



Newstead Road, Athersley, Barnsley
Phase 2 Site Investigation Report
S130805/SI
Leeds and Yorkshire Housing Association

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PHASE 2 SITE INVESTIGATION REPORT

NEWSTEAD ROAD, ATHERSLEY, BARNSELY

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Revision	Date	Prepared By	Checked By
Final	OCTOBER 2013	D SIMPSON	S J FISK
			

1 EXECUTIVE SUMMARY

Site Address	Newstead Road, Athersley, Barnsley
Site Description	The site currently comprises a public open space made up of maintained grassland. Within the grassland are signs of made ground including brick rubble and tarmac
Fieldwork	• 6no small percussive boreholes to 4.0mbgl • 8no machine excavated trial pits to a maximum of 2.10mbgl
Ground Conditions	• Made ground was encountered in all of the boreholes to a maximum depth of 2.15mbgl (BH5). Generally from ground level the made ground comprised grass over sandy topsoil to depths of between 0.20m and 0.6mbgl. Limestone fill was noted in BH's 5 and 6 to depths of between 0.3 and 0.4mbgl. Underlying the topsoil sandy clay fill was proven to rockhead in BH's 1, 3, 4 and 5 at depths of between 1.2 and 2.15mbgl. Within BH's 2 and 6 the clay fill was present to 1.2 and 0.6mbgl respectively. In the trial pits made ground was proven to depths of between 0.25 and 1.3mbgl. The made ground generally comprised sandy topsoil over gravelly clay fill. Locally within TP5 and TP7 granular fill underlay the topsoil. In TP6 the made ground comprised reworked clay fill to 1.2mbgl over topsoil to 1.3mbgl. Made ground to a maximum depth of 1.00mbgl and generally comprising topsoil over localised clay and granular fill. • In BH's 2 and 6 stiff becoming very stiff sandy clay underlay the clay fill to rockhead at depths of 4.0 and 2.25mbgl respectively. Within the trial pits natural ground comprised stiff sandy gravelly clay was proven to the base of each trial pit. In TP1 sandstone was encountered at 1.55mbgl. • Groundwater was not recorded within the boreholes or trial pits except TP3 where slight seepage was noted at 1.7mbgl within the natural slightly gravelly clay.
Contamination Testing Results	• From the 3no samples of made ground subject to testing no raised levels of metals, semi-metals, non-metals and inorganic determinands were recorded. • No asbestos fibres noted within the samples subject to screening.
Contamination Analysis	• No long term risk to human health. • Made ground should be classed as slightly contaminated with respect to construction workers with localised contaminated material in the vicinity of BH5. • Given the low contamination profile of the site, the predominantly cohesive nature of the substrata across the site and the lack of significant groundwater encountered during the investigation the risk to controlled waters is considered low. • The topsoil and sub-soil materials should be stripped and screened of deleterious material such as brick and concrete and reused. The screened topsoil and sub-soil should be stockpiled separately on site and re-tested prior to being placed within soft landscaping areas. The deleterious material may be placed beneath areas of permanent hardcover such as parking areas or within building footprints. Within soft landscaping areas in the vicinity of BH5 a clean cover system should be implemented comprising a minimum of 200mm of clean screened topsoil over 300mm of clean screened sub-soil. • With respect to utility suppliers, arsenic and pH were noted to be raised above the relevant threshold values. All services should be laid in clean trenches as a minimum and consultation with service providers is recommended. • Sub surface concrete should be designed to DS-1 ACEC (Class AC-2z). This assumes mobile groundwater conditions.
Ground Gas Results & Analysis	• Ground gas monitoring is currently underway and will be reported as an addendum to this report.
Contamination Risk Assessment	Based on the information contained in this report, it is the opinion of Solmek that the site represents a low environmental risk.
Environmental Protection Act 1990	For the site to be designated as contaminated under Part 2A of the EPA 1990, a proven source-pathway-receptor linkage has to be present. No such linkage has yet been proven; however on site investigation works are proposed.
Geotechnical Testing Results	• Shallow cohesive deposits firm to stiff (65-170kPa). • Granular deposits medium dense (SPT N values 19 to 25). • Cohesive materials on site have a medium volume change potential. • Low levels of water soluble sulphates and slightly alkaline conditions.
Geotechnical Analysis & Foundation Recommendations	Based on a shear strength of 85kN/m² a safe bearing capacity of 200kN/m² has been determined for 0.60m wide strip foundations placed on the natural clay at depths of around 1.2mbgl. Where footings cross differing founding strata the strip footings should be reinforced to prevent excessive differential settlement. Excavations may require shoring where shallow granular deposits are encountered. Allowances for dewatering should be made due to the localised groundwater identified within the granular deposits.

2 INTRODUCTION

2.1 Authorisation

The site investigation described in this report was carried out by Solmek to the instructions of Acanthus WSM Architects on behalf of Leeds and Yorkshire Housing Association on a parcel of land off Newstead Road, Athersley, Barnsley.

Sources of information, including previous work undertaken at the site, are detailed below:

- *Solmek Phase 1 Desk Study Report (S130805/DS, August 2013).*

Reference should be made to the above report for details of the site's history and environmental setting.

2.2 Scope of Works

The proposed development of the site is to involve the construction of residential housing. The final development will also include hardstanding in the form of access road, car parking and areas of soft landscaping as residential gardens. A drawing showing the site is included in Appendix A (Figure 1).

A geotechnical and environmental investigation including a ground gas risk assessment was requested. The fieldwork and testing was generally carried out according to the recommendations of BS5930: 1999 "Code of Practice for Site Investigations" and all stratum descriptions are as recommended in that publication. The information provided in this report is based on the investigation fieldwork, and is subject to the comments and approval of the various regulatory authorities.

There may be other conditions prevailing on the site which have not been disclosed by this investigation and which have not been taken into account by this report. Solmek reserve the right to alter conclusions and recommendations should further information be available or provided. Any schematic representation or opinion of the possible configuration of ground conditions between exploratory holes is conjectural and given for guidance only and confirmation of intermediate ground conditions should be considered if deemed necessary.

3 SITE DESCRIPTION AND FIELDWORK

The centre of the site is located at OS Grid Ref 434510, 409890 and covers an area of approximately 0.73Ha. The site is situated within a residential area of north Barnsley off Newstead Road.

The site currently comprises a public open space made up of maintained grassland. Within the grassland are signs of made ground including brick rubble and tarmac. Along the western edge of the site is an access off Newstead Road, which leads to a tarmac area running parallel with the western boundary. Within the tarmac area are a number of surface water drains along a kerbed edge of the tarmac. There are also a number of street lights situated on the eastern boundary of the tarmac. A variety of semi mature deciduous trees including sycamore and maple are situated along the western boundary of the site. Situated north of the access off Newstead Road is a telegraph pole with cables extending west away from the site to the neighbouring residential properties. A mast is present towards the south of the site surrounded by a steel fence of approximately 2m in height. The area has a gentle slope from west to east with the proposed development site being situated on a plateau of possible made ground. To the north east of the site are a number of manholes suggesting services beneath the development area. The northern boundary of the site is bordered by allotments separated by a steel fence. Along this steel fence are a variety of mature poorly maintained bushes extending into the site.

3.1 Fieldwork

The fieldwork was carried out on 19th August 2013. Six small percussive boreholes (BH1 to BH6 inclusive) were drilled to depths of up to 4.0m below ground level (bgl) and eight machine dug trial pits (TP1 to TP8 inclusive) were excavated to a maximum depth of 2.10mbgl. Percolation trials were undertaken within TPs 1, 2 and 3. A plan showing the location of all the boreholes and trial pits undertaken can be found in Appendix A, Figure 1.

Standard penetration tests (SPT) were undertaken at various depths within the small percussive boreholes and disturbed samples were retrieved for laboratory testing. Descriptions of the strata encountered in the boreholes and trial pits together with details of testing, sampling and groundwater are presented in Appendix B of this report.

Ground gas monitoring installations were placed within three of the boreholes (BH1, BH2 and BH5) during the investigation. Three rounds of gas monitoring are currently being undertaken, the results of which will be provided as an addendum to this report.

4 GROUND CONDITIONS

A summary of the ground conditions encountered is given below.

4.1 Made Ground

Made ground was encountered in all of the boreholes to a maximum depth of 2.15mbgl (BH5). Generally from ground level the made ground comprised grass over sandy gravelly topsoil to depths of between 0.20m and 0.6mbgl. Limestone fill was noted in BH's 5 and 6 to depths of between 0.4 and 0.3mbgl respectively. Underlying the topsoil sandy clay fill was proven to rockhead in BH's 1, 3, 4 and 5 at depths of between 1.2 and 2.15mbgl. Within BH's 2 and 6 the clay fill was present to 1.2 and 0.6mbgl respectively.

In the trial pits made ground was proven to depths of between 0.25 and 1.3mbgl. The made ground generally comprised sandy topsoil over gravelly clay fill. Locally within TP4, TP5 and TP7 granular fill underlay the topsoil. In TP6 the made ground comprised reworked clay fill to 1.2mbgl over topsoil to 1.3mbgl.

4.2 Natural Deposits

In BH's 2 and 6 stiff becoming very stiff sandy clay underlay the clay fill to rockhead at depths of 4.0 and 2.25mbgl respectively. Within the trial pits natural ground comprised stiff sandy gravelly clay was proven to the base of all trial pits except TP1 where sandstone was encountered at 1.55mbgl.

4.3 Groundwater

Groundwater was not recorded within the boreholes or trial pits except TP3 where slight seepage was noted at 1.7mbgl within the natural slightly gravelly clay. It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

5 CONTAMINATION TESTING RESULTS

The proposed development of the site is to involve the construction of residential housing. The final development will also include hardstanding in the form of access roads and car parking along with areas of soft landscaping as gardens.

5.1 Contamination Testing

To provide information upon the possibility of ground contamination three samples of made ground deposits at depths of between 0.30m and 0.80mbgl were subject to chemical contamination analysis. A suite of metals, semi-metals, non-metals and inorganic determinands was undertaken.

Asbestos soil screening was also undertaken on the samples.

5.2 Test Results

Given the sites end use, the test results have been compared to a series of Solmek Generic Assessment Criteria (GAC) thresholds based on a residential land use with home grown produce. Solmek GAC were

derived using the EA CLEA Software Version 1.06 (May 2011) which produce Model Output Reports to compare the contamination concentrations against. In the absence of Solmek GAC values, WS Atkins Soil Screening Values (SSV) for residential land use with home grown produce have been used (which have been derived using EA CLEA Version 1.06, May 2011).

Solmek used the following input parameters within the CLEA Model to generate the GAC values:

- **Land use:** Residential with home grown produce
- **Receptor:** Female (Res)
- **Building Type:** Semi-detached house
- **Soil Type:** Sandy clay loam
- **Soil pH:** 6.1 (lowest recorded value)
- **Soil Organic Matter:** 1.5% (lowest recorded value)

The test results are presented in Appendix C, and a summary is provided below in Table 1.

The CLEA UK Model Output Reports have been included in Appendix C. The CLEA Model output reports show three assessment criteria (Oral, Inhalation and Combined). Where all three boxes are shaded red the threshold values have been assumed to be the soil saturation limit.

TABLE 1: SUMMARY OF INORGANIC CONTAMINATION TEST RESULTS

Determinand	Units	Number of Samples Tested	Number Above Detection Limit	Minimum Level	Maximum Level	Threshold Value	Number Exceeding Threshold
Metals							
Cadmium	mg/kg	3	3	0.6	0.9	5.17	0
Chromium (Total)	mg/kg	3	3	23	430	3000	0
Hexavalent Chromium	mg/kg	3	0	<1.0	-	4.25	0
Copper	mg/kg	3	3	17	24	2360	0
Lead	mg/kg	3	3	18	24	276*	0
Mercury (Inorganic)	mg/kg	3	2	<0.05	0.05	169	0
Nickel	mg/kg	3	3	10	48	127	0
Zinc	mg/kg	3	3	43	85	2860	0
Semi-metals and non-metals							
Arsenic	mg/kg	3	3	5.6	15	32.4	0
Boron	Mg/kg	3	1	<0.2	0.3	10.3	0
Selenium	mg/kg	3	1	<0.5	0.7	350	0
Inorganic chemicals							
Cyanide (Total)	mg/kg	3	0	<0.1	-	1.49	0
Sulphate (WS)	mg/l	3	3	43	95	500**	0
Sulphide	mg/kg	3	3	16	93	250***	0
Other							
pH	pH	3	3	6.1	10.2	<5	0
Phenol	mg/kg	3	0	<0.3	-	254	0
* Atkins SSV (GAC), CLEA Software Version 1.04 ** BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground' *** EA Lower Tier Threshold Values							

5.3 Metals, Semi Metals and Non Metals

From the three samples tested, all concentrations of the determinands were below the relevant thresholds for long term risk to human health.

