

Our ref: SMB:le:H12232

11th March 2013

Princes Foods Ltd (by email only)

FAO Pat McNamee

Dear Sirs,

Bridge Road, Long Sutton – Ground Investigation for Proposed Office/Canteen Extension

Preamble

Further to the submission of our desk study report (Ref. H12232 dated January 2013), we are pleased to report on the results of the ground investigation undertaken at the site. The objectives of the investigation were as follows: -

1. To confirm ground conditions using window sampling methods, including the measurement of *in situ* soil strength (with the collection of soil samples for laboratory testing)
2. The inspection of a hand-dug trial pit to expose existing foundations
3. To make recommendations for foundations

A proposed foundation general arrangement for the extension is shown on Drawing H12232/002.

Following completion of the desk study, we were provided with a copy of a site investigation report for review, prepared by Ground Engineering in 1999. This was undertaken to inform the design and construction of an above-ground tank in the south of the factory complex.

Limitations

This report is based on and limited to an assessment of the information obtained during the ground investigation, described herein and has been prepared for the sole use of Princes Ltd and their agents only. This report should not be relied upon by any third party without the written permission of DCE.

DCE will bear no responsibility for ground conditions that may exist between the exploratory holes but which were not proven within this investigation.

Fieldwork

Fieldwork was carried out on January 2013 and comprised 3 window sample boreholes, taken to maximum depths of 5.45m, with follow-on dynamic probing to 10m depth.

The locations of the window sample boreholes are shown on the attached sketch plan and

the logs of the boreholes are also attached. Note that five window sample boreholes were proposed initially (WS01 to WS05 inclusive). However, because of access and health and safety issues, only three were selected to be drilled, these being: WS01, WS03 and WS05. A groundwater monitoring standpipe was installed in WS05 to 3m, to enable groundwater levels to be checked. Samples of shallow soils were collected for lab testing.

An exploratory hole location plan, Drawing H12232-705 is attached. A hand-dug trial pit was excavated adjacent to the external wall of the existing building. A sketch plan of the pit is attached. The

Ground Conditions

The ground conditions typically comprised less than 0.4m of made ground, described as, *'Brown and dark brown sandy fine to coarse angular to subangular gravel and cobble size whole and part brick and sandstone.'*

The underlying natural soils comprised generally: *'Loose indistinctly laminated light brown sandy SILT'*, becoming *'Loose grey brown silty fine SAND'* below between 1.7 to 2.6m. The strength of the silty sand from the SPT results, increased below approximately 4.0 to 5.0m below ground level, being described as medium dense towards the base of the window sample boreholes, with SPTs (uncorrected) of between 10 and 17.

The dynamic probe follow-on indicated consistent strength, with the soils below 5m being medium dense, becoming dense towards the base of the probe holes.

Groundwater was generally encountered at around 1.8m below ground level. A groundwater monitoring standpipe was installed in WS05 to 3.0m depth.

Laboratory Testing

Two samples of the sandy silt were sent to GSTL for particle size distribution (PSD) testing. The results are attached. The tests indicate that soils have between 15 and 20% sand content. No sulphate testing was considered required on the basis of the ground conditions encountered. Class DS-1 AC-1 conditions may be assumed in the natural soils.

Inspection of Hand-dug Trial Pit

The hand-dug pit revealed a similar shallow soil profile to the window sample boreholes. The top of the concrete foundation was exposed at 1.10m below ground level. The foundation was 400mm thick with an outstand from the external wall of 500mm. The formation was sandy silt.

Conclusions and Recommendations

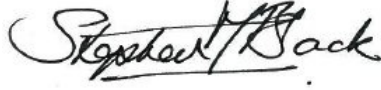
On the basis of the ground conditions revealed and the *in situ* soil strength measurements, the undisturbed natural soils will be able to accommodate a net bearing pressure of 50kN/m², with total settlements of less than 25mm. This takes into account the potential for shallow groundwater, at around 1.8m below existing ground level.

Thickened, widened and strengthened 'strip' foundations (ground beams) are proposed to carry the structural loads, with movement joints between the old and new buildings. Whilst the minimum foundation depth may be 600mm on the undisturbed natural sandy silt, the foundations will need to be taken down to the same depth of the foundation of the existing building (refer to Drawing H12232-002).

There is the potential for fluctuations in groundwater level and local dewatering may be required during foundation construction. The foundation formation may also require blinding. Prior to construction we recommend that groundwater levels are monitored via the existing monitoring well (in WS05), to confirm dewatering requirements.

