

REPORT

Boston Alternative Energy Facility – Environmental Statement

Appendix 11.3 T.L.P. Ground Investigation Report
Proposed Power Generation Plant

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T. L. P. Ground Investigations.

Ground Investigation Report

Proposed Power Generation Plan,
Land off Nursery Road,
Boston,
Lincolnshire.

November 2012

Geotechnical Engineers & Geologists

T. L. P. Ground Investigations.

Proposed Power Generation Plant, Land off Nursery Road, Boston.

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T. L. P. Ground Investigations.

Site Investigation Report

Site: Proposed Power Generation Plant, Land off Nursery Road, Boston,
Lincolnshire.

Client:

Consultants :

Date: November 2012.

1.0 Brief

A new Power Generation Plant is proposed on land off Nursery Lane, Boston, Lincolnshire. In order to evaluate the suitability of the ground for the intended development, TLP Ground Investigations Ltd. were requested by [redacted] to undertake a preliminary ground investigation at the site which was to include the following: -

- The sinking of 4 No. boreholes using percussive cable tool boring techniques to a depth of 15.00m beneath the surface taking disturbed and undisturbed soil samples and performing *in situ* tests.
- The sinking of 5 No. windowless sampling boreholes using a track mounted dynamic sampling rig, taking undisturbed soil samples and carrying out *in situ* testing.
- Excavating 3 No. shallow trial pits using a combination of hand digging and dynamic sampling techniques in order to obtain large diameter undisturbed samples of the near surface subgrade for laboratory CBR analysis.
- Examination and soils laboratory testing of selected samples.
- The provision of a report with borehole records and laboratory test results.

2.0 Site and Geology

The site of the proposed new Power Generation Plant currently comprises the eastern parts of two adjacent arable fields situated to the southeast of the developing Riverside Industrial Estate in the town of Boston, Lincolnshire. The site can be accessed from the southern hammerhead of Nursery Road, which leads directly onto part of an adjoining field to the west / northwest of the site. At the time of the investigation the site area was relatively level although recent ploughing and sowing had left the surface furrowed. A drainage ditch running east-west separates the two fields, extending across what will be the central part of the proposed development.

A large excavation encroaches into the southern part of the site and this has now become a large pond filled with

water. The northern and eastern parts of the development site have not been cultivated with crops. This area is generally uneven and overgrown with weeds and grasses. A strip of land along the northern boundary has been partially covered with loose soil and rubble, which has not been sufficiently compacted to provide a suitable running surface. An area along the eastern edge of the site appeared slightly lower lying than the adjacent field and may have had the surface soil layer removed and at the time of the investigation, this area was extensively waterlogged with large areas of standing surface water. Although the adjacent arable field appeared to be slightly better drained, here the ground surface was noted to be extremely soft and water had accumulated in wheel ruts created by tractors. Overhead electricity lines were noted to extend along the length of the site just beyond the western boundary.

The northern and eastern boundaries of the site are defined by drainage ditches and the southern and western boundaries are currently undefined. To the southeast of the site the ground rises sharply onto a landfill site. Further to the east is a watercourse known as The Haven, which flows in a south easterly direction into The Wash approximately 7km to the southeast.

From data obtained during previous surveys undertaken in the vicinity, together with information shown on the British Geological Survey sheet for the area i.e., the 1:50,000 series it was anticipated that the natural deposits underlying the site would comprise Tidal Flat Deposits (Terrington Beds) represented by clay and silt resting on deposits of Glacial Till, comprising clay, silt, sand and gravel. At greater depth this rests on deposits of mudstone belonging to the Amphill Clay Formation which is of Jurassic age.

3.0 Fieldwork

The fieldwork was undertaken in accordance with the general principals of BS 5930:1999+A2 2010 Code of Practice for Site Investigations and BS EN 1997-2 2007 Eurocode 7 – Geotechnical design – Parts 2 Ground Investigation and Testing and was completed on the 9th November 2012. It involved the excavation of 4 No. borings, which extended to a depth of up to 15.00m beneath the surface using percussive cable tool boring equipment and a further 5 No. shallower windowless sampling boreholes, which were extended to depths of between 2.40m and 3.70m depth using a track mounted dynamic sampling rig. Disturbed soil samples and undisturbed core samples were obtained as the borings were advanced and these were returned to the laboratory for subsequent examination and testing. *In situ* penetration tests were also carried out as the borings were advanced in order to establish the relative compaction of the stratum *in situ*.

In addition, 3 No. trial pits were also excavated using a combination of hand digging and dynamic sampling techniques in order to obtain large diameter 'undisturbed' samples of the near surface subgrade for laboratory CBR analysis.

The approximate locations of the borings and trial pits have been indicated on the enclosed borehole location plan and details of the strata encountered have been recorded on the enclosed borehole and trial pit record sheets.

The investigation followed a period of prolonged wet weather and although the track mounted sampling rig was able to traffic the site, the heavier percussive cable tool boring rig and ancillary equipment needed the assistance of a tractor and trailer to provide access to the various parts of the site.

4.0 **Ground Conditions**

At the surface each of the borings and trial pits penetrated a superficial covering of agricultural topsoil extending to depths of between 0.23m and 0.35m beneath the surface. This comprised brown, silty and clayey soil containing very occasional fine assorted stone fragments. This was occasionally underlain by a small thickness of disturbed ground comprising firm to stiff, brown and occasionally darker brown, silty clay. The investigation was undertaken following a period of heavy rain and these superficial materials had become very soft and wet.

At each of the borehole locations, the underlying natural strata was represented by a sequence of Tidal Flat or Alluvial soils represented by clay, silt and sand. This initially comprised a 'firm to stiff' 'crust' of brown, occasional mottled rust brown and grey silty clay, containing occasional lenses of brown silt. The strength of these deposits, however, quickly deteriorated with depth and at around 1.70m and 2.70m depth, each of the borings penetrated deposits of soft becoming very soft, brown and dark grey stained, organic, silty clay, which at slightly greater depth contained traces of dark brown, organic / peaty matter. It was in this material at depths of between 2.40m and 3.70m beneath the surface, that the windowless sampling boreholes were terminated. Borehole P1, however, was extended using dynamic probing in order to establish the relative consistency of the strata at greater depth. The results of the test are recorded on the borehole record sheet as equivalent SPT 'N' values (i.e. blows per 300mm penetration). Very little resistance to penetration was encountered until around 4.70m depth where a slight increase in resistance possibly indicated the development of a layer of more compact sand which was encountered at a similar depth in the deeper percussive cable tool borings.

In three of the four percussive borings, towards the base of the alluvial sequence, at around 4.70m depth was a thin layer of firm, dark brown, clayey, amorphous peat, which varied between 100mm and 600mm in thickness. These peaty deposits rested on loose, damp to wet, light brown and occasionally dark brown or grey, silty, medium sand, which occasionally also contained traces of decomposing organic matter.

The underlying deposits of Glacial Till were encountered in the percussive cable tool borings at depths of around 5.80m to 7.00m beneath the surface. These deposits initially comprised 'firm to stiff' and 'stiff', greenish brown, mottled light grey, silty, slightly sandy clay containing assorted fine to medium fragments of chalk, flint and other assorted stones. This rested on a band of wet medium dense greenish brown and yellowish brown, silty medium sand containing fragments of fine, medium and occasional coarse gravel. This wet granular horizon was between 0.60m and 1.00m in thickness and rested on more typical boulder clay at around 6.80m and 7.20m depth. This comprised 'firm' quickly becoming 'stiff' and 'very stiff', mid grey, silty, slightly sandy clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones. Occasionally lenses of damp to wet, mid grey, silty, medium sand were encountered and also hard stony layers which proved difficult to penetrate with the available boring equipment. The four percussive cable tool borings were subsequently terminated in 'stiff' or 'very stiff' boulder clay at depths of around 14.95m to 15.00m beneath the surface.

