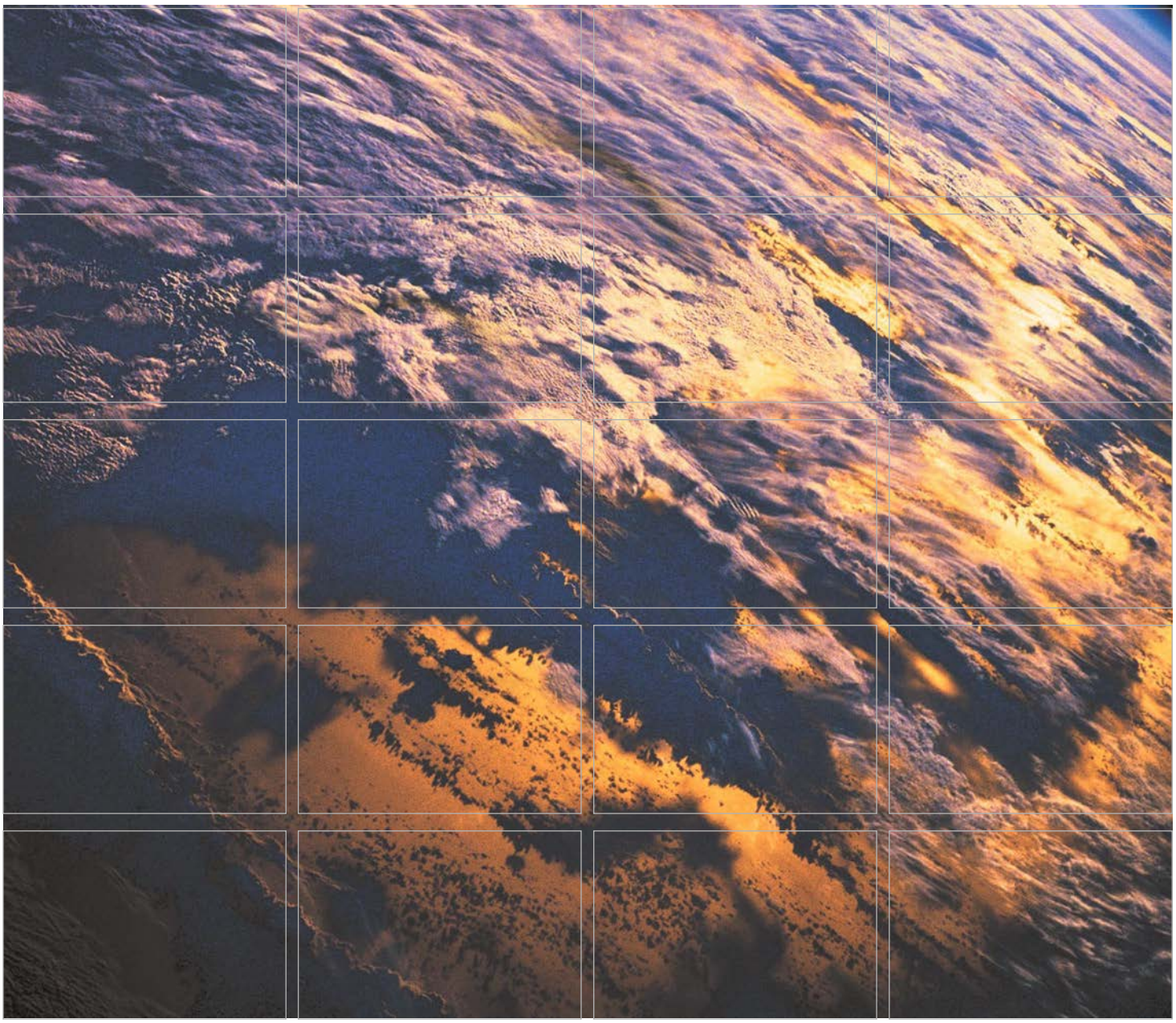


Phase II Environmental Site Assessment

Plot for Redevelopment, Abenbury Way, Wrexham, UK.

Draft Report

1st May 2015

The world's leading sustainability consultancy

ERM

Cytec Industries Inc.

Phase II Environmental Site Assessment

Draft Report

May 2015

Reference 0265147

Prepared by: Chris Rice

For and on behalf of
Environmental Resources Management

Approved by: Phil Crowcroft _____

Signed:  _____

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Date: 01/05/2015 _____

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1 INTRODUCTION

1.1 TERMS OF REFERENCE

Environmental Resources Management Ltd (ERM) was commissioned by Cytec Industries Inc. ('the client') to undertake Phase II geo-environmental site investigation works at the Subject Property located at Abenbury Way, Wrexham, UK ('the Site'), indicated in *Figure 1, Annex A*.

1.2 BACKGROUND AND INTRODUCTION

Cytec is considering developing the Site, located off Abenbury Way on Wrexham Industrial Estate in a light industrial area approximately 3.5 km east of Wrexham town centre for use as a research and testing centre. The Site is approximately 4.1 acres (1.66 hectares) in area, is undeveloped and broadly rectangular in shape. The national grid reference of the Site is approximately 337304, 350836 and the Site is at an elevation of approximately 45 m AOD.

The Site area comprises entirely of grassed areas and areas of cleared vegetation including tree stumps towards the south and west of the site which slopes gently down from the centre of the site to the west and to a surface water ditch that runs parallel to the western site boundary.

According to various historical sources, the Subject Property has always been undeveloped land. The history of the surrounding area was primarily agricultural use until the 1940s when it was industrialized as a Royal Ordnance Factory. Following closure of the Royal Ordnance factory after the Second World War the surrounding area was subject to redevelopment into Wrexham Industrial Estate.

This report presents a preliminary conceptual site model (CSM), and details the findings and recommendations of the Phase II intrusive investigation.

1.3 REPORT AIM / OBJECTIVES

The primary aims of this investigation were to establish shallow soil, groundwater and geotechnical conditions at the Site prior to the potential lease of the Site which ERM understands is still subject to ongoing negotiations. The assessment will look at regulated contaminant impacts identified in the context of the Site's proposed light industrial use and to provide information on subsurface soil and groundwater conditions at the site in order to inform potential redevelopment.

These aims are accomplished through the following specific objectives:

- evaluate the current and past operational activities at the site as far as is practicable;

- characterise the environmental setting and surrounding land use (current and historical);

- develop a conceptual site model (CSM) and identify plausible contaminant linkages present at the site based on the 'source-pathway-receptor' principle; and

- assess the significance of identified contaminant linkages by undertaking generic quantitative risk assessment (GQRA) in accordance with the appropriate guidance.

1.4 REPORT FORMAT

The remainder of this report is structured as follows:

- ***Section 2: Assessment of Land Contamination*** summarises the regulatory background to the works.
- ***Section 3: Site Setting*** describes the site environmental setting.
- ***Section 4: Preliminary Conceptual Site Model*** develops the Conceptual Site Model (CSM) and identifies plausible contaminant linkages.
- ***Section 5: Site Works*** provides detail of the completed site investigation works.
- ***Section 6: Encountered Ground Conditions*** provides detail of the ground conditions encountered throughout the course of the field works including observations of contamination impact.
- ***Section 7: Results and Significance Evaluation*** presents the results of the investigation and details the findings of the human health, controlled waters and soil gas risk assessments.
- ***Section 8: Summary, Key Findings and Conclusions*** presents a summary of the works and highlights key findings/conclusions.

Further to the above, supporting information is provided within report annexes as below:

Report Annexes
Annex A – Figures (Site Location and Layout).
Annex B – Borehole and Trial Pit Logs.
Annex C – Analytical Environmental Results Tables and Quantitative Risk Assessment.
Annex D – ERM GAC Derivation Text for environmental sample results.
Annex E – Laboratory Certificates for environmental samples.
Annex F – Applied Geology Report including geotechnical results.

Annex C Tables

Table C1 – Analytical Results – Soil.
Table C1A – Analytical Results – Soil TPH Hazard Index.
Table C2 – Analytical Results – Soils RPD.
Table C3 – Analytical Results – Groundwater.
Table C3A – Analytical Results – Groundwater Vapour Inhalation TPH.
Table C4 – Analytical Results – Groundwater RPD.
Table C5 – Gas Monitoring Results and Quantitative Risk Assessment.

2 ASSESSMENT OF LAND CONTAMINATION

2.1 REGULATORY BASIS

This S*ection* provides background information on the regulatory context which governs the assessment and remediation of potentially contaminated sites in England and Wales. With respect to the site, it is proposed that redevelopment of the entire Site will be undertaken in the near future. As such, the Planning Regime is considered the primary relevant regulatory framework, however, it should be noted that implicit within this is the requirement that after redevelopment, the site should not meet the definition of 'Contaminated Land' under Part 2A of the Environmental Protection Act 1990.

2.2 THE RISK BASED ASSESSMENT OF LAND CONTAMINATION

The UK takes a risk-based suitable for use approach to dealing with land contamination. An assessment of risk is based on either current or proposed future land use, depending upon the circumstances of the assessment. A framework for risk assessment and management is set out in the Model Procedures for the Management of Land Contamination, DEFRA, 2004 (CLR11). This provides the basis for good practice in dealing with brownfield and industrial land, whether subject to sale or acquisition, development for new use, or assessment in the context of risks posed to current users and the wider environment.

CLR11 sets out a tiered framework, where under this framework decisions may initially be informed by a preliminary or qualitative risk assessment or by Generic or Detailed Quantitative Risk Assessments (GQRA or DQRA respectively). DQRA are generally appropriate where generic guideline values are not available, or where they are not appropriate given the specific circumstances of the contaminant linkage. They may also be required where a greater level of certainty is needed to support the decision making process.

At the preliminary stage, a conceptual model is formed which characterises the site by identifying relationships between possible sources of contamination, receptors which may be affected, and where possible, the likely pathways of exposure. A contaminant-pathway-receptor relationship is known as a contaminant linkage. As the risk assessment moves through each stage, the conceptual model is refined to reflect the increasing level of knowledge about the site. Contaminants of concern may be added or deleted from the model as site investigation data becomes available, and pathways may be confirmed or eliminated from further consideration. The objective of the risk assessment should be to provide a clear picture of what if any significant risks are present, identify if remedial actions are required or

identify areas of uncertainty where further information/assessment is required before a conclusion can be reached.

2.3 PLANNING REGIME

Where a site is subject to redevelopment, the Town & Country Planning Act 1990 normally requires the grant of planning permission. Contamination of land, or the possibility of it, is a material planning consideration, and a developer will need to undertake work to establish the extent and nature of contamination, and define appropriate remediation works.

The National Planning Policy Framework (1) identifies that planning policies and decisions should ensure that:

- The site is suitable for its new use taking account of ground conditions and land instability, including from natural hazards or former activities such as mining, pollution arising from previous uses and any proposals for mitigation including land remediation or impacts on the natural environment arising from that remediation.
- After remediation, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990.
- Adequate site investigation information, prepared by a competent person, is presented.

More detailed assessment, and the remediation work itself may be controlled through conditions attached to the permission, or by separate legal agreements.

2.4 PART 2A & STATUTORY DESIGNATED CONTAMINATED LAND

For sites where existing contamination poses an unacceptable risk to the current site users or the wider environment, then Part 2A of the Environmental Protection Act (EPA) is likely to be applicable. Under the Part 2A regime, local authorities have a duty to inspect their areas and identify land, which meets the definition of contaminated land, as set out in the Statutory Guidance.

Specifically, contaminated land is defined as:

"any land which appears to the local authority in whose area it is situated to be in such a condition, by reason of the substances in, on, or under the land, that:

(1) Department of Communities and Local Government, National Planning Policy Framework, March 2012

a) significant harm is being caused or there is a significant possibility of such harm being caused; or

b) significant pollution of controlled waters is being caused, or there is significant possibility of such pollution being caused"

Under Part 2A, the receptors which may be considered are limited to those set out in the Statutory Guidance (1) and specifically include humans, controlled waters, designated ecological systems, property (domestic and commercial crops, livestock, wild animals subject to shooting and fishing rights), and property in the form of buildings.

For both human health and controlled waters, the statutory guidance has subdivided contaminated land determinations into four categories as summarised below. Sites falling within category 1 and 2 are capable of being determined as contaminated land but those within categories 3 and 4 are not:

- Human Health:
    - Category 1: Similar land, situations or similar levels of exposure are known or strongly suspected to cause significant possibility of significant harm (SPOSH).
    - Category 2: Little or no direct evidence of similar land, situations or similar levels of exposure having caused significant harm previously but strong case for taking action.
    - Category 3: No strong case for action although risks are not low but regulatory intervention is not warranted under Part 2A.
    - Category 4: No risk or level of risk is low – no relevant contaminant linkage, 'normal' levels of contamination, no exceedance of relevant generic assessment criteria, or exposure is small compared to other sources of environment exposure.
- Controlled Waters:
    - Category 1: Strong or compelling case that significant possibility of significant pollution of controlled waters (SPOSPOCW) exists or will occur.
    - Category 2: Little or no direct evidence that SPOSPOCW exists but risks of sufficient concern to adopt precautionary approach.
    - Category 3: Regulatory intervention is not warranted under Part 2A as very unlikely that serious pollution will occur or low likelihood that less serious pollution will occur.

(1) DEFRA, April 2012. Environmental Protection Act 1990: Part 2A. Contaminated Land Statutory Guidance.

- Category 4: No risk or level of risk is low – no relevant contaminant linkage, types of pollution are not considered significant or levels similar to 'background' contamination.

With regard to the Water Resources Act 1991 Section 85, the substances must be entering controlled waters in concentrations which are considered to be poisonous, noxious, polluting and/or solid waste matter. Under Part 2A, significant pollution of controlled waters constitutes:

- Pollution equivalent to 'environmental damage' as defined by the Environment Damage (Prevention and Remediation) Regulations 2009. With respect to groundwater, this means damage such that the level or concentration of pollutants changes sufficiently to lower its status' with respect to the Water Framework Directive (1).

- Inputs result in deterioration of a potable water abstraction such that additional treatment is required.

- A breach of a statutory surface water environmental quality standard (EQS).

- Input of a pollutant results in a significant and sustained upward trend in concentrations with respect to the Groundwater Daughter Directive (2).

In addition it must be determined that substances are continuing to enter controlled waters and/or are likely to enter controlled waters in the future. Controlled waters are defined as territorial waters which extend seawards for three miles, coastal waters, inland freshwaters (rivers/watercourses, relevant lakes or ponds) and groundwater (ie below the unsaturated zone).

(1) Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy

(2) Directive 2006/118/EC of the European Parliament and of the Council of 12 December 2006 on the protection of groundwater against pollution and deterioration

3 ENVIRONMENTAL SETTING

3.1 INTRODUCTION

This *Section* describes the site's environmental sensitivity. This is based on information obtained during ERM's Phase I Environmental Site Assessment (1) reported in July 2014.

3.2 SITE DESCRIPTION

The Subject Property is 4.1 acres (1.66 hectares) in area, is undeveloped and broadly rectangular in shape. The national grid reference of the Site is approximately 337304, 350836 and the Site is at an elevation of approximately 45 metres (m) AOD. The Subject Property is generally flat on the eastern side with topography sloping slightly down to the west and a small drainage ditch which runs adjacent and parallel to the western boundary.

The Subject Property is owned by Wrexham County Borough Council and is currently not in use for any operation. As part of the site redevelopment, vegetation including bushes and trees were cleared in late 2014 and the Site is now covered almost entirely in unpaved grass land. Fences are located along the southern and eastern boundaries of the Site, and dense vegetation forms a barrier along the northern boundaries. No evidence of any structures having been constructed are located at the Subject Property although a number of manholes associated with drainage for the industrial estate are located adjacent to the southern boundary.

The Subject Property is located in an area that is currently characterized by mixed industrial and commercial use to the east, west and south and agricultural land use to the north. The history of the surrounding area was primarily agricultural until the 1940s when it was industrialized as a Royal Ordnance Factory. Historical operations on surrounding properties have included a Royal Ordnance factory, foundries, metal shops, and auto repair facilities.

According to various historical sources, the Wrexham Industrial Estate was formerly a Royal Ordnance factory constructed in 1939. The facility was used for the manufacture of cordite, an explosive propellant used in munitions. Aerial photographs indicate that the Subject property was located approximately 200 m north of the previous perimeter road to the factory complex.

[1] ERM *Phase 1 Environmental Site Assessment*, Plot for Development, Abenbury Way, Wrexham, United Kingdom prepared for Cytec Industries Inc. dated 25 July 2014

3.3 GEOLOGY AND HYDROGEOLOGY

According to the British Geological Survey (BGS) website (accessed on 10 June 2014), the Subject Property is underlain by superficial deposits of Till. Till is further underlain by the Kinnerton Sandstone Formation, which is described by BGS as 'Sandstone, red-brown to yellow, generally pebble-free, fine- to medium-grained.