5.4 Inorganic Chemicals

Soluble sulphates (potentially aggressive to foundation concrete) were recorded between 43 and 95mg/l, therefore, none of the results are above the BRE Special Digest One threshold value of 500mg/l.

The results of the pH testing were between 6.1 and 10.2. These pH levels are consistent with slightly acidic to highly alkaline conditions (the latter contained limestone fill which accounts for the alkalinity).

5.5 Asbestos

No asbestos fibres were identified in the samples subject to laboratory screening.

5.6 Environmental Protection Act 1990: Part 2A Revised Statutory Guidance (April 2012)

This revised document explains how the Local Authority should decide if land, based on a legal interpretation, is contaminated. The document replaces the previous guidance given in Annex 3 of DEFRA Circular 01/2006, issued in accordance with section 78YA of the 1990 Environmental Protection Act.

The main objectives of the Part 2A regime are to *"identify and remove unacceptable risks to human health and the environment"* and to *"seek to ensure that contaminated land is made suitable for its current use"*. Part 2A uses a risk based approach to defining contaminated land whereby the "risk" is interpreted as *"the likelihood that harm, or pollution of water, will occur as a result of contaminants in, on or under the land"* and by *"the scale and seriousness of such harm or pollution if it did occur"*.

For a relevant risk to exist a contaminant, pathway and receptor linkage must be present before the land can be considered to be contaminated. The document explains that *"for a risk to exist there must be contaminants present in, on or under the land in a form and quantity that poses a hazard, and one or more pathways by which they might significantly harm people, the environment, or property; or significantly pollute controlled waters."*

A conceptual model is used to develop and communicate the risks associated with a particular site.

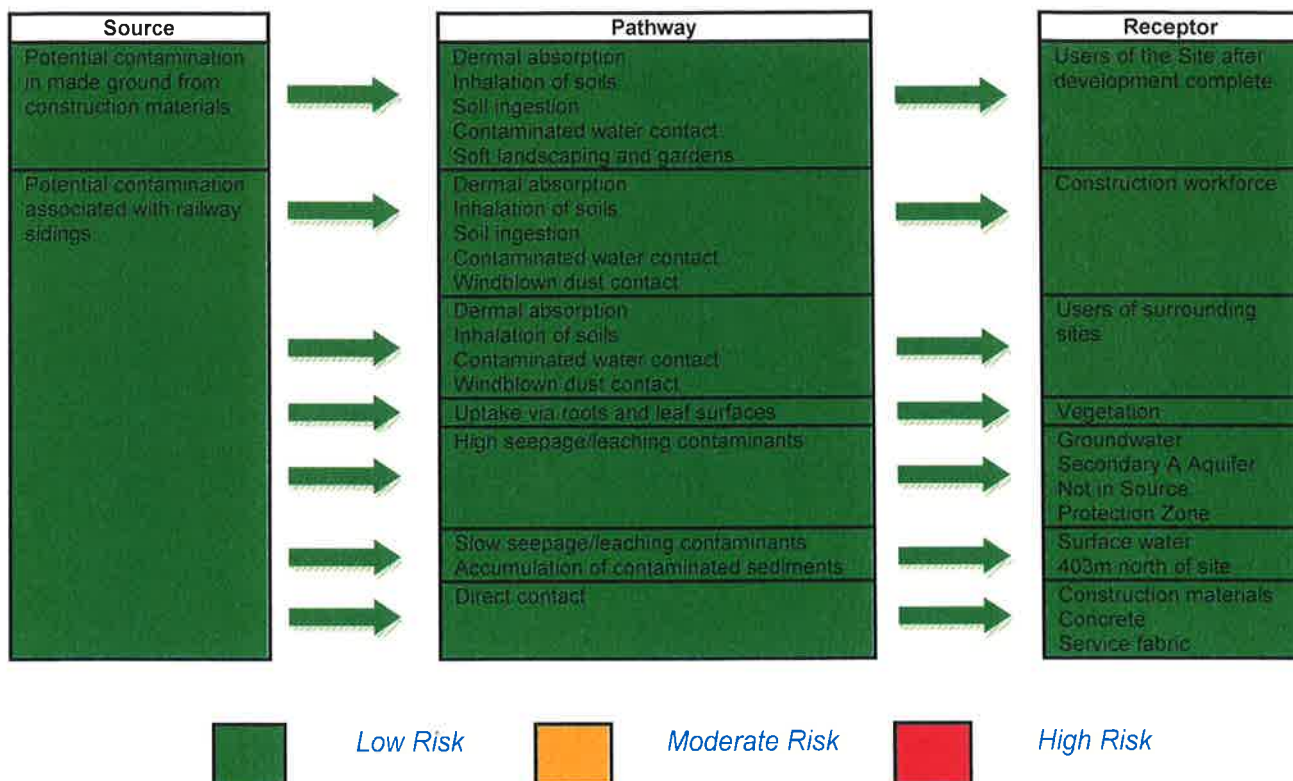
To determine if land is contaminated the local authority use various categories from 1 to 4. Categories 1 and 2 include *"land which is capable of being determined as contaminated land on grounds of significant possibility of significant harm to human health."* Categories 3 and 4 *"encompass land which is not capable of being determined on such grounds"*.

See Appendix E for additional notes on contamination guidelines.

6 CONCEPTUAL MODEL AND CONTAMINATION ANALYSIS

The contamination conceptual model in Table 2 identifies the potential pollution linkages present on site based on source – pathway – receptor relationships.

TABLE 2: CONCEPTUAL MODEL



In general terms, the users of the site, construction workers, users of the surrounding sites, vegetation, surface water, groundwater, and construction materials are considered to be **potentially** at risk from contamination in the soils on site as pollution linkages may be present for each receptor.

6.1 Users of the Site Once Development is Complete

To establish if the levels of contaminants present on site may pose a risk to the health of the future users of the site the results of the contamination testing have been compared to a series of Solmek GAC thresholds based on a residential land use with home grown produce. The results indicate that the concentrations of the metals, semi-metals and non-metals within the made ground are low and are below the threshold values for long term risk to human health.

It is considered that the contamination levels on site are unlikely to pose a risk to the current and future users of the site, and remediation is not required for the building footprints and other areas of hardstanding such as access roads.

If any zones of odorous, brightly coloured or suspected contaminated ground are encountered then work should cease in that area until the material has been tested. The results of the tests will determine whether or not remediation will be required.

The current legislation on waste involves the categorization of materials into inert waste, non reactive hazardous wastes and hazardous wastes. The determination of the category depends on DEFRA landfill directive waste acceptance criteria (WAC) testing. Material taken off site may be subject to WAC by the appropriate waste disposal company.

6.2 Construction Workers and Users of Surrounding Sites

Short term human exposure to contaminants present in soils can occur via several pathways during the construction and ground works phase of the development. These include dermal absorption after contact with contaminated ground, inhalation of soil or dust (including windblown dust), inhalation of volatised compounds, inadvertent soil ingestion and contact with contaminated groundwater.

Using guidance in the HSE publication *"Protection of Workers and the General Public during the Development of Contaminated Land"*, the made ground can generally be classed as slightly contaminated due to raised concentration of nickel. Within the limestone fill sample from BH5 localised contaminated levels of sulphide, chromium and pH were recorded. It is considered that the levels of contamination may pose a risk to construction workers and users of surrounding sites. Therefore it is recommended that appropriate PPE in accordance with HSE and Environment Agency guidance is adopted for the duration of the contractor works and good practice is adopted to minimise the release of potential contaminants during ground works.

During dry weather, any excavations may require clean water to be sprinkled at shallow depth to prevent excess dust escaping to off-site receptors.

6.3 Vegetation

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, nickel, and zinc.

To establish if the levels of contaminants present on site may pose a risk to vegetation the results of the contamination testing have been compared to a series of threshold values published in *"Code of Good Agricultural Practice for the Protection of Soil"*. No elevated concentrations of the phytotoxic determinands were noted within the samples subject to testing apart from one chromium level (BH5).

Soft landscaping is to be included within the development as residential garden areas. The topsoil and sub-soil materials should be stripped and screened of deleterious material such as brick and concrete and reused. The screened topsoil and sub-soil should be stockpiled separately on site and re-tested prior to being placed within soft landscaping areas. The deleterious material may be placed beneath areas of permanent hardcover such as parking areas or within building footprints. Within soft landscaping areas in the vicinity of BH5 a clean cover system should be implemented comprising a minimum of 200mm of clean screened topsoil over 300mm of clean screened sub-soil.

A minimum of 200mm of topsoil material should be present in all other soft landscaping areas. If insufficient material is available on site for re-use then suitable topsoil should be imported from a reputable source.

6.4 Ground and Surface Water

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology.

The site does not lie within a Source Protection Zone and the solid geology is classified as a Secondary A Aquifer. The nearest surface water feature lies 403m to the north of site. Groundwater was not recorded within the boreholes or trial pits except TP3 where slight seepage was noted at 1.7mbgl within the natural slightly gravelly clay. It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

Given the general low level of contamination noted within the samples subject to testing, the predominantly cohesive nature of the sub-soil and the limited shallow groundwater noted on site the risk to groundwater and surface water receptors from leaching of the contamination on site is considered to be low.

6.5 Construction Materials

Materials at risk from potential soil contamination include inorganic matrices such as cement and concrete and also organic material; e.g. plastics and rubbers. Acid ground conditions and elevated levels of sulphates can accelerate the corrosion of building materials. Plastics and rubbers are generally used for

piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

BRE Special Digest One: "*Concrete in Aggressive Ground*", 2005 3rd Edition has been used to assess the risks posed to underground concrete and to establish the design measures required to mitigate the risks. The results of the pH and sulphate tests fall into Class DS-1, ACEC (Class AC-2z) requirements for concrete protection. This assumes mobile groundwater conditions.

The levels of potential contaminants detected have been compared to thresholds supplied in the Water Regulations Advisory Scheme Guidance Note 9-04-03 "*The Selection of materials for Water Supply Pipes to be laid in Contaminated Land*". Based on the contamination test results concentrations of arsenic and pH were recorded that exceed the relevant threshold values. Consultation with the utility providers is recommended. As a minimum services should be placed within clean service trenches.

7 GROUND GAS ASSESSMENT

A period of three ground gas monitoring visits is currently underway and the results will be provided as an addendum to this report.

8 GEOTECHNICAL TESTING AND ANALYSIS

Samples taken from the boreholes underwent a series of geotechnical tests (BS 1377:1990) to aid foundation design and soil description. In addition, insitu Standard Penetration Tests (SPTs) were undertaken at regular intervals during drilling and in-situ hand shear vane testing was undertaken within the trial pits where cohesive material was encountered. The geotechnical results are presented in Appendix D.

8.1 Strength and Density

In-situ hand vane tests undertaken within the trial pits recorded shear strengths of 85 and 120+kPa, indicative of stiff conditions.

Within the cohesive deposits SPT N-values ranged between 19 and 40. Using the rule of thumb that five times the N-value approximates shear strength this equates to shear strengths of between 95 and 200kN/m², indicative of stiff to very stiff conditions.

8.2 Moisture Contents

Four samples recovered from the boreholes at depths of between 0.70 and 1.20mbgl were subject to moisture content tests. Moisture levels were recorded between 12% and 23%.

8.3 Atterberg Limit Determinations

Two Atterberg Limit Determination tests were out carried on samples of natural cohesive material to classify the fine grained soils. The results were compared to the Casagrande Chart published in BS 5930 and showed the samples to generally be clay of **low** plasticity. Two Atterberg Limit Determination tests were also out carried on samples of clay fill material. The results were compared to the Casagrande Chart published in BS 5930 and showed the samples to generally be clay of **intermediate** plasticity.

The Plasticity Indices of the natural clay ranged from 18 and 19 with moisture contents recorded above and below the corresponding plastic limits. The cohesive material can be assessed as having a **low** shrinkage potential in relation to NHBC Guidance Chapter 4.2.

8.4 Soluble Sulphate and pH Results

Two samples of soil from the boreholes were tested for acidity and soluble sulphate content to assess whether the material may be potentially aggressive to building fabric. The results of the testing for pH were 7.3 and 6.9 indicating slightly alkaline and nearly neutral conditions. Soluble sulphates were recorded at

concentrations of 84 and 170mg/l.

8.5 Percolation Testing

Percolation trials were undertaken within TPs 1, 2 and 3 during the site works. The testing was generally carried out in accordance with BRE Digest 365: Soakaway Design.

The trial pits were excavated, logged and then water was poured into the trial pits from a water bowser and depth measurements were taken at regular time intervals. Following completion of the percolation trials the trial pits were backfilled with arisings. The results of the field tests are presented in full within Appendix D.

The tests showed infiltration rates of between 0.819 and 1.34m/sec^{*10⁻⁶}, which indicates that the sub-strata on site are not suitable for soakways.