4.1 **Groundwater**

The investigation followed a period of very wet weather and at a number of the borehole locations, surface water had accumulated at the base of the topsoil layer at depths of around 0.25m to 0.35m beneath the surface and when penetrated this resulted high level seepages into the boreholes. Further groundwater infiltrations were encountered at the interface with the base of the topsoil. Perched groundwater seepages were encountered at depths of between 2.20m and 3.50m within the deposits of alluvial silty clay. Stronger infiltrations were also encountered on penetrating wet granular layers at the base of the alluvial sequence and also within the upper weathered layers of the underlying glacial deposits.

On completion of the dynamic sampling boreholes and trial pits, groundwater settled out in the open excavations at depth of between 0.25m and 1.55m beneath the surface. On completion of the deeper percussive cable tool borings, groundwater was measured at depths of between 3.50m and 4.85m b.g.l. but may have been slowly rising.

5.0 Laboratory and In situ Testing

Geotechnical laboratory testing included moisture content and Atterberg limit determinations, shear vane tests, undrained triaxial compression tests and laboratory CBR analysis. Water soluble sulphate determinations were also performed selected samples of the near surface soils and selected groundwater samples.

Atterberg limit determinations performed on disturbed samples of the alluvial silty clay recorded modified plastic index values (I_p) of between 34% and 50%, indicative of material with a 'medium' to 'high' volume change potential. A similar test performed on representative samples of the glacial boulder clay recorded a modified plastic index values between 21% of 25% indicating a material of 'medium' volume change potential.

Shear vane tests were performed on sections of the undisturbed soil core recovered from the windowless sampling borings and the percussive boreholes and the results have been recorded on the borehole record sheets and summary laboratory data sheets. Tests performed on samples recovered from the firmer silty clay 'crust' recorded shear vane values ranging between 67 kN/m² and 100kN/m² indicating consistencies in the 'firm' to 'firm to stiff / stiff' ranges. However, tests performed on samples recovered from beneath this firmer 'crust' recorded values reducing from around 66kN/m² to 72kN/m² at 1.10m depth to less than 20kN/m² below 2.30m depth i.e. a rapid deterioration to a 'very soft' consistency.

Quick un-drained triaxial compression tests were performed on a limited number of undisturbed U100 samples recovered from the more weathered upper layers of the glacial boulder clay. The recorded values of un-drained cohesive strength ranged between 84kN/m² and 126kN/m², indicative of a range in consistency between 'firm to stiff' and 'stiff'. The underlying less weathered boulder clay proved too stony for effective U100 sampling and therefore Standard Penetration Tests (SPT's) were performed as the borings were advanced in order to evaluate the strength of the deposits *in situ*.

The 152mm diameter undisturbed core samples recovered from the near surface sub-grade in trial pits 1 to 3 were submitted for laboratory CBR testing. The results of these tests have presented graphically on Figs. 1 to 3 and indicate CBR values (to the nearest 1%) between 3% and 5%.

Chemical tests performed on representative samples of the alluvium, boulder clay and groundwater recorded water-soluble sulphate concentrations between 0.27g/l and 1.1g/l with pH between 7.4 and 8.9.

Standard Penetration Tests were also performed as the percussive cable tool borings were advanced in order to establish the relative compactness of the various soil layers *in situ*. The results of the tests have been interpreted as 'N' values (blows for 300mm penetration) and these have been indicated on the enclosed borehole record sheets. SPT's carried out within alluvial silty clays recorded 'N' values between 1 and 5, which is what would be expected for cohesive deposits with a 'very soft' to 'firm' consistency. Tests taken in the sandy layer at the base of the alluvial sequence recorded values typically between 5 and 7, which although indicating a slight improvement in consistency, is in terms of a granular deposit, indicative of only a 'loose' state of compaction. Tests performed in the sand and gravel layers towards the top of the underlying

glacial sequence, recorded 'N'-values between 10 and 13, suggesting a 'medium dense' state of compaction.

Beneath the initial upper weathered zone, the boulder clay quickly became 'very stiff' and generally too stony to allow satisfactory undisturbed U100 core samples from being taken. Instead SPT's were taken at regular intervals in order to assess the strength of the deposit with depth. SPT 'N' values ranged between 21 and 43, with a general tendency towards an increase in resistance with increasing depth. Whilst it is possible that the results may have been influenced by the stone content of the deposit, for an essentially cohesive material these values, nevertheless suggest a 'stiff' to 'very stiff' consistency.

6.0 Engineering Comments

- The boreholes have confirmed that beneath a thin surface 'crust' of 'firm to stiff' silty clay the alluvial deposits below 2.00m depth quickly become 'soft' to 'very soft' in consistency. Whilst the firmer 'crust' would be capable of accommodating relatively light loads (50kN/m^2) from near surface footings it is unlikely to be able to provide a satisfactory foundation bearing horizon for the proposed new power generation plant. The foundation pressures would extend into the weaker and highly compressible layers beneath and this could result in excessive consolidation settlement and /or bearing capacity failure. Bearing in mind the thickness of the weak alluvial deposits, surface raft foundations would also be prone to excessive long term movements as a result of consolidation settlement of these weaker layers. In view of this, it is recommended that the proposed new power generation plant in constructed on pile foundations.
- The piles will need to penetrate the alluvial sequence and terminate after a suitable penetration into the underlying stiff /very stiff boulder clay which was first encountered in the borings at around 6.80m to 7.20m depth.
- The carrying capacity of piles is fundamentally related to their method of installation therefore advice should be sought from specialist piling contractors in order to establish the most appropriate type and length of pile to adopt given the prevailing geological conditions. The properties of the boulder clay as asessed from *in situ* and laboratory testing indicate that for piles terminating in very stiff boulder clay, the allowable end bearing capacity (applying a F.O.S of 2.5) would be of the order 550kN/m^2 and the allowable shaft adhesion around 36kN/m^2 .
- Owing to the highly compressible nature of the alluvial deposits beneath the site, ground bearing floor slabs could experience long term consolation settlement, the magnitude of which will depend on the intensity of loading. As preliminary guide to design, it has been computed (using typical values for the constrained modulus (E_c) for the various layers represented) that for a ground bearing floor slab measuring say 25m by 13m and resting on a 300mm blanket of compacted stone and having a modest uniform loading of around 15kN/m^2 , the potential long term settlement in the centre of the slab could be of the order 54mm. This will reduce to approximately half of this figure at the edges of the slab and around 13mm at the corners. Settlements could be potentially reduced by employing appropriate ground improvement techniques, however, bearing in mind the very weak and occasional organic nature of the alluvial deposits, it would be wise to seek advice from specialist ground improvement specialists in order to establish the viability of the various techniques which are presently available. Alternatively floor slabs could be fully suspended on piles.
- Laboratory California Bearing Ratio (CBR) tests performed on undisturbed samples of the silty clay sub-grade beneath the topsoil recorded CBR values (to the nearest 1%) between 3% and 5%. For preliminary design purposes it would be advisable to use the

lower value of 3% as this would not only ensure the operational integrity of any paved areas but should provide for a sufficient construction thickness to resist the potentially damaging effects of frost action.

- Atterberg limit determinations performed on selected samples of the alluvial silty clay recorded modified plastic index values (I_p) between 34% and 50%, indicative of material with a 'medium' to 'high' shrinkage / swell potential. These soils would therefore be susceptible to significant volume change as a result of changes in soil moisture content as a result of climatic variation and root activity. If shallow foundations are adopted for any of the lighter structures at the power plant, then consideration should be given to the proximity of any trees or hedges in the vicinity of these structures and if necessary appropriate precautions taken (ref NHBC Standrad 4.2 'Building near trees).
- Sulphate test performed on representative soil and groundwater samples recorded water soluble sulphate concentrations which fall within class DS-1 of the BRE Special Digest 1 'Concrete in aggressive ground'. In accordance with the guidelines contained in part 1 of the Digest and taking into account the geology and specific soil and groundwater conditions, the site has been assigned a, ACEC (Aggressive Chemical Environment for Concrete) Class AC-1.
- The opinions expressed in this Report are consistent with guideline standards available at the time of its preparation and assume that the ground conditions do not vary significantly beyond the range revealed within the agreed scope and budget for the investigation. There may, however, be conditions at the site, which have not been identified by the investigation and therefore will not have been considered in the report. Accordingly a careful watch should be maintained during any future ground works at the site and the report and its conclusions reviewed and / or modified accordingly within the context of the nature any development intended at the site.