The soils have been reported as being of low leaching potential, which is described in the Envirocheck Report as 'soils in which pollutants are unlikely to penetrate the soil layer because water movement is largely horizontal or they have large ability to attenuate diffuse pollutants'.

According to the Environment Agency website (accessed on 10 June 2014) the superficial deposits have been designated as Unproductive Strata. The underlying Kinnerton Sandstone Formation has been designated as a Principal bedrock aquifer.

The Subject Property is located within an Environment Agency Zone 3 (Total catchment) Source Protection Zone. Source protection zones are defined by the Environment Agency around boreholes and wells used for potable water supply.

According to the River Basin Management Plans for Groundwater on the Environment Agency website, the current quantitative quality has been designated as 'poor' and the current chemical quality has been designated 'good'. The 2015 predicted classification of the qualitative quality is poor and the predicted chemical quality of groundwater is 'good'.

3.4 HYDROLOGY

The land is relatively level, gently sloping to the southeast towards the Redwither Brook and the River Clywedog. Surface water at the Subject Property drains via an unnamed, on-Site surface water ditch which runs parallel and directly adjacent to the western boundary of the Subject Property. The drain is culverted and re-emerges 20 m south east of the Subject Property. This drain appears to flow towards the Redwither Brook, which is located 1.25 km south east of the Subject Property. Redwither Brook is a tributary of the River Clywedog.

According to the River Basin Management Plans for Rivers on the Environment Agency website (accessed on 10 June 2014), the River Clywedog is located approximately 1.5 km south east and has been designated as currently having 'moderate' ecological potential. The current chemical quality has been designated as a 'fail'. The predicted ecological quality for 2015 is 'good' and the predicted chemical quality for 2015 is 'fail'.

According to the Environment Agency website, the Subject Property is not located in a surface water Nitrate Vulnerable Zone.

4 CONCEPTUAL SITE MODEL

4.1 INTRODUCTION

The purpose of the Conceptual Site Model (CSM) is to identify potential contaminant linkages, based on the information available at this stage. The presence (or likely presence) of the following three elements are critical to the identification of a contaminant linkage:

- a potential contaminant source in, on, or under the land at a concentration likely to have the potential to cause harm or pollution;
- a receptor which may suffer harm as a result of contact with the above; and
- an exposure pathway by which the receptor may come into contact with the contaminant source.

Where all three of the above are present (or may be present), a "plausible contaminant linkage" is said to exist.

This section describes the potential contaminant sources, receptors and exposure pathways identified as potentially present at the site in the context of the environmental setting and an ongoing commercial land use. Based on this, the plausible contaminant linkages present at the site are determined.

4.2 SOURCES

The Subject Property is currently not in use for any operation. The presence of a worn footpath from the gate located at the northern corner of the Subject Property around the accessible areas of the interior of the Subject Property indicates some use by the general public for recreational purposes. However, during the site investigation works it was found that the southern section of the site had waste soil and concrete deposited on it during the construction works at the neighbouring property.

No previous soil and groundwater or geotechnical investigations have been carried out on-Site as far as Site management is aware.

Wrexham Industrial Estate was formerly a Royal Ordnance factory which was constructed in 1939. The facility was used for the manufacture of cordite, an explosive propellant used in munitions. Based on a review of a historical aerial photograph dated 2 May 1946, the Subject property was located approximately 200 m north of the previous perimeter road to the ordnance factory complex. At this time a small building was located just north of the perimeter road approximately 150 m south of the Subject Property. Bearing in mind the historical use of this land as a munitions factory, the following contaminants that may possibly be found on site include:

- asbestos from demolished building material in the made ground; and
- theoretical possibility of explosives or residues from explosives associated with wartime bombing of the munitions factory and also production of cordite.

4.3 RECEPTORS

A summary of the statutory receptors considered for inclusion in the conceptual site model is provided in *Table 4.1*. Further detail relating to the receptors identified within the table is presented in *Sections 4.3.1 – 4.3.4*.

Table 4.1Receptors Check List

	On-Site	Off-Site (<1km)
Human beings	✓	✓
Ecological systems	✓	✓
Property - crops/livestock	X	✓
Property – buildings	✓	✓
Property - domestically grown produce	X	X
Controlled waters – groundwater	✓	✓
Controlled waters - surface water	✓	✓

4.3.1 Human Health

Onsite Permanent Workers

In the context of a commercial land end use, the primary human health receptor is likely to be an adult member of the site workforce. The primary consideration relating to these workers is likely to be harmful effects caused by long term exposure to low contaminant concentrations (chronic effects).

Onsite Temporary Workers

In addition to the regular workforce, it is possible/likely that ground workers may be present onsite in the future, undertaking works during which exposure to any possible ground contamination is likely (ie earthworks). Given the temporary nature of this work, the primary consideration relating to these receptors is likely to be harmful effects caused by short term exposure to contaminants at higher concentrations (acute effects). For the purposes of risk assessment, lower contaminant concentrations associated with long term exposure/chronic effects to the permanent work force is considered to be protective of temporary workers.

Offsite Human Receptors

Offsite human health receptors are highly likely to be present in the area surrounding the site. This includes workers in the surrounding commercial properties and occupants of the residential properties situated north of the boundary of the site. For the purposes of risk assessment, with the possible exclusion of exposure as result of vapour generation as a result of migratory

groundwater, exposure risk assessment covering the onsite human health receptors is considered likely to be protective of offsite equivalents.

4.3.2 Ecological Receptors

As part of the Extended Phase 1 survey conducted in June 2013 by third parties, several protected species were identified at the site; Great Crested Newts, Badges, Bats, and Reptiles. As part of the mitigation works prior to commencement of the works the newts were trans-located off-site.

4.3.3 Property

Buildings & Services

If the site is to be developed at some point in the future, the consideration of chemical attack on subsurface structures/services as an issue would be dependent on the nature of the development (including layout, selection of materials, foundation type etc).

4.3.4 Controlled Waters

Groundwater

The Kinnerton Sandstone Formation bedrock likely to be present across the site area is classified as a Principal Aquifer. However, this is overlain by Till, which is classified as Unproductive Strata.

The vulnerability of the above groundwater receptor is likely to be a function of the depth of groundwater contained within this unit. Additionally, the vulnerability of this receptor is reduced due to the superficial overlying Till deposits encountered across the site area.

Surface Water

The nearest surface water feature is an unnamed drain running along the western boundary of site, which appears to flow towards Redwither Brook (1.25 km south east of the site). Redwither Brook is a tributary of the River Clywedog.

The sensitivity of the above surface watercourses is likely to primarily be a function of the level of hydraulic continuity between the unnamed drain and the underlying groundwater.

4.4 PATHWAYS

The identified potential pathways through which a contaminant source at the site could plausibly be exposed to a statutory receptor are listed below.

Human Health Receptors:

- direct/dermal contact with contaminated soils and groundwater;
- ingestion of contaminated soils and groundwater;
- migration into, or onto, property of contaminants as vapours/gases by diffusion and along pressure gradients and subsequent inhalation; and
- migration as particles in windblown dust and subsequent inhalation/ingestion.

Controlled Waters Receptors:

- dissolution of contaminants in percolating rainwaters into shallow groundwater;
- lateral continuity between shallow groundwater and surface water features; and
- surface water runoff.

4.5 IDENTIFIED POTENTIAL CONTAMINANT LINKAGES

Based on the above conceptual model, *Table 4.2* summarises the plausible contaminant linkages identified at the site under a continued commercial land use.

Table 4.2 Tabulated Theoretical Conceptual Site Model

	Primary Source	Secondary source	Hazard	Transport Mechanism	Pathway	Medium of Exposure	Receptor	Relative Risk Screening and Prioritisation
1	Historical Site activities	Contaminated soils	Human health effect	Direct contact	Ingestion of near surface soils	Soil	Humans (on-Site)	Medium
2	Historical Site activities	Contaminated soils	Human health effect	Direct contact	Dermal contact with near surface soils	Soil	Humans (on-Site)	Medium
3	Historical Site activities	Subsurface vapours & gasses	Human health effect	Emissions at surface	Inhalation of vapours	Air	Humans (on-Site)	Low
4	Historical Site activities	Subsurface vapours & gasses	Human health effect	Accumulation within buildings	Inhalation of vapours	Air	Humans (on-Site)	Low
6	Historical Site activities	Contaminated soils	Human health effect	Windblown dusts/ transport through air	Inhalation of particles	Air	Humans (on-Site)	Medium
7	Historical Site activities	Mobile soil contaminants	Deleterious effect on groundwater quality.	Migration of contaminated perched ground waters	Dissolution in groundwater	Water	Controlled waters (groundwater)	Low
8	Historical Site activities	Mobile soil contaminants	Deleterious effect on surface water quality	Percolation of mobile contaminants	Dissolution in surface water	Water	Controlled water *(groundwater)*	Low
9	Historical Site activities	Contaminated shallow/perched ground water	Deleterious effect on surface water quality	Migration of contaminated perched ground waters	Dissolution in surface water	Water	Controlled water *(groundwater)*	Low
10	Historical Site activities	Subsurface vapours & gasses	Substantial damage to buildings	Accumulation and ignition within buildings	Migration in soils & into buildings	Air	Property-buildings (on-Site)	Low
11	Historical Site activities	Contaminated soils/mobile soil contaminants	Chemical attack services inc. water supply pipes	Direct contact	Direct contact & migration in soils	Soil/Water	Property -Services (on-Site)	Low - Medium
12	Historical Site activities	Contaminated soils/mobile soil contaminants	Chemical attack on building materials	Migration of contaminated ground waters	Direct contact & migration in soils	Soil/Water	Property-buildings (on-Site)	Low – Medium

Relative Risk Screening and Prioritisation for further Investigation & or Assessment	
H	Higher probability of occurrence and identification of primary sources of contamination with respect to most sensitive receptors.
M	Pollutant linkage generally dependent on the presence of other primary pollutant linkages and/or where pollutant linkage generally associated with less sensitive receptors.
L	Lower probability of occurrence such as based on requirement for significant migration pathway or where pollutant linkage requires the presence of source contaminants at concentration likely to be much higher than other identified pollutant linkages.

5 SITE INVESTIGATION WORKS

5.1 INTRODUCTION

All intrusive investigation works and associated soil and groundwater sampling activities were undertaken by ERM (and subcontractors) at the site between two phases of works, the dates for which were Friday 20 February to Wednesday 4 March 2015 and Monday 23 March to Thursday 26 March 2015.

5.2 INVESTIGATION SCOPE AND METHODS

The following geo-environmental fieldworks were completed by ERM as part of the Phase II investigation:

- utility/service clearance of 18 locations and positional/elevation survey;
- advancement of 5 (BH 5 to 9) shallow boreholes to a depth of up to 5.45 m below ground level (bgl) using a lined percussive drilling methodology ('windowless sampler') and recovery of one environmental soil sample at each location;
- advancement of 4 deep boreholes (BH 1 to 4) to depths of between 15 m and 30 m bgl using a cable percussive drilling methodology ('windowless sampler') and recovery of one environmental soil sample at each location;
- monitoring of unexploded ordnance (UXO) during drilling works at regular intervals using a magnetometer;
- installation of 9 soil gas/groundwater monitoring wells;
- advancement of 19 trial pits using a back-hoe excavator. Of these, 7 trial pits were focussed on the delineation of a peat deposit encountered on the southern boundary of the site;
- field screening for volatile organic compounds at 0.5 m intervals throughout the encountered ground at all locations;
- one round of groundwater elevation measurement/groundwater quality monitoring and recovery of 9 groundwater samples; and
- two rounds of soil gas quality monitoring.

Additional samples were taken for geotechnical purposes.

The rationale for each of the investigation locations is provided in *Table 5.1* Also provided within this table are details of any limitations relating to the borehole locations encountered throughout the course of the investigation (ie drilling refusals or moving of locations due to services).

Table 5.1 Investigation Locations and Rationale

Location	Rationale	Comments
BH1	Building footprint	Installed as monitoring well
BH2	Building footprint	Installed as monitoring well
BH3	Building footprint	Installed as monitoring well
BH4	Building footprint	Installed as monitoring well
BH5	Building footprint Spatial coverage	Installed as monitoring well
BH6	Building footprint Spatial coverage	Installed as monitoring well
BH7	Spatial coverage	Installed as monitoring well
BH8	Spatial coverage	Installed as monitoring well
BH9	Spatial coverage	Installed as monitoring well
TP1	Spatial coverage	-
TP2	Building footprint	-
TP3	Building footprint	-
TP4	Building footprint	-
TP5	Building footprint	-
TP6	Spatial coverage	-
TP9	Spatial coverage	-
TP9a	Spatial coverage	-
TP101	Spatial coverage	Geotechnical purposes
TP102	Spatial coverage	Geotechnical purposes
TP103	Spatial coverage	Geotechnical purposes
TP104	Spatial coverage	Spatial coverage
TP105	Spatial coverage	Peat delineation
TP106	Spatial coverage	Peat delineation
TP107	Spatial coverage	Peat delineation
TP108	Spatial coverage	Peat delineation
TP109	Spatial coverage	Peat delineation
TP110	Spatial coverage	Peat delineation
TP111	Spatial coverage	Peat delineation

In addition to the above environmental works, ERM was requested by the client to provide preliminary geotechnical information to be used to inform potential site purchasers/developers. For this purpose, *Applied Geology* was appointed as ERM's subcontractor and the following additional geotechnical works were completed in conjunction with the geo-environmental investigation:

- Completion of Standard Penetration Tests (SPTs) within the nine cable percussion boreholes.

- In addition undisturbed cohesive soil samples were recovered from boreholes BH1, BH2, BH3, BH4 and BH6. Bulk granular material samples from the above boreholes and trial pits TP101, TP102, TP103 and TP3.

- Geotechnical laboratory testing was carried out on the recovered samples by Terra Tek on behalf of *Applied Geology*.

A summary of the laboratory geotechnical testing undertaken is presented in *Section 5.3.3* below.

The results of all geotechnical works are presented in Applied Geology's report presented in *Annex F*.

Further detail on the completed fieldworks is provided in the following S*ections 5.2.1 – 5.2.6*.

5.2.1 Utility / Service Clearance

In order to reduce the likelihood of subsurface utility/service disruption during the works, available site plans were reviewed and each investigation location was surveyed by a specialist utilities tracing company (*Subsight Surveys Ltd*) prior to the breaking of ground. The elevation of each borehole location was additionally surveyed at this point.

In accordance with ERM subsurface clearance protocols, following completion of the above utility tracing survey, each location was further hand excavated to a depth of 1.5 m bgl prior to the commencement of drilling (or to the maximum depth achievable dependent on the ground conditions).

5.2.2 Borehole Drilling & Monitoring Well Installation

A total of 9 boreholes were advanced to depths of between 5.0 and 30.0 m bgl using a lined percussive drilling methodology ('windowless sampler') and a shell and auger cable percussion drill rig. All borehole drilling activities were carried out by a specialist drilling contractor contracted by *Applied Geology*. Due to the potential presence of unexploded ordnance (UXO) at the site, each borehole was scanned by *First Line Defence* using a magnetometer at regular intervals during the drilling works to ensure each location was safe to drill.

Following drilling, 50 mm internal diameter HDPE soil gas/groundwater monitoring wells were installed at eight of the borehole locations by the drilling contractor. One 19 mm diameter piezometer monitoring well was installed in BH3. In all cases, the specification of the monitoring well comprised a graded gravel filter pack installed around a slotted response zone, with an overlying plain riser section encased within a synthetic clay plug (bentonite). In order to allow the completion of soil gas monitoring, all standpipes, including BH3 were completed with a gas tap/bung, and installed within metal headworks flush to the ground surface.

The locations of the 9 boreholes advanced within the site area as part of the investigation are also presented in *Figure 2, Annex A*. Exploratory drilling logs providing details of all monitoring well installations are presented as report *Annex B*.

5.2.3 *In-Situ Geotechnical Testing*

In-situ testing comprised Standard Penetration Tests within the boreholes and hand vane tests within trial pits TP101-107. Only the glacial till materials were tested as the shallow peat and made ground materials proved to be unsuitable for insitu testing.

5.2.4 *Field Screening and Soil Sampling*

Soil arisings recovered from each investigation location were field screened for the presence of Volatile Organic Compounds (VOCs) using a handheld Photoionisation Detector (PID) calibrated against a standard gas (100 ppm isobutylene). Headspace samples were recovered at 0.5 m throughout the encountered soil profile, transferred to clean/disposable polyethylene bags and sealed. A stabilisation period of not less than five minutes was then allowed to elapse, prior to headspace testing using the PID.

Based on the above VOC screening or on other visual/olfactory or general observations, a total of 18 discreet soil samples were recovered from a range of depths/strata across the site and immediately transferred to clean laboratory supplied sampling containers. Samples were then labelled and transferred to the testing laboratory by overnight courier under standard 'chain of custody' documentation.

