

**PROSPECT (GB)**

**Church Raike, Chipping**

**Geo-Environmental Assessment  
Report**

**March 2013**

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**AJH/C2179/3577**

**PROJECT QUALITY CONTROL DATA SHEET**

Site Name:	Church Raike, Chipping
Report Title:	Geo-Environmental Assessment Report
Report Number:	AJH/C2179/3577

Client: Prospect GB	
Unit 5 Meridan Business Park Hansby Drive Hunts Cross Speke L24 9LG	
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**GEO-ENVIRONMENTAL ASSESSMENT REPORT  
ON A SITE OFF CHURCH RAIKE, CHIPPING****1.0 INTRODUCTION**

- 1.1 This report describes a Geo-Environmental Investigation carried out for Prospect GB on a site off Church Raiké, Chipping.
- 1.2 The objectives of the investigation were to:
- Determine the near surface ground conditions through, window sampling related to the development of the site for residential development.
  - Carry out suitable testing to enable the ground to be assessed for chemical contamination.
  - Make recommendations for the foundations of both houses and associated roads.
  - Make comments and recommendations with regard to the geo-environmental conditions encountered.
- 1.3 A Desk study has been carried out by Brownfield Solutions Limited (BSL) ref AJH/C2179/3577. The information within the desk study report details the site description and the environmental setting. This report should be read in conjunction with the Desk Study Report.

## **2.0 METHOD OF INVESTIGATION**

### **2.1 Objectives**

2.1.1 The aim of the fieldwork was to:

- Investigate ground conditions on the site.
- Assess the potential contamination on the site and obtain samples for contamination screening.
- Assess the potential impact of any contamination on controlled waters.
- Assess the need for detailed investigation.
- Obtain geotechnical information on the ground conditions at the site for preliminary foundation design and preliminary pavement design purposes.
- Install standpipes to allow future monitoring.
- Give an assessment of the geo - environmental risks associated with redevelopment of the site.

### **2.2 Site Works**

2.2.1 Seven Window sample boreholes (WS01 to WS07) were drilled to depths between 1.70m and 3.80m on 14 February 2013 using a tracked window sampling rig and liners (windowless).

2.2.2 The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing C2179/03. The exploratory hole logs are presented in Appendix A.

2.2.3 The exploratory holes were positioned to establish general ground conditions on the site. The exploratory holes were logged by an experienced geo-environmental engineer in general accordance with BS 5930 'Code of Practice for Site Investigations' 1999, BS EN 14688-1:2002 'Geotechnical Investigation and Testing – Identification and classification of soil'.

### **2.3 Sampling**

2.3.1 During the drilling of the exploratory holes, representative samples were taken at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing.

2.3.2 Twenty six disturbed soil samples were selected and taken during the site works. The type of sample being dependent upon the stratum and the purpose of analysis.

2.3.3 Disturbed samples of soil for chemical testing were placed in 1 litre plastic tubs and amber jars.

- 2.3.4 The distribution of samples taken across the site is recorded on the exploratory logs.

## 2.4 Laboratory Testing

- 2.4.1 As part of the assessment for potential contamination of the site, selected samples were taken for the purpose of chemical contamination testing.

- 2.4.2 In the absence of particularly contaminative processes on site and the lack of visual evidence of contamination impaction eight representative soil samples were screened for the following general suite of determinands:

Arsenic, cadmium, chromium (total and hexavalent), copper, lead, mercury, nickel, selenium, zinc, pH and Speciated PAH's.

- 2.4.3 Three samples were screened for asbestos fibres. Two samples have also been scheduled for organo-phosphorus pesticides.

- 2.4.4 The Chemical Laboratory Testing Results are presented in Appendix B.

- 2.4.5 Representative disturbed samples were obtained for all soil types encountered. Selected samples were scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' 1990. The following tests were scheduled:

BS Test Number	Description	No of Samples
Part 2:	Natural Moisture Content	6
Part 2:	Plasticity Index Analysis	6
Part 3:	pH Value	6
Part 3:	Water Soluble Sulphate Content	6

- 2.4.6 The Geotechnical Laboratory Testing results are presented in Appendix C.

## 2.5 Monitoring

- 2.5.1 Gas standpipes were installed in the four of the boreholes on the site. The standpipes consisted of plain PVC pipe from ground level to 1.0m bgl, with slotted PVC pipe from 1.0m to the base of the borehole. A bentonite seal was made around the plain pipe. A clean gravel pack was placed around the slotted pipe

- 2.5.2 A program of ground gas monitoring will be instigated and will be reported in an addendum report.

### **3.0 GROUND CONDITIONS**

#### **3.1 Made Ground**

3.1.1 Made Ground was not encountered in any of the window sample locations.

#### **3.2 Natural Ground**

3.2.1 The natural strata underlying the topsoil was generally a firm to stiff yellow brown sandy clay, overlying a firm to stiff and very stiff dark brown grey sandy clay.

3.2.2 The upper yellow brown clay contained some angular sandstone gravel and was present to depths of between 0.60m and 0.80m. The stiff dark grey sandy clay contained much fine to coarse gravel and occasional cobbles.

3.2.3 In WS01 a soft to firm dark brown sandy clay was present between 0.95m and 1.50m. In WS05 in the centre of the site the drill string refused at 1.70m on an assumed cobble. WS04 also refused at 3.80m probably on a cobble.

3.2.4 In WS07 there was a very thin band of coarse black sand at 1.50m.

#### **3.3 Bedrock**

3.3.1 Bedrock was not encountered in this investigation.

#### **3.4 Groundwater**

3.4.1 Groundwater was not generally encountered during the investigation, although in WS04 the clay was saturated below 1.20m.

#### **3.5 Observations**

3.5.1 During the works undertaken by BSL observations for both visual and olfactory evidence of contamination were made.

3.5.2 There was not visual or olfactory evidence of contamination noted during the investigation.

## **4.0 TEST RESULTS**

### **4.1 Chemical Test Results - Soils**

- 4.1.1 The samples were tested for an assessment of the chemical contamination and results were examined with reference to a selection of guidance documents as detailed in Appendix D.
- 4.1.2 The apparent exceedence of the quoted Screening value is taken as indicating further detailed assessment or remedial action is required.
- 4.1.3 None of the chemical test results exceeded their respective screening concentrations for residential end use.
- 4.1.4 Asbestos fibres were not detected in the samples tested.
- 4.1.5 The results of the pesticide testing is outstanding and will be reported on receipt.

### **4.2 Geotechnical Testing**

- 4.2.1 Water soluble sulphate testing was undertaken on six of the natural strata. The results revealed soluble sulphate (SO<sub>4</sub>) contents of <0.01 g/l to 0.13g/l. Associated pH values were obtained which ranged between 5.2 and 8.2 and indicating slightly acid to slightly alkaline conditions.
- 4.2.2 Plasticity index results which ranged between 10% and 22%, moisture contents were in the range 11% to 30%.
- 4.2.3 After modification of particle size in accordance with NHBC Chapter 4.2 the modified plasticity indices are in the range 7.5% to 16.5% indicating the soils to be of low volume change potential.



## 5.0 GEOTECHNICAL ASSESSMENT

### 5.1 General

- 5.1.1 The site is currently a cricket pitch with a small pavilion. Made ground has not been found across the site.
- 5.1.2 The eastern part of the site has many semi-mature trees on and these will need to be removed to facilitate the development.

### 5.2 Foundations

- 5.2.1 The most suitable foundations for houses on this site are likely to be unreinforced strip foundations. The clay on the site is of low volume change potential, therefore the foundations should be at a minimum depth of 750mm, deeper near trees and hedges in accordance with NHBC Chapter 4.2.
- 5.2.2 A nett allowable bearing pressure not exceeding 90kN/m<sup>2</sup> should be assumed at 750mm, the shear strength increases with depth and foundations can be deepened if higher loads are required to be supported.
- 5.2.3 On the eastern part of the site there is an area of soft soil that extends to 1.50m in WS01. Foundations should be extended below this to suitable firm clays. It is likely given the trees in this area that this depth will be exceeded due to the area of influence in cohesive soils.
- 5.2.4 The bearing stratum should be inspected for 'soft spots' within the natural clay strata, resulting for instance from localised groundwater perched within the overlying fill materials. Any such soft spots should be dealt with in accordance with good site practice.
- 5.2.5 A survey of all trees and hedges on the site and within influencing distance of the site boundary should be undertaken to identify tree species and heights. This information will be required in order to assess the effects of trees on the cohesive strata.
- 5.2.6 Where foundation depths due to trees already present or recently removed exceeds 1.50m there is a possibility for heave to occur on removal of the tree. NHBC Guidance states that compressible material or void former is required against the inside face of all external wall foundations.