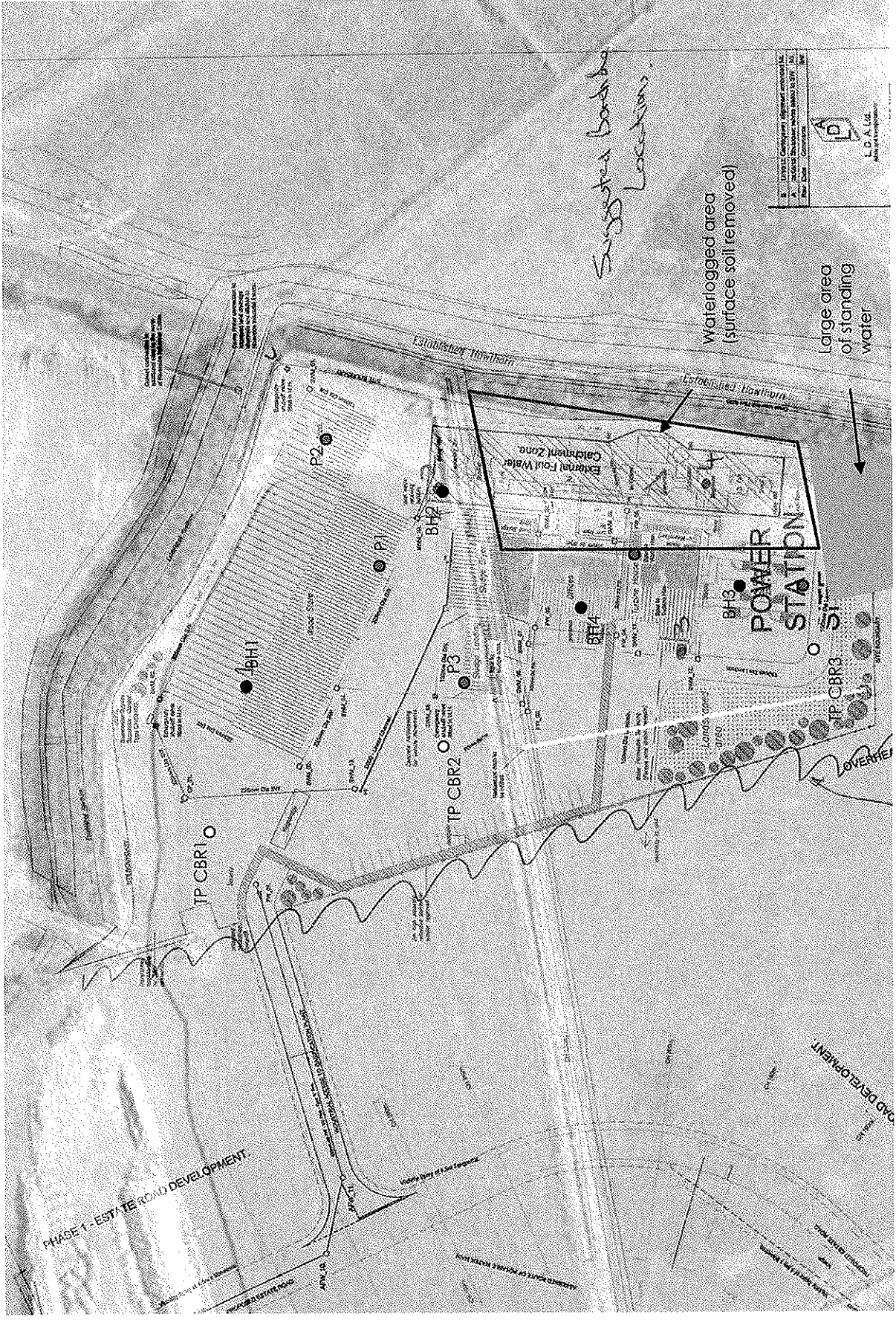
For TLP Ground Investigations Ltd

R.L.Trattles

RT/BRIT/SC/11/12

Borehole / Trial Pit Location Plan

Proposed Power Generation Plant, Land off Nursery Road, Boston, Lincolnshire



T.L.P. Ground Investigations Ltd. Borehole Record Dynamic Probe / Sampler.		Location : Nursery Road, Boston, Lincolnshire.		Borehole No. P1.				
Carried out For		Ground Level		Co-ordinates		Date : 06.11.2012.		
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests		Test	Field Records	
				Depth	samples Type No			
Brown, silty, clayey Topsoil containing very occasional fine fragments of coal, brick and other assorted stones. Topsoil / disturbed Ground Firm to stiff, brown, mottled darker brown, silty clay.			(0.30)					
			0.30	0.30 - 1.35	U	1		
Firm becoming soft, brown, mottled grey, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium Very soft, brown and dark grey stained, organic, silty Clay containing occasional traces of dark brown, peaty, organic matter. Terrington Beds (Quaternary)			(0.30)				82kN/m ²	
			0.60			Vane		
				0.80			Vane	74kN/m ²
				1.10			Vane	72kN/m ²
			(1.40)					
				1.35 - 2.40	U	2	Vane	42kN/m ²
				1.70	W	1		
				1.70			Vane	18kN/m ²
			2.00			Vane	22kN/m ²	
			2.30			Vane	19kN/m ²	
			2.40 - 3.70	U	3			
			2.60			Vane	17kN/m ²	
			2.90			Vane	17kN/m ²	
			3.20			Vane	16kN/m ²	
Observations Groundwater seepages were encountered at a depth of around 3.50m. The borehole was extended below 3.70m depth using a dynamic penetration test (DPSH). Penetrometer finished in dark brown, silty, sandy peaty clay. On completion groundwater settled out at 1.55m beneath the surface.			3.70			Penetrometer pushed to a depth of 4.70m under weight of hammer.		
						Gradual increase in resistance to penetration noted below 4.70m depth.		
				4.70			S N4	
				5.15			S N10	
				6.60			S N10	
			7.05	End of Borehole				
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)	Samples/Test Key		Remarks			Logged by		
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.	<ul style="list-style-type: none"> D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test 					S. P. T. / J. T.		
						Scale		
						1 : 25		
						Fig.		

T.L.P. Ground Investigations Ltd.		Borehole Record Dynamic Probe / Sampler.		Location : Nursery Road, Boston, Lincolnshire.			Borehole No. P2.	
Carried out For		Ground Level		Co-ordinates			Date : 06.11.2012.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
				Depth	samples Type No.	Test		
Brown, silty, clayey Topsoil containing very occasional fine assorted stones.			(0.30)					
Topsoil Firm to stiff, brown, mottled darker brown, silty clay containing occasional fine fragments of coal and flint.			0.30 0.38	0.25 - 1.20 (0.08)	U 1			
Firm to stiff becoming soft, brown, mottled grey, silty Clay containing occasional lenses of brown silt.				0.50		Vane	86kN/m ²	
				0.60	W 1			
				0.80		Vane	86kN/m ²	
Tidal Flat Deposits / Alluvium				1.10		Vane	69kN/m ²	
			(1.77)	1.20 - 2.40	U 2			
				1.40		Vane	56kN/m ²	
Terrington Beds (Quaternary)				1.70		Vane	54kN/m ²	
				2.00		Vane	38kN/m ²	
Very soft, brown and dark grey stained, organic, silty Clay containing occasional traces of dark brown, organic matter.			2.15			Vane	20kN/m ²	
			2.30					
			2.40					
			End of Borehole					
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)		Samples/Test Key		Remarks			Logged by	
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test					S. P. T. / J. T.	
							Scale	
							1 : 25	
							Fig.	