If you have any queries, or require further information, please contact us.

Yours faithfully



Steve Black
Principal

Encl.

Plan showing location of window sample boreholes and hand-dug trial pit (Drawing H12232-705)

Drawing H12232-002 Foundation General Arrangement

Window sample borehole logs and dynamic probe data sheets

Sketch detail of hand dug trial pit

GSTL particle size distribution test certificates



Laboratory Report



Contract Number: 18704

Client's Reference: H12232

Report Date: 06-03-2013

Client Name: Patrick Parsons Limited
Waterloo House,
Thornton Street,
Newcastle upon Tyne,

NE1 4AP

Contract Title: Bridgeroad, Long Sutton
For the attention of: Rexine Perry

Date Received: 20-02-2013
Date Commenced: 20-02-2013
Date Completed: 01-03-2013

Test Description	Quantity	Checked	Approved
PSD Wet Sieve method 1377 : 1990 Part 2 : 9.2 *	2		

Notes: **Observations and Interpretations are outside the UKAS Accreditation**
 * - **Denotes test included in laboratory scope of accreditation**
 # - **Denotes test carried out by approved contractor**

This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced in full, without the prior written approval of the laboratory.

Approved Signatories:

Paul Evans (Quality Manager), Emma Williams (Office Manager),
Benjamin Sharp (Laboratory Coordinator), Alex Wynn (Business Development Manager).

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cup

B. Sharp

1/3/13

GSTL
GEO Site & Testing Services Limited

Contract No.:
18704-200213

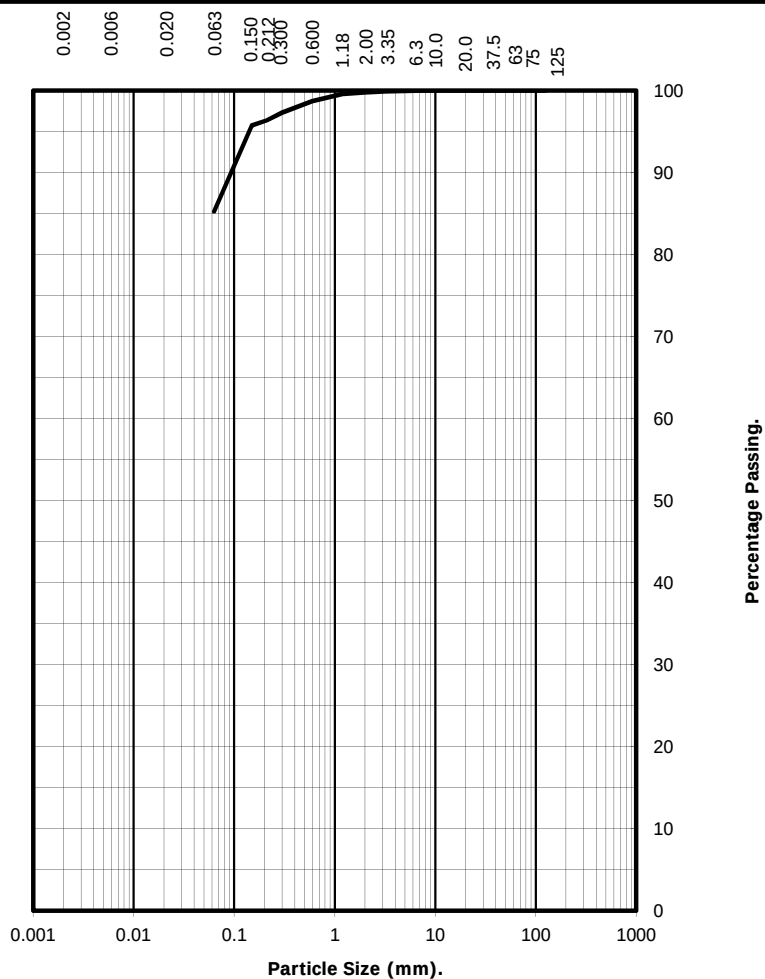
Client ref:
H12232

Test Report: Particle Size Distribution Test
BS 1377 Part 2:1990.
Wet Sieve, Clause 9.2

Client ref: H12232
Location: Bridgeroad, Long Sutton
Contract Number: 18704-200213
Hole Number: WS01
Sample Number:
Depth (m) : 0.80-1.00
Sample Type: B