8.6 Foundations

Based on plasticity index results, all natural cohesive soils at the site should be regarded as being of low volume change potential. Foundations should therefore be placed at a minimum depth of 0.75m below original or finished ground level, whichever is the lower. However the depth to natural ground is generally in excess of this due to the overlying clay fill. Therefore it would be prudent to adopt deep strip footings founding on either the natural clay or rockhead.

Based on the lowest shear strength of 85kN/m² a safe bearing capacity of 200kN/m² has been determined for 0.60m wide strip foundations on the natural clay at depths of around 1.2mbgl. Providing the safe bearing capacity is not exceeded settlements have been calculated to be less than 25mm.

Reinforcement should be adopted within the foundations which span a change in strata to prevent differential settlement.

Foundations near existing or proposed trees should be deepened and provided with appropriate heave precautions in accordance with NHBC Standards Chapter 4.2.

It should be recognised that clay rich soils can deteriorate fairly rapidly on exposure, particularly in periods of wet weather and frost. It would be prudent to protect all exposed soils in foundation excavations with a concrete blinding layer, particularly if they are likely to remain open for extended period of time.

Prior to placing foundation concrete, obvious soft or loose spots should be removed and replaced with suitably recompacted hardcore or lean mix concrete. In addition, all excavations should be inspected to ensure that they fully penetrate areas of disturbed ground.

Sub-surface concrete should be Design Sulphate Class DS-1, with the site allocated an ACEC Classification of AC-2z.

Further advice should be sought from Solmek if unexpected ground conditions are encountered during redevelopment.

8.7 Excavation

Based on the nature of the ground conditions encountered, excavations should be within the capacity of normal earthworks plant. Stability of excavations is expected to be poor in the made ground and localised granular deposits but should improve within the natural cohesive deposits. Excavation sides should be designed, constructed and supported in accordance with the recommendations given in CIRIA Report No. 97: "Trenching Practice".

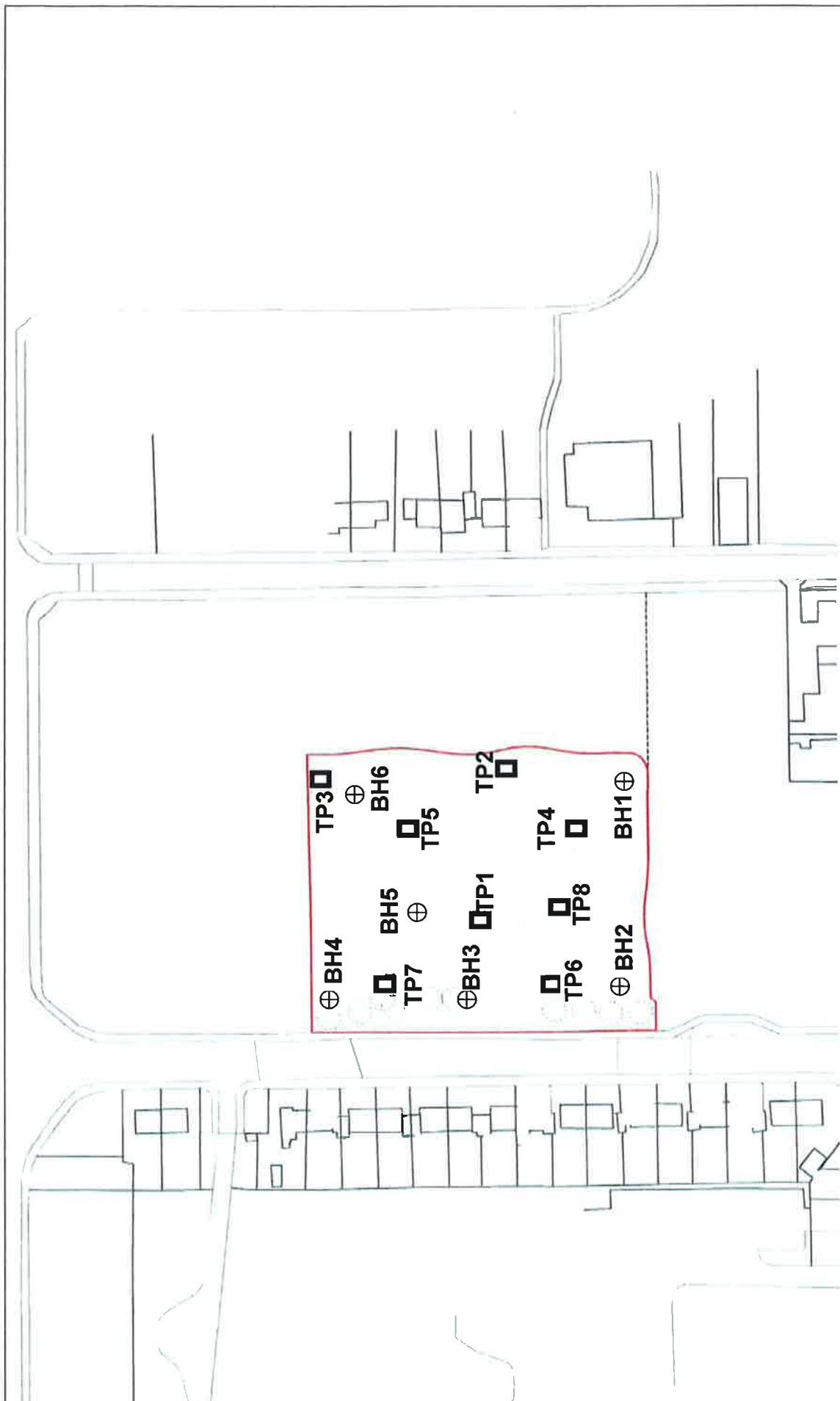
8.8 Groundwater

Groundwater was not recorded within the boreholes or trial pits except TP3 where slight seepage was noted at 1.7mbgl within the natural slightly gravelly clay. Based on the evidence gathered to date it is considered that allowances for dewatering may be required due to the groundwater seepage identified.

It should be noted the rapid rate of advancement of the exploratory holes may mask minor seepages and it should be borne in mind that water levels fluctuate with a number of influences including season, rainfall, dewatering and pumping activities. Therefore, water levels significantly higher than those found during this investigation may be encountered.

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APPENDIX A



CLIENT: LEEDS AND YORKSHIRE HOUSING ASSOCIATION			
PROJECT: NEWSTEAD ROAD, ATHERSLEY, BARNSELEY			
DRG NO: FIGURE 1			
TITLE: BOREHOLE AND TRIAL PIT LOCATION PLAN			SCALE: NTS
SOLMEK			

APPENDIX B

BOREHOLE LOG

Project Newstead Road, Athersley, Barnsley				BOREHOLE No BH1	
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	Sheet 1 of 1	
Contractor					

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)		
0.30-0.40	B					0.20	MADE GROUND: Sandy topsoil.	
						MADE GROUND: Brown sandy clay fill.		
0.70-0.80	B					(1.20)		
1.20-1.65	B					1.40		
1.20-1.65 1.20	J SPT	N=17					Dense weathered SANDSTONE.	
2.00-2.45	J					(1.05)		
2.00	SPT	N=34				2.45		
							Borehole refused.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered.
All dimensions in metres Scale 1:31.25			Client Leeds and Yorkshire Housing Association			Method/ Plant Used Mini Rig			Logged By DS		

GRD BOREHOLE LOG TEST S130805 GPJ AGSS ALL GDT 29/8/13

BOREHOLE LOG

Project Newstead Road, Athersley, Barnsley				BOREHOLE No BH2	
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	Sheet 1 of 1	
Contractor					

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick- ness)		
0.30-0.40	B	N=26				(0.60)	MADE GROUND: Light brown gravelly topsoil.	
0.70-0.80	B					0.60	MADE GROUND: Clay fill.	
1.20-1.65 1.20-1.65 1.20	B D SPT					1.20	Stiff becoming very stiff brown CLAY.	
2.00-2.45 2.00-2.45 2.00	B D SPT	N=19				(2.80)		
3.00-3.45 3.00-3.45 3.00	B D SPT	N=40				4.00		
						Borehole complete.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
All dimensions in metres Scale 1:31.25		Client Leeds and Yorkshire Housing Association		Method/ Plant Used Mini Rig		Logged By DS					

GRD_BOREHOLE_LOG TEST S130805.GPJ AGS3 ALL GDT 29/8/13

BOREHOLE LOG

Tel 01642607083
Fax 01642612355

Project Newstead Road, Athersley, Barnsley				BOREHOLE No BH3	
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()		
Contractor				Sheet 1 of 1	

SAMPLES & TESTS			Water	STRATA				Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thickness)	DESCRIPTION		
0.30-0.40	B					(0.40) 0.40	MADE GROUND: Light brown gravelly topsoil.		
0.70-0.80	B					(0.80) 1.20	MADE GROUND: Brown clay fill.		
1.20-1.65 1.20	D SPT	N=50+					Sampler refusal. Borehole complete.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered.
All dimensions in metres Scale 1:31.25			Client	Leeds and Yorkshire Housing Association			Method/ Plant Used	Mini Rig		Logged By	DS

GRD_BOREHOLE_LOG TEST S130805 GPJ AGS3 ALL GDT 29/8/13

BOREHOLE LOG

Project Newstead Road, Athersley, Barnsley				BOREHOLE No BH4	
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	Sheet 1 of 1	
Contractor					

SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)		
0.30-0.40	B	N=23			(0.30) 0.30	MADE GROUND: Sandy topsoil.		
						MADE GROUND: Clay fill with rubble.		
0.70-0.80	B			(1.30)				
1.20-1.65 1.20-1.65 1.20	B J SPT			1.60				
1.90-2.45 1.90	J SPT		N=33		(0.55) 2.15	Dense weathered SANDSTONE.		
						Borehole refused.		

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Casing Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered.

All dimensions in metres Scale 1:31.25	Client Leeds and Yorkshire Housing Association	Method/ Plant Used Mini Rig	Logged By DS
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GRD_BOREHOLE_LOG TEST S130805 GPJ AGSS ALL GDT 29/8/13

Tel 01642607083
Fax 01642612355

Tel 01642607083
Fax 01642612355

Tel 01642607083
Fax 01642612355

Tel 01642607083
Fax 01642612355

BOREHOLE LOG

Project Newstead Road, Athersley, Barnsley				BOREHOLE No BH6	
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()		
Contractor				Sheet 1 of 1	

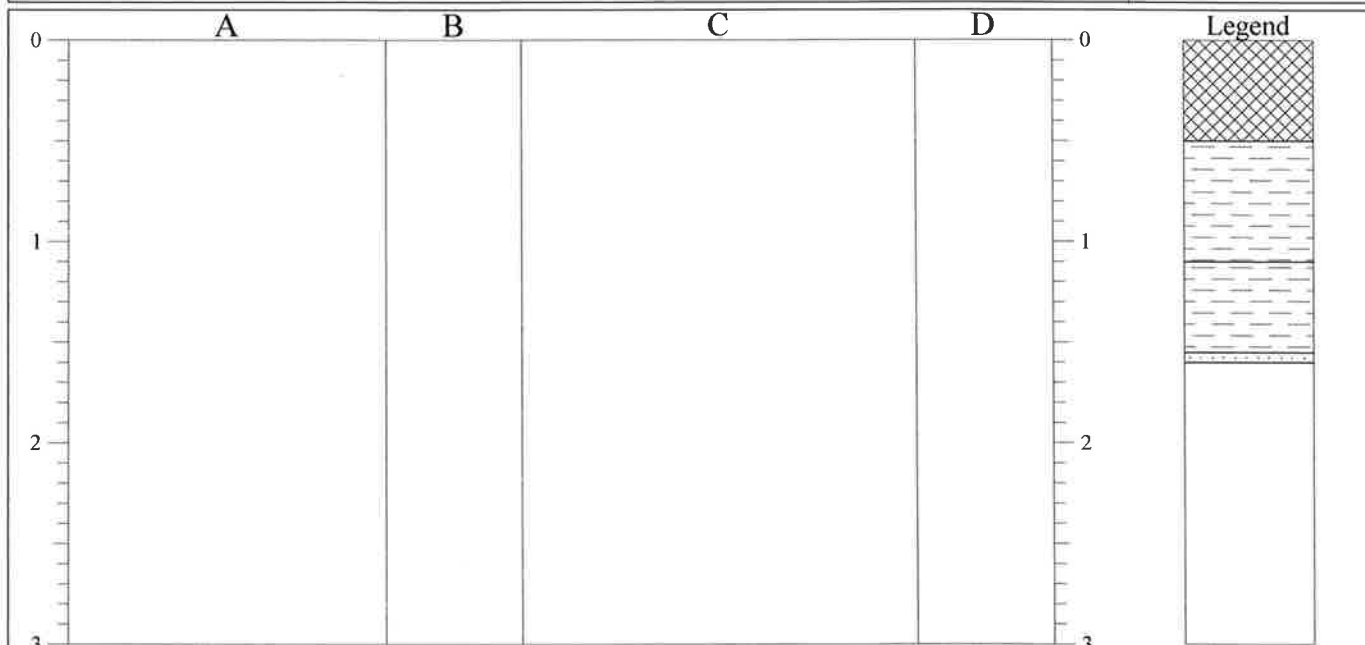
SAMPLES & TESTS			Water	STRATA			Geology	Instrument/ Backfill
Depth	Type No	Test Result		Reduced Level	Legend	Depth (Thick-ness)	DESCRIPTION	
0.30-0.40	B					(0.30) 0.30	MADE GROUND: Limestone fill.	
						(0.30) 0.60	MADE GROUND: Brown clay fill with rubble.	
0.70-0.80	B					(1.65)	Stiff becoming very stiff brown slightly sandy CLAY, occasional cobbles.	
1.20-1.65 1.20-1.65 1.20	B J SPT	N=21						
2.00-2.25 2.00	J SPT	N=50+				2.25	Borehole refused slightly weathered SANDSTONE.	