Full details of all soil samples recovered, together with the results of all completed field screening/headspace testing are included within the exploratory drilling logs provided in *Annex B*.

5.2.5 *Groundwater Monitoring and Sampling*

Following installation, all monitoring wells were 'developed' through the removal of five standing well volumes of groundwater (or until the well ran dry) using a disposable bailer and line. This was completed in order to remove drilling fines and to settle the well filter pack. The monitoring wells were then allowed to stabilise for a period of not less than 24 hours prior to groundwater monitoring and sample recovery.

Following development, a total of nine groundwater samples were recovered from the all of the installed monitoring wells. Additionally, one duplicate sample was recovered for QA/QC purposes (this sample is identified within the laboratory results as DUP1). The completed groundwater sampling works included measurement of the depth to resting water using an oil interface meter, followed by low flow purging using a peristaltic pump and clean/disposable polyethylene tubing. In all cases, the peristaltic pump was set at a flow rate of less than 0.5 L per minute and throughout the purging process, groundwater quality parameters, including temperature, dissolved oxygen, conductivity, pH and oxygen reducing potential were recorded using a multiparameter probe (*YSI Multimeter*). Once the above field parameters

had stabilised (providing indication that the sample was representative of the surrounding groundwater), a groundwater sample was recovered, filtered if required and immediately transferred to clean laboratory supplied sampling containers. Samples were then labelled and stored on ice prior to transfer the testing laboratory by overnight courier under standard 'chain of custody' documentation.

A summary of the recorded groundwater quality parameters, together with all recorded visual/olfactory observations and level monitoring data are provided in *Section 6* of this report.

5.2.6 Soil Gas Monitoring

A round of soil gas monitoring was completed by ERM on Tuesday 3 March 2015, the results of which are presented within *Table C6, Annex C*. An additional round was carried out on Friday 27 March 2015 to monitor BH3 which was installed during a second phase of works.

Soil gas monitoring was undertaken at the installed monitoring wells using a portable infra-red gas analyser (*GFM 435*) set to record flow rate (L/h), methane (CH_4 %), carbon dioxide (CO_2 %), oxygen (O_2 %) and barometric pressure (mb). In addition, VOC levels were recorded at each monitoring well location using a handheld PID calibrated against a standard gas (100 ppm isobutylene).

Risk assessment of the soil gas monitoring results is included in *Section 7* of this report.

5.3 LABORATORY ANALYTICAL WORK

5.3.1 Soils Analysis

A total of 19 soil samples were recovered throughout the course of the Phase II investigation. This comprised 9 borehole samples, 9 trial pit samples, and one duplicate sample. All of which were scheduled for chemical analysis.

The standard analytical suite undertaken for soil samples was as detailed below:

- Metals - Arsenic, Cadmium, Copper, Chromium, Mercury, Nickel, Lead, Selenium, Zinc, Barium, Cobalt, Iron, Manganese;
- TPH CWG (Aliphatic/Aromatic Split);
- Volatile Organic Compounds (VOCs);
- Polycyclic aromatic hydrocarbons (PAH) 16 US EPA;
- BTEX (Benzene, toluene, ethylbenzene and xylenes);
- Phenol;
- Polychlorinated biphenyls (PCBs) WHO 12;
- Asbestos fibre screen;

- Total Organic Carbon (TOC);
- Ammoniacal Nitrogen;
- Sulphide;
- Total cyanide;
- Free cyanide;
- pH; and
- Sulphate.

All soil analytical work was undertaken by *Jones Environmental Forensics* (Unit 3 Deeside Point, Deeside Industrial Park, Flintshire, CH5 2UA, United Kingdom), a UKAS accredited laboratory.

Laboratory transcripts relating to the above completed soil analysis are provided in full as report *Annex E*.

5.3.2 Water Analysis

A total of 9 groundwater samples (plus 1 duplicate sample) were recovered as part of the investigation. All of the water samples were scheduled for the chemical analysis as detailed below:

- Metals - Arsenic, Cadmium, Copper, Chromium, Mercury, Nickel, Lead, Selenium, Zinc, Barium, Cobalt, Iron, Manganese;
- TPH CWG (Aliphatic/Aromatic Split);
- Volatile Organic Compounds (VOCs);
- Semi-Volatile Organic Compounds (SVOCs);
- BTEX (Benzene, toluene, ethylbenzene and xylenes);
- Total Organic Carbon (TOC);
- Ammoniacal Nitrogen;
- Sulphide;
- Total cyanide;
- Free cyanide;
- Thiocyanate;
- pH;
- Sulphate; and
- Hardness as $CaCO_3$

All groundwater analytical work was carried out by *Jones Environmental Forensics*.

Laboratory transcripts relating to the above completed analysis are provided in full as report *Annex E*.

5.3.3 Geotechnical Testing

Geotechnical laboratory testing was carried out on soil samples recovered from the drilling works. The testing suite comprised the following:

- Natural moisture content;
- Atterberg limits;
- Particle size distribution;
- Undrained triaxial tests;
- Moisture content/dry density relationship;
- Consolidation test; and
- Sulphate classification testing.

5.4 GENERAL SAMPLING AND DECONTAMINATION PROCEDURES

Potential sources of cross-contamination were avoided wherever possible throughout the course of the investigation. No grease or petroleum-based lubricants were used on the drilling equipment, and during sampling/decontamination activities, disposable nitrile gloves were worn to prevent the transfer of contaminants from other sources. Single use disposable equipment such as gloves and tubing was disposed of after each use and were not re-used between locations in any instance.

Care was taken throughout the sampling procedures to ensure that all soil and groundwater samples submitted for volatile organic analysis were correctly sealed with no headspace present within the sampling containers.

A groundwater field duplicate sample was taken from location BH1 and labelled as DUP1. This sample was submitted as a blind duplicate to the laboratory in order to evaluate sampling and analytical bias.

As part of the overall sampling QA/QC procedures, sample tags and chain-of custody travel documents were filled out for each sample. This allowed tracking of the samples from acquisition through to analysis.

5.5 QUALITY CONTROL AND QUALITY ASSURANCE

General sampling and decontamination procedures used in the course of the investigation were designed to allow the collection of representative samples and to minimize the potential for cross-contamination between samples. During sampling all non-disposable hand equipment was decontaminated with deionized water prior to initial use, between locations/events and at the completion of activities, wherever appropriate. All disposable equipment, such as gloves and disposable bailers were changed between each sample obtained and each borehole. A program of field QA/QC was implemented including sample labelling and the submission of field blanks and duplicates. QA/QC samples were collected at the following frequencies:

- duplicate groundwater samples at a frequency of 1 per 10 samples.

The relative percentage difference (RPD) was calculated between the samples and duplicates using the following formula:

$$RPD = \frac{measured_1 - measured_2}{\left(measured_1 + measured_2\right)/2} * 100\%$$

The target RPD of ≤ 30% was selected with reference to the US EPA's Uniform Federal Policy for Quality Assurance Project Plans Manual (1) which refers to the use of this level for volatile compounds and has been extended as an acceptable limit for other types of compounds. The use of duplicate samples in this way assesses both field sample and laboratory error.

Findings

From a comparison of duplicate samples where the calculated RPD was <10% (*Tables C3* and *C5, Annex C*), the analytical data is considered robust.

(1)U.S. Environmental Protection Agency. 'Uniform Federal Policy for Quality Assurance Project Plans', Intergovernmental Data Quality Task Force, EPA 505-B-04-900A.

6 ENCOUNTERED GROUND CONDITIONS AND EVIDENCE OF IMPACT

6.1 GEOLOGY

The following text provides a generalised summary of the ground conditions encountered across the site. A full description of the recorded geological sequence and observed visual/olfactory evidence of contamination impact at each individual borehole location is given in the exploratory borehole logs, provided as report *Annex B*.

The geological sequence encountered at the site was generally as expected prior to the start of the fieldwork, based on a review of the publicly available geological mapping (see *Section 3*). This is with the following notable exceptions:

- Made ground was encountered at limited locations across the site. Generally this was of a relatively limited thickness (<1.5 m).
- Slag/burnt shale was observed in BH7 at a depth of 1.0 to 1.35 m bgl.
- Suspected asbestos-containing material (approximately one square metre of fibrous matting) was observed in TP6 in made ground up to 0.9 m bgl.
- Peat or alluvium was recorded on the southern limit of the site at depth of between 0.2 m and 1.7 m.

T*able 6.1* provides a generalised summary of the main strata encountered throughout the course of the investigation.

Table 6.1 Encountered Ground Conditions

Strata	Classification	Generalised Description	Maximum Depth	Comments
Made Ground	-	Firm dark brown gravelly sandy clay with rounded quartzite and brick fragments.	1.05 m bgl	BH7
Made Ground	-	Brown slightly sandy clayey gravel with slag, burnt shale, brick and coal.	1.35 m bgl	BH7
Made Ground	-	Firm dark brown gravelly sandy clay with rounded quartzite and rare red clay tile.	0.5 m bgl	BH9
Made Ground	-	Dark brown slightly sandy clay with gravel, cobble, and boulder size fragments of concrete slabs, wood, and metal brick , and a suspected asbestos containing matting material	0.9 m bgl	TP6

Strata	Classification	Generalised Description	Maximum Depth	Comments
Made Ground	-	Firm dark brown gravelly sandy clay with rounded quartzite.	1.0 m bgl	BH9
Made Ground	-	Brown gravelly sand with timber fragments and rootlets. Gravel is coarse quartzite and mudstone.	1.5 m bgl	
Peat	Organic-rich soil	Spongy amorphous, fibrous peat with sandy silt and very fine silty sand with organic material and wood fragments	2.5 m bgl	Low lying areas in the south/south west area of the site
Till	Superficial Deposits	Firm laminated brown sand clay. Laminations are extremely close to very closely spaced with silt and sand infill.	25.0 m bgl (base not proven)	Likely present across site area.

6.2 *VISUAL / OLFACTORY OBSERVATIONS AND HEADSPACE TESTING*

The site appeared to be generally free from gross/significant contamination and minor evidence of impact at the 18 borehole and trial pit locations. All visual or olfactory observations of potential contaminant impact recorded throughout the course of the investigation are summarised in Tab*le 6.2.* Also included within the table is a summary of the PID/headspace readings recorded at each investigation location.

Table 6.2 Field Observations of Impact

Location	Observation	Max. PID Reading (ppm)
BH1	NVO	1.7
BH2	NVO	5.5
BH3	NVO	<0.1
BH4	NVO	3.9
BH5	NVO	3.5
BH6	NVO	6.0
BH7	NVO	3.5
BH8	NVO	0.2
BH9	NVO	1.2
TP1	NVO	<0.1
TP2	NVO	2.5
TP3	NVO	2.2
TP4	NVO	0.7
TP5	NVO	1.7
TP6	Suspected asbestos containing matting material at 0.9m	0.5
TP9	NVO	0.2
TP9a	NVO	0.2
TP101	NVO	<0.1
TP102	NVO	0.1
TP102	NVO	<0.1

Location	Observation	Max. PID Reading (ppm)
TP103	NVO	0.1
TP104	NVO	0.1
TP105	NVO	<0.1
TP106	NVO	0.1
TP107	NVO	<0.1
TP108	NVO	<0.1
TP109	NVO	<0.1
TP110	NVO	<0.1
TP111	NVO	<0.1

NVO = No visual or olfactory evidence of impact

6.3 GROUNDWATER

Groundwater encountered throughout the course of investigation was associated with the natural clay layers.

Table 6.3 provides a summary of groundwater depths recorded within the installed monitoring wells and the corresponding groundwater elevations calculated using the surface elevation survey data.

Table 6.3Groundwater Elevation Data

Location	Depth to Water (m bgl)	Depth to Base (m bgl)	Surface Elevation (m AOD)	GW Elevation (m AOD)	Observed Recharge
BH1	0.82	7.42	**	**	Good
BH2	1.69	8.09	41.53	39.84	Good
BH3	0.3* Ar	25.3	39.72	40.42	Ran dry after 1.5L
BH4	2.09	7.60	41.25	39.16	Good
BH5	1.3	3.90	40.75	39.45	Ran dry after 6L
BH6	0.59	4.82	40.73	40.14	Good
BH7	2.58	5.03	40.47	37.89	Ran dry after 5L
BH8	0.58	4.36	38.06	37.48	Good
BH9	0.18	4.95	38.79	38.61	Good

Ar Artesian

*Piezometer installed to +1 m above ground level. Depth to water is from the top of piezometer

**BH1 was moved approx. 10 m east of original location, therefore, the original surface elevation no longer applicable to this location.

Groundwater flow direction is inferred to be in a south-south westerly direction towards the surface water ditch along the south west boundary which leads to Redwither Brook.

A groundwater strike was encountered at 25.3 m bgl within a granular layer of the glacial till. This proved to be artesian with a resting water level 0.7 m above ground level (0.3 m from the top of the piezometer which was installed 1 m above ground level).

In addition to level measurement data, a range of groundwater quality parameters were recorded at each location prior to the recovery of a sample for chemical analysis. This groundwater quality data is summarised in *Table 6.4*

Insufficient water was present within the piezometer installed at BH3. Therefore, a grab sample was obtained and field parameters were not recorded.

Table 6.4 Groundwater Quality Data

Location	**Temp.**	**DO**	**SPC**	**pH**	**ORP**
	°C	%	µS/m	units	mV
BH1	9.3	36.0	712.5	7.61	26.3
BH2	10.0	25.4	554.2	7.26	91.7
BH3	-	-	-	-	-
BH4	9.9	7.4	727	7.40	93.3
BH5	9.3	40.5	587.5	8.12	92.7
BH6	8.2	30.9	589.9	7.89	91.1
BH7	9.9	14.5	1059	6.94	-28.4
BH8	6.9	10.7	887	6.83	115.0
BH9	7.1	10.2	859	6.84	98.4

No obvious visual or olfactory evidence of gross groundwater contamination (free phase product, chemical/hydrocarbon odours etc.) was recorded at any investigation location.

7 GEOTECHNICAL RESULTS EVALUATION

A total of 22 Atterberg tests were carried out on the glacial till material giving liquid limits ranging between 25% and 59% and plasticity index values of between 14% and 37%. These results suggest a variable material of low to high plasticity clay.

Particle size distribution tests were carried out on 9 glacial till samples which confirmed the material to vary between coarse sand and clay as identified within the borehole logs.

Standard penetration tests (SPTs) carried out within the cohesive glacial till ranged between 5 and 43. SPTs carried out within the granular glacial till deposits gave SPT values ranging between 12 and 43. Lower results were encountered within the cohesive and granular deposits, potentially where the SPT was taken within a groundwater strike zone.

Unconsolidated undrained triaxial tests were carried out on 18 glacial till samples. These gave undrained shear strengths of between 26 kN/m^2 and 166 kN/m^2. The lowest strength of 26 kN/m2 was from a silt recovered at 3.0 m to 3.45 m depth in BH3. The second lowest result was 43 kN/m^2 from firm clay at 6.0 m-6.45 m within BH3 suggesting that the silt deposits exhibit a lower shear strength than the firm clays.

Hand shear vane tests carried out within trial pits TP 101 to 107 within the glacial till at depth of between 1.0 m and 2.4 m recorded shear strengths ranging between 100 kN/m^2 and 220 kN/m^2.

A total of 4 moisture content/dry density relationship tests were carried out on the glacial till. These gave maximum dry densities of between 1.64 Mg/m3 and 1.7 Mg/m3 for optimum moisture contents of between 20.1% and 22.1%

A single consolidation test was carried out on a glacial till sample recovered from a depth of 6.00 m-6.45 m at BH3. This gave an M_v value of 0.074 m^2/MN and a C_v of 2.41 m^2/year.

BRE sulphate tests were carried out on 13 soil samples which all conformed with a Design Sulphate Class of DS-1 and an Aggressive Chemical Environment for Concrete of AC-1 (ref. *BRE Special Digest 1, Concrete in Aggressive Ground, 2005*).

The risk based assessment of land contamination is undertaken in accordance with a 'suitable for use' approach and should follow a tiered framework, as detailed in *Section 2.2* ERM has undertaken an assessment of the identified plausible contaminant linkages at the site through the completion of a GQRA with respect to human health and controlled waters receptors.

Risk assessment tables providing a summary of the relevant analytical results and screening criteria are presented within *Tables C1-C6, Annex C*. Full laboratory transcripts are additionally included as report *Annex E*.

8.1 HUMAN HEALTH EFFECTS

8.1.1 Rationale

The conceptual site model indicates that the most sensitive potential human health risks are likely to relate to the long term health of current/future on site users (ie the site workforce). This section summarises the methodology adopted in undertaking the generic quantitative human health risk assessment and presents the results of the assessment.