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	100
2.00	100
1.18	100
0.60	99
0.300	97
0.212	96
0.150	96
0.063	85

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	85	15	0	0	Total Percentage

Remarks:

#- not determined



Checked By

Date Approved:

Approved By:

13.13

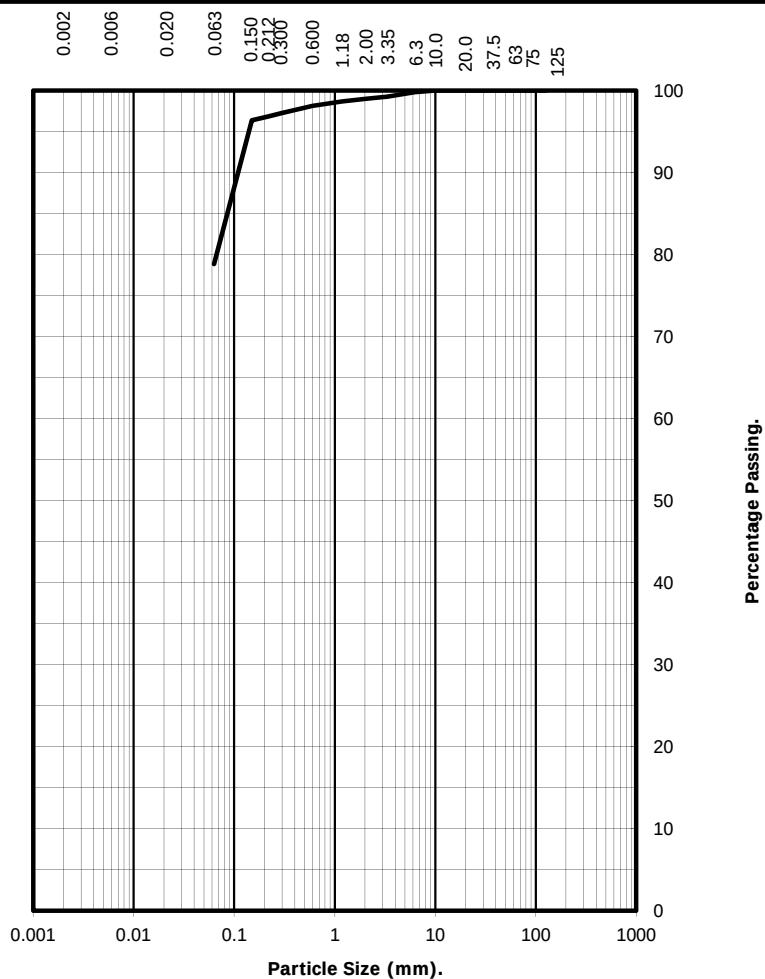


Test Report: Particle Size Distribution Test
BS 1377 Part 2:1990.
Wet Sieve, Clause 9.2

Client ref: H12232
Location: Bridgeroad, Long Sutton
Contract Number: 18704-200213
Hole Number: WS05
Sample Number:
Depth (m) : 0.60-0.80
Sample Type: B

BS Test Sieve	Percentage Passing
125	100
75	100
63	100
37.5	100
20	100
10	100
6.3	100
3.35	99
2.00	99
1.18	99
0.60	98
0.300	97
0.212	97
0.150	96
0.063	79

Particle Diameter	Percentage Passing
0.02	#
0.006	#
0.002	#



	Silt and Clay	Sand	Gravel	Cobbles	Soil Fraction
	79	20	1	0	Total Percentage

Remarks:

#- not determined



Checked By

Date Approved:

Approved By:

13.13



ORIGINAL SIZE A3

LEGEND

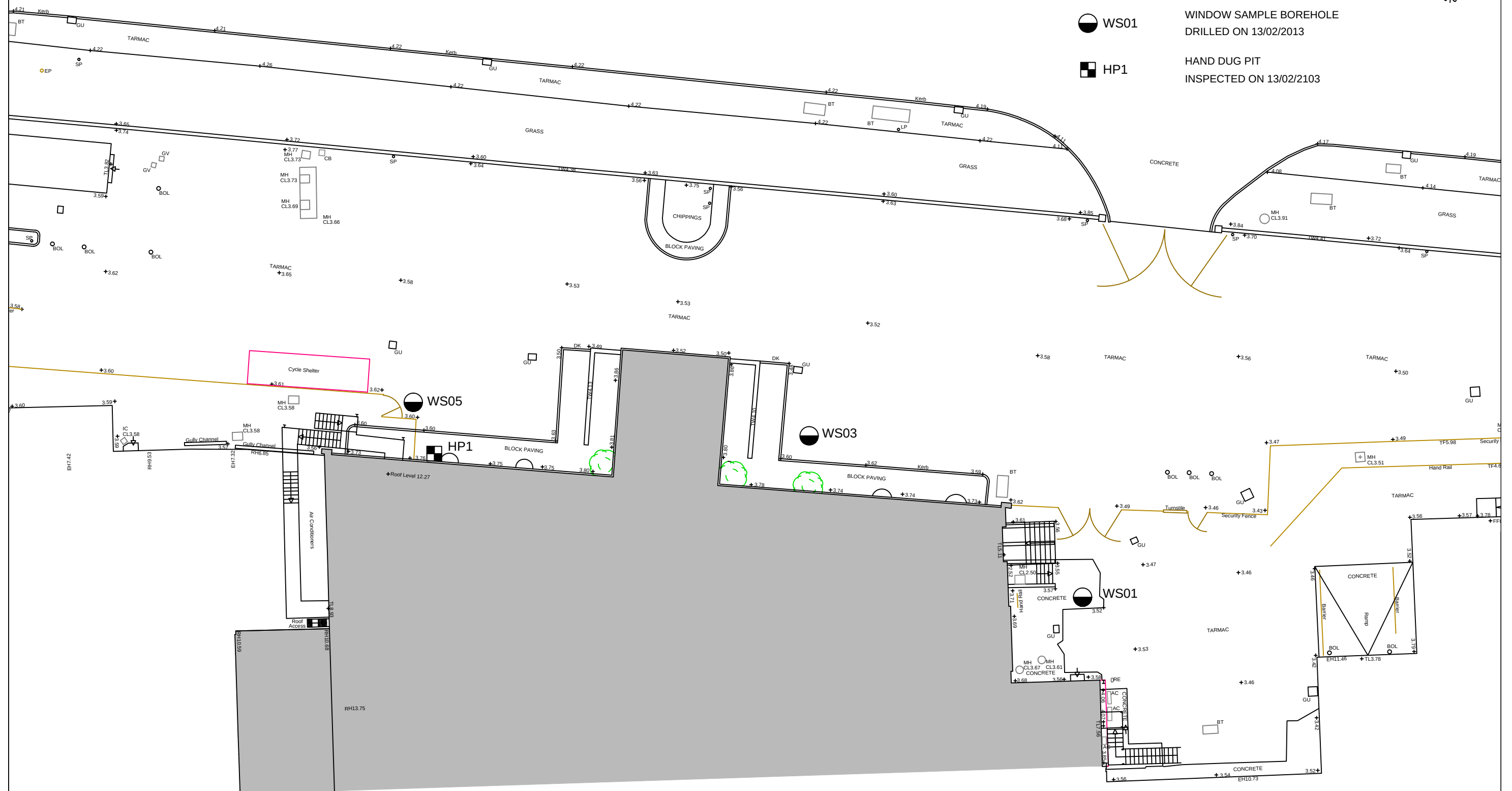


 WS01

WINDOW SAMPLE BOREHOLE
DRILLED ON 13/02/2013

 HP1

HAND DUG PIT
INSPECTED ON 13/02/2103



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Newcastle upon Tyne
NE1 4AP

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E. info@patrickparsons.co.uk
W. www.patrickparsons.co.uk