T.L.P. Ground Investigations Ltd. Borehole Record Dynamic Probe / Sampler		Location : Nursery Road, Boston, Lincolnshire.			Borehole No. P3.		
Carried out For		Ground Level		Co-ordinates		Date : 06.11.2012.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	Type	Test	
Brown, silty, clayey Topsoil containing very occasional fine assorted stones. Topsoil Firm to stiff, brown, mottled darker brown, silty clay containing occasional fine fragments of coal and brick.			(0.30)				
			0.30 0.38	0.30 - 1.00 (0.08)	U	1	
Firm to stiff becoming soft, brown, mottled grey, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium Terrington Beds (Quaternary) Soft, brown and dark grey stained, organic, silty Clay containing occasional traces of dark brown, organic matter.			0.50			Vane	82kN/m ²
			0.80			Vane	76kN/m ²
			1.10			Vane	66kN/m ²
			(1.82)	1.00 - 2.40	U	2	
			1.40			Vane	47kN/m ²
			1.70			Vane	32kN/m ²
			2.00			Vane	34kN/m ²
			2.20			Vane	24kN/m ²
			2.30 2.40 - 3.60		U	3	
			2.60			Vane	19kN/m ²
		2.90			Vane	20kN/m ²	
		3.20			Vane	18kN/m ²	
		3.50			Vane	18kN/m ²	
		3.60					
			End of Borehole				
Observations Groundwater seepages were encountered at a depth of around 2.35m. On completion groundwater settled out at 1.30m beneath the surface.							
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)		Samples/Test Key D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test			Remarks		Logged by S. P. T. / J. T.
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.							Scale 1 : 25
							Fig.

T.L.P. Ground Investigations Ltd. Borehole Record Dynamic Probe / Sampler		Location : Nursery Road, Boston, Lincolnshire.			Borehole No. P4.		
Carried out For		Ground Level		Co-ordinates		Date : 06.11.2012.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	samples Type	No.	
Brown, silty, clayey Topsoil containing very occasional fine fragments of coal, brick and other assorted stones. Topsoil / disturbed Ground Firm to stiff, brown, mottled darker brown, silty clay.			(0.30)	0.20 - 1.10	U	1	
			0.30				
Firm to stiff becoming soft, brown, mottled grey, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium Terrington Beds (Quaternary) Soft, brown and dark grey stained, organic, silty Clay containing occasional traces of dark brown, peaty organic matter. Observations Perched water seepages were encountered at a depth of around 0.25m depth. On completion groundwater settled out at 0.25m beneath the surface.			(0.35)	1.10 - 2.50	U	2	Vane
			0.65				
			0.80				
			1.10				
			(1.60)				
			1.40				
			1.70				
		2.00					
		2.25	2.30	Vane	24kN/m ²		
		2.50	End of Borehole				

S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)

Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.

Samples/Test Key:
D Disturbed Sample
B Bulk Sample
W Water Sample
U Undisturbed Core sample
S Standard Penetration Test
V Vane Test

Remarks

Logged by
S. P. T. / J. T.

Scale
1 : 25

Fig.

T.L.P. Ground Investigations Ltd. Borehole Record Dynamic Probe / Sampler.		Location : Nursery Road, Boston, Lincolnshire.		Borehole No. P5.				
Carried out For		Ground Level		Co-ordinates		Date : 06.11.2012.		
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests		Test	Field Records	
				Depth	samples Type No.			
Brown, silty, clayey Topsoil containing very occasional fine fragments of coal, brick and other assorted stones. Topsoil / disturbed Ground Firm to stiff, brown, mottled darker brown, silty clay containing occasional fine fragments of coal and other stone.			(0.30)					
			0.30	0.30 - 1.05	U 1			
Stiff becoming soft, brown, mottled grey, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium Terrington Beds (Quaternary) Soft, brown and dark grey stained, organic, silty Clay containing occasional traces of dark brown, organic matter. Observations Perched water seepages were encountered at a depth of around 0.35m depth. On completion groundwater settled out at 0.25m beneath the surface.			(0.35)	0.50		Vane	87kN/m ²	
			0.65	0.80		Vane	100kN/m ²	
			(1.67)	1.10		Vane	68kN/m ²	
				1.05 - 2.50	U 2			
				1.40		Vane	54kN/m ²	
				1.70		Vane	43kN/m ²	
				2.00		Vane	39kN/m ²	
			2.32	2.30		Vane	25kN/m ²	
			2.50					
			End of Borehole					

S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.	Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test	Remarks	Logged by S. P. T. / J. T. Scale 1 : 25 Fig.
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T.L.P. Ground Investigations Ltd		Borehole Record		Location : Nursery Road, Boston, Lincolnshire				Borehole No. 1.	
Carried out For		Ground Level		Co-ordinates		Date : 07.11.12.			
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records		
				Depth	Type	No.		Test	
Brown, silty and clayey Topsoil containing very occasional fine stones.			(0.35)	0.20	D	1			
Topsoil			0.35						
Firm to stiff, becoming soft, brown, mottled rust brown, silty Clay containing occasional lenses of brown silt.			(1.00)	1.00	U	1			
Soft, greyish brown, silty Clay containing occasional lenses of brown silt.			1.35	1.50	D	2	S N3		
Tidal Flat Deposits / Alluvium			(0.95)						
Soft very silty Clay / clayey Silt.			2.30	2.40	D	3	S N1		
			(0.40)						
			2.70						
Very soft, brown and dark grey stained, organic, silty Clay containing traces of dark brown, organic matter.			(0.80)						
			3.50	3.50	W	1			
Firm, grey, very silty Clay containing pockets of damp to wet, fine, silty sand.			3.50	3.60	D	4	S N5		
Terrington Beds (Quaternary)			(1.25)						
			4.75	5.00	D	5	S N7		
Loose, damp to wet, dark brown, slightly organic, silty, medium Sand.			(0.85)						
Stiff, greenish brown, mottled light grey, silty, sandy Clay containing assorted fine to medium fragments of chalk, flint and other assorted stones.			5.60	5.80	D	6	S N11		
			(0.40)						
Medium dense, wet, greenish brown, silty, medium Sand containing assorted medium Gravel.			6.00						
			(1.00)						
Stiff, grey, mottled greenish brown, silty, slightly sandy Clay containing occasional fine to medium fragments of chalk, flint and other assorted stones.			7.00	7.00	U	2			
			(0.30)						
Glacial Till / Boulder Clay.			7.30						
				8.50	U	3			
Stiff and very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones interspersed with occasional thin lenses of wet, silty sand.				10.00	D	7	S N21		

S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)

Depths: All depths and reduce levels in metres.
Thickness given in brackets in depth column.

Samples/Test Key.

D Disturbed Sample
B Bulk Sample
W Water Sample
U Undisturbed Core sample
S Standard Penetration Test
V Vane Test

Remarks

Logged by
S. P. T. / J. T.

Scale
1 : 50

Fig.

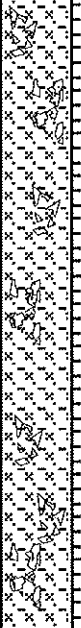
T.L.P. Ground Investigations Ltd		Borehole Record		Location : Nursery Road, Boston, Lincolnshire				Borehole No. 1.	
Carried out For		Ground Level		Co-ordinates		Date : 07.11.12.			
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records		
				Depth	Type	No		Test	
Stiff or very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones interspersed with occasional thin lenses of wet, silty sand. Glacial Till / Boulder Clay				11.50	D	7	S N33	Too stony for U100 sampling	
				13.50	U	8	S N39		
				14.50	U	9	S N36		
Observations Groundwater seepages were encountered at a depth of around 3.60m on penetration of wet granular stratum. This was sealed of using borehole casing to a depth of 7.50m. Further intermittent seepages were experienced whilst penetrating lenses of wet granular strata trapped within the glacial sequence. On completion groundwater settled out in the open boring at a depth of 3.50m b.g.l.			14.95	End of Borehole					
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T. Scale 1 : 50 Fig.		