### 5.3 Floor Slabs

- 5.3.1 If required ground bearing floor slabs may generally be adopted at the site provided that once finished levels have been established, less than 600mm of suitable, appropriately compacted granular material exists beneath the slab.

- 5.3.2 Where foundation depths due to trees already present exceeds 1.50m there is a possibility for heave to occur on removal of the tree. NHBC Guidance states that either a precast concrete floor, a suspended timber or in-situ concrete floor must be used. We recommend the former, the required void size for beneath floor slabs on this site is 125mm low.

## 5.4 Construction

- 5.4.1 Instability of excavations through natural soils is not anticipated provided they are not exposed to adverse weather conditions for any substantial period of time. All excavations should be carried out in accordance with CIRIA Report 97 'Trenching Practice'.
- 5.4.2 Excavation depths should generally be readily achieved using conventional plant (JCB or similar) although high specification plant (tracked 360° or similar) and possibly breaking equipment may be required locally to penetrate old foundations associated with pavillion.
- 5.4.3 The results of laboratory pH and sulphate content testing indicates that ACEC Class AC-1 and sulphate class DS-1 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005. The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

## 5.5 Highways

- 5.5.1 Cohesive soils will be encountered at road formation levels, therefore CBR values of 2% to 5% are likely to be achieved in undisturbed natural soils for pavement design purposes. However unless proven otherwise by in-situ testing at sub-base level by a specialist geotechnical engineer, a design CBR value not exceeding 2% should be assumed.

## 5.6 Soakaways

- 5.6.1 The use of soakaways within the natural ground is not feasible at the site due to the presence of relatively impermeable strata underlying the site.

## 5.7 Slope Stability

- 5.7.1 The site is elevated above the road by approximately 2m and care will be required to ensure that foundation loads do not induce instability in this bank. It is recommended that houses are set back and foundations are set below a line of 45 degrees drawn up from the base of the bank.

## 6.0 ENVIRONMENTAL ASSESSMENT

### 6.1 Contamination

6.1.1 On the basis of the testing undertaken to date it would appear that there is no made ground on the site. The chemical testing indicates that the natural ground is uncontaminated.

### 6.2 Qualitative Risk Assessment

6.2.1 The risk assessment methodology used in this instance is based on **Source – Pathway – Receptor** (SPR) philosophy. The **source** is the presence of contamination, or substance/event likely to cause harm. The **receptor** is the target that may be detrimentally affected by the source. The **pathway** is the means of the contamination to move from the source to the receptor. Where any of these three factors are removed there is deemed to be no risk.

Source-Pathway-Receptor Analysis

Potential Contaminative Source / Location	Contaminant	Receptor	Likelihood	Justification
Pesticides from farming	Pesticides.	Site end users, workers	Low	Unlikely that significant contamination from pesticides is present. The results for the pesticide testing is outstanding however the risk is still considered to be <b>low</b> .
Landfill site	Ground gases	Confined spaces in buildings	Low	Former landfill site situated 110m south west of the site and received difficult waste. Therefore the risk is considered to be <b>moderate</b> .
Natural Rock	Radon Gas	Confined spaces in buildings	High	Full Radon precautions are required. The risk is considered to be <b>high</b> .

6.2.2 It is considered that there is no source of soil contamination on the site.

6.2.3 The site requires full radon protection, other ground gas monitoring is on-going.

### 6.3 Remedial Measures

6.3.1 Full radon precautions are required within the properties, this would mitigate any other ground gases as well.

6.3.2 No other remedial measures are considered unnecessary.

### 6.4 Asbestos

6.4.1 The investigation of asbestos issues within buildings was beyond the scope of this report. However, guidance from UK Government indicates that

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asbestos should be assumed to be present in buildings unless proven otherwise.

- 6.4.2 Any asbestos will require removal prior to re-development. This will need to be done by a suitably qualified experienced and licensed contractor, who ensures that adequate PPE is provided to operatives, and that all the relevant legislation is adhered to.

## **6.5 Health and Safety Issues**

- 6.5.1 No sources of contamination were recorded on the site, although the site is not contaminated it is good practice to prevent site workers from coming into contact with soils. General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

- All ground workers should be issued with the relevant protective clothing, footwear and gloves. These protective items should not be removed from the site and personnel should be instructed as to why and how they are to be used.
- Hand-washing and boot-washing facilities should be provided.
- Care should be taken to minimise the potential for off-site migration of contamination by the provision of dust suppression control and wheel cleaning equipment during the construction works.
- Good practices relating to personal hygiene should be adopted on the site.
- The contractor shall satisfy the Health and Safety Executive with regard to any other matters concerning the health, safety and welfare of persons on the site.

## **6.7 Waste Disposal**

- 6.7.1 The Landfill Directive (Directive 1999/31/EC on the landfilling of waste) led to the establishment of a methodology for classifying wastes. Wastes can only be accepted at a landfill if they meet the relevant Waste Acceptance Criteria (WAC) for that type of landfill.

There are three different WAC, these are for:

- Inert waste
- Non –hazardous waste
- Hazardous waste

- 6.7.2 Wastes should be first classified based on their total concentrations. WAC testing is then required if the end disposal route is a hazardous waste landfill, Stable non-reactive waste cell or inert landfill.

- 6.7.3 The implementation of the landfill directive has had the effect of increasing significantly disposal costs. Dependent on the proposed disposal route

waste may need to be classified on the basis of detailed Waste Acceptance Criteria (WAC) testing, which is outside the scope of this work.

- 6.7.4 The total testing results indicate that generally the soils are inert (below the relevant SGV or GAC criteria). It is unlikely that the soils encountered would be classified as hazardous waste.
- 6.7.5 However as the material is generally clean it is entirely possible that the soils could be recycled at a suitable local waste treatment plant or transfer station or re-used on another site.
- 6.7.6 Where it is necessary to dispose material off site it is recommended that materials are segregated and where necessary sufficient time is allowed to further classify the material properly, including discussion with landfill sites and waste transfer stations to find the best disposal route.

## **7.0 CONCLUSIONS**

### **7.1 Summary**

- 7.1.1 The site has previously been used for agriculture and from the 1960's has been used as a cricket pitch.
- 7.1.2 The site does not contain any made ground and the soils on the site are indicated to be uncontaminated.
- 7.1.3 Strip foundations with a safe bearing capacity of 90kN/m<sup>2</sup> are considered suitable on the site. Locally some deepening may be required to found below soft spots. Deepening will also be required due to trees
- 7.1.4 Care should be taken not to load the bank adjacent to the road and it is recommended that buildings are set back from this.
- 7.1.5 The site requires full radon precautions, a full gas assessment will be made on completion of the gas monitoring..

### **7.2 Further Work**

- 7.2.1 The gas monitoring program should be completed.
- 7.2.2 The results of the pesticide testing is outstanding and will be reported on receipt.