Human health effects have been assessed in the context of an ongoing commercial land use with respect to the potential exposure of end users to contaminants present within shallow soils and groundwater as a result of:

- direct contact with soils (ingestion and dermal contact);
- inhalation of soil particulates; and
- inhalation of soil & groundwater derived vapours (commercial land use).

The exposure pathways, frequencies and durations of the CLEA standard commercial land use scenario (SR3 - Environment Agency 'Updated technical background to the CLEA Model', August 2008) are considered to be appropriate for a preliminary assessment of the land use of the site.

Where available, the soil contaminant concentrations reported in the site data have been compared against UK EA published Soil Guideline Values (SGV) (commercial land use). In the absence of a SGV value, soil concentrations have been compared with ERM's in house generic assessment criteria (GAC) (commercial land use) which have been developed in general accordance with the "CLEA Framework" of documents.

Further details relating to the derivation of ERM's human health generic assessment criteria (GAC) are provided as report *Annex D*.

8.1.2 Data Evaluation

A tabulated maximum value comparison of the recorded soil concentrations against the human health screening criteria for a commercial land use is presented within *Tables C1 and C1A, Annex C.*

A maximum value comparison is undertaken as the first level of assessment where each individually recorded concentration is compared against the relevant assessment criteria value, irrespective of sample depth and/or location. This should be considered a conservative assessment methodology, particularly with regards to the direct contact (ingestion and dermal) pathways, given that significant exposure via these pathways is unlikely below a depth of (approximately) 0.4 m or where hardstanding is present at the site.

In this instance, all substances present within the soils data were reported at concentrations below their respective assessment criteria and/or the analytical limits of detection (ie no exceedances of the GQRA screening criteria are reported).

No asbestos-containing material (ACM) was detected in the sample obtained from TP6 within made ground where fibrous matting was observed to potentially contain ACM.

Further to the above chemical testing, where samples were composed of made ground, a visual screen for asbestos was undertaken by the laboratory. The results of this screening indicate that asbestos was not observed to be present in any of the submitted samples.

8.1.3 Ground Water Derived Vapours Assessment

The CLEA framework does not currently include specific guidance for assessing the potential risks to human health via the inhalation of groundwater derived vapours. In the absence of UK specific guidance, ERM has followed the spirit of the methodology to derive a set of Generic Assessment Criteria for groundwater (GACGW) based on the partitioning of vapours from groundwater and subsequent migration through the unsaturated zone using the same standard land use assumptions detailed within SR3.

The tabulated groundwater vapour inhalation assessment against the human health screening criteria for a commercial land use is presented in *Table C3A, Annex C.*

In this instance, all substances reported within the groundwater data were recorded at concentrations below their respective assessment criteria and/or the analytical limits of detection (ie no exceedances of the screening criteria are reported).

8.1.4 *Human Health Summary*

As detailed above, no chemical concentrations exceeding the screening criteria were reported within the laboratory data relating to human health risks at the site under a commercial land use scenario. Based on this, the site should be viewed as suitable for use under this scenario.

8.2 *CONTROLLED WATERS EFFECTS*

8.2.1 *Rationale*

This section summarises the methodology adopted in undertaking the generic quantitative controlled waters risk assessment and presents the results of the assessment. The assessment of plausible contaminant linkages with respect to the pollution of controlled waters has been undertaken consistent with the guidance and methods specified by the UK EA in the document Groundwater Protection: Policy & Practice (GP3), Version 1, November 2012.

The nearest surface water receptor is present within 100m of the site boundary which may be in continuity with shallow/perched groundwater encountered during the course of the investigation. As such, contaminant concentrations reported in the submitted groundwater samples were initially screened against UK Environmental Quality Standards (EQS).

With regards to the above, where the relevant UK EQS/DWS screening values relating to specific compounds are not freely available, proxy values relating to freshwater receptors, or surrogate values published by non-UK organisations (for example United States Environmental Protection Agency (USEPA)) may be used.

8.2.2 *Data Evaluation (Groundwater)*

A tabulated maximum value comparison of the recorded groundwater concentrations against the controlled waters screening criteria is presented within *Table C3, Annex C.*

Exceedances of the controlled waters screening criteria (EQS/DWS) relating to contaminant concentrations reported within the groundwater data are summarised in *Table 8.2.*

Table 8.1 Summary of Groundwater Exceedances

Substance	Units	No. of samples exceeding WQS	Detected Range of Exceedances	WQS
Metals				
Dissolved Selenium	µg/l	2 of 9	6 – 29	WHO (DWS) in absence of WQS

All other concentrations reported within the groundwater samples were recorded at concentrations below their respective assessment criteria and / or the analytical limits of detection.

8.2.3 Controlled Waters Summary

Generally the laboratory data suggests that the groundwater at the site is of relatively good quality.

Exceedances of the controlled waters screening criteria were reported in the data relating to selenium in two locations (BH1 and BH6) installed as monitoring wells.

8.3 SOIL GAS RISK ASSESSMENT

8.3.1 Rationale

In confined conditions, ground gas can accumulate to form an explosive and/or asphyxiating atmosphere. Methane is a flammable, colourless and odourless gas and is potentially explosive in the range 5% to 15% by volume, assuming the presence of oxygen of at least 13% by volume. In confined spaces, carbon dioxide can displace oxygen and accumulate to form asphyxiating and toxic conditions.

Ground gas concentrations recorded at the site were assessed against the guidance detailed within CIRIA report C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings", 2007, British Standard "Code of practice for the characterization and remediation from ground gas in affected developments" BS 8485:2007. This guidance identifies that the assessment of risks from ground gases requires consideration of both gas concentrations and borehole flow rates, whereby the combination of the two can be used to define a site Characteristic Gas Situation (CGS) based on the limiting borehole gas volume flow for methane and carbon dioxide, known as the Gas Screening Value (GSV).

The GSV is calculated by multiplication of the borehole flow rate (L/h) with the recorded gas concentration (%). In order to represent the differing acute/chronic risk profiles for CH4 and CO2, GSV are calculated using the maximum observed flow rate/concentration for CH4, whereas the steady state flow rate/concentration is used for CO2.

8.3.2 Data Assessment

Ground gas (CH4 and CO2) and total VOC concentrations were monitored at all of the three monitoring wells installed as part of the investigation.

Full details of the monitoring wells at which gas monitoring was undertaken and all flow rates, CH4, CO2 and VOC concentrations recorded during the

monitoring round are presented in full in *Table C6 Annex C*. Also included in this table are the GSVs and corresponding CGS calculated for each monitoring location.

In summary, the highest CH4 and CO2 concentrations recorded at the site were <0.1% and 0.2% (BH6) respectively. The highest single flow rate recorded across the site was -1.6 L/h (BH1). Calculated from the CH4, CO2 and flow rate data, the highest single GSV recorded across the site was 0.00. This GSV corresponds to a Level 1 CGS or a 'Very Low' hazard potential.

8.3.3 Soil Gas Summary

In general, the site does not appear to have gas generation issues. Based on the data from the single gas monitoring round, the gas regime at the site would likely be characterised as a CIRIA Level 1 CGS (Very Low Hazard Potential), representative of natural soils with low organic content or 'typical' made ground. It should be noted that the localised peat deposits found along the south-western side of the site may generate low volumes of methane and carbon dioxide associated with the gradual decomposition of the peat.

It should be noted that where soil gas monitoring is limited to a single round (as in this case), the results provide only a snapshot of the conditions present at the time of monitoring. Where full characterisation of the soil gassing regime at a site is required, several rounds of monitoring undertaken over an extended period of time and under a range of climactic conditions are likely to be required by the regulatory authorities.

9 SUMMARY, KEY FINDINGS AND CONCLUSIONS

9.1 GENERAL

Environmental Resources Management Ltd (ERM) was commissioned by Cytec Industries Inc. ('the client') to undertake geo-environmental site investigation works at the Subject Property located at Abenbury Way, Wrexham, UK.

These works were completed by ERM (and appointed subcontractors) between the dates of Friday 20 February and Friday 27 March 2015.

9.2 ENCOUNTERED GROUND CONDITIONS

The geological sequence encountered at the site was generally as expected prior to the start of the fieldwork, based on a review of the publicly available geological mapping (see *Section 3*). This is with the following notable exceptions:

- Made ground was encountered in locations in the south and west of the site. Generally this was of a relatively limited thickness (<1.5 m); and
- Peat (organic rich soil) was encountered in low lying areas in proximity to the stream along the south west boundary of the site and a maximum thickness of 2.2 m.

The site appeared to be generally free from gross/significant contamination. No obvious visual or olfactory evidence of contamination (free phase product, chemical/hydrocarbon odours etc) was recorded at any location. All PID readings were below 5 ppm. A fibrous matting material in TP6 was suspected to comprise asbestos, but testing showed no asbestos present.

Groundwater encountered throughout the course of investigation was associated with the natural clay layers. No obvious visual or olfactory evidence of gross groundwater contamination (free phase product, chemical/hydrocarbon odours etc) was recorded at any investigation location.

9.3 HUMAN HEALTH RISK ASSESSMENT

Human health effects have been assessed in the context of an ongoing commercial land use. Where available, the soil contaminant concentrations reported in the site data have been compared against UK EA published Soil Guideline Values (SGV) (commercial land use). In the absence of a C4SL/SGV value, soil concentrations have been compared with ERM's in house generic assessment criteria (GAC) (commercial land use).

In this instance, no chemical concentrations exceeding the screening criteria were reported within the laboratory data relating to human health risks at the site under a commercial land use scenario. Based on this, the site should be viewed as suitable for use under this scenario.

9.4 CONTROLLED WATERS RISK ASSESSMENT

The assessment of plausible contaminant linkages with respect to the pollution of controlled waters has been undertaken consistent with the guidance and methods specified by the UK EA in the document Groundwater Protection: Policy & Practice (GP3), Version 1, November 2012.

With the exception of dissolved selenium, no chemical concentrations exceeding the screening criteria were reported within the laboratory data relating to human health risks at the site under EQS parameters. No EQS values exist for dissolved selenium so a USEPA value of 1 µg/l has been used instead. Generally the laboratory data suggests that the groundwater at the site is of relatively good quality, although dissolved selenium was reported as elevated at BH1 and BH6, exceeding the WQS. This parameter may be associated with agricultural or industrial use in the immediate surrounding area of the site.

9.5 SOIL GAS RISK ASSESSMENT

Ground gas concentrations recorded at the site were assessed against the guidance detailed within CIRIA report C665 "Assessing Risks Posed by Hazardous Ground Gases to Buildings", 2007, British Standard "Code of practice for the characterization and remediation from ground gas in affected developments" BS 8485:2007.

In summary, the highest CH4 and CO2 concentrations recorded at the site were <0.1% and 2.4% (BH2) respectively. The highest single flow rate recorded across the site was -1.1 L/h (BH1, BH6 and BH9). Calculated from the CH4, CO2 and flow rate data, the highest single GSV recorded across the site was 0.00.

In general, the site does not appear to have gas generation issues, with the exception of the localised peat deposit along the southwestern boundary, which may generate small amounts of methane and carbon dioxide. Based on the data from the first gas monitoring round, the gas regime at the site would likely be characterised as a CIRIA Level 1 CGS (Very Low Hazard Potential), representative of natural soils with low organic content or 'typical' made ground.

9.6 REMEDIAL RECOMMENDATIONS

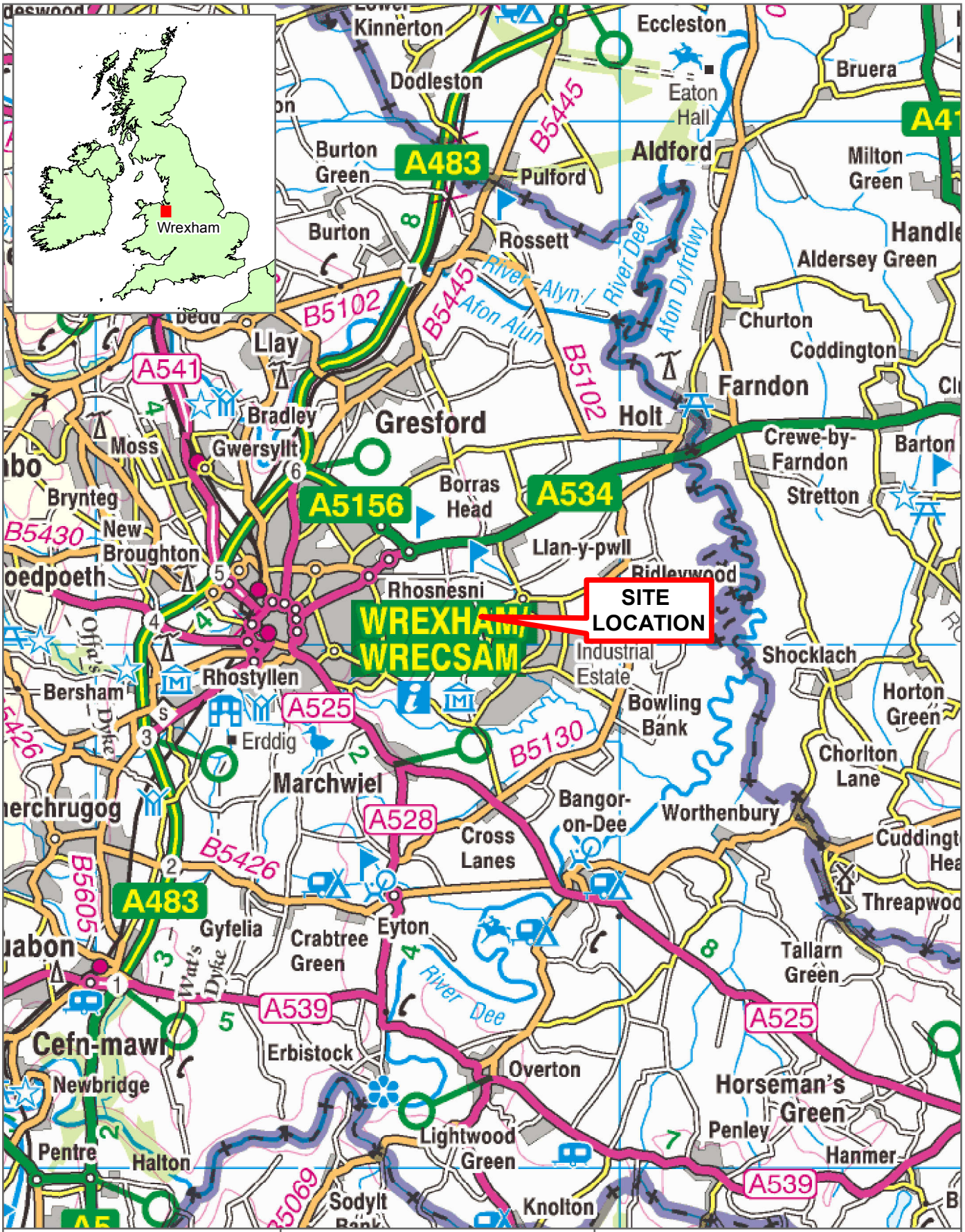
Based on the findings of the above detailed site investigation and risk assessment works, ERM considers the site to be suitable for an ongoing commercial land use without the need for further remedial works.

As the Site is to be developed for commercial use, the following should be noted to accord with the requirements for a new building:

- Two rounds of soil gas monitoring undertaken within one month indicated that the site would likely be characterised as a CIRIA Level 1 Characteristic Gas Situation. If the site is taken forward for redevelopment, several further rounds of monitoring undertaken over an extended period of time and under a range of climactic conditions are likely to be required in order to confirm the gas regime at the site. This will allow decisions to be taken regarding the need (or otherwise) for gas protection measures at the site, and demonstrate whether there is any evidence of migration of gas from the peat deposit into the area planned for new build.