Boring Progress and Water Observations						Chiselling			Water Added		GENERAL REMARKS
Date	Time	Depth	Casing Depth	Dia. mm	Water Dpt	From	To	Hours	From	To	
											No groundwater encountered.
All dimensions in metres Scale 1:31.25			Client Leeds and Yorkshire Housing Association			Method/ Plant Used Mini Rig			Logged By DS		

GRD_BOREHOLE_LOG S130805 GPJ AGS3 ALL GDT 18/10/13

TRIAL PIT LOG

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP1
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.50		MADE GROUND: Sandy gravelly topsoil. Gravel is sub angular to sub rounded fine to coarse of brick and dolomite.	0.20	J	
0.50-1.10		Stiff grey to orangey brown sandy gravelly CLAY with cobbles. Gravel is sub angular to sub rounded fine to coarse of sandstone.	0.70	HV	=105kPa
1.10-1.55		Stiff brown to grey sandy gravelly CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone.	1.00 1.00	B HV	=120+kPa
1.55-1.60		Light brown SANDSTONE.			

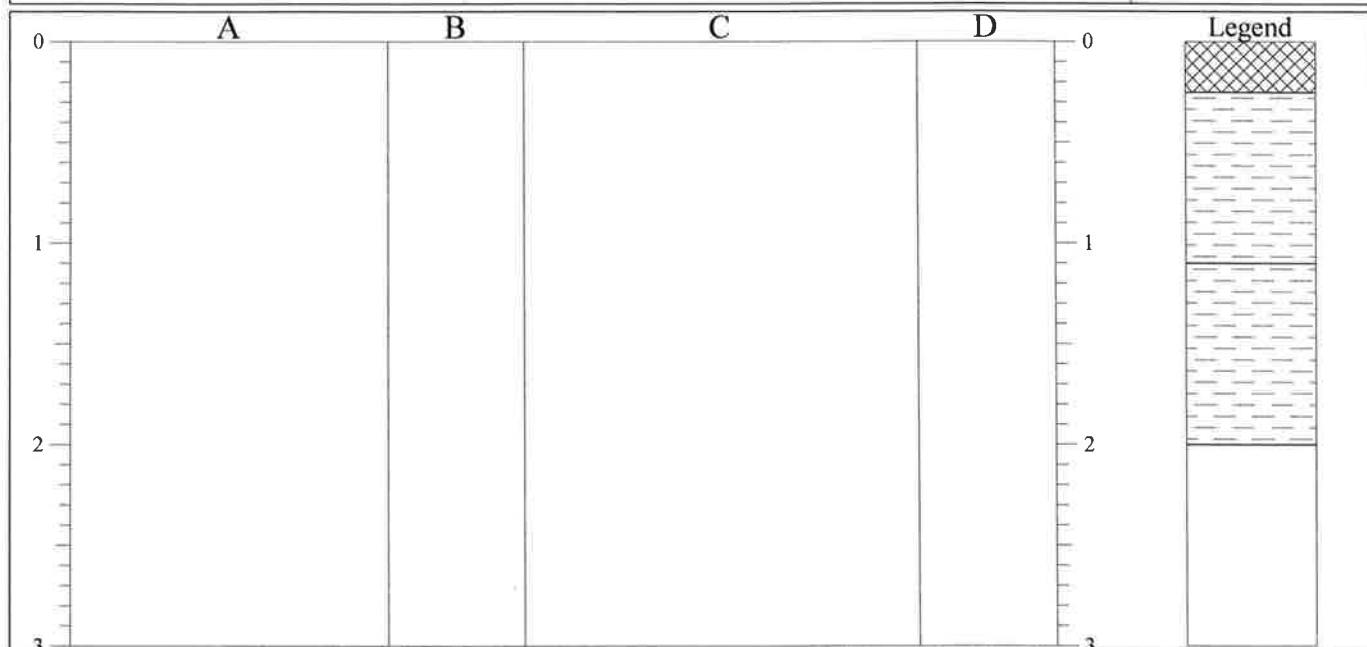
Shoring/Support: Stability: 	GENERAL REMARKS No groundwater encountered. Pit walls stable.

All dimensions in metres Scale 1:37.5	Client Leeds and Yorkshire Housing Association	Method/ Plant Used Excavator	Logged By RF
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GRD_TRIAL_PIT_LOG_S130805.GPJ AGS3 ALL GDT 3/9/13

TRIAL PIT LOG

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP2
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



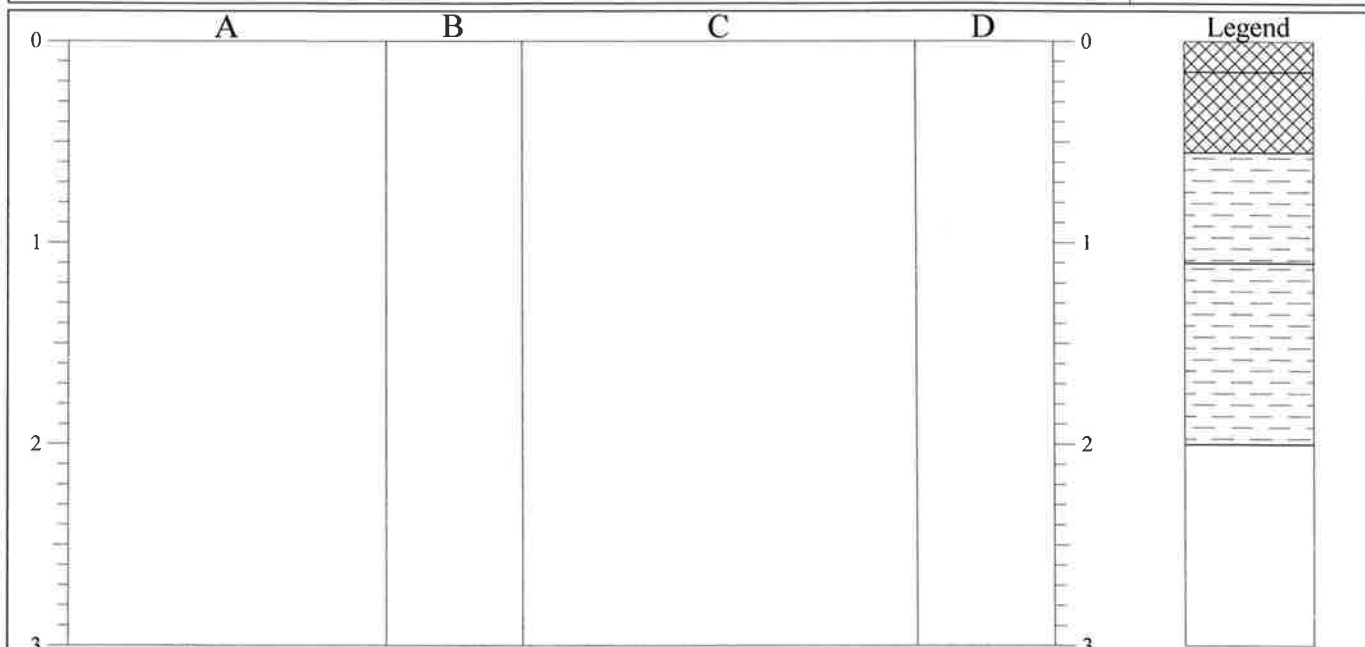
STRATA				SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests	
0.00-0.25		MADE GROUND: Dark brown topsoil.	0.10	J	=120kPa	
0.25-1.10		Stiff grey mottled orangey brown slightly gravelly slightly silty CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone.	0.50	HV		
			0.80	B		
			0.80	HV		
1.10-2.00		Brown to grey sandy gravelly CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone.	1.20	B		

Shoring/Support: Stability:				GENERAL REMARKS	
				No groundwater encountered. Pit walls stable.	
All dimensions in metres Scale 1:37.5					
Client	Leeds and Yorkshire Housing Association	Method/ Plant Used	Excavator	Logged By	RF

TRIAL PIT LOG

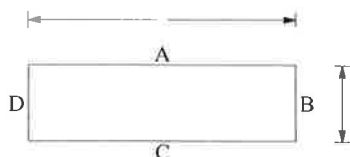
Tel 01642607083
Fax 01642612355

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP3
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



STRATA				SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests	
0.00-0.15		MADE GROUND: Brown topsoil.	0.10	J		
0.15-0.55		MADE GROUND: Brown gravelly clay fill. Gravel is angular to sub angular fine to coarse of brick rubble.	0.30	J		
0.55-1.10		Stiff orangey brown mottled grey silty CLAY, occasional bands of sand. Gravel below 0.8m.	0.60	HV	=85kPa	
1.10-2.00		Brown to grey slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone.	1.00	HV	=120+kPa	
			1.10	B		

Shoring/Support:
Stability:



GENERAL REMARKS

Groundwater seepage at 1.7m.
Pit walls stable.

All dimensions in metres
Scale 1:37.5

Client
Leeds and Yorkshire
Housing Association

Method/
Plant Used

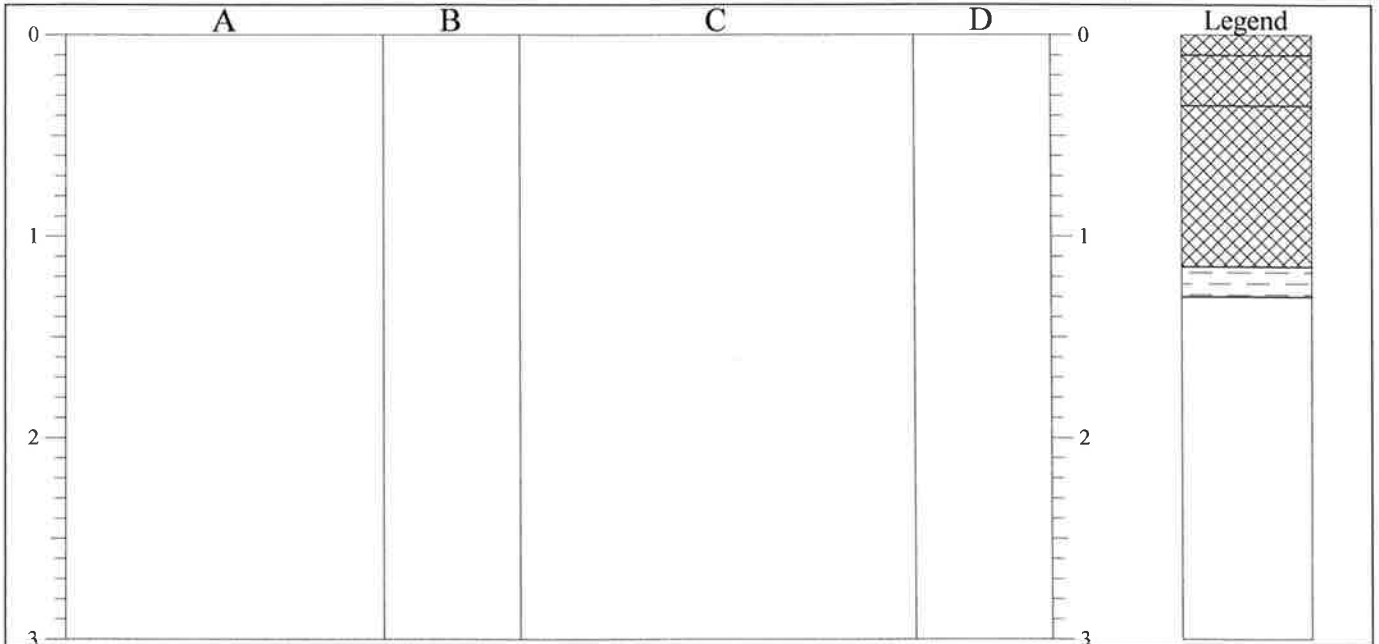
Excavator

Logged By
RF

TRIAL PIT LOG

Tel 01642607083
Fax 01642612355

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP4
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