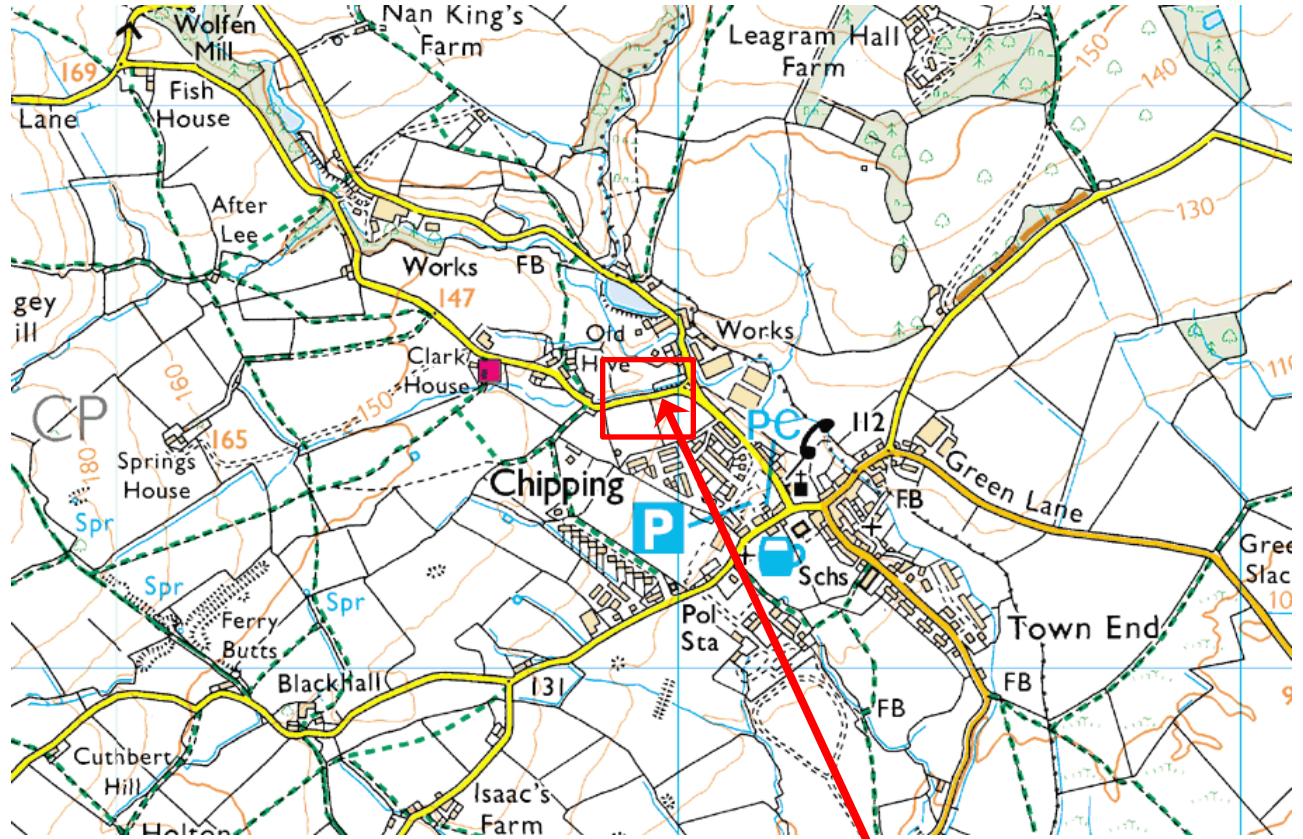
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## DRAWINGS



**SITE**



**Brownfield Solutions Limited** **BSL**

PROSPECT GB

Church Raike, Chipping

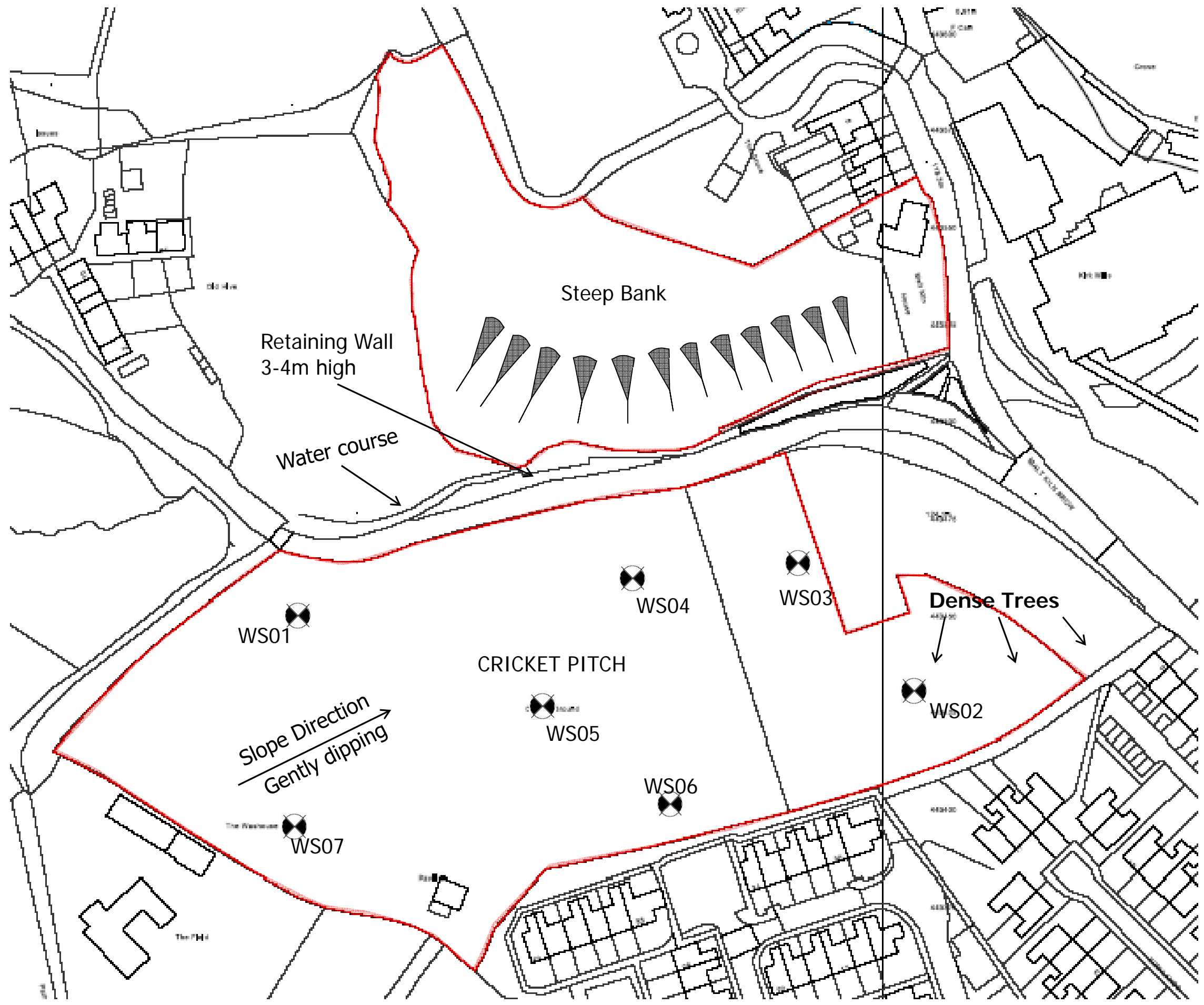
Site Location Plan

Drawing Number C2179/01

Scale: NTS

Drawn By: LC

Checked By: JMJ



Key:



Window Sample Borehole

Brownfield Solutions Limited



Prospect GB

Church Raiké, Chipping

Proposed Exploratory Hole Plan

Drawing No. C2179/03

Date: 18 Feb 13

Scale: NTS

Drawn By: AJH

Checked By: JMJ

## APPENDIX A Exploratory Hole Logs

Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd			Dates: 14/02/2013	Checked by RW
				Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.30		Dark brown sandy clayey TOPSOIL	
		0.90	D		0.95		Firm yellow brown mottled grey sandy CLAY with some angular gravel of sandstone	
		1.00	SPT	N=5 (2,1,0,2,1,2)	0.95		Soft to firm dark brown sandy CLAY with some angular gravel	
		1.50	D		1.50		Firm to stiff dark brown grey sandy CLAY with much gravel. Gravel is fine to coarse angular sandstone	
		2.00	SPT	N=21 (3,4,4,5,5,7)			Becoming friable and very stiff below 2.00	
		2.50	D					
		3.00	SPT	N=31 (6,5,5,10,8,8)	3.00		End of Borehole at 3.00 m	

Remarks: 1. Groundwater not encountered.



Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd		Dates: 14/02/2013	Checked by RW	Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.30		Dark brown sandy clayey TOPSOIL	
		0.80	D		0.80		Firm yellow brown mottled grey sandy CLAY with some angular gravel of sandstone	
		1.00	SPT	N=6 (2,2,2,1,1,2)				Firm to stiff to becoming very stiff dark brown grey sandy CLAY with much gravel and occasional cobbles. Gravel is fine to coarse angular sandstone
		1.50	D					
		2.00	SPT	N=21 (1,2,6,4,4,7)				
		3.00	SPT	N=42 (5,5,5,12,15,10)	3.00			End of Borehole at 3.00 m

Remarks: 1. Groundwater not encountered.

Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd		Dates: 14/02/2013	Checked by RW	Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.30		Dark brown sandy clayey TOPSOIL	
		0.60	D				Firm to stiff yellow brown mottled grey sandy CLAY with some angular gravel of sandstone	
		1.00	SPT	N=11 (1,1,1,2,4,4)	0.80		Firm to stiff becoming very stiff dark brown grey sandy CLAY with much gravel and occasional cobbles. Gravel is fine to coarse angular sandstone	
		1.20	D					
		2.00	SPT	N=19 (3,4,4,5,4,6)	3.00			
		2.50	D					
3.00	SPT	N=24 (6,5,5,5,6,8)			End of Borehole at 3.00 m			

Remarks: 1. Groundwater not encountered.



Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd			Dates: 14/02/2013	Checked by RW
				Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.30		Dark brown sandy clayey TOPSOIL	
		0.50	D		0.70		Firm light grey mottled brown slightly sandy CLAY with occasional angular gravel of sandstone	
		1.00	SPT	N=9 (1,0,1,1,3,4)			Firm dark brown grey sandy CLAY with much gravel and occasional cobbles. Gravel is fine to coarse angular sandstone	
		1.25	D				Dark grey coarse sand band 1.20m to 1.30m becoming stiff to very stiff with much gravel and occasional cobbles below 1.30m	
		1.80	D					
		2.00	SPT	N=23 (5,4,5,6,6,6)				
		3.00	SPT	N=25 (6,5,5,6,7,7)				
		3.80	SPT	N=27 (4,5,5,7,7,8)	3.80			
								End of Borehole at 3.80 m

Remarks: 1. Clay saturated below 1.20m.  
 2. Sampler bouncing at at 3.80m



Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd			Dates: 14/02/2013	Checked by RW
				Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
Well	Water Strikes	0.20	D		0.30			Dark brown sandy clayey TOPSOIL
		0.50	D		0.80			Firm yellow brown mottled grey sandy CLAY with some angular gravel of sandstone
		1.00	SPT	N=9 (1,2,2,2,2,3)	1.70			Firm to stiff becoming very stiff dark brown grey sandy CLAY with much gravel and occasional cobbles. Gravel is fine to coarse angular sandstone
		1.60	D					
		1.70	SPT	50/45mm 45mm (25,50)				
End of Borehole at 1.70 m								

Remarks: 1. Groundwater not encountered.  
 2. Refusal at 1.70m on cobble.



Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd		Dates: 14/02/2013	Checked by RW	Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.30		Dark brown sandy clayey TOPSOIL	
					0.60		Firm to stiff yellow brown mottled grey sandy CLAY with some angular gravel of sandstone	
		0.90 1.00	D SPT	N=17 (4,5,5,5,4,3)				Stiff dark brown grey sandy CLAY with much gravel and occasional cobbles. Gravel is fine to coarse angular sandstone
		1.80 2.00	D SPT	N=17 (2,3,3,4,5,5)				
		3.00	SPT	N=29 (6,5,5,6,9,9)	3.00		End of Borehole at 3.00 m	

Remarks: 1. Groundwater not encountered.



Project Name Church Raike, Chipping		Project No. C2179	Co-ords: -	Hole Type WLS
Location: Chipping			Level: -	Scale 1:25
Client: Prospect (GB) Ltd			Dates: 14/02/2013	Checked by RW
				Logged By AJH

Well	Water Strikes	Samples & In Situ Testing			Depth (m)	Level (m AOD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	D		0.30		Dark brown sandy clayey TOPSOIL	
		0.50	D		0.60		Firm to stiff yellow brown mottled grey sandy CLAY with some angular gravel of sandstone	
		1.00	SPT	N=11 (2,1,1,4,3,3)			Firm to stiff dark brown grey sandy CLAY with much gravel and occasional cobbles. Gravel is fine to coarse angular sandstone	
		1.50	D				very thin band of black coarse sand at 1.50m	
		1.60	D					
		2.00	SPT	N=28 (13,4,6,5,5,12)			becoming very stiff below 2.0m	
		2.00-2.45	D					
		3.00	SPT	N=36 (9,12,8,9,8,11)	3.00		End of Borehole at 3.00 m	

Remarks: 1. Groundwater not encountered.



**APPENDIX B**  
**Chemical Laboratory Testing Results**

Brownfield Solutions Limited  
Wychwood House  
1 Queen Street  
Northwich, Cheshire  
CW9 5JLFAO Tony Hewitt  
22 February 2013

Dear Tony Hewitt

**Test Report Number**                   **224002**  
**Your Project Reference**           **C2179 - Church Raike, Chipping**

Please find enclosed the results of analysis for the samples received 19 February 2013.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to [customerservices@chemtest.co.uk](mailto:customerservices@chemtest.co.uk). Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely



Keith Jones, Technical Manager



2183

*Notes to accompany report:*

- The sign < means 'less than'
- Tests marked 'U' hold UKAS accreditation
- Tests marked 'M' hold MCertS (and UKAS) accreditation
- Tests marked 'N' do not currently hold UKAS accreditation
- Tests marked 'S' were subcontracted to an approved laboratory
- n/e means 'not evaluated'
- i/s means 'insufficient sample'
- u/s means 'unsuitable sample'
- Comments or interpretations are beyond the scope of UKAS accreditation
- The results relate only to the items tested
- 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
- Uncertainties of measurement for the determinands tested are available upon request
- None of the test results included in this report have been recovery corrected

**Test Report**    **224002**    **Cover Sheet**

# LABORATORY TEST REPORT

Results of analysis of 13 samples  
 received 18 February 2013

Report Date  
 22 February 2013

FAO Tony Hewitt

C2179 - Church Raike, Chipping

Login Batch No					224002					
Chemtest LIMS ID					AI31467	AI31468	AI31469	AI31470	AI31472	AI31473
Sample ID					WS1	WS1	WS2	WS2	WS3	WS3
Sample No										
Sampling Date					14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013
Depth					0.20m	0.90m	0.20m	0.80m	0.60m	2.50m
Matrix					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	6.3	6.9	5.5	7.4	6.3	8.0
2120	Sulfate (2:1 water soluble) as SO <sub>4</sub>	14808798	g l <sup>-1</sup>	M		<0.01		<0.01		0.13
2490	Chromium (hexavalent)	18540299	mg kg <sup>-1</sup>	N	<0.5	<0.5	<0.5		<0.5	
2450	Arsenic	7440382	mg kg <sup>-1</sup>	M	12	13	7.7		19	
	Cadmium	7440439	mg kg <sup>-1</sup>	M	0.83	1.3	0.59		5.7	
	Chromium	7440473	mg kg <sup>-1</sup>	M	12	16	7.6		12	
	Copper	7440508	mg kg <sup>-1</sup>	M	43	33	28		36	
	Mercury	7439976	mg kg <sup>-1</sup>	M	0.19	<0.10	0.10		<0.10	
	Nickel	7440020	mg kg <sup>-1</sup>	M	12	29	9.9		65	
	Selenium	7782492	mg kg <sup>-1</sup>	M	1.4	1.1	0.80		0.90	
	Zinc	7440666	mg kg <sup>-1</sup>	M	78	110	59		160	
	2800	Naphthalene	91203	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10
Acenaphthylene		208968	mg kg <sup>-1</sup>	N	<0.10	<0.10	<0.10		<0.10	
Acenaphthene		83329	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Fluorene		86737	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Phenanthrene		85018	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Anthracene		120127	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Fluoranthene		206440	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Pyrene		129000	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Benzo[a]anthracene		56553	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Chrysene		218019	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Benzo[b]fluoranthene		205992	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
Benzo[k]fluoranthene		207089	mg kg <sup>-1</sup>	N	<0.10	<0.10	<0.10		<0.10	
Benzo[a]pyrene		50328	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	

# LABORATORY TEST REPORT

Results of analysis of 13 samples  
 received 18 February 2013

Report Date  
 22 February 2013

FAO Tony Hewitt

C2179 - Church Raike, Chipping

**Login Batch No**

Chemtest LIMS ID

Sample ID

Sample No

Sampling Date

Depth

Matrix

SOP↓ Determinand↓

CAS No↓

Units↓

\*

**224002**

				AI31474	AI31475	AI31476	AI31477	AI31478	AI31479	
				WS4	WS5	WS5	WS6	WS6	WS7	
				14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013	
				0.50m	0.20m	0.50m	0.20m	1.80m	1.60m	
				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	
SOP↓	Determinand↓	CAS No↓	Units↓	*						
2010	pH			M	6.7	4.7	5.8	5.2	7.9	8.2
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l <sup>-1</sup>	M			<0.01		<0.01	
2490	Chromium (hexavalent)	18540299	mg kg <sup>-1</sup>	N	<0.5	<0.5		<0.5		<0.5
2450	Arsenic	7440382	mg kg <sup>-1</sup>	M	3.6	9.4		12		15
	Cadmium	7440439	mg kg <sup>-1</sup>	M	0.35	0.57		0.71		2.2
	Chromium	7440473	mg kg <sup>-1</sup>	M	22	8.4		8.6		13
	Copper	7440508	mg kg <sup>-1</sup>	M	9.3	32		33		31
	Mercury	7439976	mg kg <sup>-1</sup>	M	<0.10	0.20		0.11		<0.10
	Nickel	7440020	mg kg <sup>-1</sup>	M	17	9.4		13		48
	Selenium	7782492	mg kg <sup>-1</sup>	M	0.42	0.89		1.3		11
	Zinc	7440666	mg kg <sup>-1</sup>	M	56	53		62		110
2800	Naphthalene	91203	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Acenaphthylene	208968	mg kg <sup>-1</sup>	N	<0.10	<0.10		<0.10		<0.10
	Acenaphthene	83329	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Fluorene	86737	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Phenanthrene	85018	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Anthracene	120127	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Fluoranthene	206440	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Pyrene	129000	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Benzo[a]anthracene	56553	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Chrysene	218019	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Benzo[b]fluoranthene	205992	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Benzo[k]fluoranthene	207089	mg kg <sup>-1</sup>	N	<0.10	<0.10		<0.10		<0.10
	Benzo[a]pyrene	50328	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10