Annex A

Figures
(Site Location and Layout)



0 0.5 1 1.5 2 2.5
Kilometres

N

Figure 1
Site Location Plan
Abenbury Way,
Wrexham

SIZE: A4	VERSION: A
SCALE: 1:100,000	DRAWN: MTC
PROJECT: 0252754	CHECKED: CR
DATE: 30/06/2014	APPROVED:

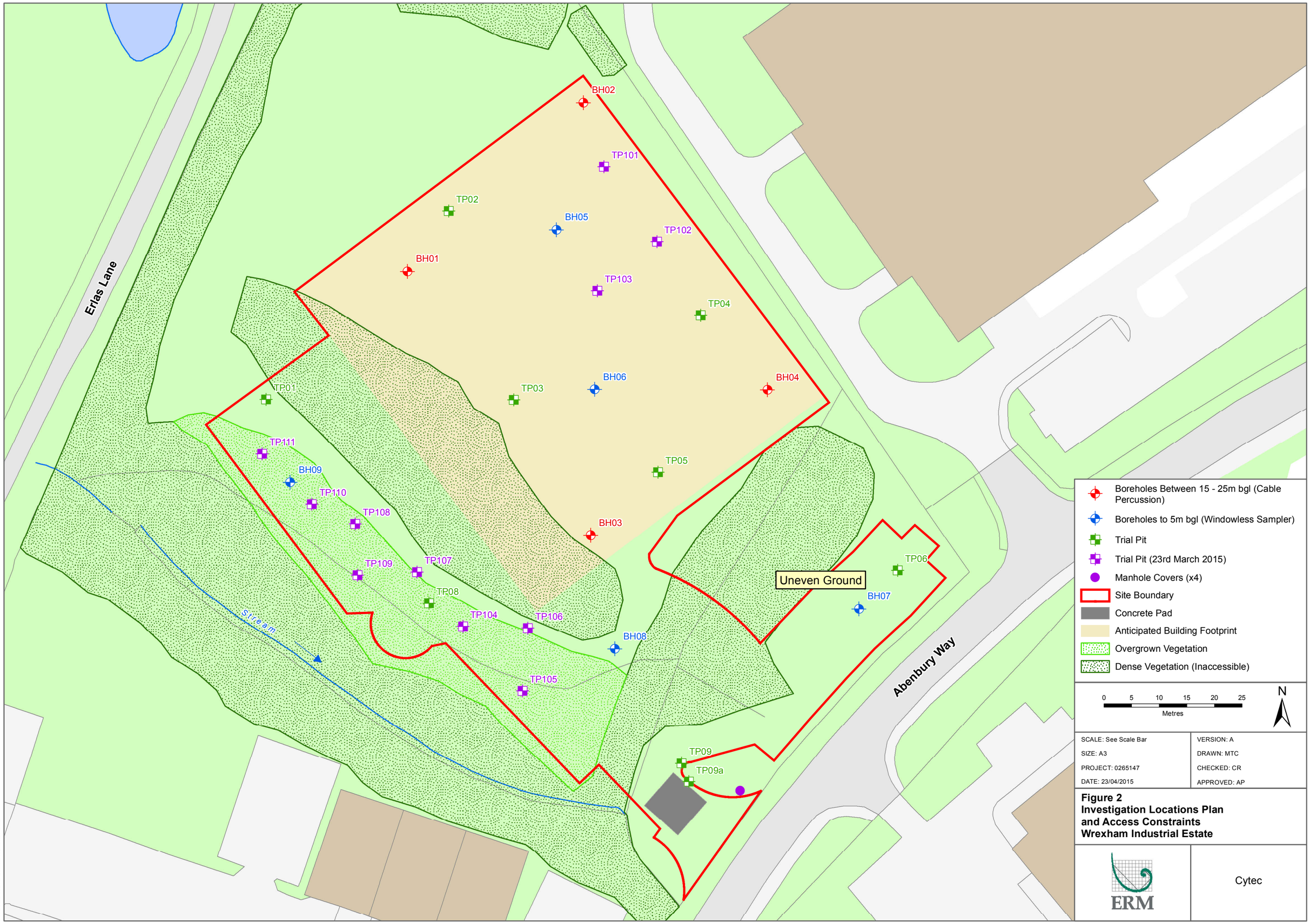
ERM

CYTEC

PROJECTION: British National Grid

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Annex B

Borehole and Trial Pit Logs

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH1
Sheet 1 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
26/02/2015-27/02/2015	150mm to 20.00m	40.50m AOD	GM	AP	1:50
Method: Cable Percussion		Depth (m): 20.00	Co-ordinates: -		Ground Slope

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.10	D					Firm dark brown slightly gravelly sandy CLAY. Gravel is medium subrounded to rounded quartzite. Sand is fine to medium. (TOPSOIL)	40.30	0.20		
	0.50	D									
	1.00	D	0.00				Firm brown mottled reddish brown and orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse rounded quartzite. (GLACIAL DEPOSITS)	39.60	0.90		
								39.30	1.20		
1.50	1.50-1.95	U(63)		95	19/48	23.00	Stiff brown mottled light bluish grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded quartzite and mudstone. (GLACIAL DEPOSITS)				
	1.50	D				24.00					
	1.70	D									
	1.80	SPT	0.40	15N	19/47	21.00					
	2.00	D		15/300							
	2.00-2.45						Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely spaced with frequent sandy silt infill. (GLACIAL DEPOSITS)				
	2.80	D			18/40	22.00					
	3.00-3.45	U(39)	1.70				Brown silty fine SAND. (GLACIAL DEPOSITS)	37.50	3.00		
	3.00										
	3.50	D									
	3.80	D									
4.00	4.00	SPT	0.00	6N			Firm laminated brown slightly sandy CLAY. Laminations are extremely closely spaced with sand and silt infill. (GLACIAL DEPOSITS)	36.50	4.00		
	4.00-4.45	B		6/300							
		D									
4.50											
	4.80	D									
	5.00-5.45	U(43)	0.00	62	20/49	26.00					
	5.00										
	5.50	D									
6.00	6.00	D	0.30								
	6.50	SPT		13N							
	6.50-6.95	D		13/300							
			0.50								
7.50	7.50	D									
	8.00-8.45	U(42)	1.00	61		20.00					
	8.00										
	8.50	D									
9.00	9.00	D	0.10								
	9.50	SPT		12N							
	9.50-9.95	D		12/300							

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 10.0 - 8.0m and from GL -1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.00	1.50	2.80	-	26/02/2015	Slight
12.50	10.50	12.30	-	26/02/2015	Slight
15.00	13.00	5.10	-	26/02/2015	Fast inflow
15.00	15.00	2.70	-	27/02/2015	Overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH1 Sheet 2 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
26/02/2015-27/02/2015	150mm to 20.00m	40.50m AOD	GM	AP	1:50
Method: Cable Percussion		Depth (m): 20.00	Co-ordinates: -		Ground Slope

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.20				Firm laminated brown slightly sandy CLAY. Laminations are extremely closely spaced with sand and silt infill. (GLACIAL DEPOSITS)				
10.50	10.50	D									
	11.00-11.45 11.00	U(43)	0.20	74	17/37	24.00					
	11.50	D									
			0.00								
	12.50 12.50-12.95	SPT B D		14N 14/300							
13.00			0.00								
	13.50	D									
	14.00-14.45 14.00	U(64)	0.10	69		21.00					
	14.50	D									
	15.00	D	0.10					25.50	15.00		
							Loose brown slightly silty fine SAND. (GLACIAL DEPOSITS)				
	15.50	D									
16.00	16.00 16.00-16.45	SPT B D	0.10	5N 5/300							
	17.00	D	0.10								
17.50	17.50 17.50-17.95	SPT D		8N 8/300							
			0.10								
	18.50	D									
19.00	19.00 19.00-19.45	SPT B	0.10	7N 7/300							

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 10.0 - 8.0m and from GL -1.0m and security cover concreted at surface.

End of Borehole at 20.00 m

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.00	1.50	2.80	-	26/02/2015	Slight
12.50	10.50	12.30	-	26/02/2015	Slight
15.00	13.00	5.10	-	26/02/2015	Fast inflow
15.00	15.00	2.70	-	27/02/2015	Overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH2 Sheet 1 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
24/02/2015-25/02/2015	150mm to 15.00m	41.53m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		15.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.30	D					Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded quartite. (TOPSOIL)	41.13	0.40		
	0.60	D					Firm brown mottled orangish brown sandy CLAY. Sand is fine to medium. (GLACIAL DEPOSITS)				
	1.10	D	1.00					40.53	1.00		
1.50	1.50	SPT		18N			Brown clayey SAND and GRAVEL. Gravel is medium to coarse rounded quartzite and mudstone. (GLACIAL DEPOSITS)	40.23	1.30		
	1.50-1.95	D		18/300							
	1.80	D									
	2.00-2.45	U(77)	1.00	138		24.00	Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely to very closely spaced with occasional sandy silt infill. (GLACIAL DEPOSITS)				
	2.00										
	2.50	D									
	2.80	D									
3.00	3.00	SPT	0.30	16N							
	3.00-3.45	D		16/300							
	3.80	D									
4.00	4.00-4.45	U(35)	0.10					37.53	4.00		
	4.00						Loose brown very silty SAND. (GLACIAL DEPOSITS)				
	4.50	D									
4.70	4.80	D									
	5.00	SPT	0.10	6N				36.53	5.00		
	5.00-5.45	B		6/300			Firm laminated brown sandy CLAY. Laminations are extremely closely to very closely spaced with silt and sand infill. (GLACIAL DEPOSITS)				
		D									
6.00	6.00	D	0.10								
	6.50-6.95	U(27)		42		27.00					
	6.50										
	7.00	D	0.10								
7.50 150mm	7.50	D									
	8.00	SPT	0.10	9N							
	8.00-8.45	D		9/300							
	9.00	D	0.10								
	9.50-9.95	U(41)		78	19/46	26.00					
	9.50										

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 9.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.20	-	1.20	-	24/02/2015	No rise
3.40	-	3.30	-	25/02/2015	Slight seepage

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH2 Sheet 2 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
24/02/2015-25/02/2015	150mm to 15.00m	41.53m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		15.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	10.00	D	0.20				Firm laminated brown sandy CLAY. Laminations are extremely closely to very closely spaced with silt and sand infill. (GLACIAL DEPOSITS)				
	10.50	D									
	11.00	SPT	0.70	13N							
	11.00-11.45	B		13/300							
		D									
	12.00	D	5.00								
	12.50-12.95	U(41)		72		22.00					
	12.50										
	13.00	D	5.50								
	13.50	D									
	14.00	SPT	2.00	14N							
	14.00-14.45	B		14/300							
		D									
	15.00	D	1.60				End of Borehole at 15.00 m	26.53	15.00		

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 9.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.20	-	1.20	-	24/02/2015	No rise
3.40	-	3.30	-	25/02/2015	Slight seepage

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH3 Sheet 1 of 3

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
23/03/2015-24/03/2015	200mm to 10.50m 150mm to 30.00m	39.72m AOD	AS	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		30.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.20	D					Grass over soft brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Frequent small roots. (TOPSOIL)	39.62	0.10		
	0.50 0.50-1.00	D B						39.22	0.50		
			0.00				Firm orange-brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coasre subrounded quartzite and mudstone. Occasional small roots. (SUBSOIL)				
1.50	1.50-1.95 1.50	U(44)		109	21/46	21.00	Firm to stiff closely fissured brown mottled blue-grey silty slightly gravelly CLAY. Gravel is fine subrounded mudstone. Occasional root traces within fissures. (GLACIAL DEPOSITS)				
2.00	2.00 2.00-2.45	SPT D	0.00	16N 16/300			Below 2.00m bgl: Indistinctly thinly laminated.				
3.00	3.00-3.45 3.00	U(90)	0.00	26		23.00		36.62	3.10		
	3.50	D					Grey-brown silty fine SAND. (GLACIAL DEPOSITS)				
4.00	4.00 4.00-4.45	SPT B		5N 5/300			Below 4.00m bgl: loose.				
4.50							Firm thinly to thickly laminated silty slightly sandy CLAY with fine sand between laminations. (GLACIAL DEPOSITS)	35.42	4.30		
	5.00 5.00-5.45	SPT D	0.00	8N 8/300							
6.00	6.00-6.45 6.00	U(26)	0.00	43	21/59	28.00					
	6.50	D									
7.50	7.50 7.50-7.95	SPT B		14N 14/300							
			0.00								
	9.00-9.45 9.00	U(22)		52	18/41	25.00					
	9.50	D					Below 9.50m bgl: very sandy with fine to medium sand between laminations.				

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. Water added from 15.00m to 26.00m bgl to assist boring. 50mm diameter piezo standpipe installed to 25.30m bgl. Backfilled with concrete ground level to 0.50m bgl, arisings to 3.00m bgl, gravel to 5.00m bgl, bentonite to 24.30m bgl, gravel to 25.50m bgl, bentonite to 27.00m bgl and gravel to 30.00m bgl.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
10.50	7.50	6.10	13.50	23/03/2015	
15.00	-	4.20	-	24/03/2015	overnight level
24.00	-	0.00	-	25/03/2015	overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH3 Sheet 2 of 3

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
23/03/2015-24/03/2015	200mm to 10.50m 150mm to 30.00m	39.72m AOD	AS	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		30.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.00				Firm thinly to thickly laminated silty slightly sandy CLAY with fine sand between laminations. (GLACIAL DEPOSITS)				
10.50 200mm	10.50 10.50-10.95	SPT D		19N 19/300				29.22	10.50		
			0.00				Firm brown-grey sandy SILT with occasional bands of silty fine sand. (GLACIAL DEPOSITS)				
12.00	12.00 12.00-12.45	SPT D		4N 4/300							
13.50	13.50 13.50-13.95	SPT D		37N 37/300							
							Firm to stiff thinly laminated brown slightly sandy silty CLAY with occasional fine sand between laminations. (GLACIAL DEPOSITS)	26.22	13.50		
15.00	15.00-15.45 15.00 15.10	U(117) D	0.00								
							Grey-brown very silty fine SAND. (GLACIAL DEPOSITS)	24.62	15.10		
	16.50	D									
							Medium dense brown and grey-brown slightly silty fine to medium SAND. (GLACIAL DEPOSITS)	23.22	16.50		
18.00	18.00 18.00-18.45	SPT D		12N 12/300							
19.50	19.50 19.50-19.95	SPT(C) B	0.00	13N 13/300							

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. Water added from 15.00m to 26.00m bgl to assist boring. 50mm diameter piezo standpipe installed to 25.30m bgl. Backfilled with concrete ground level to 0.50m bgl, arisings to 3.00m bgl, gravel to 5.00m bgl, bentonite to 24.30m bgl, gravel to 25.50m bgl, bentonite to 27.00m bgl and gravel to 30.00m bgl.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
10.50	7.50	6.10	13.50	23/03/2015	
15.00	-	4.20	-	24/03/2015	overnight level
24.00	-	0.00	-	25/03/2015	overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH3 Sheet 3 of 3

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
23/03/2015-24/03/2015	200mm to 10.50m 150mm to 30.00m	39.72m AOD	AS	AP	1:50
Method: Cable Percussion		Depth (m): 30.00	Co-ordinates: -		Ground Slope

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
							Medium dense brown and grey-brown slightly silty fine to medium SAND. (GLACIAL DEPOSITS)				
21.00	21.00	SPT(C)		14N 14/300							
	21.50	D									
22.50	22.50 22.50-22.95	SPT D		20N 20/300			Firm brown-grey silty slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded mudstone and sandstone. (GLACIAL DEPOSITS)	17.22	22.50		
	23.00	D									
24.00 ▽	24.00 24.00-24.45	SPT D		43N 43/300			Dense becoming medium dense brown silty fine to medium SAND with occasional fine bands of silt and clay. (GLACIAL DEPOSITS)	15.52	24.20		
			0.00								
25.50	25.50 25.50-25.95	SPT D		23N 23/300							
	26.10	D					Firm to stiff brown-grey slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium occasionally coarse subrounded to subangular sandstone and mudstone. (GLACIAL DEPOSITS)	13.62	26.10		
			0.00								
27.00	27.00-27.45 27.00	U(70)		54	15/30	18.00					
	27.50	D									
			0.00								
28.50	28.50 28.50-28.95	SPT D		43N 43/300							
29.50	29.50 29.50-29.95	SPT D		33N 33/300							

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. Water added from 15.00m to 26.00m bgl to assist boring. 50mm diameter piezo standpipe installed to 25.30m bgl. Backfilled with concrete ground level to 0.50m bgl, arisings to 3.00m bgl, gravel to 5.00m bgl, bentonite to 24.30m bgl, gravel to 25.50m bgl, bentonite to 27.00m bgl and gravel to 30.00m bgl.