STRATA				SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests	
0.00-0.10		MADE GROUND: Brown topsoil.				
0.10-0.35		MADE GROUND: Grey fine to coarse gravel fill with angular to sub angular limestone, brick and tarmac.	0.20	J		
0.35-1.15		MADE GROUND: Dark grey to brown sandy gravelly clay fill. Gravel is sub angular to sub rounded fine to coarse of sandstone.	0.40	CBR		=3%
			0.70	CBR		=3%
			1.00	CBR		=5.5%
1.15-1.30		Stiff orangey brown-grey sandy slightly gravelly CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone.	1.20	HV		=100kPa

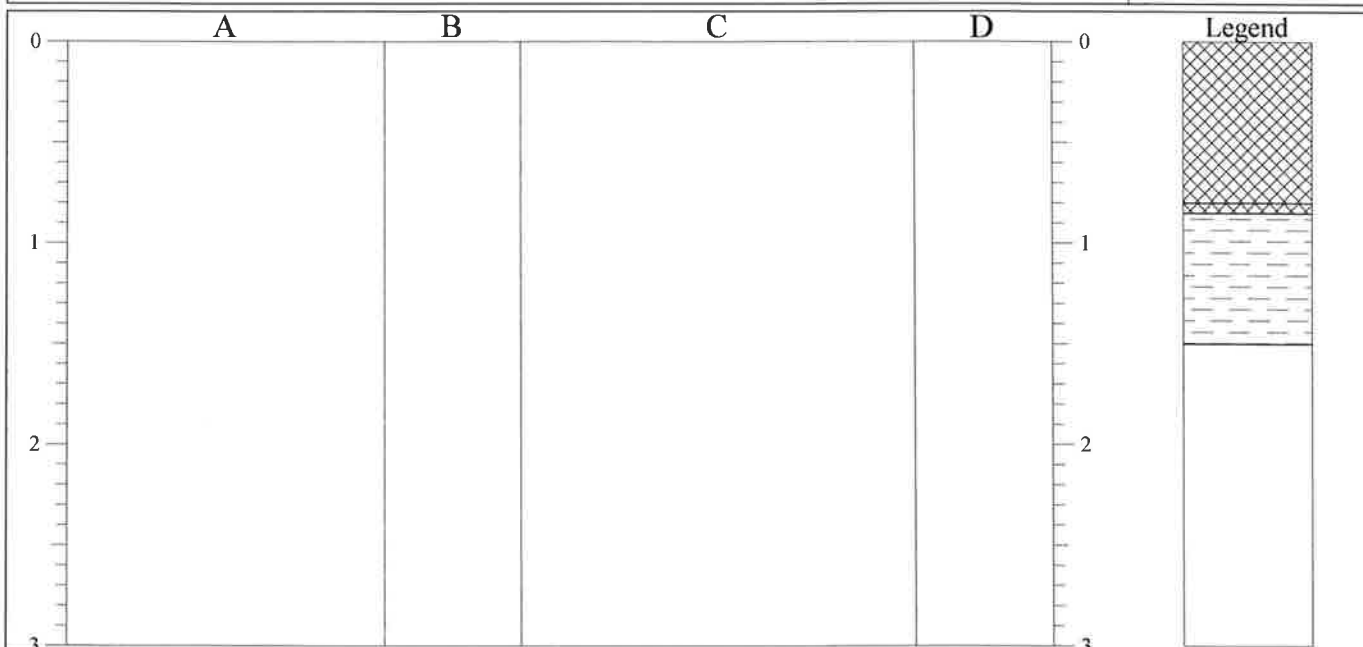
GRD_TRIAL_PIT_LOG S130805.GPJ AGS3 ALL GDT 3/9/13

Shoring/Support: Stability:				GENERAL REMARKS No groundwater encountered. Pit walls stable.	
All dimensions in metres Scale 1:37.5		Client Leeds and Yorkshire Housing Association	Method/ Plant Used Excavator	Logged By RF	

TRIAL PIT LOG

Tel 01642607083
Fax 01642612355

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP5
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



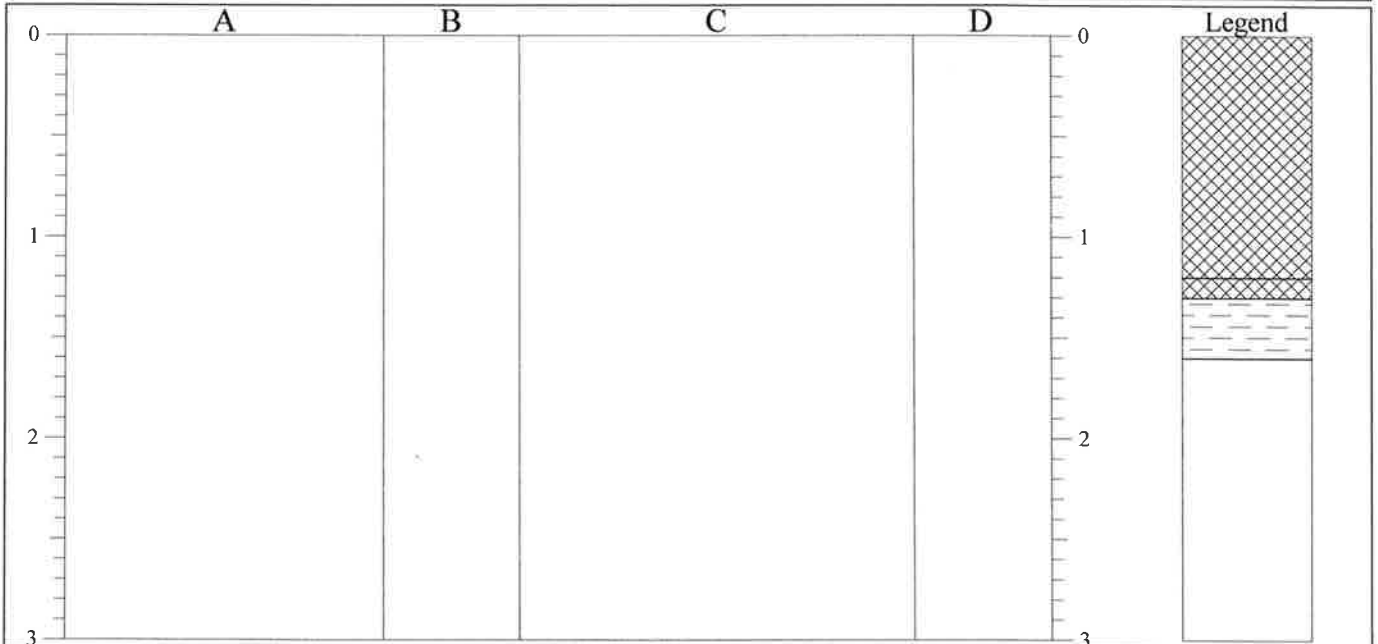
STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.80		MADE GROUND: Brown gravelly sandy topsoil.			
0.80-0.85		MADE GROUND: Light brown fine to coarse gravel fill of angular to sub rounded dolomite.	0.70	CBR	
0.85-1.50		Stiff orangey-grey slightly gravelly CLAY, occasional bands of sand. Gravel is sub angular to sub rounded fine to coarse of sandstone.	0.95	CBR	=6%
			1.20	HV	=120kPa

Shoring/Support: Stability:				GENERAL REMARKS No groundwater encountered. Pit walls stable.
All dimensions in metres Scale 1:37.5	Client Leeds and Yorkshire Housing Association	Method/ Plant Used Excavator	Logged By RF	

GRD_TRIAL_PIT_LOG_S130805.GPJ AGS3_ALL.GDT 3/9/13

TRIAL PIT LOG

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP6
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



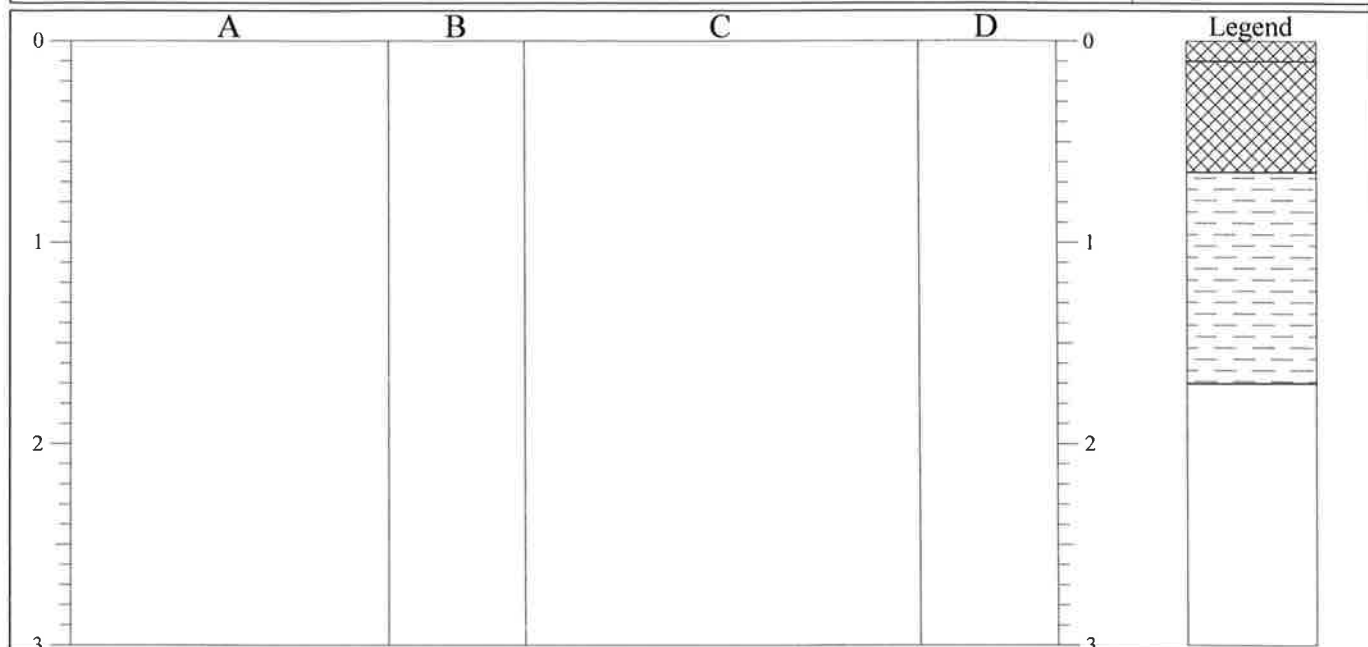
STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-1.20		MADE GROUND: Brown gravelly reworked clay. Gravel is angular to sub rounded, fine to coarse of sandstone, concrete and brick.			
1.20-1.30		MADE GROUND: Brown topsoil.			
1.30-1.60		Stiff orangey brown to grey sandy CLAY.			

Shoring/Support: Stability: 	GENERAL REMARKS
	No groundwater encountered. Pit walls stable.