T.L.P. Ground Investigations Ltd		Borehole Record		Location : Nursery Road, Boston, Lincolnshire				Borehole No. 2.	
Carried out For		Ground Level		Co-ordinates				Date : 08.11.12.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records		
				Depth	Type	No.		Test	
Brown, silty and clayey Topsoil containing very occasional fine stones. Topsoil			(0.30) 0.30						
Firm to stiff becoming soft, brown, mottled rust brown, silty Clay containing occasional lenses of brown silt.			(1.00) 1.00	0.50	D	1			
Firm, brown, mottled grey, silty Clay containing occasional lenses of brown silt.			(1.30) (0.70) 1.50	1.00	U	1			
Firm, brown, mottled grey, silty Clay containing occasional lenses of brown silt.			(2.00) (0.70) 1.50	1.50	D	2	S N2		
Very soft, brown and dark grey stained, silty Clay .			2.00	3.00	D	3			
Tidal Flat Deposits / Alluvium			(1.60)						
Terrington Beds (Quaternary)			3.60	3.70	D	4			
Very soft to firm, grey and dark brown, organic, silty Clay containing traces of dark brown, organic matter.			(1.20)						
Firm, dark brown, slightly clayey, amorphous Peat .			4.80	4.70	W	1			
Loose, damp to wet, light brown, silty, medium Sand .			4.90 (0.10) 5.10	5.10	D	5	S N6		
Stiff, greenish brown, mottled light grey, silty, sandy Clay containing assorted fine to medium fragments of chalk, flint and other assorted stones.			5.80 (0.40) 6.20	6.10	D	6	S N13		
Medium dense, wet, yellowish brown, silty, medium Sand containing assorted fine, medium and occasional coarse Gravel .			(1.00) 7.20	7.30	U	2			
Glacial Till / Boulder Clay									
Firm to stiff becoming very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones and occasional thin lenses of wet, silty sand.				9.00	D	7	S N27		
				10.50	D	8	S N32		
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)	Samples/Test Key.		Remarks				Logged by		
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.	D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test						S. P. T. / J. T.		
							Scale		
							1 : 50		
							Fig.		

Too Stony for U100 sampling

T.L.P. Ground Investigations Ltd		Borehole Record		Location : Nursery Road, Boston, Lincolnshire				Borehole No. 2.	
Carried out For		Ground Level		Co-ordinates		Date : 08.11.12.			
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records		
				Depth	Type	No		Test	
Stiff and very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones and occasional thin lenses of wet, silty sand.				12.00	D	9	N S29		
				13.05	D	10	N S36		
				14.05	D	11	N S40		
				15.00	End of Borehole				
Observations Groundwater seepages were encountered at a depth of around 4.90m on penetration of wet granular layer. Further seepages were experienced between 6.20m and 7.20m depth. These were sealed off using borehole casing. Further intermittent seepages were experienced emanating from lenses of wet granular strata trapped within lower levels of the boulder clay sequence. On completion groundwater settled out in the open boring at a depth of 4.70m b.g.l.									
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value) Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		Samples/Test Key: D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T. Scale 1 : 50 Fig.		

T.L.P. Ground Investigations Ltd		Borehole Record Cable Tool Boring 150mm. dia. to base.		Location : Nursery Road, Boston,		Borehole No. 3.	
Carried out For		Ground Level		Co-ordinates		Date : 08.11.12.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	Type	Test	
Brown, silty and clayey Topsoil containing very occasional fine stones.			(0.23) 0.23				
Topsoil				0.50	D	1	S N4
Firm to stiff becoming firm, brown, mottled rust brown, very silty Clay containing occasional lenses of brown silt.			(1.47) 1.00	1.00	U	1	
Tidal Flat Deposits / Alluvium			1.70				
Terrington Beds (Quaternary)				2.00	D	2	S N1
Soft to firm becoming very soft, brown and dark grey stained, silty Clay .			(1.70) 3.00	3.00	D	3	
Soft to firm, grey and dark brown, organic, silty Clay containing traces of dark brown, peaty organic matter.			3.40 3.70	3.70	D	4	S N2
			(1.30) 4.70				
Firm, dark brown, slightly clayey, amorphous Peat .			4.70 5.00	4.80	W	1	S N3
			(0.60) 5.30	5.00	D	5	
Loose, damp to wet, light brown and grey, silty, slightly clayey medium Sand containing traces of peaty organic matter.			(1.70) 7.00	5.00	D	6	S N5
Stiff becoming very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones interspersed with occasional thin lenses of wet, silty sand.			7.00 7.30	7.30	U	2	
Glacial Till / Boulder Clay.				9.00	D	7	S N27
				10.50	D	8	S N37
S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)		Samples/Test Key		Remarks			Logged by
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.		<ul style="list-style-type: none"> D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test 					S. P. T. / J. T.
							Scale
							1 : 50
							Fig.

T.L.P. Ground Investigations Ltd		Borehole Record Cable Tool Boring 150mm dia. to base.		Location : Nursery Road, Boston, Lincolnshire Borehole No. 3.			
Carried out For		Ground Level		Co-ordinates		Date : 09.11.12.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	samples Type	Test	
<p>Very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones interspersed with occasional thin lenses of wet, silty sand.</p>				12.00	D 9	S N34	
				13.00	D 10	S N39	
				14.50	D 11	S N42	
				14.95	End of Borehole		
<p>Observations Groundwater seepages were encountered at a depth of around 5.30m on penetration of wet granular stratum. These were sealed of using borehole casing to a depth of 7.50m. Further intermittent seepages were experienced emanating from lenses of wet granular strata trapped within lower levels of the boulder clay sequence. On completion groundwater settled out in the open boring at a depth of 4.80m b.g.l.</p>							
<p>S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)</p> <p>Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.</p>		<p>Samples/Test Key</p> <p>D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test</p>		Remarks		<p>Logged by S. P. T. / J. T.</p> <p>Scale 1 : 50</p> <p>Fig.</p>	

E.L.P. Ground Investigations Ltd		Borehole Record Cable Tool Boring 150mm dia. to base		Location : Nursery Road, Boston,		Borehole No. 4.	
Carried out For		Ground Level		Co-ordinates		Date : 09.11.12.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	Type	No.	
Brown, silty and clayey Topsoil containing very occasional fine stones. Topsoil			(0.30) 0.30	0.30	D	1	
Firm to stiff becoming soft, brown, mottled rust brown, silty Clay containing occasional lenses of brown silt.			(1.50) 1.80	0.75	U	1	
Firm becoming soft to firm, brown, mottled grey, silty Clay containing occasional lenses of brown silt.			(0.60) 2.40	1.90	D	2	S N3
Soft to firm becoming soft, brown and dark grey stained, silty Clay .			(1.10) 3.50	2.75	D	3	
Tidal Flat Deposits / Alluvium Terrington Beds (Quaternary)			(1.30) 4.80	3.60	D	4	
Soft to firm, grey and dark brown, organic, silty Clay containing traces of dark brown, peaty organic matter.			(1.30) 4.95	4.85 (0.15) 5.00	W D	1 5	S N5
Firm, dark brown, slightly clayey, amorphous Peat .			(1.05) 6.00	5.00	D	5	
Loose, damp to wet, light brown, silty, medium Sand .			(0.20) 6.20	6.10	D	6	S N10
Firm to stiff, yellowish brown, mottled light grey, silty, sandy Clay containing assorted fine to medium fragments of chalk, flint and other assorted stones.			(0.60) 6.80	6.20	D	6	S N10
Medium dense, wet, yellowish brown, silty, medium Sand containing assorted fine, medium and occasional coarse Gravel .			(0.60) 7.30	6.80	U	2	
Glacial Till / Boulder Clay			(0.60) 9.00	7.30	U	2	
Stiff becoming very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones interspersed with occasional thin lenses of wet, silty sand.			(0.60) 10.50	9.00	D	7	S N22
			(0.60) 10.50	10.50	D	8	S N36

S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)

Depths: All depths and reduce levels in metres.
Thickness given in brackets in depth column.