# LABORATORY TEST REPORT

Results of analysis of 13 samples  
 received 18 February 2013

Report Date  
 22 February 2013

FAO Tony Hewitt

C2179 - Church Raike, Chipping

**Login Batch No**

Chemtest LIMS ID

Sample ID

Sample No

Sampling Date

Depth

Matrix

SOP↓ Determinand↓

CAS No↓

Units↓

\*

224002

AI31480

WS7

14/2/2013

2.00m - 2.45m

SOIL

SOP↓	Determinand↓	CAS No↓	Units↓	*		
2010	pH			M	7.8	
2120	Sulfate (2:1 water soluble) as SO4	14808798	g l <sup>-1</sup>	M	0.11	
2490	Chromium (hexavalent)	18540299	mg kg <sup>-1</sup>	N		
2450	Arsenic	7440382	mg kg <sup>-1</sup>	M		
	Cadmium	7440439	mg kg <sup>-1</sup>	M		
	Chromium	7440473	mg kg <sup>-1</sup>	M		
	Copper	7440508	mg kg <sup>-1</sup>	M		
	Mercury	7439976	mg kg <sup>-1</sup>	M		
	Nickel	7440020	mg kg <sup>-1</sup>	M		
	Selenium	7782492	mg kg <sup>-1</sup>	M		
	Zinc	7440666	mg kg <sup>-1</sup>	M		
	2800	Naphthalene	91203	mg kg <sup>-1</sup>	M	
		Acenaphthylene	208968	mg kg <sup>-1</sup>	N	
Acenaphthene		83329	mg kg <sup>-1</sup>	M		
Fluorene		86737	mg kg <sup>-1</sup>	M		
Phenanthrene		85018	mg kg <sup>-1</sup>	M		
Anthracene		120127	mg kg <sup>-1</sup>	M		
Fluoranthene		206440	mg kg <sup>-1</sup>	M		
Pyrene		129000	mg kg <sup>-1</sup>	M		
Benzo[a]anthracene		56553	mg kg <sup>-1</sup>	M		
Chrysene		218019	mg kg <sup>-1</sup>	M		
Benzo[b]fluoranthene		205992	mg kg <sup>-1</sup>	M		
Benzo[k]fluoranthene		207089	mg kg <sup>-1</sup>	N		
Benzo[a]pyrene		50328	mg kg <sup>-1</sup>	M		



# LABORATORY TEST REPORT

Results of analysis of 13 samples  
 received 18 February 2013

Report Date  
 22 February 2013

FAO Tony Hewitt

C2179 - Church Raik, Chipping

					224002					
					AI31467	AI31468	AI31469	AI31470	AI31472	AI31473
					WS1	WS1	WS2	WS2	WS3	WS3
					14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013
					0.20m	0.90m	0.20m	0.80m	0.60m	2.50m
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
2800	Dibenzo[a,h]anthracene	53703	mg kg <sup>-1</sup>	N	<0.10	<0.10	<0.10		<0.10	
	Indeno[1,2,3-cd]pyrene	193395	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
	Benzo[g,h,i]perylene	191242	mg kg <sup>-1</sup>	M	<0.10	<0.10	<0.10		<0.10	
	Total (of 16) PAHs		mg kg <sup>-1</sup>	N	<2.0	<2.0	<2.0		<2.0	

# LABORATORY TEST REPORT

Results of analysis of 13 samples  
 received 18 February 2013

Report Date  
 22 February 2013

FAO Tony Hewitt

C2179 - Church Raik, Chipping

					224002					
					AI31474	AI31475	AI31476	AI31477	AI31478	AI31479
					WS4	WS5	WS5	WS6	WS6	WS7
					14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013	14/2/2013
					0.50m	0.20m	0.50m	0.20m	1.80m	1.60m
					SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
2800	Dibenzo[a,h]anthracene	53703	mg kg <sup>-1</sup>	N	<0.10	<0.10		<0.10		<0.10
	Indeno[1,2,3-cd]pyrene	193395	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Benzo[g,h,i]perylene	191242	mg kg <sup>-1</sup>	M	<0.10	<0.10		<0.10		<0.10
	Total (of 16) PAHs		mg kg <sup>-1</sup>	N	<2.0	<2.0		<2.0		<2.0

# LABORATORY TEST REPORT

Results of analysis of 13 samples  
received 18 February 2013

Report Date  
22 February 2013

FAO Tony Hewitt

C2179 - Church Raik, Chipping

<b>224002</b>
AI31480
WS7
14/2/2013
2.00m - 2.45m
SOIL

2800	Dibenzo[a,h]anthracene	53703	mg kg <sup>-1</sup>	N
	Indeno[1,2,3-cd]pyrene	193395	mg kg <sup>-1</sup>	M
	Benzo[g,h,i]perylene	191242	mg kg <sup>-1</sup>	M
	Total (of 16) PAHs		mg kg <sup>-1</sup>	N

Brownfield Solutions Limited  
Wychwood House  
1 Queen Street  
Northwich, Cheshire  
CW9 5JL

FAO Tony Hewitt  
26 February 2013

Dear Tony Hewitt

**Test Report Number**                   **224002**  
**Your Project Reference**           **C2179 - Church Raike, Chipping**

Please find enclosed the results of analysis for the samples received 19 February 2013.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely



Darrell Hall, Director



2183

*Notes to accompany report:*

- *The in-house procedure is employed to identify materials and fibres in soils*
- *The sample is examined by stereo-binocular and polarised light microscopy*
- *Sample size is reduced by coning and quartering to obtain a representative sub-sample if necessary*
- *The bulk identification is in accordance with the requirements of the analyst guide (HSG 248)*
- *Samples associated with asbestos are retained for six months*
- *The results relate only to the items tested as supplied by the client*
- *Comments or interpretations are beyond the scope of UKAS accreditation*



**Test Report**    **224002**    **Cover Sheet**

# LABORATORY TEST REPORT

## Asbestos in Soils

Results of analysis of 3 samples  
received 18 February 2013  
C2179 - Church Raike, Chipping

Report Date  
26 February 2013

Login Batch No: 224002

### Qualitative Results

Chemtest ID	Sample ID	Sample Desc	Depth (m)	SOP 2190	
				ACM Type	Asbestos Identification
AI31467		WS1	0.20	-	No Asbestos Detected
AI31471		WS3	0.20	-	No Asbestos Detected
AI31477		WS6	0.20	-	No Asbestos Detected