End of Borehole at 30.00 m

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
10.50	7.50	6.10	13.50	23/03/2015	
15.00	-	4.20	-	24/03/2015	overnight level
24.00	-	0.00	-	25/03/2015	overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH4 Sheet 1 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
27/02/2015-02/03/2015	150mm to 12.00m	41.25m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		15.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.20	D					Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)	40.95	0.30		
	0.50	D					Firm brown mottled orangish brown and light grey sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	40.55	0.70		
	1.00	D	0.10				Stiff laminated brown mottled light bluish grey slightly sandy CLAY. Laminations are extremely closely to very closely spaced with occasional sandy silt infill. (GLACIAL DEPOSITS)				
1.50	1.50-1.95	U(76)		166	19/56	22.00					
	1.50	D				24.00					
	1.70	D									
	1.80	SPT	0.10	17N	20/55	23.00					
	2.00	D		17/300							
	2.00-2.45										
	2.80	D			22/54	26.00					
3.00	3.00-3.45	U(42)	0.10								
	3.00										
	3.50	D					Very loose brown silty fine SAND. (GLACIAL DEPOSITS)	37.75	3.50		
	3.80	D									
4.00	4.00	SPT	0.10	3N							
	4.00-4.45	B		3/300							
		D									
4.50											
	4.80	D					Firm laminated brown slightly sandy CLAY. Laminations are very closely spaced with occasional silty sand infill. (GLACIAL DEPOSITS)	36.65	4.60		
	5.00-5.45	U(47)	0.10	48	20/49	28.00					
	5.00										
	5.50	D									
6.00	6.00	D	3.80								
	6.50	SPT		12N							
	6.50-6.95	D		12/300							
			1.90								
7.50	7.50	D									
	8.00-8.45	U(44)	2.90	77	20/49	27.00					
	8.00										
	8.50	D									
9.00	9.00	D	0.20								
	9.50	SPT		10N							
	9.50-9.95	B		10/300							
		D									

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 12.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.50	3.00	3.20	-	27/02/2015	Slight
14.70	12.00	14.30	-	02/03/2015	Slight

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH4
Sheet 2 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
27/02/2015-02/03/2015	150mm to 12.00m	41.25m AOD	GM	AP	1:50

Method	Depth (m)	Co-ordinates	Ground Slope
Cable Percussion	15.00	-	

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.10				Firm brown interbedded silty CLAY and sandy SILT. (GLACIAL DEPOSITS)	31.25	10.00		
10.50	10.50	D									
	11.00-11.45	U(43)	0.10	50		25.00					
	11.00										
	11.50	D									
12.00	12.00	D	0.40								
								28.95	12.30		
	12.50	SPT		16N			Firm laminated brown slightly sandy CLAY with freqent silty sand laminae. (GLACIAL DEPOSITS)				
	12.50-12.95	D		16/300							
			3.90								
	13.50	D									
	14.00-14.45	U(51)	3.40								
	14.00										
	14.50	D						26.75	14.50		
							Firm brown sandy CLAY. (GLACIAL DEPOSITS)				
								26.35	14.90		
	15.00	D	1.70				Firm laminated brown slightly sandy CLAY. Laminations are very closely spaced with occasional silty sand infill. (GLACIAL DEPOSITS)	26.25	15.00		
							End of Borehole at 15.00 m				

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 12.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.50	3.00	3.20	-	27/02/2015	Slight
14.70	12.00	14.30	-	02/03/2015	Slight

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH5
Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
02/03/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	40.75m AOD	GM	AP	1:50

Method	Depth (m)	Co-ordinates	Ground Slope
Driven Continuous Sampling	5.45	-	

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.40	D	0.30 0.50				Firm dark brown slightly gravelly sandy CLAY. Gravel is medium subrounded quartzite. (TOPSOIL)	40.50	0.25		
	1.00	D	0.80				Firm brown mottled orangish brown and light bluish grey sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	40.05	0.70		
	1.50 1.50-1.95	SPT D		13N 13/300			Stiff laminated brown mottled light bluish grey slightly sandy CLAY. Laminations are extremely closely spaced with occasional silt and fine sand infill. (GLACIAL DEPOSITS) At 1.50m bgl: Rare fine angular coal gravel.				
	2.00 2.00-2.45	SPT D	2.40	16N 16/300							
	2.80	D	2.50								
	3.00 3.00-3.45	SPT D		5N 5/300			At 3.00m bgl: Becoming firm.				
	3.80	D	2.90				Very loose brown slightly silty fine grained SAND. (GLACIAL DEPOSITS)	37.05	3.70		
	4.00 4.00-4.45	SPT D		2N 2/300			Firm brown slightly sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	36.45	4.30		
	5.00 5.00-5.45	SPT D	3.50	5N 5/300			End of Borehole at 5.45 m	35.30	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 4.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 4.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.20	-	-	-	02/03/2015	

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH6 Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
02/03/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	40.73m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Driven Continuous Sampling		5.45	-		

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
							Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)	40.53	0.20		
			0.20								
▽	0.80	D					Firm brown mottled orangish brown slightly gravelly sandy CLAY. Gravel is coarse rounded quartzite. (GLACIAL DEPOSITS)	40.03	0.70		
			0.10								
	1.50 1.50-1.95	SPT D	0.10	18N 18/300	21/50	29.00	Stiff laminated brown mottled light bluish grey slight sandy CLAY with rare cream calcareous silt pockets. Laminae are extremely closely spaced with occasional silt and fine grained sand infill. (GLACIAL DEPOSITS)				
	2.00 2.00-2.45	SPT D	5.70	18N 18/300	18/49	24.00					
	2.80	D	6.00		19/43	25.00					
	3.00 3.00-3.45	SPT D		6N 6/300			At 3.00m bgl: Becoming firm.				
	3.70	D					Brown silty fine grained SAND. (GLACIAL DEPOSITS)	37.13	3.60		
	4.00 4.00-4.45	SPT D	5.70	4N 4/300	11/25	21.00	Firm brown sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	36.88	3.85		
	4.90	D									
	5.00 5.00-5.45	SPT D		5N 5/300		21.00					
							End of Borehole at 5.45 m	35.28	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 5.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 5.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
0.80	-	-	-	02/03/2015	Seepage

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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH7
Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
25/02/2015	116mm to 2.00m 92mm to 3.00m 79mm to 4.00m 70mm to 5.00m	40.47m AOD	GM	AP	1:50

Method	Depth (m)	Co-ordinates	Ground Slope
Driven Continous Sampling	5.45	-	

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.90				Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite and rare brick fragments. (MADE GROUND)				
			1.40					39.42	1.05		
							Brown slightly sandy clayey GRAVEL of fine to coarse angular slag, burnt shale, brick and coal. Rare brick cobble. (MADE GROUND)	39.12	1.35		
	1.50	SPT	3.10	18N 18/300							
			3.60				Firm greyish brown mottled orangish brown slightly gravelly sandy CLAY. Sand is fine. Gravel is fine rounded mudstone and rare coal. (GLACIAL DEPOSITS)	38.77	1.70		
	2.00	SPT		21N 21/300							
			2.30				Stiff laminated brown mottled light blusih grey slightly sandy CLAY with rare cream calcareous silt pockets. Laminations are extremely closely spaced with silt and fine grained sand infill. (GLACIAL DEPOSITS)				
	3.00	SPT		16N 16/300							
▽			3.50					36.57	3.90		
	4.00	SPT		4N 4/300			Very loose to loose brown silty fine grained SAND. (GLACIAL DEPOSITS)				
			3.10					35.82	4.65		
	5.00	SPT		3N 3/300			Soft to firm brown sandy CLAY with occasional silty sand laminae. Sand is fine. (GLACIAL DEPOSITS)				
							End of Borehole at 5.45 m	35.02	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 5.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 5.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
4.00	-	-	0.00	20/02/2015	Inflow

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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH8
Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
25/02/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	38.06m AOD	GM	AP	1:50
Method: Driven Continous Sampling		Depth (m): 5.45	Co-ordinates: -		Ground Slope

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.50	D	0.10				Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)	37.86	0.20		
	1.00	D	0.10				Firm brown mottled light bluish grey slightly gravelly sandy CLAY with occasional brown and reddish brown silty sand pockets. Sand is fine to medium. Gravel is fine to medium rounded mudstone and sandstone. (GLACIAL DEPOSITS)				
	1.50	SPT D		10N 10/300				36.56	1.50		
	1.90 2.00	D SPT D	0.10	13N 13/300			Stiff brown mottled light bluish grey slightly sandy CLAY with rare rootlets. (GLACIAL DEPOSITS)				
	3.00	SPT	0.10	11N 11/300			At 3.00m bgl: Becoming firm.				
	3.80 4.00	D SPT D	0.20	6N 6/300							
	4.90 5.00	D SPT D		1N 1/300			Soft brown slightly sandy clayey SILT. (GLACIAL DEPOSITS)	33.06	5.00		
							End of Borehole at 5.45 m	32.61	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 4.50m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 4.50m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.00	-	0.80	-	25/02/2015	

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Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
25/02/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	38.79m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Driven Continuous Sampling		5.45	-		

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.10				Soft dark brown slightly gravelly sandy CLAY. Gravel is fine to medium subrounded quartzite with rare brick fragments. (MADE GROUND)	38.54	0.25		
			0.10								
	0.55	D	0.10					38.29	0.50		
	0.80	D					Firm brown slightly gravelly sandy CLAY with occassional light brown silty sand pockets. Gravel is fine to coarse rounded quartzite and rare red clay tile. (MADE GROUND)	38.19	0.60		
			0.10								
	1.50	SPT		12N							
	1.50-1.95	D		12/300							
	1.80	D	0.10				Brown slightly silty slightly sandy GRAVEL of fine to coarse rounded quartzite. (GLACIAL DEPOSITS)				
	2.00	SPT		19N							
	2.00-2.45	D		19/300			Firm brown mottled light bluish grey sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)				
			1.20								
	2.90	D									
	3.00	SPT		18N							
	3.00-3.45	D		18/300			Between 3.45m and 4.00m bgl: no recovery - possible loose sand.				
	4.00	SPT		10N				34.79	4.00		
	4.00-4.45	D		10/300			Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium rounded mudstone. (GLACIAL DEPOSITS)				
			0.30								
	4.80	D									
	5.00	SPT		9N							
	5.00-5.45	D		9/300							
							End of Borehole at 5.45 m	33.34	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 5.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 5.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
No Groundwater Encountered					

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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP1
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS		1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.60	0.65	-	3.10	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Grass over soft light brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Frequent small roots. (TOPSOIL)		0.30	
						E	Firm closely fissured brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Occasional small to medium roots. (GLACIAL DEPOSITS)		0.55	
0.80	D		0.00			E-M	Stiff very closely fissured brown motled light grey slightly gravelly silty CLAY with occasional root traces and roots. Gravel is fine to medium subrounded quartzite. (GLACIAL DEPOSITS)			
1.70	D		0.00			H	Below 1.70m bgl: Hard and indistinctly thickly laminated.			
2.80	D		0.00			M	Firm to stiff closely fissured brown mottled grey silty CLAY with bands of light grey silt and fine sand. (GLACIAL DEPOSITS)		2.70	
							End of Trial Pit at 3.10 m		3.10	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15	Site: Abenbury Way, Wrexham	Trial Pit Log	
	Client: ERM	TP2	
	Engineer:	Sheet 1 of 1	

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	45	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)		0.20	
0.40	D		0.80				Firm brown mottled orangish brown and reddish brown slightly gravelly sandy CLAY. Gravel is medium to coarse rounded quartzite. (GLACIAL DEPOSITS)		0.70	
0.90	D		0.00			E	Stiff laminated brown mottled light bluish grey slightly sandy CLAY with rare cream calcareous silt pockets. Laminations are extremely closely spaced with occasional silt and fine grained sand infill. (GLACIAL DEPOSITS)			
			0.50			M				
1.90	D		0.50							
2.50-2.60	B		2.50							
3.00	D		0.10				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP3
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
JCB 3CX	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	3	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)		0.25	
0.50	D		0.60			E	Firm brown mottled orangish brown and reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse rounded quartzite and sandstone. (GLACIAL DEPOSITS)		0.80	
1.00	D		1.60				Stiff brown mottled light bluish grey slightly sandy CLAY with rare medium grained sand pockets and cream clacareous silt pockets. (GLACIAL DEPOSITS)			
			0.30			M				
2.00	D		2.20							
							Brown silty fine to medium grained SAND with rare black organic pockets. (GLACIAL DEPOSITS)		2.30	
2.50	D		1.10							
2.60-2.80	B					E				
									2.85	
3.00	D		1.10			E	Firm laminated brown mottled light bluish grey slightly sandy CLAY. Laminae are extremely closely spaced with silt and sand infill. (GLACIAL DEPOSITS)		3.00	
							End of Trial Pit at 3.00 m			

GROUNDWATER DETAILS:
Groundwater no encountered.

STABILITY OF PIT WALLS:
Slight spalling from 2.30m within sand.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP4
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	90	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm dark brown slightly gravelly sandy CLAY. Gravel is medium rounded quartzite. (TOPSOIL)		0.20	
0.40	D		0.30			E	Firm brown mottled orangish brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium rounded quartzite. (GLACIAL DEPOSITS)		0.70	
0.90	D		0.40			M	Stiff laminated brown mottled light bluish grey slightly sandy slightly gravelly CLAY with occasinal sand pockets and rare cream calcareous silt pockets with fine subrounded calcrete nodules. Gravel is fine to medium rounded mudstone and quartzite. (GLACIAL DEPOSITS)			
1.60	D		0.30							
			0.70							
2.50	D		0.70							
2.90	D		0.50				Brown silty fine to medium grained SAND. (GLACIAL DEPOSITS)		2.90	
							End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

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Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP5
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	3	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)		0.20	
0.50	D		0.20			E	Firm brown mottled orangish brown and reddish brown slightly gravelly sandy CLAY. Gravel is fine rounded quartzite. (GLACIAL DEPOSITS)		0.60	
0.80	D		0.60				Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely spaced with occasional silt and fine grained sand infill. (GLACIAL DEPOSITS)			
			1.50			M				
1.50	D		0.90							
			0.00							
2.50	D		0.40							
2.90-3.00	B									
			0.60				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP6
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backohe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
3.00	0.50	90	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.00			M-H	Firm dark brown slightly sandy CLAY with frequent gravel, cobble and boulder size fragments of concrete slabs (up to 2.0m x 2.0m x 0.4m), wood, metal, brick, concrete and possible asbestos. (MADE GROUND)			
			0.00						0.90	
1.10	D		0.00			M	Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely spaced with occasional infill of silt and fine grained sand. (GLACIAL DEPOSITS)			
			0.00							
2.00	D		0.00							
			0.00							
3.00	D		0.00				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not ecnountered.

STABILITY OF PIT WALLS:
Collapse in Made Ground up to 0.9m.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP8
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
4.00	3.00	-	0.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Black spongy amorphous PEAT.			
							End of Trial Pit at 0.50 m		0.50	

GROUNDWATER DETAILS:
Grounwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
JCB became stuck in soft ground, log represents strata exposed in ruts. Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP9
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.00	0.50	135	1.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.20			E	Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (REWORKED TOPSOIL / MADE GROUND)			
			0.10						1.00	
1.30	D					M	Stiff brown mottled light grey slightly sandy CLAY. (GLACIAL DEPOSITS)			
			0.00				End of Trial Pit at 1.50 m		1.50	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP9A
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
1.80	0.50	0	2.10	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.20			E	Brown gravelly SAND with frequent timber fragments and rootlets. Sand is medium. Gravel is fine to coarse quartzite and rare mudstone. (MADE GROUND)			
			0.10							
			0.00			E	Firm brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to coarse rounded quartzite and sandstone. (GLACIAL DEPOSITS)		1.50	
			0.00				End of Trial Pit at 2.10 m		2.10	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Collpase in sand up to 1.50m bgl

GENERAL REMARKS:
Trial pit extended from TP9 through soil mound access ramp into site from main road. Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP101
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.40	0.65	-	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Grass over soft brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Frequent small roots. (TOPSOIL)			
						E	Soft brown mottled orange slightly sandy CLAY. Occasional small roots. (GLACIAL DEPOSITS)		0.30	
							Stiff closely fissured orange-brown mottled grey CLAY. Occasional small roots and occasional sand with fissures. (GLACIAL DEPOSITS)		0.50	
0.90	B, D			20/50	22.0					
1.00	V	220	0.00			M				
1.50	V	160				M-H				
							Stiff to hard thinly to thickly laminated light blue grey and brown CLAY with fine sand/silt between laminations. (GLACIAL DEPOSITS)		1.70	
2.00	V B, D	180	0.00			H				
2.80	B, D									
			0.00				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP102
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.30	0.65	-	3.10	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Grass over soft light brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded quartzite frequent small roots. (TOPSOIL)		0.30	
							Soft to firm light brown slighlty sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite and mudstone. Frequent small roots. (GLACIAL DEPOSITS)		0.40	
0.80	B, D			23/56	26.0		Stiff closely fissured indistinctly thinly to thickly laminated orange-brown and light grey slightly gravelly CLAY. Occasional sand and silt between laminated and fissures. Gravel is fine to coarse subrounded to subangular mudstone rare quartzite. (GLACIAL DEPOSITS)			
1.00	V	140	0.00			E-M				
1.50	V D	210								
							Firm to stiff thinly to thickly laminated brown and blue-grey CLAY with fine to medium sand and silt between laminations. (GLACIAL DEPOSITS)		1.60	
1.90	B, D									
2.00	V	120	0.00			M				
2.90	D		0.00				End of Trial Pit at 3.10 m		3.10	

GROUNDWATER DETAILS:
Seepage at 1.00m bgl. Heavy seepage at 1.80m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES: B = Bulk; D = Tub; W = Water; ES = Amber Glass Jar; CBR = CBR Test; SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2): V=Hand Vane; P=Hand Penetrometer

GROUNDWATER: ▽ Entry; ▼ Standing Level

Ease of Dig: E = Easy; M = Moderate; H = Hard; VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15	Site: Abenbury Way, Wrexham	Trial Pit Log	
	Client: ERM	TP103	
	Engineer:	Sheet 1 of 1	