Client PRINCES LTD

Project
BRIDGE ROAD, LONG SUTTON

Drawing

EXPLORATORY HOLE LOCATION PLAN

Scales 1 : 250

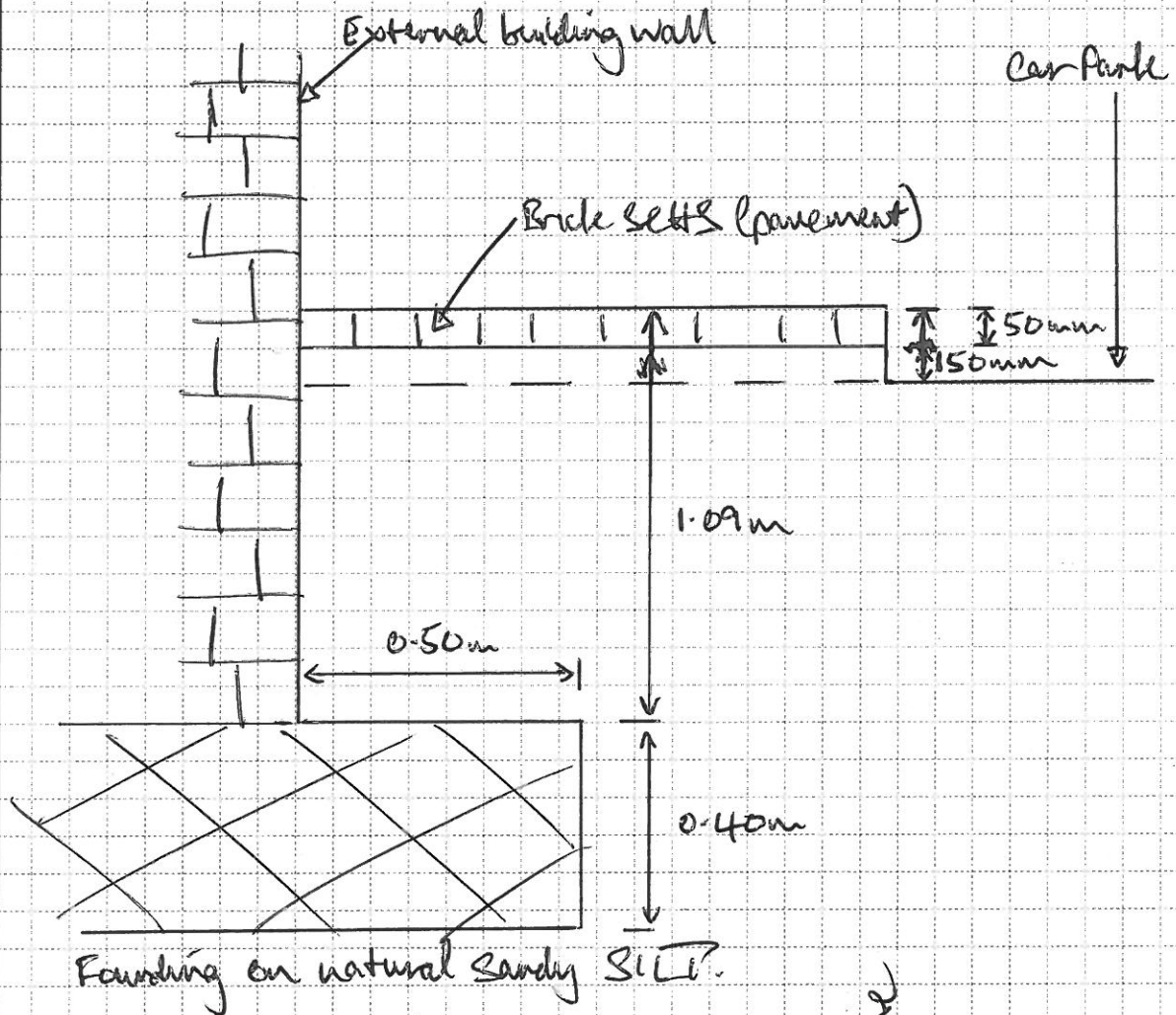
Drawn. JCF
FEB 13

Checked. SMB

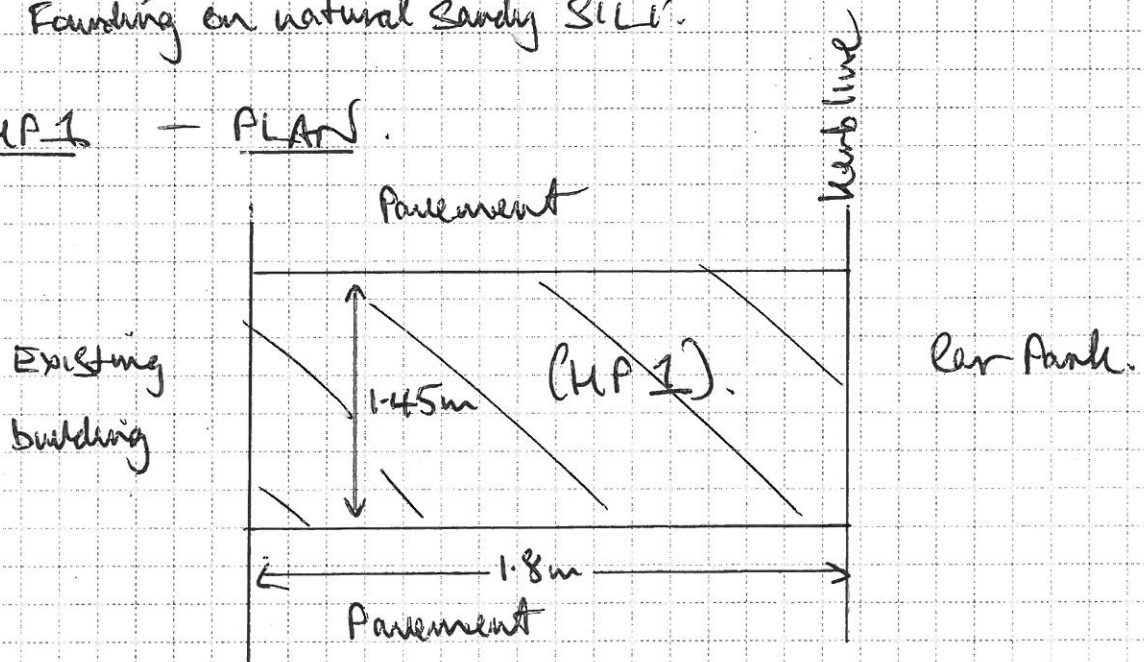
Drawing No. H12232-705

Rev. 1

INSPECTION PIT HP1 - SECTION.



HP1 - PLAN.



Project Name
Bridge Road

Project No.
H12232

Co-ords: -

Hole Type
WS

Location: Long Sutton

Level: -

Scale
1:50

Client: Princes Ltd

Dates: 13/02/2013

Logged By
JR

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.15			0.15		MADE GROUND: Coated macadam		
		0.30			0.30		MADE GROUND: Reinforced concrete		
		0.45			0.45		MADE GROUND: Brown and dark brown sandy fine to coarse angular to subangular gravel and cobble size whole and part brick and sandstone		
		0.60	D				Loose indistinctly laminated light brown sandy SILT		1
		0.80-1.00	B						
		1.20	CPT	N=6 (1,1/ 1,1,2,2)					
		1.50	D						
		2.00	CPT	N=6 (2,1/ 2,1,1,2)					2
		2.00	D						
		2.60			2.60		Loose grey brown silty fine SAND		3
		3.00	CPT	N=6 (0,0/ 1,1,1,3)					
		3.00	D						
		4.00	CPT	N=7 (1,1/ 1,2,2,2)			Below 3.8m, becoming light brown		4
		4.00	D						
		5.00	CPT	N=15 (2,3/ 3,4,4,4)			Below 5.0m, becoming medium dense		5
		5.00	D						
		5.45			5.45		End of Borehole at 5.45 m		6
									7
									8
									9