Samples/Test Key.

- D Disturbed Sample
- B Bulk Sample
- W Water Sample
- U Undisturbed Core sample
- S Standard Penetration Test
- V Vane Test

Remarks

Logged by
S. P. T. / J. T.

Scale
1 : 50

Fig.

T.L.P. Ground Investigations Ltd.		Borehole Record Cable Tool Boring 150mm. dia. to base.		Location : Nursery Road, Boston, Lincolnshire				Borehole No. 4.	
Carried out For		Ground Level		Co-ordinates		Date : 09.11.12.			
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records		
				Depth	Type	No.		Test	
<p>Very stiff, mid grey, silty, slightly sandy Clay containing assorted fine, medium and occasional coarse fragments of chalk, flint, mudstone and other assorted stones interspersed with occasional thin lenses of wet, silty sand.</p> <p>Observations Groundwater seepages were encountered at a depth of around 4.95m on penetration of wet granular stratum. Further seepages were also experienced between 6.20m and 6.80m. These were sealed off using borehole casing. Further intermittent seepages were experienced emanating from lenses of wet granular strata trapped within lower levels of the boulder clay sequence. On completion groundwater settled out in the open boring at a depth of 4.85m b.g.l.</p>									
			12.00	D	9	S	N37		
			13.30	D	10	S	N35		
			14.00	D	11	S	N43		
			14.95	End of Borehole					
<p>S.P.T. : Where full penetration has not been achieved the number of blows for the quoted penetration is given (Not 'N' value)</p> <p>Depths: All depths and reduce levels in metres. Thickness given in brackets in depth column.</p>		<p>Samples/Test Key.</p> <p>D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test</p>		Remarks			<p>Logged by S. P. T. / J. T.</p> <p>Scale 1 : 50</p> <p>Fig.</p>		

T.L.P. Ground Investigations Ltd. Trial Pit Record Hand digging / Dynamic Sampling.		Location : Nursery Road, Boston, Lincolnshire					Trial Pit No. 1.	
Carried out For		Ground Level		Co-ordinates		Date : 06.11.12.		
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records	
				Depth	samples Type No.	Test		
Brown, silty, clayey Topsoil containing very occasional fine fragments of stone. Topsoil			(0.34) 0.34	CBR	U	1		
Firm to stiff, brown, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium Terrington Beds (Quaternary)			0.60 End of Excavation					
Observations No groundwater seepages were encountered within the depth penetrated.								
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks			Logged by S. P. T. / J. T.	
							Scale 1 : 25	
							Fig.	

T.L.P. Ground Investigations Ltd. Trial Pit Record <small>Hand digging / Dynamic Sampling.</small>		Location : Nursery Road, Boston, Lincolnshire Trial Pit No. 2.					
Carried out For		Ground Level		Co-ordinates		Date : 06.11.12.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	Type	No.	
Brown, silty, clayey Topsoil containing very occasional fine stone fragments. Topsoil			(0.35) 0.35	CBR	U	1	
Firm to stiff, brown, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium			0.60 End of Excavation				
<p>Observations No groundwater seepages were encountered within the depth penetrated.</p>							
<p>Depths: All depths and reduce levels in metres. Thickness given in brackets in depth</p>		<p>Samples/Test Key.</p> <ul style="list-style-type: none"> D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test 		Remarks		<p>Logged by S. P. T. / J. T.</p> <p>Scale 1 : 25</p> <p>Fig.</p>	

T.L.P. Ground Investigations Ltd. Trial Pit Record Hand digging / Dynamic Sampling.		Location : Nursery Road, Boston, Lincolnshire Trial Pit No. 3.					
Carried out For		Ground Level		Co-ordinates		Date : 06.11.12.	
Description	Reduced Level	Legend	Depth & Thickness	Samples/Tests			Field Records
				Depth	Type	No	
Brown, silty, clayey Topsoil containing very occasional fine stone fragments. Topsoil			(0.35) 0.35	CBR	U	1	
Firm to stiff, brown, silty Clay containing occasional lenses of brown silt. Tidal Flat Deposits / Alluvium Terrington Beds (Quaternary) Observations Perched water seepages were encountered at a depth of 0.35m beneath the topsoil layer.			0.60 End of Excavation				
Depths: All depths and reduce levels in metres. Thickness given in brackets in depth		Samples/Test Key. D Disturbed Sample B Bulk Sample W Water Sample U Undisturbed Core sample S Standard Penetration Test V Vane Test		Remarks		Logged by S. P. T. / J. T. Scale 1 : 25 Fig.	

California Bearing Ratio.

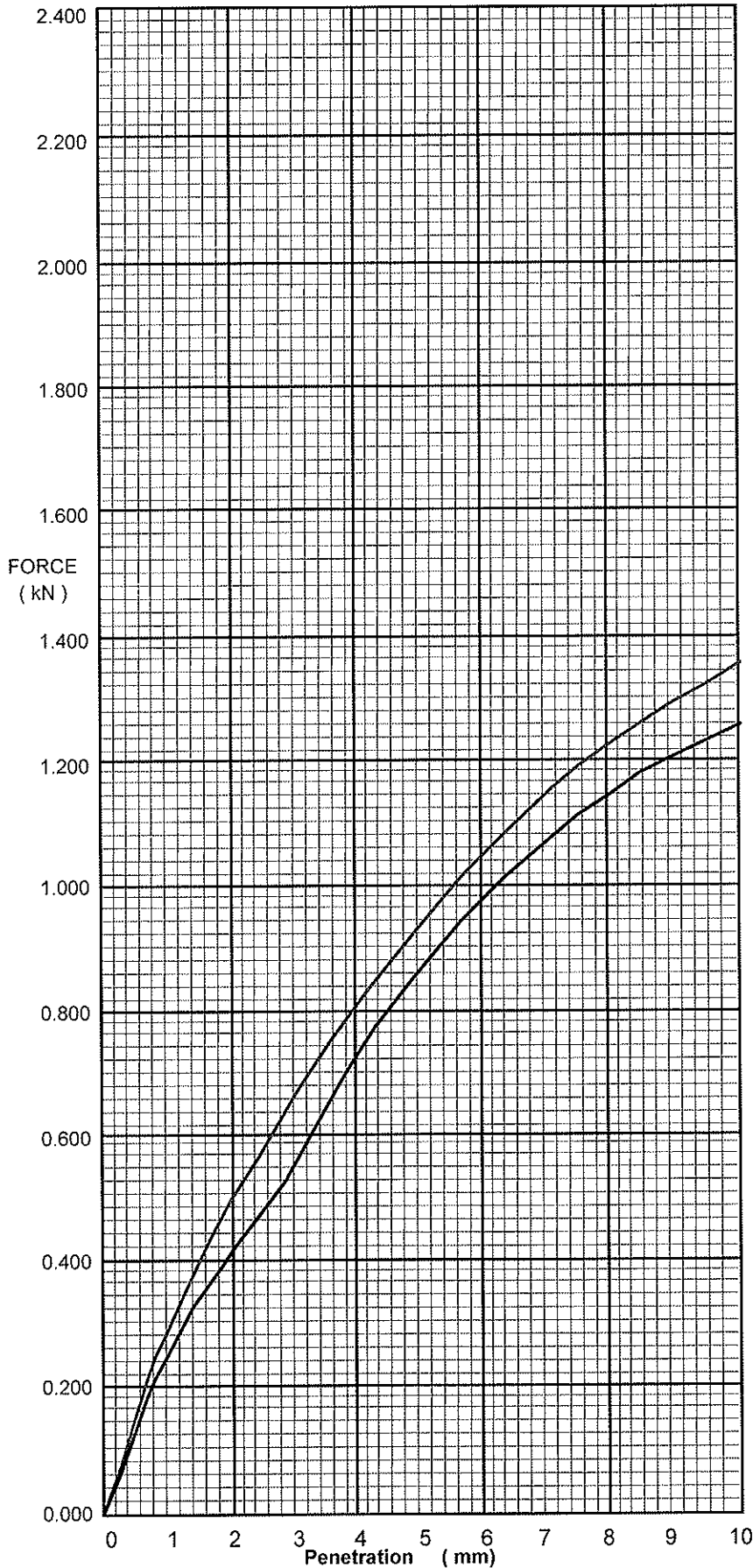
(BS1377 : Part 4 : 1990 : Test 7)

Client

Location Land off Nursery Road, Boston, Lincolnshire.