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.50	0.65	-	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Grass over soft light brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to medium occasionally coarse quartzite. Frequent small roots. (TOPSOIL)		0.25	
							Firm orange-brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular quartzite and mudstone. Frequent small roots. (GLACIAL DEPOSITS)		0.50	
1.00	V B, D	180	0.00	20/50	22.0		Stiff occasionally hard closely fissured light brown mottled blue-grey silty slightly gravelly silty CLAY. Gravel is fine to coarse subrounded to angular quartzite and mudstone. Occasional small roots. (GLACIAL DEPOSITS)			
1.50	V	160								
1.60	D								1.55	
1.80	B, D						Firm to stiff thinly to thickly laminated brown and light blue-grey silty CLAY with fine to medium sand and silt between laminations. (GLACIAL DEPOSITS)			
2.00	V	210	0.10							
2.50	V	210								
2.70	D									
			0.00				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Slight seepage below 1.90m bgl and 3.00m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP104
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.20	0.65	-	2.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Soft brown sandy SILT with much organic material including wood, leaves, roots.		0.20	
							Soft dark brown slightly sandy fibrous PEAT. Organic material including wood, roots.			
0.60	D									
									0.80	
			0.00			E	Soft light grey-brown sandy SILT with occasional roots and soft wood fragments.			
									1.20	
							Light grey-brown very silty fine SAND with occasional pockets of soft brown fibrous peat.			
									1.90	
			0.10			E	Firm light-grey sandy SILT with occasional soft roots. (GLACIAL DEPOSITS)			
									2.30	
						M	Stiff thinly to thickly laminated brown and light-grey silty CLAY with silt and fine sand between laminations. (GLACIAL DEPOSITS)		2.50	
							End of Trial Pit at 2.50 m			

GROUNDWATER DETAILS:
Inflow at 0.80m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP105
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.10	0.65	-	1.90	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Soft brown sandy SILT with organic material including wood, leaves and roots.			
							Soft black-dark brown silty fibrous PEAT.		0.25	
							Orange-brown clayey gravelly fine to medium SAND with pockets of soft to firm sandy clay and frequent roots and wood fragments.		0.60	
			0.00							
1.70	V	120					Stiff closely fissured brown mottled grey silty CLAY. (GLACIAL DEPOSITS)		1.60	
1.90	V	200	0.00				End of Trial Pit at 1.90 m		1.90	

GROUNDWATER DETAILS:
Heavy inflow at 0.60m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP106
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.40	0.65	-	2.30	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Firm brown sandy slightly gravelly SILT. Gravel is fine to coarse subrounded to subangular quartzite. Occasional roots. (TOPSOIL)		0.30	
							Firm orange-brown mottled orange sandy slighlty gravelly CLAY. Gravel is fine to coarse subrounded quartzite. (GLACIAL DEPOSITS)		0.80	
0.90	D		0.00				Orange-brown occasionally red-brown very gravelly SAND with occasional pockets of sandy gravelly clay. (GLACIAL DEPOSITS)		1.50	
1.60	V	100					Firm to stiff closely fissured brown mottled grey silty CLAY with silt and fine sand between fissures. (GLACIAL DEPOSITS)		2.30	
1.70	D									
			0.00							
2.10	V	160								
							End of Trial Pit at 2.30 m			

GROUNDWATER DETAILS:
Inflow with running sand at 1.40m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP107
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.30	0.65	-	2.40	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Firm brown sandy slightly gravelly SILT. Gravel is fine to coarse subrounded quartzite. Occasional small to medium roots. (TOPSOIL)		0.30	
0.60	V	80				E	Firm closely fissured orange-brown mottled grey silty CLAY. Occasional small roots. (GLACIAL DEPOSITS)		0.75	
						E-M	Brown grey very gravelly fine to medium SAND with occasional pockets of sandy slighlty gravelly clay. Gravel is fine to coarse subrounded quartzite. (GLACIAL DEPOSITS)		1.30	
						M	Firm grey-brown sandy SILT with occasional soft wood fragments and medium roots. (GLACIAL DEPOSITS)		1.80	
2.00	V	120					Firm to stiff thinly to thickly laminated brown and grey silty CLAY with occasional soft wood and roots and fine sand and silt between laminations. (GLACIAL DEPOSITS)			
2.40	V	120					End of Trial Pit at 2.40 m		2.40	

GROUNDWATER DETAILS:
Seepage at 1.30m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP108
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
-	-	-	1.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	SOIL SAMPLES/TESTS Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Water over brown slightly gravelly sandy fiberous PEAT. Gravel is fine to medium subrounded quartzite.			
									0.30	
						E	Soft light grey-brown fibrous silty CLAY with frequent soft wood, roots and organic debris.			
							End of Trial Pit at 1.00 m		1.00	

GROUNDWATER DETAILS:
Flooded above ground level.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES	B = Bulk	ES = Amber Glass Jar
	D = Tub	CBR = CBR Test
	W = Water	SPT = Insitu Penetration Test
SHEAR STRENGTH (kN/m2)	V=Hand Vane	P=Hand Penetrometer
GROUNDWATER	▽ Entry	
	▼ Standing Level	
Ease of Dig	E = Easy	M = Moderate
	H = Hard	VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP109
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	24/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.40	0.65	-	2.90	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Soft brown fiberous sandy SILT with frequent organic material.			
							Soft dark brown-black silty fiberous PEAT. Organic material includes wood, leaves, roots. Occasional bands of blue-grey sandy silt.		0.25	
			0.10			E				
							Very soft brown-grey slightly sandy SILT with occasional bands of brown silty fine sand and frequent soft wood, roots and organic material.		1.70	
						E	Below 2.20m bgl: Becoming firm.			
							Firm to stiff closely fissured brown occasional orange-brown mottled grey silty CLAY with occasional root traces and bands of silty fine to medium sand. (GLACIAL DEPOSITS)		2.50	
							End of Trial Pit at 2.90 m		2.90	

GROUNDWATER DETAILS:
Seepage at 1.40m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP110
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	24/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
-	-	-	1.90	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.00				Very soft dark-brown silty fibrous PEAT with soft wood, roots, leaves.			
							Very soft light grey-brown slightly sandy slightly gravelly SILT. Gravel is fine to coarse subrounded quartzite. Frequent soft wood, roots.		1.10	
							Firm to stiff closely fissured gravelly slightly sandy CLAY. Gravel is fine to coarse subrounded quartzite. Occasionally gravelly sand bands and occasional roots. (GLACIAL DEPOSITS)		1.70	
							End of Trial Pit at 1.90 m		1.90	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
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Trial Pit Log
TP111
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	24/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.30	0.65	-	1.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Very soft slightly sandy fiberous PEAT. Organic material includes soft wood, roots, leaves.			
			0.00				Soft light brown-grey slightly gravelly SILT. Gravel is fine to medium subrounded quartzite. Frequent roots, soft wood organic material and pockets of peat.		0.80	
							Firm closely fissured grey-brown mottled grey gravelly CLAY with bands of gravelly fine to medium sand. Gravel is fine to coarse subrounded quartzite. (GLACIAL DEPOSITS)		1.20	
							End of Trial Pit at 1.50 m		1.50	

GROUNDWATER DETAILS:
Heavy seepages at 0.80m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

Annex C

Analytical Environmental Results Tables and QRA

Table C1: Wrexham Soil Analytical Results

	Units	ERM GAC Value (Commercial)	Sample name	TP2-260215-1.0-SO	TP3-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH1-260215-1.0-SO	BH2-250215-1.0-SO			BH6-250215-0.5-SO	BH7-250215-0.2-SO	BH8-250215-0.5-SO	BH9-250215-0.1-SO	
			Location	TP2	TP3	TP4	TP5	TP6	TP9	BH1	BH2	BH4	BH5	BH6	BH7	BH8	BH9	DUP A
			Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	02/03/2015	02/03/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	02/03/2015
			Sample Depth (m)	1.00	1.00	1.00	0.80	0.80	1.00	1.00	1.00	1.0	0.5	0.50	0.20	0.50	0.10	
VOC MS																		
BTEX																		
Benzene #	mg/kg	28		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Toluene #	mg/kg	419194		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ethylbenzene #	mg/kg	184722		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Xylenes (sum of isomers) #	mg/kg	305338		<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
p/m-Xylene #	mg/kg	305338		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
o-Xylene #	mg/kg	314550		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Chloroethenes																		
Tetrachloroethene (PCE) #	mg/kg	164		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Trichloroethene (TCE) #	mg/kg	12		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethene (1,1 DCE) #	mg/kg	25		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
cis-1-2-Dichloroethene #	mg/kg	43		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
trans-1-2-Dichloroethene #	mg/kg	20		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Vinyl Chloride	mg/kg	0.063		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chloroethanes																		
1,1,1,2-Tetrachloroethane	mg/kg	115		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1,2,2-Tetrachloroethane #	mg/kg	290		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1,1-Trichloroethane #	mg/kg	700		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1,2-Trichloroethane #	mg/kg	92		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,1-Dichloroethane #	mg/kg	213		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dichloroethane #	mg/kg	0.712		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chloroethane #	mg/kg	942		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Chlorobenzenes																		
1,2,3-Trichlorobenzene #	mg/kg	36141		<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
1,2,4-Trichlorobenzene #	mg/kg	32531		<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
1,2-Dichlorobenzene #	mg/kg	634120		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
1,3-Dichlorobenzene #	mg/kg	34		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
1,4-Dichlorobenzene #	mg/kg	199420		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chlorobenzene #	mg/kg	66448		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Chloromethanes																		
Carbon tetrachloride #	mg/kg	3		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Chloroform #	mg/kg	109		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dichloromethane (DCM) #	mg/kg	269		<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007
Chloromethane #	mg/kg	0.441		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Chloropropanes																		
1,2,3-Trichloropropane #	mg/kg	0.042		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
1,2-Dichloropropane #	mg/kg	4.257		<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
2,2-Dichloropropane	mg/kg	4.767		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
1,3-Dichloropropane #	mg/kg	54.487		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Chloropropenes																		
1,1-Dichloropropene #	mg/kg	0.32		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
cis-1-3-Dichloropropene	mg/kg	5.2		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
trans-1-3-Dichloropropene	mg/kg	5.2		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Other VOCs																		
Bromobenzene	mg/kg	471		<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Bromochloromethane #	mg/kg	2824		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromodichloromethane #	mg/kg	1.6		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromoform	mg/kg	956		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Bromomethane	mg/kg	0.89		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
n-Butylbenzene #	mg/kg	73997		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
sec-Butylbenzene #	mg/kg	73825		<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
tert-Butylbenzene #	mg/kg	72299		<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005
2-Chlorotoluene	mg/kg	3022		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
4-Chlorotoluene	mg/kg	96488		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Isopropylbenzene #	mg/kg	184977		<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003

		Sample name	TP2-260215-1.0-SO	TP3-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH1-260215-1.0-SO	BH2-250215-1.0-SO			BH6-250215-0.5-SO	BH7-250215-0.2-SO	BH8-250215-0.5-SO	BH9-250215-0.1-SO	
		Location	TP2	TP3	TP4	TP5	TP6	TP9	BH1	BH2	BH4	BH5	BH6	BH7	BH8	BH9	DUP A
		Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	02/03/2015	02/03/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	02/03/2015
		Sample Depth (m)	1.00	1.00	1.00	0.80	0.80	1.00	1.00	1.00	1.0	0.5	0.50	0.20	0.50	0.10	
	Units	ERM GAC Value (Commercial)															
1,2-Dibromo-3-chloropropane #	mg/kg	0.04	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Dibromochloromethane #	mg/kg	55	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
1,2-Dibromoethane #	mg/kg	0.07	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dibromomethane #	mg/kg	23	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Dichlorodifluoromethane	mg/kg	2.9	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
4-Isopropyltoluene #	mg/kg	170343	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Propylbenzene #	mg/kg	188351	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Styrene	mg/kg	21947	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Trichlorofluoromethane #	mg/kg	67	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
1,2,4-Trimethylbenzene #	mg/kg	314	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006
1,3,5-Trimethylbenzene #	mg/kg	213	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Methyl Tertiary Butyl Ether #	mg/kg	10952	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
Hexachlorobutadiene	mg/kg	19	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004
Naphthalene	mg/kg	31046	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027
Surrogate Recovery Toluene D8	%	-	107	109	104	104	91	104	105	106	113	111	104	100	105	96	113
Surrogate Recovery 4-Bromofluorobenzene	%	-	97	105	103	103	87	105	103	105	127	127	99	87	97	81	128
Metals																	
Arsenic	mg/kg	640	11.7	10.8	11.9	9.4	12.8	25.3	12	8.3	12.4	12.1	9.4	8.9	8.3	13.6	12.3
Cadmium	mg/kg	230	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	<0.1	0.1	<0.1
Chromium	mg/kg	33830	44.8	48.7	47.7	44.5	46.6	62.4	54.3	32.6	51.1	52.5	32.8	42.2	23.4	45.7	56.5
Copper	mg/kg	72775	30	29	34	23	26	17	29	14	33	30	12	14	9	10	29
Lead	mg/kg	6406	30	23	31	26	30	24	27	26	33	33	33	40	23	29	31
Mercury	mg/kg	3600	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Nickel	mg/kg	1800	50.5	46.5	52.7	42.1	49.3	49.7	54.5	19.7	49.8	56.7	19.3	20.2	14.5	18.5	52.2
Selenium	mg/kg	13000	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Zinc	mg/kg	702236	100	93	92	77	92	86	104	42	99	89	60	74	42	65	87
TPH CWG																	
Aliphatics																	
>C5-C6 #	mg/kg	NRP	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>C6-C8 #	mg/kg	NRP	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>C8-C10	mg/kg	92563	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>C10-C12 #	mg/kg	94990	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
>C12-C16 #	mg/kg	95267	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
>C16-C21 #	mg/kg	-	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
>C21-C35 #	mg/kg	-	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
>C16-C35 #	mg/kg	NRP	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14
>C35-C44	mg/kg	NRP	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
Total aliphatics C5-35	mg/kg	-	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
Total aliphatics C5-44	mg/kg	-	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26
Aromatics																	
>C5-EC7	mg/kg	405675	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC7-EC8	mg/kg	418711	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC8-EC10 #	mg/kg	33128	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
>EC10-EC12	mg/kg	37607	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2
>EC12-EC16	mg/kg	38065	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
>EC16-EC21	mg/kg	28562	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
>EC21-EC35	mg/kg	28563	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
>EC35-EC44	mg/kg	28563	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7
Total aromatics C5-35	mg/kg	-	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19
Total aliphatics and aromatics(C5-35)	mg/kg	-	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38
Total aromatics C5-44	mg/kg	-	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26
Total aliphatics and aromatics(C5-44)	mg/kg	-	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52
BTEX / MTBE																	
Benzene #	mg/kg	28	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Toluene #	mg/kg	419194	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Ethylbenzene #	mg/kg	184722	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Xylenes (sum of isomers) #	mg/kg	305338	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008
p/m-Xylene #	mg/kg	305338	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005