All dimensions in metres Scale 1:37.5	Client Leeds and Yorkshire Housing Association	Method/ Plant Used Excavator	Logged By RF
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TRIAL PIT LOG

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP7
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1

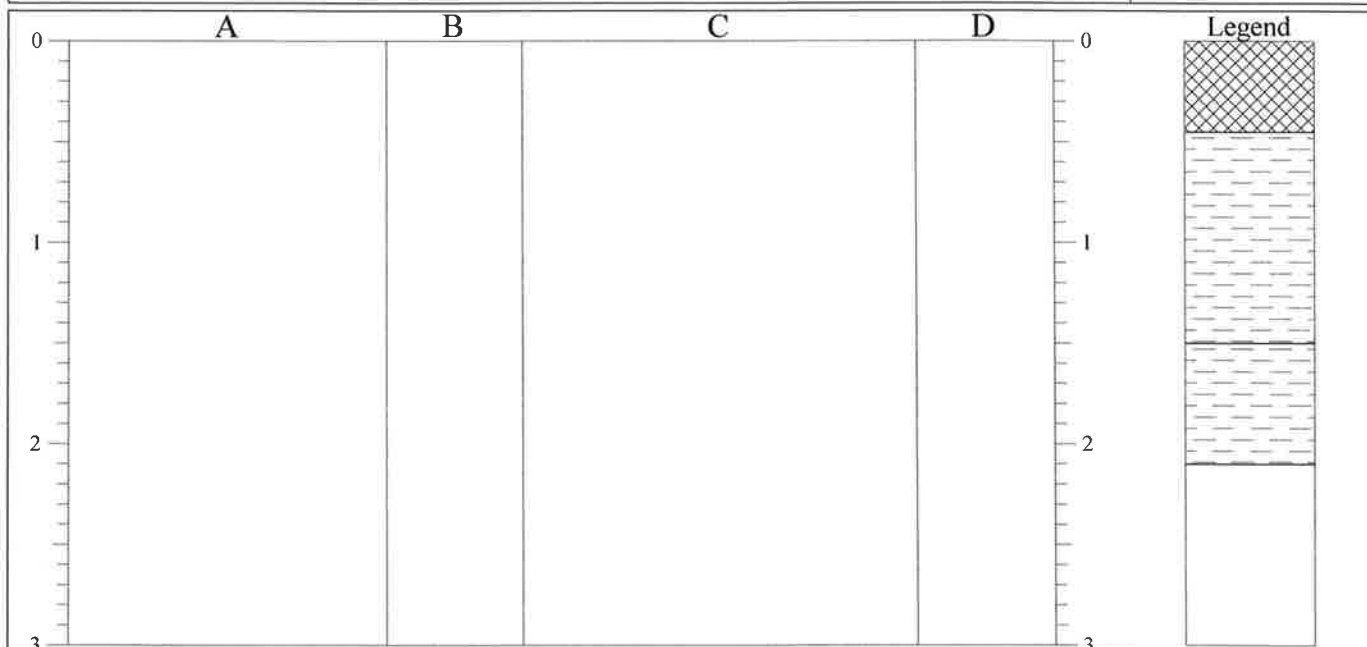


STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.10		MADE GROUND: Brown topsoil.			
0.10-0.65		MADE GROUND: Brown to grey fine to coarse gravel fill of angular to sub rounded brick, concrete and sandstone. Occasional cobbles of brick.	0.40	B	
0.65-1.70		Stiff orangey brown to grey sandy slightly gravelly CLAY, occasional cobbles. Gravel is sub angular to sub rounded fine to coarse of sandstone.	1.00	HV	=90kPa
			1.30	HV	=100kPa

Shoring/Support: Stability:			GENERAL REMARKS No groundwater encountered. Pit walls stable.
All dimensions in metres Scale 1:37.5	Client Leeds and Yorkshire Housing Association	Method/ Plant Used Excavator	Logged By RF

TRIAL PIT LOG

Project Newstead Road, Athersley, Barnsley				TRIAL PIT No TP8
Job No S130805	Date 19-08-13	Ground Level (m)	Co-Ordinates ()	
Contractor				Sheet 1 of 1



STRATA			SAMPLES & TESTS		
Depth	No	DESCRIPTION	Depth	Type	Remarks/Tests
0.00-0.45		MADE GROUND: Brown clayey fine to coarse gravel fill of angular to sub rounded brick, concrete and sandstone.	0.20	J	
0.45-1.50		Stiff orangey brown to grey slightly gravelly slightly sandy CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone.	0.60	HV	=90kPa
			0.80	HV	=120kPa
			1.00	B	
			1.00	HV	=120kPa
1.50-2.10		Stiff brown-grey sandy gravelly CLAY. Gravel is sub angular to sub rounded fine to coarse of sandstone. Cobble noted at 1.8m.			

Shoring/Support: Stability:			GENERAL REMARKS
			No groundwater encountered. Pit walls stable.

All dimensions in metres Scale 1:37.5	Client Leeds and Yorkshire Housing Association	Method/ Plant Used Excavator	Logged By RF
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APPENDIX C



2139

Certificate of Analysis

Date: 23/09/2013

Certificate Number: 13-88687

Client: SOLMEK
12 Yarm Road
Stockton On Tees
Cleveland
TS18 3NA

Our Reference: 13-88687

Client Reference: S130805

Contract Title: Newstead Road, Athersley

Description: 5 soil samples

Date Received: 13 September 2013

Date Started: 13 September 2013

Date Completed: 23 September 2013

Test Procedures: Identified by prefix DETSn (details on request), Asbestos Analysis (DETS 082).

Notes: Observations and interpretations are outside the scope of UKAS accreditation

Approved By: 
Rob Brown, Business Manager

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

Information in Support of the Analytical Results

Analysis

Inorganic soil analysis was carried out on a dried sample, crushed to pass a 425um sieve, in accordance with BS1377.

Organic soil analysis was carried out on an 'as received' sample. Organics results are corrected for moisture and expressed on a dry weight basis.

The Loss on Drying, used to express organics analysis on an air dried basis, is carried out at a temperature of 28oC +/-2oC.

Key

- * Denotes test not included in laboratory scope of accreditation
- # Denotes test that holds MCERTS accreditation, however, MCERTS accreditation is only implied if the report carries the MCERTS logo
- \$ Denotes tests completed by an approved subcontractor
- I/S Denotes insufficient sample to carry out test
- U/S Denotes that the sample is not suitable for testing

Disposal

From the issue date of this test certificate, samples will be held for the following times prior to disposal :-

Soils - 1 month

Liquids - 2 weeks

Asbestos (test portion) - 6 months

Summary of Chemical Analysis

Soil Samples

Our Ref: 13-88687

Client Ref: S130805

Contract Title: Newstead Road, Athersley

				Lab No.	554535	554536	554537	554538	554539
				Sample ID	BH2	BH4	BH5	BH5	BH6
				Depth	0.30-0.40	0.70-0.80	0.30-0.40	0.70-0.80	0.70-0.80
				Sample Ref					
				Sample Type					
				Sampling Date	//	//	//	//	//
				Sampling Time					
Test	Units	DETSxx	LOD						
Mercury	mg/kg	DETSC 2325#	0.05	< 0.05	0.05	0.05			
Arsenic	mg/kg	DETSC2301#	0.2	8.2	15	5.6			
Cadmium	mg/kg	DETSC2301#	0.1	0.6	0.9	0.8			
Chromium	mg/kg	DETSC2301#	0.15	23	27	430			
Copper	mg/kg	DETSC2301#	0.2	17	24	18			
Nickel	mg/kg	DETSC2301#	1	12	48	10			
Lead	mg/kg	DETSC2301#	0.3	18	20	24			
Selenium	mg/kg	DETSC2301#	0.5	< 0.5	< 0.5	0.7			
Zinc	mg/kg	DETSC2301#	1	43	85	64			
Hexavalent Chromium	mg/kg	DETSC 2204*	1	< 1.0	< 1.0	< 1.0			
Boron (water soluble)	mg/kg	DETSC2123#	0.2	< 0.2	< 0.2	0.3			
Cyanide total	mg/kg	DETSC 2130#	0.1	< 0.1	< 0.1	< 0.1			
Organic matter	%	DETSC 2002#	0.1	1.5	1.5	2.8			
Sulphide	mg/kg	DETSC 2024#	10	44	16	93			
Sulphate Aqueous Extract as SO4	mg/l	DETSC 2076#	10	60	43	95	170	84	
pH		DETSC 2008#		6.9	6.1	10.2	7.3	6.9	
Phenol - Monohydric	mg/kg	DETSC 2130#	0.3	< 0.3	< 0.3	< 0.3			

Summary of Asbestos Analysis

Soil Samples

Our Ref: 13-88687

Client Ref: S130805

Contract Title: Newstead Road, Athersley

Lab No	Sample Ref	Material Type*	Result	Comment	Analyst
554535	BH2 0.30-0.40	Soil	NAD	na	Andrew Little
554536	BH4 0.70-0.80	Soil	NAD	na	Andrew Little
554537	BH5 0.30-0.40	Soil	NAD	na	Andrew Little

Crocidolite = Blue Asbestos, Amosite = Brown Asbestos, Chrysotile = White Asbestos. NAD = No Asbestos Detected. Anthophyllite, Actinolite and Tremolite are other forms of Asbestos. Samples are analysed by DETS 082 using polarised light microscopy in accordance with HSG248 and documented in-house methods. Where a sample is NAD, the result is based on analysis of at least 2 sub-samples and should be taken to mean 'no asbestos detected in sample'.

CLEA Software Version 1.06		Page 1 of 11
Report generated	17-Oct-13	 Environment Agency
Report title	NEWSTEAD ROAD	
Created by	DS at Solmek	
RESULTS		



	Assessment Criterion (mg kg ⁻¹)			Ratio of ADE to HCV			Saturation Limit (mg kg ⁻¹)		50% rule?	
	oral	inhalation	combined	oral	inhalation	combined			Oral	Inhal
21										
22										
23										
24										
25										
26										
27										
28										
29										
30										

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CLEA Software Version 1.06		Report generated 17-Oct-13		Page 7 of 11		
 Environment Agency	Average Daily Exposure (mg kg ⁻¹ bw day ⁻¹)		Distribution by Pathway (%)			
	Direct soil ingestion					
	Consumption of homegrown produce and attached soil					
	Dermal contact with soil and dust					
	Inhalation of dust					
	Inhalation of vapour					
	Background (oral)					
	Background (inhalation)					
	Direct soil ingestion					
	Consumption of homegrown produce					



	Oral Health Criteria Value ($\mu\text{g kg}^{-1}$ BW day ⁻¹)	Inhalation Health Criteria Value ($\mu\text{g kg}^{-1}$ BW day ⁻¹)	Oral Mean Daily Intake ($\mu\text{g day}^{-1}$)	Inhalation Mean Daily Intake ($\mu\text{g day}^{-1}$)	Air-water partition coefficient (K _{aw}) ($\text{cm}^3 \text{ cm}^{-3}$)	Coefficient of Diffusion in Air (m ² s ⁻¹)	Coefficient of Diffusion in Water (m ² s ⁻¹)	log K _{oc} ($\text{cm}^3 \text{ g}^{-1}$)	log K _{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g ⁻¹ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1 Cadmium	TDI 0.36	TDI 0.0014	13.4	0.02	NR	NR	NR	NR	NR	0.001	0.5	1	1	1
2 Chromium III	TDI 150	TDI 0.1	60.2	0.27	NR	NR	NR	NR	NR	0	0.5	1	1	1
3 Chromium VI	TDI 1	ID 0.0001	6.7	NR	NR	NR	NR	NR	NR	0	0.5	1	1	1
4 Copper	TDI 160	TDI 0.286	7000	0.68	NR	NR	NR	NR	NR	0	0.5	1	1	1
5 Mercury, inorganic	TDI 2	TDI 0.06	1	0	NR	NR	NR	NR	NR	0	0.5	1	1	1
6 Nickel	TDI 12	TDI 0.006	130	0.06	NR	NR	NR	NR	NR	0.005	0.5	1	1	1
7 Zinc	TDI 600	TDI 600	27000	2.4	NR	NR	NR	NR	NR	0	0.5	1	1	1
8 Arsenic	ID 0.3	ID 0.002	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	1	1
9 Boron	TDI 160	TDI 2.9	3700	0.398	NR	NR	NR	NR	NR	0	0.5	1	1	1
10 Selenium	TDI 6.4	NR 0	35	0.06	NR	NR	NR	NR	NR	0	0.5	1	1	1
11 Cyanide	TDI 12	TDI 0.9	300	0.06	NR	NR	NR	NR	NR	0.1	0.5	1	1	1
12 Phenol	TDI 700	TDI 10	350	40	8.35E-06	7.90E-06	6.36E-10	1.92	1.48	0.3	0.5	1	1	1

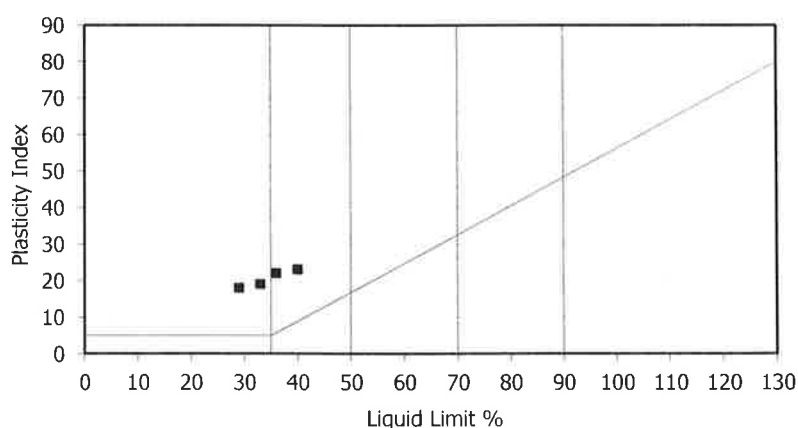
CLEA Software Version 1.06		Report generated 17-Oct-13		Page 9 of 11	
					
21	Oral Health Criteria Value (µg kg ⁻¹ BW day ⁻¹)				
22	Inhalation Health Criteria Value (µg kg ⁻¹ BW day ⁻¹)				
23	Oral Mean Daily Intake (µg day ⁻¹)				
24	Inhalation Mean Daily Intake (µg day ⁻¹)				
25	Air-water partition coefficient (K _{aw}) (cm ³ cm ⁻³)				
26	Coefficient of Diffusion in Air (m ² s ⁻¹)				
27	Coefficient of Diffusion in Water (m ² s ⁻¹)				
28	log K _{oc} (cm ³ g ⁻¹)				
29	log K _{ow} (dimensionless)				
30	Dermal Absorption Fraction (dimensionless)				
	Soil-to-dust transport factor (g g ⁻¹ DW)				
	Sub-surface soil to indoor air correction factor (dimensionless)				
	Relative bioavailability via soil ingestion (unitless)				
	Relative bioavailability via dust inhalation (unitless)				