Sample CBR1

TP1 (0.34m).



SAMPLE DETAILS.

Dimensions 152mm dia.
140mm high.

Preparation

Undisturbed

Bulk Density 1.913 t/m³

Moisture Content 20.0 %

Dry Density 1.594 t/m³

Surcharge weight = 13kg.

AFTER CBR TEST.

Moisture Content below plunger.

Top 21.2 %

Base 18.7 %

CBR Results.

Pene - tration. mm.	Load. kN.	Standard Load. kN.	CBR %
Top			
2.5	0.52	13.2	3.9
5.0	0.86	20.0	4.3
Base			
2.5	0.56	13.2	4.2
5.0	0.92	20.0	4.6

Fig. 1

California Bearing Ratio.

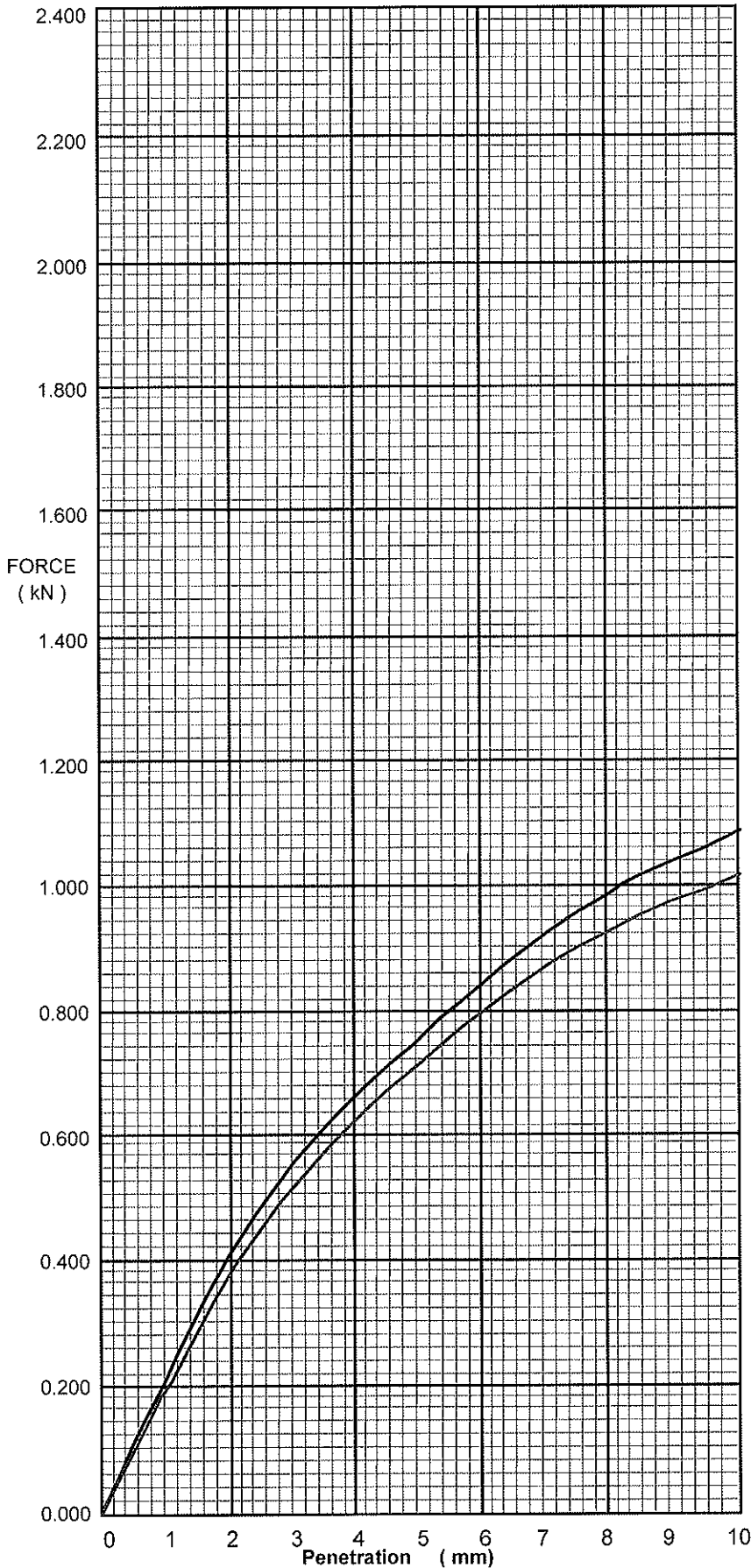
(BS1377 : Part 4 : 1990 : Test 7)

Client

Location Land off Nursery Road, Boston, Lincolnshire.

Sample CBR2

TP2 (0.35m).



SAMPLE DETAILS.

Dimensions 152mm dia.
140mm high.

Preparation

Undisturbed

Bulk Density 1.945 t/m³

Moisture Content 22.0 %

Dry Density 1.621 t/m³

Surcharge weight = 13kg.

AFTER CBR TEST.

Moisture Content below plunger.

Top 21.6 %

Base 20.4 %

CBR Results.

Pene - tration. mm.	Load. kN.	Standard Load. kN.	CBR %
Top			
2.5	0.47	13.2	3.6
5.0	0.74	20.0	3.7
Base			
2.5	0.45	13.2	3.4
5.0	0.71	20.0	3.6

Fig. 2

California Bearing Ratio.