The detection limit for this method is 0.001%

Signed



**Albert Vella**  
Senior Environmental Surveyor

**APPENDIX C**  
**Geotechnical Laboratory Testing Certificates**



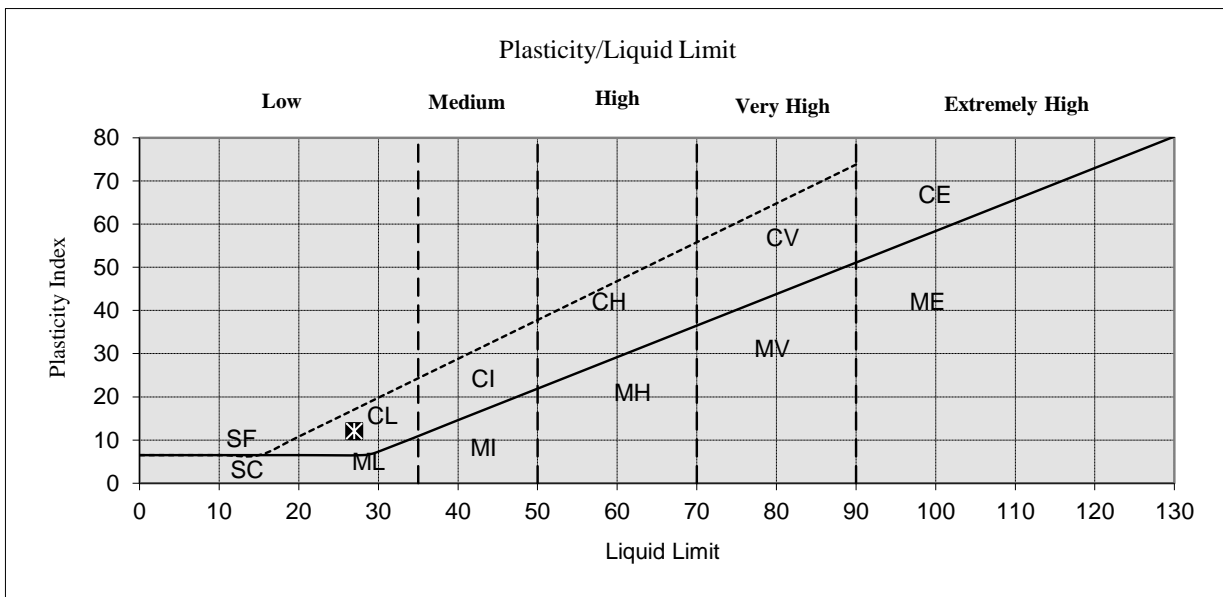
**TESTCONSULT LIMITED**  
 Ruby House, 40A Hardwick Grange, Warrington WA1 4RF  
 Tel (01925) 286880 Fax (01925) 286881



**LABORATORY TEST REPORT**  
**LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 Cl 4.4,5.3**

<b>Site:</b>	Church Raike, Chipping	<b>Job No.:</b>	-
<b>Client:</b>	Brownfield Solutions Ltd Wychwood House 1 Queen Street Northwich CW9 5JL	<b>Lab Ref No.:</b>	SA13268/01
<b>Originator:</b>	<b>Anthony Hewitt</b>	<b>Sample Ref.:</b>	WS1 @ 1.50m
		<b>Date Received:</b>	20/02/2013
		<b>Date Tested:</b>	27/02/2013
		<b>Date Reported:</b>	27/02/2013

Sampling Certificate	No
Sampled By	Client
Sample Type	Disturbed
Sample Preparation Method	Washed
<b>MATERIAL</b>	<b>Brown Gravelly Clay</b>
Retained 425 micron (%)	30
Natural Moisture Content (%)	13
Liquid Limit (single point)(%)	27
Plastic Limit (%)	15
Plasticity Index	12



**Approved Signature**  
**TESTCONSULT LIMITED**

*M. Baker*

Gary Foy, Laboratory Manager;  Marcus Baker, Operations Manager;  Liam Williams, Operations Manager



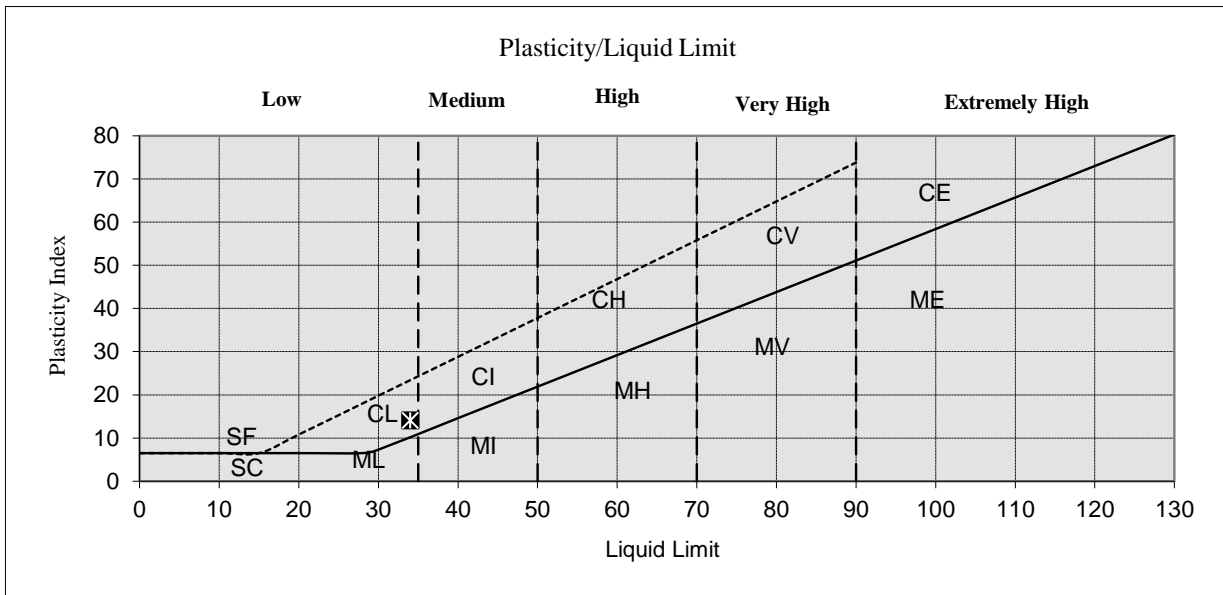
**TESTCONSULT LIMITED**  
 Ruby House, 40A Hardwick Grange, Warrington WA1 4RF  
 Tel (01925) 286880 Fax (01925) 286881



**LABORATORY TEST REPORT**  
**LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 Cl 4.4,5.3**

<b>Site:</b>	Church Raike, Chipping	<b>Job No.:</b>	-
<b>Client:</b>	Brownfield Solutions Ltd	<b>Lab Ref No.:</b>	SA13268/05
	Wychwood House	<b>Sample Ref.:</b>	WS5 @ 1.60m
	1 Queen Street	<b>Date Received:</b>	20/02/2013
	Northwich CW9 5JL	<b>Date Tested:</b>	27/02/2013
<b>Originator:</b>	<b>Anthony Hewitt</b>	<b>Date Reported:</b>	27/02/2013

Sampling Certificate	No
Sampled By	Client
Sample Type	Disturbed
Sample Preparation Method	Washed
<b>MATERIAL</b>	<b>Brown Gravelly Clay</b>
Retained 425 micron (%)	25
Natural Moisture Content (%)	15
Liquid Limit (single point)(%)	34
Plastic Limit (%)	20
Plasticity Index	14



**Approved Signature**  
**TESTCONSULT LIMITED**

*M.A. Baker*

Gary Foy, Laboratory Manager;  Marcus Baker, Operations Manager;  Liam Williams, Operations Manager





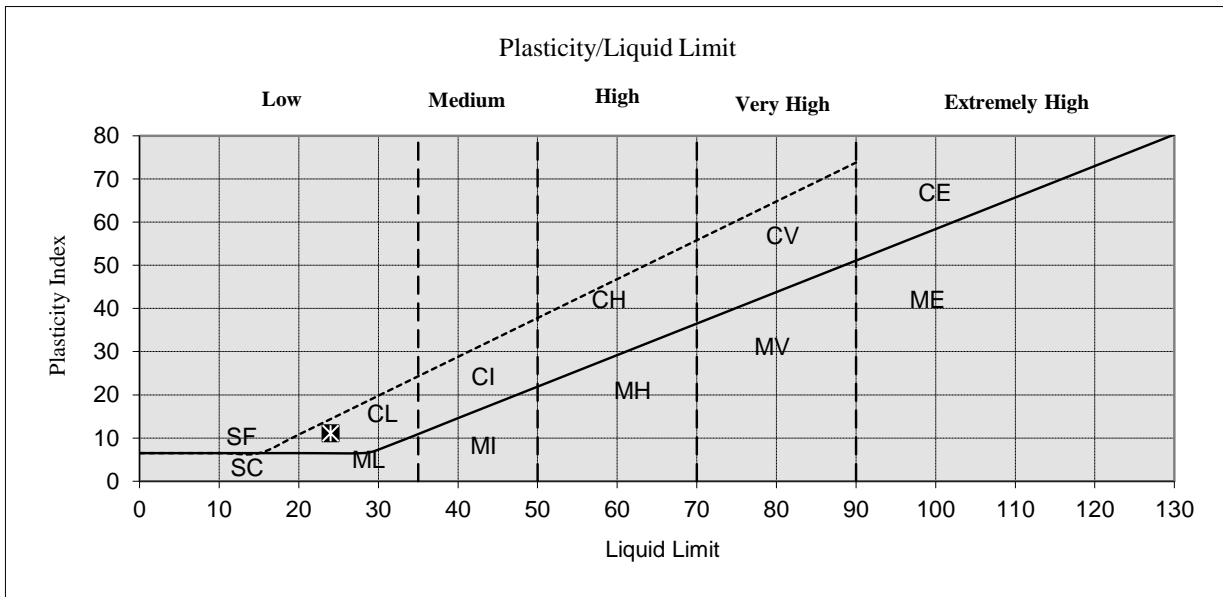
**TESTCONSULT LIMITED**  
 Ruby House, 40A Hardwick Grange, Warrington WA1 4RF  
 Tel (01925) 286880 Fax (01925) 286881