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	Soil-to-water partition coefficient (cm ³ g ⁻¹)																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																								</
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APPENDIX D

NEWSTEAD ROAD, ATHERSLEY
S130805

[illegible]

		Liquid Limit
CE	Extremely high plasticity CLAY	>90%
ME	Extremely high plasticity SILT	
CV	Very high plasticity CLAY	70 - 90%
MV	Very high plasticity SILT	
CH	High plasticity CLAY	50 - 70%
MH	High plasticity SILT	
CI	Intermediate plasticity CLAY	35 - 50%
MI	Intermediate plasticity SILT	
CL	Low plasticity CLAY	<35%
ML	Low plasticity SILT	

Comments

Prepared: *I. Johnson*

Date: 16/09/2013

Checked: MO

Date: 16/09/2013

Approved: *I. Nelson*

Date: 16/09/2013

SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991

BRE Digest 365, Figure 2, Page 5

Client: Leeds and Yorkshire Housing

Site: Newstead Road, Barnsley

Job No: S130805

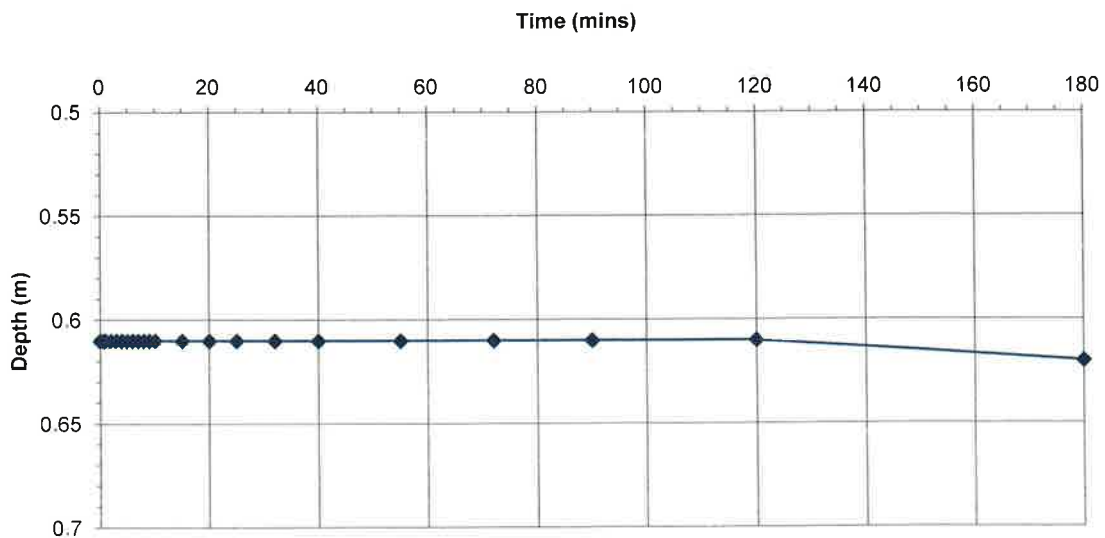
Pit No: TP1

Test No:

1

CALCULATION OF SOIL INFILTRATION RATE

Time (min)	Depth (m)	Pit Dimensions	Length (m) =	1.90	
0	0.61		Width (m) =	0.30	
0.5	0.61		Depth (m) =	1.60	
1	0.61				
2	0.61	Depth at start of test (m) =		0.610	
3	0.61	Depth at end of test (m)=		0.620	
4	0.61	75% level (m)=		0.613	
5	0.61	50% Effective Depth		0.005	
6	0.61	25% level (m)=		0.618	
7	0.61				
8	0.61	Base area of pit (m ²) =		0.570	
9	0.61	Vp ₇₅₋₂₅ (m ³) =		0.003	
10	0.61	a _{n50} (m ²) =		0.592	
15	0.61				
20	0.61		From the graph:		
25	0.61		tp 75 (min) =	120	
32	0.61		tp 25 (min) =	180	
40	0.61				
55	0.61	Soil infiltration rate, f, (m/s) =		1.34E-06	normal test
72	0.61				
90	0.61				
120	0.61	Input by:	RF	Date:	03/09/2013
180	0.62	Checked by:	PF	Date:	03/09/2013



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991

BRE Digest 365, Figure 2, Page 5

Client: Leeds and Yorkshire Housing Association

Site: Newstead Road, Barnsley

Job No: S130805

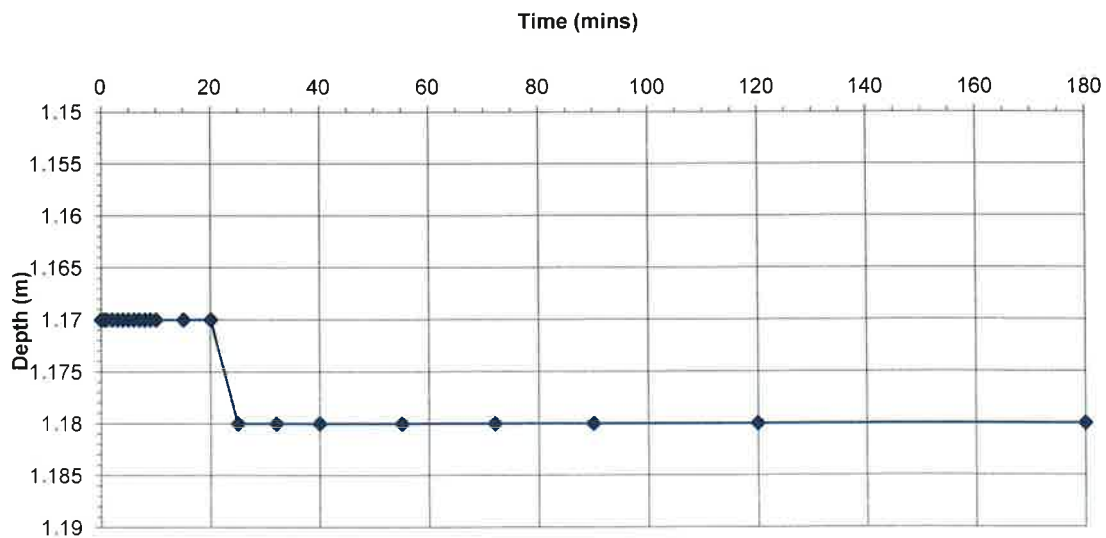
Pit No: TP2

Test No:

1

CALCULATION OF SOIL INFILTRATION RATE

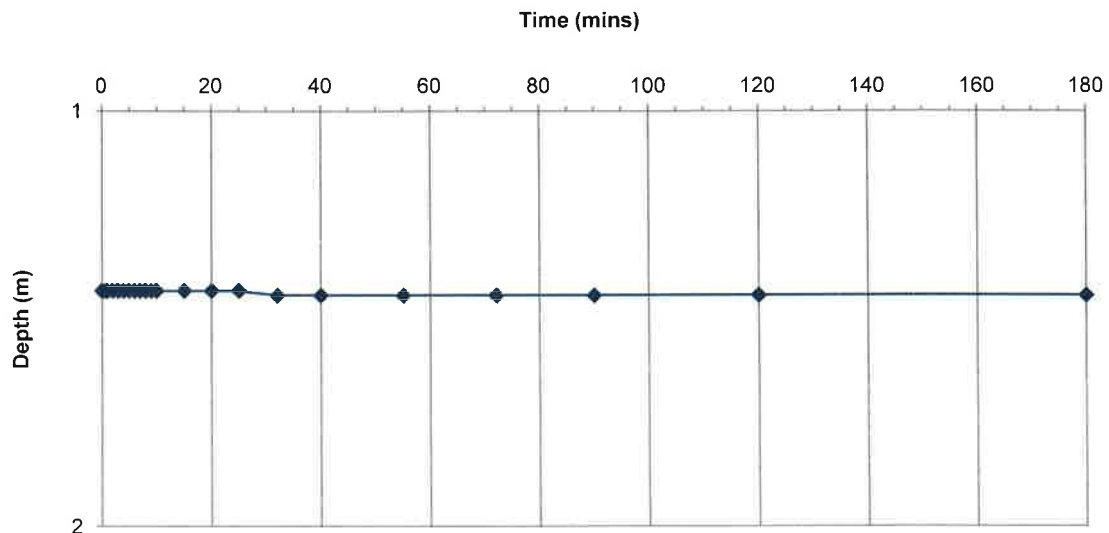
Time (min)	Depth (m)		Pit Dimensions	Length (m) =	1.80
0	1.17			Width (m) =	0.30
0.5	1.17			Depth (m) =	2.00
1	1.17				
2	1.17	Depth at start of test (m) =			1.170
3	1.17	Depth at end of test (m)=			1.180
4	1.17	75% level (m)=			1.173
5	1.17	50% Effective Depth			0.005
6	1.17	25% level (m)=			1.178
7	1.17				
8	1.17	Base area of pit (m ²) =			0.540
9	1.17	V _{p75-25} (m ³) =			0.003
10	1.17	a _{p50} (m ²) =			0.561
15	1.17				
20	1.17		From the graph:		
25	1.18		tp 75 (min) =	22	
32	1.18		tp 25 (min) =	120	
40	1.18				
55	1.18	Soil infiltration rate, f, (m/s) =	8.19E-07		normal test
72	1.18				
90	1.18				
120	1.18	Input by:	RF	Date:	03/09/2013
180	1.18	Checked by:	PF	Date:	03/09/2013



SOAKAWAY DESIGN IN ACCORDANCE WITH BRE DIGEST 365: 1991

BRE Digest 365, Figure 2, Page 5

Client: Leeds and Yorkshire Housing					
Site: Newstead Road, Barnsley					
Job No: S130805					
Pit No: TP3			Test No:	1	
CALCULATION OF SOIL INFILTRATION RATE					
Time (min)	Depth (m)		Pit Dimensions	Length (m) =	1.70
0	1.35			Width (m) =	0.30
0.5	1.35			Depth (m) =	2.00
1	1.35				
2	1.35	Depth at start of test (m) =			1.350
3	1.35	Depth at end of test (m)=			1.360
4	1.35	75% level (m)=			1.353
5	1.35	50% Effective Depth			0.005
6	1.35	25% level (m)=			1.358
7	1.35				
8	1.35	Base area of pit (m ²) =			0.510
9	1.35	V _{p75-25} (m ³) =			0.003
10	1.35	a _{0.50} (m ²) =			0.530
15	1.35				
20	1.35		From the graph:		
25	1.35		tp 75 (min) =	27	
32	1.36		tp 25 (min) =	120	
40	1.36				
55	1.36	Soil infiltration rate, f, (m/s) =		8.62E-07	normal test
72	1.36				
90	1.36				
120	1.36	Input by:	RF	Date:	03/09/2013
180	1.36	Checked by:	PF	Date:	03/09/2013



APPENDIX E

SOLMEK NOTES ON CONTAMINATION GUIDANCE(REF: VERSION 1/2013)

UK BACKGROUND

A qualitative approach using the statutory definition of Contaminated land as defined with Section 78A (2) of Part 2A of the Environmental Protection Act has been adopted. This defines contaminated land (DEFRA 'Guidance on the Legal Definition of Contaminated Land', July 2008b) as:

"any land which appears to the local authority in whose area the land is situated to be in such a condition, by reason of substances in, on or under the land, that (a) significant harm is being caused or there is a significant possibility of such harm being caused; or (b) pollution of controlled waters is being, or is likely to be, caused"

"Harm" is defined as *harm to the health of living organisms or other interference within the ecological systems of which they form part, and in the case of man, includes harm to his property.*

The concept of "significant harm" is dealt with via the Government guidance DEFRA Circular 02/2000 Contaminated Land: "Implementation of Part IIA of the Environmental Protection Act 1990". The statutory guidance uses the concept of pollutant linkages set out in Section 2.4 of the circular. Before the Local Authority can make a judgement on whether "significant harm" and the significant possibility of harm is being caused they are required to identify a "significant pollution linkage". This means effectively that three elements (a **source** of contamination, a relevant **receptor** and a **pathway**) must be present. In statutory terms:

- ▲ A **source** is a substance that is in, on or under the land and has the potential to cause harm.
- ▲ A **receptor** is in general terms, is something that could be adversely affected by a contaminant, such as people.
- ▲ A **pathway** is a route or means by which a receptor can be exposed to, or affected by, a contaminant.

Without identification of all three elements together, land should not be regarded as "Contaminated" in the statutory sense. Solmek adopts the above measures in accordance with CLR 11 (2004) 'Model Procedures for the management of Land Contamination'.