Remarks: 1. Inspection pit hand excavated to 1.2 metres
2. Seepage at 1.5 metres and standing WL at 1.8 metres on pulling casing
3. Borehole extended by super heavy dynamic probing to 10 metres (refer to DP log).
4. Surface reinstated upon completion (topped with cold rolled macadam).

Project Name
Bridge Road

Project No.
H12232

Co-ords: -

Hole Type
WS

Location: Long Sutton

Level: -

Scale
1:50

Client: Princes Ltd

Dates: 13/02/2013

Logged By
JR

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05			MADE GROUND: Coated macadam	
					0.25			MADE GROUND: Black sandy ashy fine to coarse angular to subangular gravel and cobble size cinder and whole and part brick	
		0.40-0.60	B						
		0.80	D					Very loose to loose indistinctly laminated light brown mottled orange and light grey sandy SILT	1
		1.20	CPT	N=4 (1,1/ 1,1,1,1)				Below 1.2m, becoming light brown	
		1.50	D						
					1.70			Very loose to loose grey brown silty fine SAND	2
		2.00	CPT	N=4 (0,1/ 1,1,1,1)					
		2.00	D						
		3.00	CPT	N=1 (0,0/ 0,0,1,0)				Below 3.0m, becoming very loose	3
		3.00	D						
		4.00	CPT	N=6 (0,0/ 1,1,2,2)				Below 4.0m, becoming loose and brown	4
		4.00	D						
		5.00	CPT	N=17 (2,2/ 3,4,4,6)				Below 5.0m, becoming medium dense	5
		5.00	D						
					5.45			End of Borehole at 5.45 m	6
									7
									8
									9