**LABORATORY TEST REPORT**  
**LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 Cl 4.4,5.3**

<b>Site:</b>	Church Raike, Chipping	<b>Job No.:</b>	-
<b>Client:</b>	Brownfield Solutions Ltd	<b>Lab Ref No.:</b>	SA13268/04
	Wychwood House	<b>Sample Ref.:</b>	WS4 @ 1.80m
	1 Queen Street	<b>Date Received:</b>	20/02/2013
	Northwich CW9 5JL	<b>Date Tested:</b>	27/02/2013
<b>Originator:</b>	<b>Anthony Hewitt</b>	<b>Date Reported:</b>	27/02/2013

Sampling Certificate	No
Sampled By	Client
Sample Type	Disturbed
Sample Preparation Method	Washed
<b>MATERIAL</b>	<b>Brown Gravelly Clay</b>
Retained 425 micron (%)	25
Natural Moisture Content (%)	11
Liquid Limit (single point)(%)	24
Plastic Limit (%)	13
Plasticity Index	11



**Approved Signature**  
**TESTCONSULT LIMITED**

Gary Foy, Laboratory Manager;  Marcus Baker, Operations Manager;  Liam Williams, Operations Manager



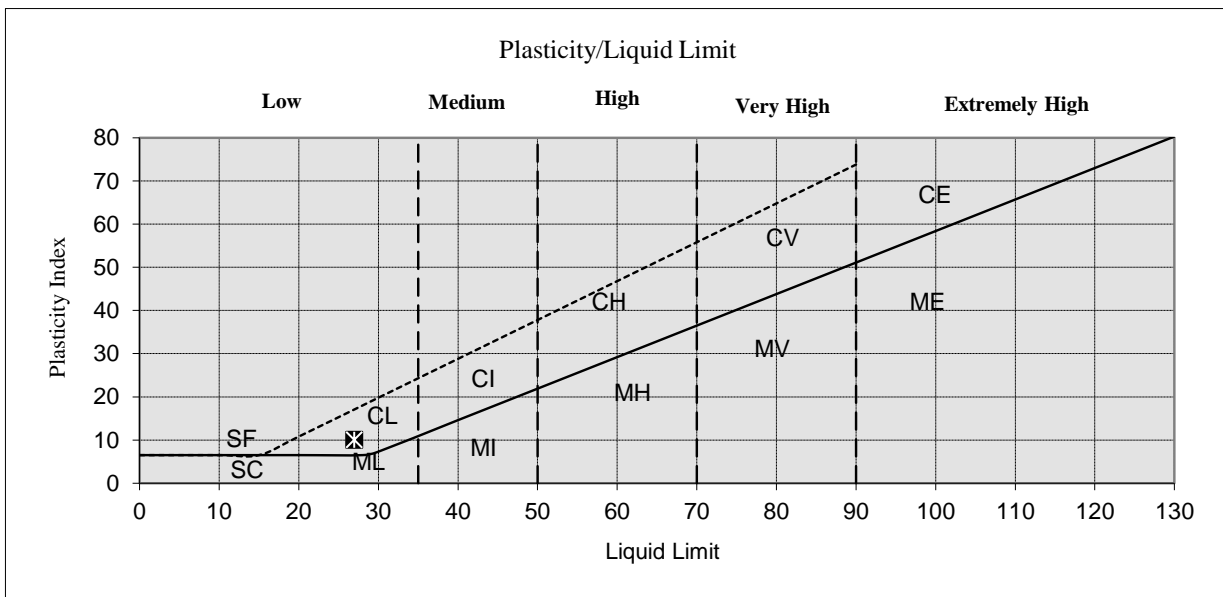
**TESTCONSULT LIMITED**  
 Ruby House, 40A Hardwick Grange, Warrington WA1 4RF  
 Tel (01925) 286880 Fax (01925) 286881



**LABORATORY TEST REPORT**  
**LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 Cl 4.4,5.3**

<b>Site:</b>	Church Raike, Chipping	<b>Job No.:</b>	-
<b>Client:</b>	Brownfield Solutions Ltd	<b>Lab Ref No.:</b>	SA13268/03
	Wychwood House	<b>Sample Ref.:</b>	WS3 @ 1.20m
	1 Queen Street	<b>Date Received:</b>	20/02/2013
	Northwich CW9 5JL	<b>Date Tested:</b>	27/02/2013
<b>Originator:</b>	<b>Anthony Hewitt</b>	<b>Date Reported:</b>	27/02/2013

Sampling Certificate	No
Sampled By	Client
Sample Type	Disturbed
Sample Preparation Method	Washed
<b>MATERIAL</b>	<b>Brown Gravelly Clay</b>
Retained 425 micron (%)	25
Natural Moisture Content (%)	13
Liquid Limit (single point)(%)	27
Plastic Limit (%)	17
Plasticity Index	10



**Approved Signature**  
**TESTCONSULT LIMITED**

Gary Foy, Laboratory Manager;  Marcus Baker, Operations Manager;  Liam Williams, Operations Manager



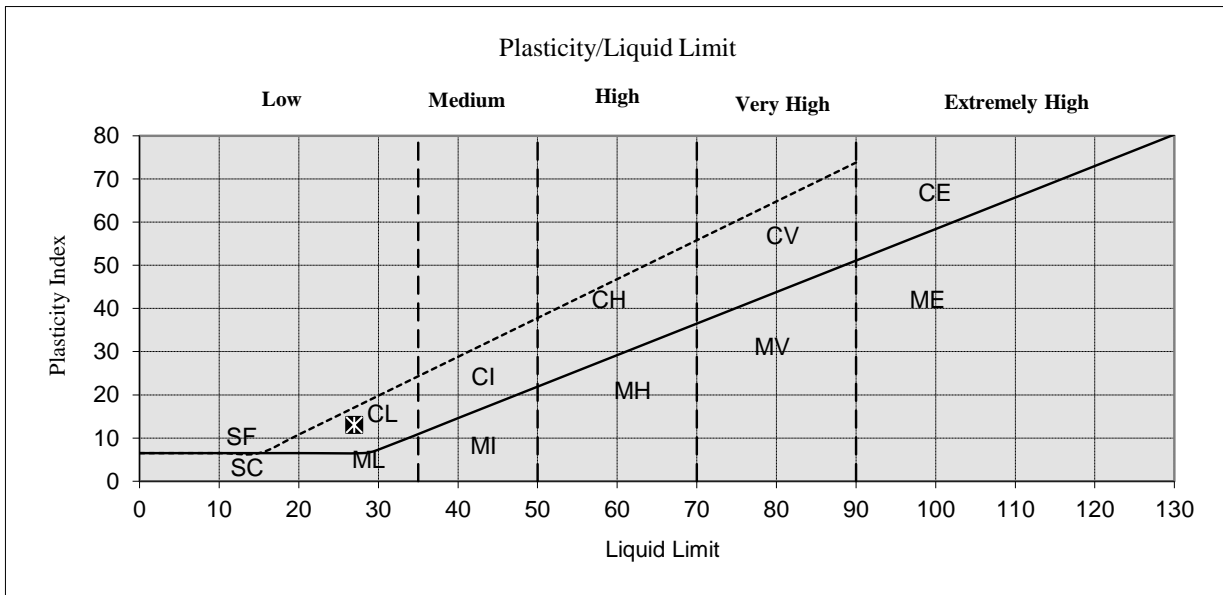
**TESTCONSULT LIMITED**  
 Ruby House, 40A Hardwick Grange, Warrington WA1 4RF  
 Tel (01925) 286880 Fax (01925) 286881



**LABORATORY TEST REPORT**  
**LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 Cl 4.4,5.3**

<b>Site:</b>	Church Raike, Chipping	<b>Job No.:</b>	-
<b>Client:</b>	Brownfield Solutions Ltd	<b>Lab Ref No.:</b>	SA13268/02
	Wychwood House	<b>Sample Ref.:</b>	WS2 @ 1.50m
	1 Queen Street	<b>Date Received:</b>	20/02/2013
	Northwich CW9 5JL	<b>Date Tested:</b>	27/02/2013
<b>Originator:</b>	<b>Anthony Hewitt</b>	<b>Date Reported:</b>	27/02/2013

