01

Sheet 4 of 4

Project ID: GTS-19-190

Client: Princes Ltd

Engineer: Patrick Parsons

Ground Level:
Coordinates:

[illegible]

Hole Diameter Detail			Chiselling		Water Strike - General					
Diameter (mm)	Hole Depth (m)	Casing Depth (m)	Depth Top (m)	Duration (mins)	Date	Water Strike (m)	Standing Time (mins)	Standing Level (m)	Casing Depth (m)	Depth Sealed (m)
150mm 200mm	25.45m 11.00m	21.00m 10.50m								
					Remarks: 1. Inspection pit hand dug to a depth of 1.20m. 2. Depth of groundwater strike not recorded. 3. Water added to assist progress below 6.45m. 4. Bentonite seal from 11m to 9m. 5. Borehole backfilled with arisings and reinstated at surface.					
Dates:	Start:	11/03/2019	End:	13/03/2019						
Plant:	Dando 2000									
Drilled By:	S. Whiteman									
Logged By:	J. Tomalin	Status:	FINAL							
Checked By:	M. Smith	Rev:	R1							



Site Location: Princes Ltd Long Sutton
Project Number: GTS-19-190
Client: Patrick & Parsons Limited

Key:	U	Undisturbed Sample	(x) %	% passing BS 0.425mm sieve	MUU	Multi Stage Unconsolidated Undrained	s1-s3	Deviator Stress
	D	Small Disturbed Sample	NP	Non Plastic	HV	Hand Vane	C _u	Undrained Shear Strength
	B	Bulk Disturbed Sample	SUU	Single Stage Unconsolidated Undrained	s ₃	Cell Pressure	Æ _u	Angle of Shear Resistance



- o James Elliott (Technical Manager)



2183

Final Report

Report No.: 19-09880-1

Initial Date of Issue: 29-Mar-2019

Client Ground Technology Services

Client Address: Maple Road
Kings Lynn
Norfolk
PE34 3AF

Contact(s): Chantal Cousins
GT.Lab
J. Elliott

Project GTS-19-190 Princess Ltd Long Sutton

Quotation No.:		Date Received:	21-Mar-2019
Order No.:	GTS	Date Instructed:	21-Mar-2019
No. of Samples:	5		
Turnaround (Wkdays):	7	Results Due:	29-Mar-2019
Date Approved:	29-Mar-2019		

Approved By:



Details: Robert Monk, Technical Manager

Results - Soil

Client: Ground Technology Services	Chemtest Job No.:				19-09880	19-09880	19-09880	19-09880	19-09880
Quotation No.:	Chemtest Sample ID.:				797019	797020	797021	797022	797023
	Client Sample ID.:				B1	D5	D15	D30	D33
	Sample Location:				BH01	BH01	BH01	BH01	BH01
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.2	2	7.5	19	21
	Bottom Depth (m):				0.6	2.45	7.95	19.1	21.45
	Asbestos Lab:				COVENTRY				
Determinand	Accred.	SOP	Units	LOD					
ACM Type	U	2192		N/A	-				
Asbestos Identification	U	2192	%	0.001	No Asbestos Detected				
ACM Detection Stage	U	2192		N/A	-				
Moisture	N	2030	%	0.020	11	25	22	13	13
Stones and Removed Materials	N	2030	%	0.020	< 0.020				
pH	U	2010		N/A	[A] 11.7	[A] 9.5	[A] 9.1	[A] 8.8	[A] 9.0
Boron (Hot Water Soluble)	U	2120	mg/kg	0.40	0.81				
Sulphate (2:1 Water Soluble) as SO4	U	2120	g/l	0.010	0.24	0.12	< 0.010	0.021	0.27
Cyanide (Free)	U	2300	mg/kg	0.50	[A] < 0.50				
Cyanide (Total)	U	2300	mg/kg	0.50	[A] < 0.50				
Thiocyanate	U	2300	mg/kg	5.0	[A] < 5.0				
Sulphide (Easily Liberatable)	N	2325	mg/kg	0.50	[A] 5.5				
Sulphate (Total)	U	2430	%	0.010	[A] 0.18				
Arsenic	U	2450	mg/kg	1.0	14				
Cadmium	U	2450	mg/kg	0.10	< 0.10				
Chromium	U	2450	mg/kg	1.0	45				
Copper	U	2450	mg/kg	0.50	7.1				
Mercury	U	2450	mg/kg	0.10	< 0.10				
Nickel	U	2450	mg/kg	0.50	30				
Lead	U	2450	mg/kg	0.50	23				
Selenium	U	2450	mg/kg	0.20	< 0.20				
Zinc	U	2450	mg/kg	0.50	55				
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50				
Organic Matter	U	2625	%	0.40	[A] < 0.40				
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C8-C10	U	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C10-C12	U	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C12-C16	U	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C16-C21	U	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C21-C35	U	2680	mg/kg	1.0	[AC] < 1.0				
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0	[AC] < 1.0				
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0	[AC] < 5.0				
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0	[AC] < 1.0				
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0	[AC] < 1.0				
Aromatic TPH >C8-C10	U	2680	mg/kg	1.0	[AC] < 1.0				
Aromatic TPH >C10-C12	U	2680	mg/kg	1.0	[AC] < 1.0				