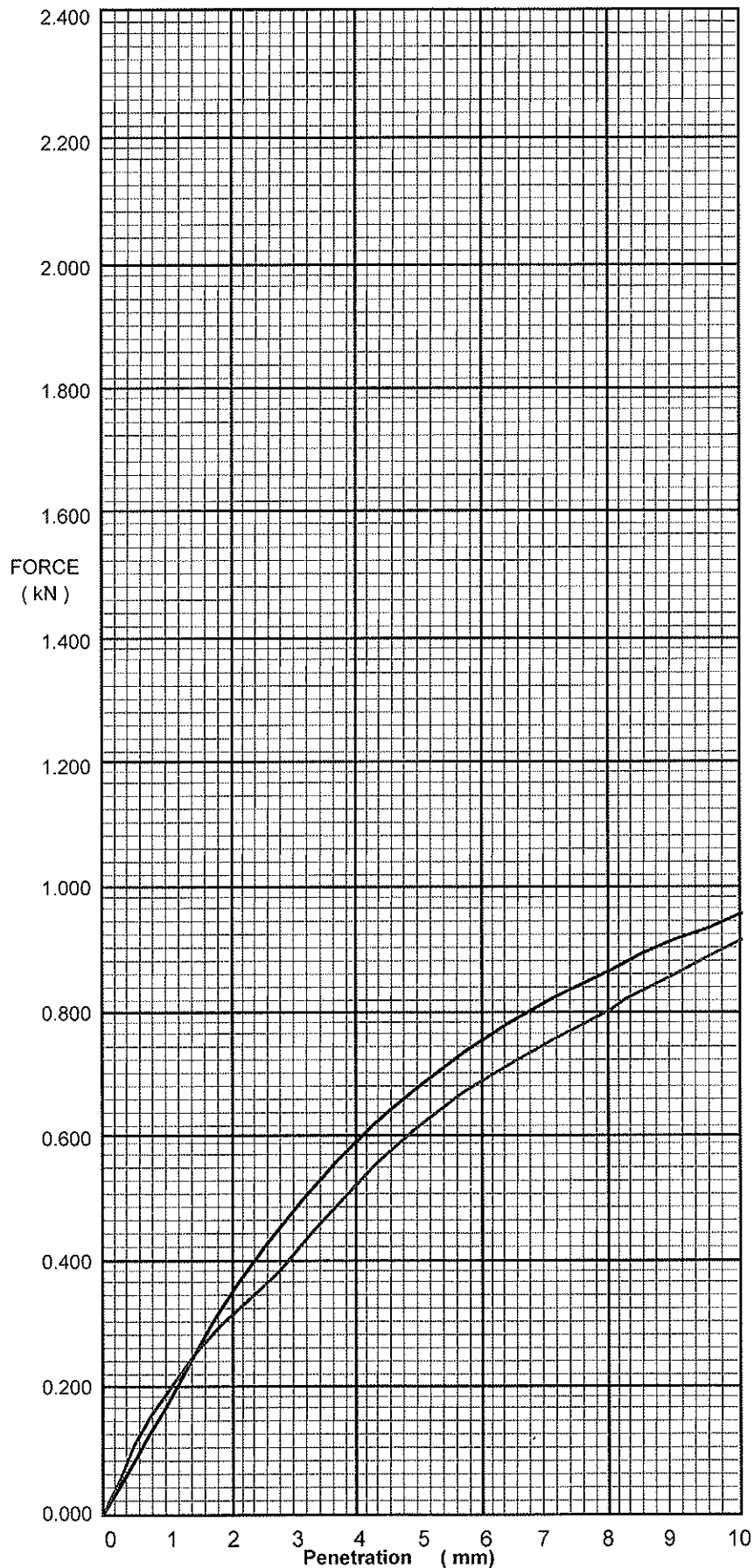
(BS1377 : Part 4 : 1990 : Test 7)

Client

Location Land off Nursery Road, Boston, Lincolnshire.

Sample CBR3

TP3 (0.35m).



SAMPLE DETAILS.

Dimensions 152mm dia.
140mm high.

Preparation

Undisturbed

Bulk Density 1.892 t/m³

Moisture Content 18.8 %

Dry Density 1.593 t/m³

Surcharge weight = 13kg.

AFTER CBR TEST.

Moisture Content below plunger.

Top 18.4 %

Base 19.2 %

CBR Results.

Pene - tration. mm.	Load. kN.	Standard Load. kN.	CBR %
Top			
2.5	0.42	13.2	3.2
5.0	0.68	20.0	3.4
Base			
2.5	0.38	13.2	2.9
5.0	0.62	20.0	3.1

Fig. 3

Summary of Laboratory Test Data

Client :

Location : Nursery Road, Boston

Sample Details			Classification				Chemical		Density		Strength		
No. Type	Depth m.	Description	w %	LL %	PL %	PI %	SO ₄ g/l	pH	Bulk Density Mg/m ³	Dry Density Mg/m ³	Type	c kN/m ²	φ Deg.
P1													
U1	1.10	Silty Clay	31	70	20	50	0.27 (2:1)	7.7					
P3													
U2	1.20	Silty Clay	30	68	22	46							
P5													
U2	1.10	Silty Clay	33	65	21	44							
U2	2.00	Silty Clay	35	53	19	34	0.37(2:1)	7.8					
BH1													
U1	1.00	Silty Clay	35								V	78	-
W1	3.50	Groundwater					1.10	7.4					
U2	7.00	Boulder Clay	21				0.33(2:1)	8.9	2.11	1.74	T	84	-
U3	8.50	Boulder Clay	19	41	16	25			2.07	1.74	T	126	-
BH2													
U1	1.00	Silty Clay	30								V	67	-
U2	7.30	Boulder Clay	17	38	17	21			2.03	1.73	T	75	-
BH3													
U1	1.00	Silty Clay	28								V	67	-
U2	7.30	Boulder Clay	16						2.14	1.84	T	103	-
BH4													
U1	0.75	Silty Clay	31								V	70	-
U2	7.30	Boulder Clay	18						2.09	1.77	T	111	-

Notes U Undisturbed

NP Non Plastic

B Bulk

D Disturbed

Settlement calculation after DIN 4019

Nursery Lane, Boston, Lincolnshire

Settlement in 0.200 m b. GL
 Limiting depth = base of profile
 Influence distance = 500.000 m

Soil properties Layer	gamma [kN/m ³]	Es [MN/m ²]	nu [-]	Designation
1	19.50	3.00	0.100	Stone hardcore
2	19.00	8.00	0.300	Firm to stiff silty clay
3	19.00	3.50	0.300	Firm silty clay
4	18.50	2.00	0.300	Soft silty clay
5	18.00	1.00	0.300	Soft organic silty clay
6	14.00	0.60	0.300	Firm, clayey peat
7	18.50	3.00	0.100	Loose silty medium sand
8	20.50	15.00	0.300	Stiff boulder clay

Foundation: Slab1

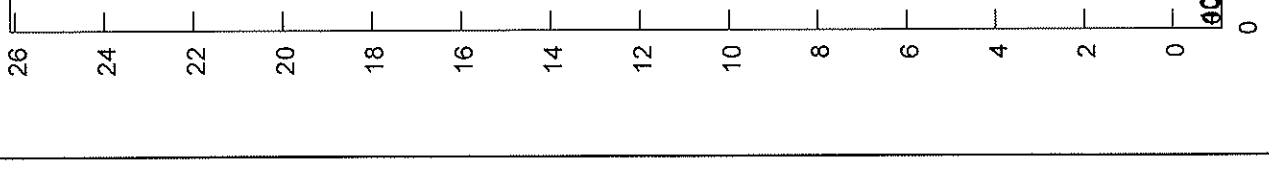
x(left) = 2.000 m
 y(bottom) = 2.000 m
 a = 25.000 m
 b = 13.000 m
 Gradient = 0.000 °
 Foundation stress (top left) = 15.000 kN/m²
 Foundation stress (top right) = 15.000 kN/m²
 Foundation stress (bottom left) = 15.000 kN/m²
 Foundation stress (bottom right) = 15.000 kN/m²
 Excav. unloading = 0.000 kN/m²
 Foundation base = 0.600 m
 Settlement at found. centre = 5.44 cm
 Settlement at foundation corners
 top left = 1.32 cm
 top right = 1.32 cm
 bottom left = 1.32 cm
 bottom right = 1.32 cm

Settlement at the characteristic points

top left = 4.36 cm
 top right = 4.36 cm
 bottom left = 4.36 cm
 bottom right = 4.36 cm

Mean settlement of charact. points [cm] = 4.363
 Rotation (CP) about long axis [-] = 0.00000
 Rotation (CP) about short axis [-] = 0.00000

Layer	γ [kN/m ³]	E_s [MN/m ²]	ν []	Designation
1	19.50	3.00	0.100	Stone hardcore
2	19.00	8.00	0.300	Firm to stiff silty clay
3	19.00	3.50	0.300	Firm silty clay
4	18.50	2.00	0.300	Soft silty clay
5	18.00	1.00	0.300	Soft organic silty clay
6	14.00	0.60	0.300	Firm clayey peat
7	18.50	3.00	0.100	Loose silty medium sand
8	20.50	15.00	0.300	Stiff boulder clay



Basis for calculation:
 Nursery Lane, Boston, Lincolnshire
 Settlements [cm]
 Settlement in 0.200 m b. GL
 Limiting depth = base of profile