Sampling Certificate	No
Sampled By	Client
Sample Type	Disturbed
Sample Preparation Method	Washed
<b>MATERIAL</b>	<b>Brown Gravelly Clay</b>
Retained 425 micron (%)	30
Natural Moisture Content (%)	12
Liquid Limit (single point)(%)	27
Plastic Limit (%)	14
Plasticity Index	13



**Approved Signature**  
**TESTCONSULT LIMITED**

Gary Foy, Laboratory Manager;  Marcus Baker, Operations Manager;  Liam Williams, Operations Manager



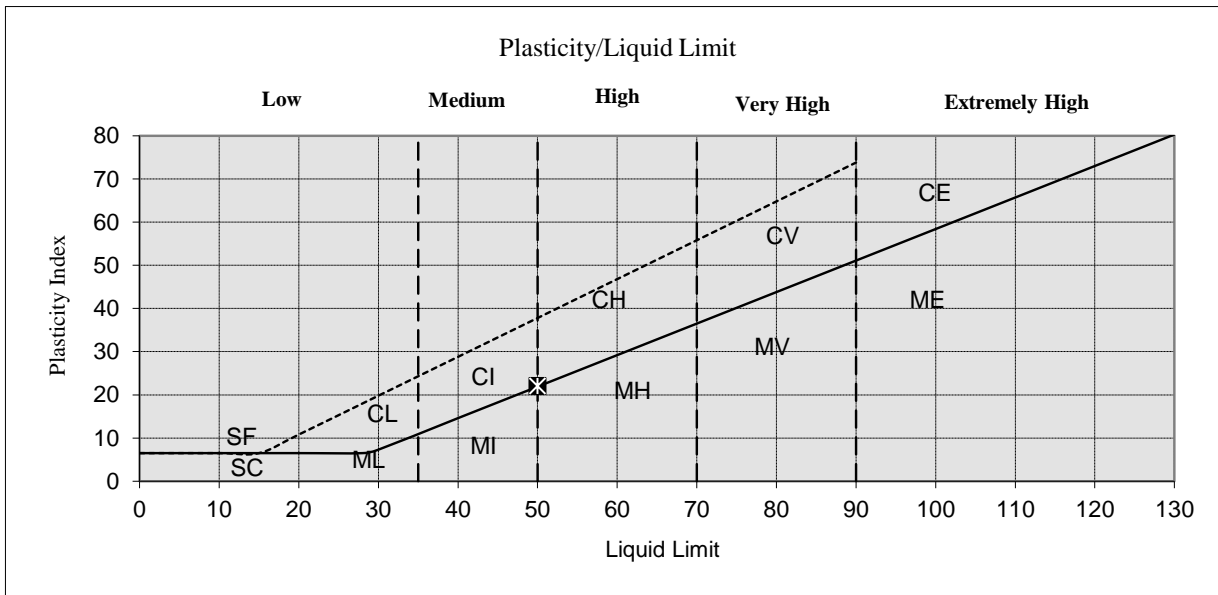
**TESTCONSULT LIMITED**  
 Ruby House, 40A Hardwick Grange, Warrington WA1 4RF  
 Tel (01925) 286880 Fax (01925) 286881



**LABORATORY TEST REPORT**  
**LIQUID & PLASTIC LIMIT TESTS BS 1377: Part 2: 1990 Cl 4.4,5.3**

<b>Site:</b>	Church Raike, Chipping	<b>Job No.:</b>	-
<b>Client:</b>	Brownfield Solutions Ltd	<b>Lab Ref No.:</b>	SA13268/06
	Wychwood House	<b>Sample Ref.:</b>	WS7 @ 0.50m
	1 Queen Street	<b>Date Received:</b>	20/02/2013
	Northwich CW9 5JL	<b>Date Tested:</b>	27/02/2013
<b>Originator:</b>	<b>Anthony Hewitt</b>	<b>Date Reported:</b>	27/02/2013

Sampling Certificate	No
Sampled By	Client
Sample Type	Disturbed
Sample Preparation Method	Washed
<b>MATERIAL</b>	<b>Brown Sandy Clay</b>
Retained 425 micron (%)	25
Natural Moisture Content (%)	30
Liquid Limit (single point)(%)	50
Plastic Limit (%)	28
Plasticity Index	22



**Approved Signature**  
**TESTCONSULT LIMITED**

Gary Foy, Laboratory Manager;  Marcus Baker, Operations Manager;  Liam Williams, Operations Manager

## APPENDIX D Contaminated Land Screening Levels

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## **Contaminated Land Screening Values**

In assessing the potential for contamination Brownfield Solutions Limited (BSL) follows UK guidance and current best practice.

### **General**

The current recommended method for assessing contamination is on the basis of:

#### **Source-Pathway-Receptor**

Where any one of these "pollution linkages" is absent there is deemed to be no risk.

Fundamentally receptors can be considered as humans and controlled waters (surface and ground waters).

The purpose of using screening levels is to have a simple means of assessing the potential contamination of a site and to inform decisions on whether further investigation is warranted or whether an option to undertake clean up based on the data to hand is cost effective.

### **Human Health**

Current UK guidance is provided by DEFRA and the Environment Agency(EA). Publications forming part of the guidance include; CLEA Model, toxicological reports and soil guideline values (SGV), collectively referred to as the CLEA Guidance. The CLEA Guidance has included a number of publications which have provided initial screening values for soil contamination based on standard land uses and soil assumptions.

CLEA guidance has gone through a number of revisions, all of the original SGV's that were published have been withdrawn and publication of new SGV's started in 2009. The preference from the EA is that site specific screening levels are used wherever possible. Due to numerous factors it is not always possible to utilise site specific values. In these instances BSL uses the following data sources in the order of preference given below:

- Current UK SGV's
- CIEH GAC values (derived by LQM)
- Withdrawn UK SGV's
- Guidance from other European countries
- Guidance from the rest of the World.

### **Controlled Waters**

The impact of contamination on controlled waters is assessed by the comparison with Environmental Quality Standards (EQS). The EQS's cover a large number of compounds.

Where certain compounds are not covered by the EQS these are commonly compared to the UK Drinking Water Standards (DWS).

### **Further Assessment**

When screening values are exceeded then further consideration is required. This could include the use of simple measures to break the pollution pathway and mitigate the risk, further more detailed investigation, including the deriving of site specific values to better define the risk and to design appropriate remedial measures.

## APPENDIX E Limitations

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## Limitations

This ground investigation was conducted and has been prepared for the sole internal use and reliance of the Client, Prospect (GB) and cannot be relied upon or transferred to any other parties without the express written authorisation of BSL. If an unauthorised third party comes into possession of this report they rely on it at their risk and the authors owe them no duty of care or skill.

The findings and opinions conveyed via the desk study within this report are based on information obtained from a variety of sources as detailed within this report, which BSL believes are reliable. In addition if information has been used from third parties and in particular other investigations and reports this information has been used in good faith. BSL cannot and does not guarantee the authenticity or reliability of third party information it has relied upon.

The investigation carried out on the site has been conducted to provide the best information and assessment on the ground conditions within site access and budgetary constraints. Exploratory holes only investigate a small area in relation to the overall site area and can therefore only provide a general indication of overall site conditions. Therefore the findings, opinions, geotechnical and environmental recommendations within this report are based on the ground conditions encountered at each location. It should be noted that different ground conditions may exist that have not been identified within this investigation.

The occurrence of and depths to groundwater may vary seasonally due to changes in weather, it should be noted that any observations and recommendations made on groundwater within this report are based on a select number of site visits over a limited period of time and may not be fully representative of groundwater conditions on the site.

Current UK guidance and legislation has been used in the geotechnical and environmental assessment of the site, BSL is not liable for any subsequent changes in the guidance and legislation.

The recommendations within this report are based upon the proposed site end use provided to BSL at the time of the investigation. If the end use or development layout changes from the proposal then the recommendations may change or become invalid.

Although every effort has been made to position exploratory holes in the least sensitive areas of the site, exploratory hole positions were located approximately as part of this investigation and no guarantee can be given as to their accuracy. Consideration should be given to the possibility that exploratory holes excavated as part of this investigation and indeed any previous ground investigation work by others may be encountered beneath or within the influence of individual foundations. BSL cannot be held responsible for structural failures caused by the location of foundations of any form of structure within the influence of exploratory holes.

No existing manhole covers were lifted or drainage runs inspected during the course of this ground investigation. The site plans enclosed in this report should not be scaled off.