Results - Soil

Client: Ground Technology Services	Chemtest Job No.:					19-09880	19-09880	19-09880	19-09880	19-09880
Quotation No.:	Chemtest Sample ID.:					797019	797020	797021	797022	797023
	Client Sample ID.:					B1	D5	D15	D30	D33
	Sample Location:					BH01	BH01	BH01	BH01	BH01
	Sample Type:					SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):					0.2	2	7.5	19	21
	Bottom Depth (m):					0.6	2.45	7.95	19.1	21.45
	Asbestos Lab:					COVENTRY				
Determinand	Accred.	SOP	Units	LOD						
Aromatic TPH >C12-C16	U	2680	mg/kg	1.0	[AC] < 1.0					
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0	[AC] < 1.0					
Aromatic TPH >C21-C35	U	2680	mg/kg	1.0	[AC] < 1.0					
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0	[AC] < 1.0					
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0	[AC] < 5.0					
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0	[AC] < 10					
Naphthalene	U	2700	mg/kg	0.10	[A] < 0.10					
Acenaphthylene	U	2700	mg/kg	0.10	[A] < 0.10					
Acenaphthene	U	2700	mg/kg	0.10	[A] < 0.10					
Fluorene	U	2700	mg/kg	0.10	[A] < 0.10					
Phenanthrene	U	2700	mg/kg	0.10	[A] 0.20					
Anthracene	U	2700	mg/kg	0.10	[A] < 0.10					
Fluoranthene	U	2700	mg/kg	0.10	[A] 0.33					
Pyrene	U	2700	mg/kg	0.10	[A] 0.35					
Benzo[a]anthracene	U	2700	mg/kg	0.10	[A] 0.13					
Chrysene	U	2700	mg/kg	0.10	[A] 0.15					
Benzo[b]fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10					
Benzo[k]fluoranthene	U	2700	mg/kg	0.10	[A] < 0.10					
Benzo[a]pyrene	U	2700	mg/kg	0.10	[A] < 0.10					
Indeno(1,2,3-c,d)Pyrene	U	2700	mg/kg	0.10	[A] < 0.10					
Dibenz(a,h)Anthracene	U	2700	mg/kg	0.10	[A] < 0.10					
Benzo[g,h,i]perylene	U	2700	mg/kg	0.10	[A] < 0.10					
Total Of 16 PAH's	U	2700	mg/kg	2.0	[A] < 2.0					
Total Phenols	U	2920	mg/kg	0.30	< 0.30					

Deviations

In accordance with UKAS Policy on Deviating Samples TPS 63. Chemtest have a procedure to ensure 'upon receipt of each sample a competent laboratory shall assess whether the sample is suitable with regard to the requested test(s)'. This policy and the respective holding times applied, can be supplied upon request. The reason a sample is declared as deviating is detailed below. Where applicable the analysis remains UKAS/MCERTs accredited but the results may be compromised.

Sample:	Sample Ref:	Sample ID:	Sample Location:	Sampled Date:	Deviation Code(s):	Containers Received:
797019		B1	BH01		AC	Plastic Bag
797020		D5	BH01		A	Plastic Tub 500g
797021		D15	BH01		A	Plastic Tub 500g
797022		D30	BH01		A	Plastic Tub 500g
797023		D33	BH01		A	Plastic Tub 500g

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2325	Sulphide in Soils	Sulphide	Steam distillation with sulphuric acid / analysis by 'Aquakem 600' Discrete Analyser, using N,N-dimethyl-p-phenylenediamine.
2430	Total Sulphate in soils	Total Sulphate	Acid digestion followed by determination of sulphate in extract by ICP-OES.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2700	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-FID	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[ah]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Dichloromethane extraction / GC-FID (GC-FID detection is non-selective and can be subject to interference from co-eluting compounds)
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

- U UKAS accredited
- M MCERTS and UKAS accredited
- N Unaccredited
- S This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
- SN This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
- T This analysis has been subcontracted to an unaccredited laboratory
- I/S Insufficient Sample
- U/S Unsuitable Sample
- N/E not evaluated
- < "less than"
- > "greater than"

Comments or interpretations are beyond the scope of UKAS accreditation

The results relate only to the items tested

Uncertainty of measurement for the determinands tested are available upon request

None of the results in this report have been recovery corrected

All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis

All Asbestos testing is performed at the indicated laboratory

Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

- A - Date of sampling not supplied
- B - Sample age exceeds stability time (sampling to extraction)
- C - Sample not received in appropriate containers
- D - Broken Container
- E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 45 days from the date of receipt