HUMAN RECEPTORS

Human exposure to contaminants present in soils can occur via several pathways. Direct exposure pathways include dermal absorption after contact with contaminated ground, inhalation of soil or dust, inhalation of volatilised compounds, and inadvertent soil ingestion (or deliberate soil ingestion in the case of some children). Other indirect pathways include human ingestion of plants grown in contaminated soil or contaminated ground or surface water. Contaminants associated with wind blown dust can affect humans on surrounding sites.

DEFRA published the discussion paper 'Soil Guideline Values: the way forward' (2006). Following consultation, DEFRA released 'Improvements to Contaminated Land Guidance and Outcome of the Way Forward exercise on Soil Guideline Values' (2008b). From this review DEFRA and the Environment Agency had withdrawn documents CLR 7 to 10 since these no longer fully reflect the new UK approach, along with the associated Soil Guideline Values (SGV). The Environment Agency have revised and updated information presented in CLR 7 to 10 within two recently published CLEA Framework Reports: Human health toxicological assessment of contaminants in soil (Science Report Final SC050021/SR2) and updated technical background to the CLEA model (Science Report Final SC050021/SR3).

The Environment Agency released the updated CLEA Software Version 1.06 in May 2011 which accompanies the two CLEA Framework Reports and reflects the updated approach. Solmek uses the CLEA Software Version 1.06 to derive a series of Generic Assessment Criteria (GAC) threshold values based on a number of site and soil parameters. Solmek GAC values represent a level at which a risk to human health may exist and are primarily intended as a guide to site redevelopment. Various factors used within the CLEA software by Solmek are summarised below:

Land Use	Receptor	Building	Soil Type	pH and SOM
Residential with Homegrown Produce	Female (Age Class 1-6: Young Child)	Bungalow Small Terraced House	Clay Silty Clay	pH and SOM content values as presented from testing.
Residential without Homegrown Produce	Female (Age Class 1-6: Young Child)	Medium/large Terraced House Semi-detached House Detached House	Silty Clay Loam Clay Loam Sandy Lam Loam	
Allotments	Female (Age class 1-6: Young Child)	Assumes None	Silty Loam	
Parks			Sandy Loam	
Open spaces			Sandy Loam	
Playing fields	Female (Age class 4-11: Child)	Warehouse (pre 1970) Warehouse (post 1970) Office (pre 1970) Office (post 1970)	Sand	
Commercial	Female (Age Class 17-17: Working Adult)			
DERIVATION OF SOL MEK GAC THRESHOLD VALUES				

A number of specific exposure pathways are considered in addition to the above table when considering the generated GAC values. In some instances, the GAC generated value may be presented at the soil saturation limit if this has been exceeded. The choice of receptor may differ from the table above based on professional judgment (with justification).

Solmek adopts a pH value of 7, Soil Organic Matter (SOM) content of 1% and a sandy loam soil where this information is not available. These figures accord with the generic units presented within the CLEA Software. Where Solmek cannot generate specific GAC values, the Environment Agency's SGVs (where available), released from March 2009, and Atkins SSV's (derived using CLEA Software Version 1.04, May 2011) are adopted for comparison.

VEGETATION

Plants can be affected by soil contamination in a number of ways resulting in growth inhibition, nutrient deficiencies and yellowing of leaves. Contaminants are taken up by plants through the roots and through foliage. Contaminants identified as being highly phytotoxic include boron, cadmium, copper, lead, nickel, and zinc.

To establish if the levels of contaminants present on a site may pose a risk to vegetation the results of the contamination testing are compared to a series of threshold values published in 'Code of Good Agricultural Practice for the Protection of Soil'.

GROUNDWATER AND SURFACE WATER RECEPTORS

The principal pathway by which soil contamination may reach the water environment is through a slow seepage or leaching to groundwater or surface water. The potential for contaminants to migrate along such pathways is dependent on the chemical and physical characteristics of the contaminants and the local hydrogeology. Surface watercourses may also accumulate contamination as contaminated sediments are deposited within the water body.

Where the site investigated overlies major/principal aquifers (and in some cases minor/secondary aquifers depending on certain conditions), groundwater Source Protection Zones and areas in close proximity to groundwater abstractions, contamination test results have been compared with the Water Supply (Water Quality) Regulations 1989 and The Water Supply (Water Quality) Regulations 2000.

Should a surface water receptor, such as a fresh water environment (river, canal, stream, lake etc), or marine environment be considered sensitive in relation to a site, then test results are compared with DEFRA & SEPA Environmental Quality Standards (2004). Many of the Environmental Quality Standards are hardness (CaCO_3) depended. Where no hardness values are available, Solmek assume conservative values (of between 0 and 50mg/l).

In the absence of vulnerable ground and surface water environments, Solmek may compare any test results with the Environment Agency Leachate Quality Threshold Values.

DETAILED QUANTITATIVE RISK ASSESSMENT (DQRA)

In line with CLR 11- Model Procedures, a DQRA for groundwater/human health may be required following a Phase 2 investigation and before the preparation of a Phase 3 Remediation Strategy. For human health DQRA, a site specific assessment criteria is undertaken using CLEA Software Version 1.06. For groundwater DQRA, the Environment Agency Remedial Targets Worksheet Version 3.1 is used.

WASTE ACCEPTANCE CRITERIA

Waste Acceptance Criteria (WAC) testing accords with the Landfill (England and Wales) 2002 Regulations and the subsequent amendments set out in Schedule 1 of the Landfill (England and Wales)(Amendment) Regulations 2004. WAC testing was introduced into UK Practise to supplement the revised changes to the Hazardous Waste and Landfill regulations outlined in 2005. The WAC testing relates to materials that are to be exported from a site/development to landfill, and do not directly relate to human health specifically. The WAC test categorises materials as either inert waste, non-reactive hazardous waste, and hazardous waste. The testing results are generally presented as certificates which can be used by site owners/contractors etc, which should be presented to the accepting waste facility or waste contractor.

CONSTRUCTION MATERIALS

Materials at risk from possible soil contaminants include inorganic matrices such as cement and concrete and also organic material such as plastics and rubbers. Acid ground conditions and high levels of sulphates can accelerate the corrosion of building materials. Where pH and soluble sulphate analysis has been undertaken, Solmek compare the test results with the guidelines presented within BRE Special Digest 1, 2005 (3rd Edition) 'Concrete in Aggressive Ground'. Plastics and rubbers are generally used for piping and service ducts and are potentially attacked by a range of chemicals, most of which are organic, particularly petroleum based substances. Drinking water supplies can be tainted by substances that can penetrate piping and water companies enforce stringent threshold values.

REQUIREMENTS OF PARTIES WITHIN THE DEVELOPMENT PROCESS

Interested parties involved in the development process may use the data in different ways and there may be varying views and interpretation of the factual data. Local Authority staff may have a view on contamination and human health and the wider environment. The Environment Agency are concerned principally with the protection of Controlled waters. Building insurers, funders and purchasers may be primarily concerned with issues of potential commercial blight. Purchasers are also not always fully informed, and perceptions on issues associated with risk can affect the decision to purchase. Developers and construction organisations will focus on financial aspects of dealing with the contamination in the context of the development and construction programme.

RISKS & LIABILITIES FROM CONTAMINATION

In simple terms, risks associated with contamination may be considered in terms of 1) statutory risks and 2) development related risks. If contamination is severe or forms a potential hazard based on its potential to affect groundwater, surface water or human health, a statutory risk may be present, and as such, if the risk is not reduced, criminal proceedings may be instigated by a government body or local authority.

If the contamination is less severe or not considered to be mobile, it may be considered a commercial liability which could, in theory remain untreated, but which may at a later date affect the value of the property, or, with changing legislation, become a statutory risk. Commercial liabilities could give rise to civil proceedings by third parties if there are grounds for action.

These conditions accompany our tender and supercede any previous conditions issued. Solmek will prepare a report solely for the use of the Client (the party invoiced) and its agent(s). No reliance should be placed on the contents of this report, in whole or in part by 3rd parties. The report, its content and format and associated data are copyright, and the property of Solmek. Photocopying of part or all of the contents, transfer or reproduction of any kind is forbidden without written permission from Solmek. A charge may be levied against such approval, the same to be made at the discretion of Solmek. Solmek was a trading name of Hymas Geoenvironmental Ltd.

Solmek cannot be held liable and do not warrant, or otherwise guarantee the validity of information provided by third parties and subsequently used in our reports. Solmek are not responsible for the action negligent of otherwise of subcontractors or third parties.

Site investigation is a process of sampling. The scope and size of an investigation may be considered proportional to levels of confidence regarding the ground and groundwater conditions. The exploratory holes undertaken investigate only a small volume of the ground in relation to the overall size of the site, and can only provide a general indication of site conditions. The opinions provided and recommendations given in this report are based on the ground conditions as encountered within each of the exploratory holes. There may be different ground conditions elsewhere on the site which have not been identified by this investigation and which therefore have not been taken into account in this report. Reports are generally subject to the comments of the local authority and Environment Agency. The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that mobile contamination, ground gas levels and groundwater levels may vary owing to seasonal, tidal and/or weather related effects. Solmek cannot be held liable for any unrecorded or unforeseen obstructions between exploratory boreholes and trial pits. This includes instances where previous structures on the site (buried man made structures) or the presence of boulder clay (cobbles and/or boulder obstructions) have been anticipated. All types of piling operations should make allowance for obstructions within the construction budget to accommodate this. Unrecorded ancient mining may occur anywhere where seams that have been worked and influence the rock and soil above. Dissolution cavities can occur where gypsum or chalk is present. Rotary drilling is the recommended technique to prove the integrity of the rock.

Where the scope of the investigation is limited via access to information, time constraints, equipment limitations, testing, interpretation or by the client or his agents budgetary constraints, elements not set out in the proposal and excluded from the report are deemed to be omitted from the scope of the investigation.

Desk studies are generally prepared in accordance with RICS guidelines. Environmental site investigations are generally undertaken as 'exploratory investigations' in accordance with the definitions provided in paragraph 5.4 of BS 10175:2001 in order to confirm the conceptual assumptions. You are advised to familiarize yourself with the typical scope of such an investigation. No pumping of water will be undertaken unless a licence or facilities/equipment have been arranged by others.

Where the type, number or/and depth of exploratory hole is specified by others, Solmek cannot and will not be responsible for any subsequent shortfall or inadequacy in data, and any consequent shortfall in interpretation of environmental and geotechnical aspects which may be required at a later date in order to facilitate the design of permanent or temporary works.

All information acquired by Solmek in the course of investigation is the property of Solmek, and, only also becomes the joint property of the Client only on the complete settlement of all invoices relating to the project. Solmek reserve the right to use the information in commercial tendering and marketing, unless the Client expressly wishes otherwise in writing. The quoted rates do not include VAT, and payment terms are 30 days from dispatch of invoice from our offices. Quotes are subject to a site visit.

We have allowed for 1 mobilisation and normal working hours unless otherwise stated. The scope of the investigation may be reviewed following the desk study and/or fieldwork. The presence or otherwise of Japanese Knotweed or other invasive plants can be difficult to identify especially during winter months. If Japanese Knotweed or other invasive species are suspect, it should be confirmed by an ecologist. We have not allowed for acquiring services information, and cannot be responsible for damage to underground services or pipes not shown to us or not clearly shown on plans. Costs incurred will be passed on to you, and in commissioning Solmek you understand and accept that you/your agent have a contractual relationship with Solmek & you accept this. Our rates assume unobstructed, reasonably level and firm access to the exploratory positions and adequate clear working areas and headroom. We have priced on the basis that you or your client have the necessary permissions, wayleaves and approvals to access land. All boreholes and pits are backfilled with arisings except where gas monitoring pipes are installed with stopcock covers. Solmek are not responsible for any uneven surfaces as a result of siteworks and rutting and backfilled excavations may require re-levelling and/or making good by others after fieldwork is complete, and Solmek has not allowed for this. No price has been provided or requested for a return visit to remove pipework and covers. Hourly rates apply to consultancy only and do not include expenses unless otherwise shown. If warranties are required, legal costs incurred will be passed on to you assuming Solmek agree to complete such warranties, modified or otherwise and you understand and agree to pay all costs.

We reserve the right to pursue full payment of the invoice prior to release of any information including reports. We advise you/your client that we may elect to pursue our statutory rights under late payment legislation, and will apply 8% to the base rate for unreasonably late payments. Solmek are exempt from the CIS Scheme. Solmek offer to undertake work only in strict accordance with conditions covered by our current insurances, which are available for inspection. Solmek are not responsible for acts, negligent or otherwise of subcontractors and as a matter of policy cannot indemnify any other parties. Professional indemnity Insurance is limited to ten times the invoice net total except where stated otherwise by Solmek. Solmek give notice that consequential loss as a direct or indirect result of Solmek's activities or omission of the same are excluded.