Remarks: 1. Inspection pit hand excavated to 1.2 metres
2. Seepage at 1.2 metres and standing WL at 1.8 metres on pulling casing
3. Borehole extended by super heavy dynamic probing to 9 metres (refer to DP log)
4. Surface reinstated upon completion (topped with cold rolled macadam)

Project Name
Bridge Road

Project No.
H12232

Co-ords: -

Hole Type
WS

Location: Long Sutton

Level: -

Scale
1:50

Client: Princes Ltd

Dates: 13/02/2013

Logged By
JR

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
					0.05			MADE GROUND: Coated macadam	
		0.50	D		0.40			MADE GROUND: Black sandy ashy fine to coarse angular to subangular gravel and cobble size cinder, limestone hardcore and whole and part brick	
		0.60-0.80	B					Loose indistinctly laminated light brown mottled orange and light grey sandy SILT	1
		1.20	CPT	N=5 (2,2/ 2,1,1,1)					
		1.20	D						
		2.00	CPT	N=7 (1,2/ 1,2,2,2)	2.00			Loose light brown very sandy SILT	2
		2.00	D						
		3.00	CPT	N=2 (0,0/ 0,0,1,1)	2.70			Loose grey brown silty fine SAND	3
		3.00	D					Below 3.0m, becoming very loose	
		4.00	CPT	N=10 (0,0/ 0,2,4,4)				Below 4.0m, becoming loose to medium dense and light brown	4
		4.00	D						
		5.00	CPT	N=29 (4,4/ 7,7,7,8)				Below 5.0m, becoming medium dense	5
		5.00	D						
					5.45			End of Borehole at 5.45 m	6
									7
									8
									9

Remarks: 1. Inspection pit hand excavated to 1.2 metres
2. Seepage at 1.7 metres and standing WL at 1.7 metres on pulling casing
3. Borehole extended by super heavy dynamic probing to 10 metres (refer to DP log)
4. Groundwater monitoring standpipe installed at 3.0 metres

Project Name
Bridge Road

Project No.
H12232

Co-ords: -
Level: -

Date
13/02/2013

Location: Long Sutton

Dimensions: -

Scale
1:25

Client: Princes Ltd

Depth
1.70m

Logged By
JR

Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description	
Depth (m)	Type	Results					
			0.05			MADE GROUND: Brick setts	
			0.20			MADE GROUND: 'Bedding sand'	
			0.45			MADE GROUND: Black sandy ash fine to coarse angular to subangular gravel size cinder, limestone hardcore and part brick	
						Indistinctly laminated light brown mottled orange and light grey sandy SILT	
1.50	D						1
			1.70				
Trialpit Complete at 1.70 m							2
							3
							4

Remarks:
1. Inspection pit excavated by mechanical means and by hand
2. Seepage at 1.7 metres
3. Surface reinstated upon completion (topped with cold rolled macadam)
Groundwater:
4. Refer to sketch plan for HP1

Job No	H12232				Hole No	WS1
Job	Princes Food				Operators	RP
Date	13/02/2013				Rig No	RP01
Type	Mass (kg)	Drop (mm)	Max rod OD (mm)	Cone dia. (mm)	Remarks	
DPSH-B	63.5 X	750 X	35 X	50.5 X		
DPH	50	500	32	43.7		
Other						

Depth (m)	Blows (N ₁₀₀)	Torque (Nm)	Depth (m)	Blows (N ₁₀₀)	Torque (Nm)	Depth (m)	Blows (N ₁₀₀)	Torque (Nm)
0.0			3.4			6.8		
0.1			3.5			6.9	4	
0.2			3.6			7.0	6	
0.3			3.7			7.1	6	
0.4			3.8			7.2	8	
0.5			3.9			7.3	7	
0.6			4.0			7.4	6	
0.7			4.1			7.5	6	
0.8			4.2			7.6	7	
0.9			4.3			7.7	7	
1.0			4.4			7.8	7	
1.1			4.5			7.9	7	
1.2			4.6			8.0	7	
1.3			4.7			8.1	7	
1.4			4.8			8.2	6	
1.5			4.9			8.3	7	
1.6			5.0			8.4	7	
1.7			5.1			8.5	6	
1.8			5.2			8.6	7	
1.9			5.3			8.7	7	
2.0			5.4			8.8	7	
2.1			5.5	5		8.9	7	
2.2			5.6	6		9.0	7	
2.3			5.7	5		9.1	7	
2.4			5.8	5		9.2	7	
2.5			5.9	4		9.3	7	
2.6			6.0	5		9.4	8	
2.7			6.1	7		9.5	9	
2.8			6.2	7		9.6	12	
2.9			6.3	5		9.7	12	
3.0			6.4	5		9.8	12	
3.1			6.5	6		9.9	12	
3.2			6.6	6		10.0	12	
3.3			6.7	6				
3.4			6.8	6				