All water samples will be retained for 14 days from the date of receipt

Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:

customerservices@chemtest.com

PATRICK PARSONS					
* Non SOM dependent		Commercial		Source	
SOM %		1	2.5	6	
Metals and Inorganics *	Antimony		640	7	
	Arsenic		12	7	
	Barium		240000	7	
	Beryllium		190	7	
	Boron		8600	7	
	Cadmium		33	7	
	Chromium (III)		68000	7	
	Chromium (VI) (Hexavalent)		58 ^{vap} (25.8)	7	
	Copper		1100	7	
	Cyanide (Free)		320	7	
	Elemental Mercury		2330	8	
	Inorganic Mercury		980	7	
	Methylmercury		12000	7	
	Lead		9000	7	
	Molybdenum		730000	7	
	Nickel				
Selenium					
Tin					
Vanadium					
Zinc					
Tributyltinoxide					
Polycyclic Aromatic Hydrocarbons	Acenaphthene	84000 (57.0) ^{sol}	97000 (141) ^{sol}	100000	7
	Acenaphthylene	83000 (86.1) ^{sol}	97000 (212) ^{sol}	100000	7
	Anthracene	520000	540000	540000	7
	Benzo[a]anthracene	170	170	180	7
	Benzo[a]pyrene	35	35	36	7
	Benzo[b]fluoranthene	44	44	45	7
	Benzo[ghi]perylene	3900	4000	4000	7
	Benzo[k]fluoranthene	1200	1200	1200	7
	Chrysene	350	350	350	7
	Dibenz[ah]anthracene	3.5	3.6	3.6	7
	Fluoranthene	23000	23000	23000	7
	Fluorene	63000 (30.9) ^{sol}	68000	71000	7
	Indeno[123-cd]pyrene	500	510	510	7
	Naphthalene	190 (76.4) ^{sol}	460 (183) ^{sol}	1100 (432) ^{sol}	7
	Phenanthrene	22000	22000	23000	7
	Pyrene	54000	54000	54000	7
Coal Tar (B[a]P as surrogate marker)	15	15	15	7	
Petroleum Hydrocarbons	Benzene	27	47	90	7
	Toluene	56000 ^{vap} (869)	110000 ^{vap} (1920)	180000 ^{vap} (4360)	7
	Ethylbenzene	5700 ^{vap} (518)	13000 ^{vap} (1220)	27000 ^{vap} (2840)	7
	m-Xylene	6200 ^{vap} (625)	14000 ^{vap} (1470)	3100 ^{vap} (2620)	7
	o-Xylene	6600 ^{sol} (478)	15000 ^{sol} (1120)	3300 ^{sol} (2620)	7
	p-Xylene	5900 ^{sol} (576)	14000 ^{sol} (1350)	30000 ^{sol} (3170)	7
	Methyl tert-butyl ether (MTBE)				
	1,2,4-Trimethylbenzene				
	iso-Propylbenzene				
	Propylbenzene				
	Styrene				
	Aliphatic EC 5-6	3200 (304) ^{sol}	5900 (558) ^{sol}	12000 (1150) ^{sol}	7
	Aliphatic EC >6-8	7800 (144) ^{sol}	17000 (322) ^{sol}	40000 (736) ^{sol}	7
	Aliphatic EC >8-10	2000 (78) ^{sol}	4800 (190) ^{vap}	11000 (451) ^{vap}	7
	Aliphatic EC >10-12	9700 (48) ^{sol}	23000 (118) ^{vap}	47000 (283) ^{vap}	7
	Aliphatic EC >12-16	59000 (24) ^{sol}	82000 (59) ^{sol}	90000 (142) ^{sol}	7
	Aliphatic EC >16-35	1600000	1700000	1800000	7
	Aliphatic EC >35-44	1600000	1700000	1800000	7
	Aromatic EC 5-7 (benzene)	26000 (1220) ^{sol}	46000 (2260) ^{sol}	86000 (4710) ^{sol}	7
	Aromatic EC >7-8 (toluene)	56000 (869) ^{vap}	110000 (1920) ^{sol}	180000 (4360) ^{vap}	7
	Aromatic EC >8-10	3500 (613) ^{vap}	8100 (1500) ^{vap}	17000 (3580) ^{vap}	7
	Aromatic EC >10-12	16000 (364) ^{sol}	28000 (899) ^{sol}	34000 (2150) ^{sol}	7
	Aromatic EC >12-16	36000 (169) ^{sol}	37000	38000	7
	Aromatic EC >16-21	28000	28000	28000	7
	Aromatic EC >21-35	28000	28000	28000	7
	Aromatic EC >35-44	28000	28000	28000	7
	Petroleum Hydrocarbons EC >44-70	28000	28000	28000	7

Source

7 LQM/CIEH S4UL 3279 (2014)

8 DEFRA C4SL SP1010 (2014)