Job No	H12232				Hole No	WS3
Job	Princes Food				Operators	RP
Date	13/02/2013				Rig No	RP01
Type	Mass (kg)	Drop (mm)	Max rod OD (mm)	Cone dia. (mm)	Remarks	
DPSH-B	63.5 X	750 X	35 X	50.5 X		
DPH	50	500	32	43.7		
Other						

Depth (m)	Blows (N ₁₀₀)	Torque (Nm)	Depth (m)	Blows (N ₁₀₀)	Torque (Nm)	Depth (m)	Blows (N ₁₀₀)	Torque (Nm)
0.0			3.4			6.8		
0.1			3.5			6.9	4	
0.2			3.6			7.0	4	
0.3			3.7			7.1	4	
0.4			3.8			7.2	4	
0.5			3.9			7.3	5	
0.6			4.0			7.4	6	
0.7			4.1			7.5	6	
0.8			4.2			7.6	7	
0.9			4.3			7.7	7	
1.0			4.4			7.8	7	
1.1			4.5			7.9	7	
1.2			4.6			8.0	8	
1.3			4.7			8.1	6	
1.4			4.8			8.2	7	
1.5			4.9			8.3	6	
1.6			5.0			8.4	7	
1.7			5.1			8.5	7	
1.8			5.2			8.6	7	
1.9			5.3			8.7	6	
2.0			5.4			8.8	7	
2.1			5.5	3		8.9	7	
2.2			5.6	3		9.0	6	
2.3			5.7	2		9.1		
2.4			5.8	3		9.2		
2.5			5.9	3		9.3		
2.6			6.0	3		9.4		
2.7			6.1	3		9.5		
2.8			6.2	3		9.6		
2.9			6.3	3		9.7		
3.0			6.4	4		9.8		
3.1			6.5	4		9.9		
3.2			6.6	4		10.0		
3.3			6.7	5				
3.4			6.8	4				

Job No	H12232				Hole No	WS5
Job	Princes Food				Operators	RP
Date	13/02/2013				Rig No	RP01
Type	Mass (kg)	Drop (mm)	Max rod OD (mm)	Cone dia. (mm)	Remarks	
DPSH-B	63.5 X	750 X	35 X	50.5 X		
DPH	50	500	32	43.7		
Other						

Depth (m)	Blows (N ₁₀₀)	Torque (Nm)	Depth (m)	Blows (N ₁₀₀)	Torque (Nm)	Depth (m)	Blows (N ₁₀₀)	Torque (Nm)
0.0			3.4			6.8		
0.1			3.5			6.9	6	
0.2			3.6			7.0	6	
0.3			3.7			7.1	6	
0.4			3.8			7.2	5	
0.5			3.9			7.3	6	
0.6			4.0			7.4	8	
0.7			4.1			7.5	10	
0.8			4.2			7.6	11	
0.9			4.3			7.7	12	
1.0			4.4			7.8	11	
1.1			4.5			7.9	12	
1.2			4.6			8.0	10	
1.3			4.7			8.1	12	
1.4			4.8			8.2	12	
1.5			4.9			8.3	12	
1.6			5.0			8.4	12	
1.7			5.1			8.5	14	
1.8			5.2			8.6	14	
1.9			5.3			8.7	13	
2.0			5.4			8.8	14	
2.1			5.5	5		8.9	12	
2.2			5.6	6		9.0	12	
2.3			5.7	5		9.1	12	
2.4			5.8	5		9.2	12	
2.5			5.9	5		9.3	14	
2.6			6.0	6		9.4	14	
2.7			6.1	4		9.5	15	
2.8			6.2	4		9.6	15	
2.9			6.3	4		9.7	16	
3.0			6.4	4		9.8	16	
3.1			6.5	4		9.9	15	
3.2			6.6	5		10.0	16	
3.3			6.7	7				
3.4			6.8	6				