		Sample name	TP2-260215-1.0-SO	TP3-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH1-260215-1.0-SO	BH2-250215-1.0-SO			BH6-250215-0.5-SO	BH7-250215-0.2-SO	BH8-250215-0.5-SO	BH9-250215-0.1-SO	
		Location	TP2	TP3	TP4	TP5	TP6	TP9	BH1	BH2	BH4	BH5	BH6	BH7	BH8	BH9	DUP A
		Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	02/03/2015	02/03/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	02/03/2015
		Sample Depth (m)	1.00	1.00	1.00	0.80	0.80	1.00	1.00	1.00	1.0	0.5	0.50	0.20	0.50	0.10	
	Units	ERM GAC Value (Commercial)															
o-Xylene #	mg/kg	314550	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003
Methyl Tertiary Butyl Ether #	mg/kg	10952	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002
PAH MS																	
Naphthalene	mg/kg	31046	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Acenaphthylene	mg/kg	109163	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Acenaphthene	mg/kg	109142	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Fluorene	mg/kg	72763	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Phenanthrene	mg/kg	22703	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Anthracene	mg/kg	545841	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Fluoranthene	mg/kg	22734	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Pyrene	mg/kg	54575	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03
Benzo(a)anthracene	mg/kg	146	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06
Chrysene	mg/kg	1485	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
Benzo(bk)fluoranthene	mg/kg	146	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07
Benzo(a)pyrene	mg/kg	15	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Indeno(123cd)pyrene	mg/kg	146	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Dibenzo(ah)anthracene	mg/kg	15	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
Benzo(ghi)perylene	mg/kg	681	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04
PAH 16 Total	mg/kg	-	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Benzo(b)fluoranthene	mg/kg	146	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
Benzo(k)fluoranthene	mg/kg	365	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02
PAH Surrogate % Recovery	mg/kg	-	79	80	86	91	79	87	79	78	100	97	83	77	86	90	100
Surrogate Recovery Toluene D8	%	-	107	109	104	104	91	104	105	106	113	111	104	100	105	96	113
Surrogate Recovery 4-Bromofluorobenzene	%	-	97	105	103	103	87	105	103	105	127	127	99	87	97	81	128
PCB 77	mg/kg	23.3	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 81	mg/kg	7.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 105	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 114	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 118	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 123	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 126	mg/kg	0.0233	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 156	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 157	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 167	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 169	mg/kg	0.1	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
PCB 189	mg/kg	77.8	-	-	-	-	-	-	<0.005	-	-	<0.005	<0.005	<0.005	-	-	-
Total 12 PCBs	mg/kg	27.1	-	-	-	-	-	-	<0.06	-	-	<0.06	<0.06	<0.06	-	-	-
Phenol	mg/kg	3200* (SGV)	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Natural Moisture Content	%	-	17.6	15.6	19.5	16.6	19.4	23.3	21.9	10.8	17.8	20.5	25.6	24	25.6	36	22.2
Ammoniacal Nitrogen as N			<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6
Sulphate as SO4 (2:1 Ext) #			0.014	0.0048	0.0101	0.0075	0.0087	0.0209	0.0068	0.0113	0.0107	0.0195	0.0015	<0.0015	<0.0015	0.0097	0.0295
Free Cyanide	mg/kg	14049	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Cyanide #	mg/kg	-	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.7	<0.5	0.9	<0.5
Total Organic Carbon #			-	-	-	-	-	-	0.65	0.2	0.17	0.21	0.29	0.19	0.51	0.29	0.29
Sulphide			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
pH	pH units	-	8.17	8.32	7.57	7.39	8.06	7.01	8.23	7.27	8.24	7.6	6.45	7.29	6.42	6.45	7.62
Asbestos Screen			NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos Screen (2)			NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
Asbestos Level			NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD	NAD
General Description (Bulk Analysis)			Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone/Clay	Soil/Stone/Clay	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone	Soil/Stone/Clay

	Sample name	TP2-260215-1.0-SO	TP3-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH1-260215-1.0-SO	BH2-250215-1.0-SO			BH6-250215-0.5-SO	BH7-250215-0.2-SO	BH8-250215-0.5-SO	BH9-250215-0.1-SO	
	Location	TP2	TP3	TP4	TP5	TP6	TP9	BH1	BH2	BH4	BH5	BH6	BH7	BH8	BH9	DUP A
	Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	02/03/2015	02/03/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015	02/03/2015
	Sample Depth (m)	1.00	1.00	1.00	0.80	0.80	1.00	1.00	1.00	1.0	0.5	0.50	0.20	0.50	0.10	
Units	**ERM GAC Value (Commercial)**															
Asbestos Containing Material		None	None	None	None	None	None	None	None	None	None	None	None	None	None	None
Asbestos Containing Material (2)		None	None	None	None	None	None	None	None	None	None	None	None	None	None	None
Mass of Dry Sample		46.3	43	44.2	44.5	43.6	42.1	42	52.3	43.7	42.3	43.1	42.1	43.8	42.9	45.1

Table C2: Wrexham Soil RPD Report

	BH5 02/03/2015 0.5	DUP A 02/03/2015	RPD
VOC MS			
BTEX			
Benzene #	<0.003	<0.003	
Toluene #	<0.003	<0.003	
Ethylbenzene #	<0.003	<0.003	
Xylenes (sum of isomers) #	<0.008	<0.008	
p/m-Xylene #	<0.005	<0.005	
o-Xylene #	<0.003	<0.003	
Chloroethenes			
Tetrachloroethene (PCE) #	<0.003	<0.003	
Trichloroethene (TCE) #	<0.003	<0.003	
1,1-Dichloroethene (1,1 DCE) #	<0.006	<0.006	
cis-1-2-Dichloroethene #	<0.003	<0.003	
trans-1-2-Dichloroethene #	<0.003	<0.003	
Vinyl Chloride	<0.002	<0.002	
Chloroethanes			
1,1,1,2-Tetrachloroethane	<0.003	<0.003	
1,1,2,2-Tetrachloroethane #	<0.003	<0.003	
1,1,1-Trichloroethane #	<0.003	<0.003	
1,1,2-Trichloroethane #	<0.003	<0.003	
1,1-Dichloroethane #	<0.003	<0.003	
1,2-Dichloroethane #	<0.004	<0.004	
Chloroethane #	<0.002	<0.002	
Chlorobenzenes			
1,2,3-Trichlorobenzene #	<0.007	<0.007	
1,2,4-Trichlorobenzene #	<0.007	<0.007	
1,2-Dichlorobenzene #	<0.004	<0.004	
1,3-Dichlorobenzene #	<0.004	<0.004	
1,4-Dichlorobenzene #	<0.004	<0.004	
Chlorobenzene #	<0.003	<0.003	
Chloromethanes			
Carbon tetrachloride #	<0.004	<0.004	
Chloroform #	<0.003	<0.003	
Dichloromethane (DCM) #	<0.007	<0.007	
Chloromethane #	<0.003	<0.003	
Chloropropanes			
1,2,3-Trichloropropane #	<0.004	<0.004	
1,2-Dichloropropane #	<0.006	<0.006	
2,2-Dichloropropane	<0.004	<0.004	
1,3-Dichloropropane #	<0.003	<0.003	
Chloropropenes			
1,1-Dichloropropene #	<0.003	<0.003	
cis-1-3-Dichloropropene	<0.004	<0.004	
trans-1-3-Dichloropropene	<0.003	<0.003	
Other VOCs			
Bromobenzene	<0.002	<0.002	
Bromochloromethane #	<0.003	<0.003	
Bromodichloromethane #	<0.003	<0.003	
Bromoform	<0.003	<0.003	
Bromomethane	<0.001	<0.001	
n-Butylbenzene #	<0.004	<0.004	
sec-Butylbenzene #	<0.004	<0.004	
tert-Butylbenzene #	<0.005	<0.005	
2-Chlorotoluene	<0.003	<0.003	
4-Chlorotoluene	<0.003	<0.003	
Isopropylbenzene #	<0.003	<0.003	
1,2-Dibromo-3-chloropropane #	<0.004	<0.004	
Dibromochloromethane #	<0.003	<0.003	
1,2-Dibromoethane #	<0.003	<0.003	
Dibromomethane #	<0.003	<0.003	
Dichlorodifluoromethane	<0.002	<0.002	
4-Isopropyltoluene #	<0.004	<0.004	
Propylbenzene #	<0.004	<0.004	

Table C2: Wrexham Soil RPD Report

	BH5 02/03/2015 0.5	DUP A 02/03/2015	RPD
Styrene	<0.003	<0.003	
Trichlorofluoromethane #	<0.002	<0.002	
1,2,4-Trimethylbenzene #	<0.006	<0.006	
1,3,5-Trimethylbenzene #	<0.003	<0.003	
Methyl Tertiary Butyl Ether #	<0.002	<0.002	
Hexachlorobutadiene	<0.004	<0.004	
Naphthalene	<0.027	<0.027	
Surrogate Recovery Toluene D8	111	113	1.79%
Surrogate Recovery 4-Bromofluorobenzene	127	128	0.78%
Metals			
Arsenic	12.1	12.3	1.64%
Cadmium	<0.1	<0.1	
Chromium	52.5	56.5	7.34%
Copper	30	29	-3.39%
Lead	33	31	-6.25%
Mercury	<0.1	<0.1	
Nickel	56.7	52.2	-8.26%
Selenium	<1	<1	
Zinc	89	87	-2.27%
TPH CWG			
Aliphatics			
>C5-C6 #	<0.1	<0.1	
>C6-C8 #	<0.1	<0.1	
>C8-C10	<0.1	<0.1	
>C10-C12 #	<0.2	<0.2	
>C12-C16 #	<4	<4	
>C16-C21 #	<7	<7	
>C21-C35 #	<7	<7	
>C16-C35 #	<14	<14	
>C35-C44	<7	<7	
Total aliphatics C5-35	<19	<19	
Total aliphatics C5-44	<26	<26	
Aromatics			
>C5-EC7	<0.1	<0.1	
>EC7-EC8	<0.1	<0.1	
>EC8-EC10 #	<0.1	<0.1	
>EC10-EC12	<0.2	<0.2	
>EC12-EC16	<4	<4	
>EC16-EC21	<7	<7	
>EC21-EC35	<7	<7	
>EC35-EC44	<7	<7	
Total aromatics C5-35	<19	<19	
Total aliphatics and aromatics(C5-35)	<38	<38	
Total aromatics C5-44	<26	<26	
Total aliphatics and aromatics(C5-44)	<52	<52	
BTEX / MTBE			
Benzene #	<0.003	<0.003	
Toluene #	<0.003	<0.003	
Ethylbenzene #	<0.003	<0.003	
Xylenes (sum of isomers) #	<0.008	<0.008	
p/m-Xylene #	<0.005	<0.005	
o-Xylene #	<0.003	<0.003	
Methyl Tertiary Butyl Ether #	<0.002	<0.002	
PAH MS			
Naphthalene	<0.04	<0.04	
Acenaphthylene	<0.03	<0.03	
Acenaphthene	<0.05	<0.05	
Fluorene	<0.04	<0.04	
Phenanthrene	<0.03	<0.03	
Anthracene	<0.04	<0.04	
Fluoranthene	<0.03	<0.03	
Pyrene	<0.03	<0.03	
Benzo(a)anthracene	<0.06	<0.06	

Table C2: Wrexham Soil RPD Report

	BH5 02/03/2015 0.5	DUP A 02/03/2015	RPD
Chrysene	<0.02	<0.02	
Benzo(bk)fluoranthene	<0.07	<0.07	
Benzo(a)pyrene	<0.04	<0.04	
Indeno(123cd)pyrene	<0.04	<0.04	
Dibenzo(ah)anthracene	<0.04	<0.04	
Benzo(ghi)perylene	<0.04	<0.04	
PAH 16 Total	<0.6	<0.6	
Benzo(b)fluoranthene	<0.05	<0.05	
Benzo(k)fluoranthene	<0.02	<0.02	
PAH Surrogate % Recovery	97	100	3.05%
Surrogate Recovery Toluene D8	111	113	1.79%
Surrogate Recovery 4-Bromofluorobenzene	127	128	0.78%
PCB 77	<0.005	-	
PCB 81	<0.005	-	
PCB 105	<0.005	-	
PCB 114	<0.005	-	
PCB 118	<0.005	-	
PCB 123	<0.005	-	
PCB 126	<0.005	-	
PCB 156	<0.005	-	
PCB 157	<0.005	-	
PCB 167	<0.005	-	
PCB 169	<0.005	-	
PCB 189	<0.005	-	
Total 12 PCBs	<0.06	-	
Phenol	<0.01	<0.01	
Natural Moisture Content	20.5	22.2	7.96%
Ammoniacal Nitrogen as N	<0.6	<0.6	
Sulphate as SO4 (2:1 Ext) #	0.0195	0.0295	40.82%
Free Cyanide	<0.5	<0.5	
Total Cyanide #	<0.5	<0.5	
Total Organic Carbon #	0.21	0.29	32.00%
Sulphide	<10	<10	
pH	7.6	7.62	0.26%
Asbestos Screen	NAD	NAD	
Asbestos Screen (2)	NAD	NAD	
Asbestos Level	NAD	NAD	
General Description (Bulk Analysis)	Soil/Stone/Clay	Soil/Stone/Clay	
Asbestos Containing Material	None	None	
Asbestos Containing Material (2)	None	None	
Mass of Dry Sample	42.3	45.1	6.41%

Table C3: Wrexham Groundwater Analytical Results

	Units	ERM GAC Value (Fresh Water EQS)	BH1040315WG	BH2040315WG	BH3-270315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG
Sample Name			BH1040315WG	BH2040315WG	BH3-270315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG
Location			BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	DUP1
Date			04/03/2015	04/03/2015	27/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015
VOC MS												
BTEX												
Benzene	ug/l	10	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	ug/l	50	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	ug/l	20	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes (sum of isomers)	ug/l	30	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
p/m-Xylene	ug/l	As above	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	ug/l		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Chloroethenes												
Tetrachloroethene (PCE)	ug/l	10	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Trichloroethene (TCE)	ug/l	10	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,1-Dichloroethene (1,1 DCE)	ug/l	25	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
cis-1-2-Dichloroethene	ug/l	590	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
trans-1-2-Dichloroethene	ug/l	970	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Vinyl Chloride	ug/l	930	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Chloroethanes												
1,1,1,2-Tetrachloroethane	ug/l	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2,2-Tetrachloroethane	ug/l	610	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4
1,1,1-Trichloroethane	ug/l	100	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1,2-Trichloroethane	ug/l	400	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,1-Dichloroethane	ug/l	47	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichloroethane	ug/l	10	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroethane	ug/l	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chlorobenzenes												
1,2,3-Trichlorobenzene	ug/l	0.4	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trichlorobenzene	ug/l	0.4	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichlorobenzene	ug/l	0.7	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,3-Dichlorobenzene	ug/l	150	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,4-Dichlorobenzene	ug/l	20	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chlorobenzene	ug/l	20	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloromethanes												
Carbon tetrachloride	ug/l	12	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloroform	ug/l	2.5	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dichloromethane (DCM)	ug/l	20	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloromethane	ug/l	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Chloropropanes												
1,2,3-Trichloropropane	ug/l	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dichloropropane	ug/l	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
2,2-Dichloropropane	ug/l	-	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichloropropane	ug/l	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Chloropropenes												
1,1-Dichloropropene	ug/l	-	<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
cis-1-3-Dichloropropene	ug/l	0.055	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
trans-1-3-Dichloropropene	ug/l	0.055	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Other VOCs												
Bromobenzene	ug/l	-	<2	<2	<2	<2	<2	<2	<2	<2	<2	<2

Table C3: Wrexham Groundwater Analytical Results

			Sample Name	BH1040315WG	BH2040315WG	BH3-270315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG
			Location	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	DUP1
			Date	04/03/2015	04/03/2015	27/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015
Bromochloromethane	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromodichloromethane	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromoform	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Bromomethane	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
n-Butylbenzene	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
sec-Butylbenzene	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
tert-Butylbenzene	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
2-Chlorotoluene	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
4-Chlorotoluene	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Isopropylbenzene	ug/l	22		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2-Dibromo-3-chloropropane	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dibromochloromethane	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
1,2-Dibromoethane	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Dibromomethane	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Dichlorodifluoromethane	ug/l	-		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
4-Isopropyltoluene	ug/l	85		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Propylbenzene	ug/l	128		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Styrene	ug/l	50		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Trichlorofluoromethane	ug/l	-		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,2,4-Trimethylbenzene	ug/l	33		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
1,3,5-Trimethylbenzene	ug/l	71		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Methyl Tertiary Butyl Ether	ug/l	2600		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Hexachlorobutadiene	ug/l	0.1		<3	<3	<3	<3	<3	<3	<3	<3	<3	<3
Naphthalene	ug/l	2.4		<2	<2	<2	<2	<2	<2	<2	<2	<2	<2
Surrogate Recovery Toluene D8	%	-		102	100	98	99	100	99	104	100	100	100
Surrogate Recovery 4-Bromofluorobenzene	%	-		97	105	104	91	105	105	101	106	105	106
SVOC MS													
Phenols													
4-Chloro-3-methylphenol	ug/l	40		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2-Chlorophenol	ug/l	50		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Methylphenol	ug/l	13		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Methylphenol	ug/l	543		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4-Dichlorophenol	ug/l	20		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dimethylphenol	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitrophenol	ug/l	1920		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
4-Nitrophenol	ug/l	60		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Pentachlorophenol	ug/l	0.4		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenol	ug/l	7.7		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2,4,5-Trichlorophenol	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4,6-Trichlorophenol	ug/l	4.9		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
PAHs													
Acenaphthene	ug/l	5.8		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Acenaphthylene	ug/l	n.v.		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	ug/l	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)anthracene	ug/l	0.018		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(bk)fluoranthene	ug/l	0.00017		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(a)pyrene	ug/l	0.05		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Benzo(ghi)perylene	ug/l	0.00017		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

Table C3: Wrexham Groundwater Analytical Results

			Sample Name	BH1040315WG	BH2040315WG	BH3-270315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG
			Location	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	DUP1
			Date	04/03/2015	04/03/2015	27/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015
2-Chloronaphthalene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Chrysene	ug/l	n.v.		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzo(ah)anthracene	ug/l	n.v.		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	ug/l	0.1		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	ug/l	3		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Indeno(123cd)pyrene	ug/l	0.00017		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Methylnaphthalene	ug/l	4.7		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Naphthalene	ug/l	2.4		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Phenanthrene	ug/l	0.4		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	ug/l	0.025		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
B(ghi)Perylene + I(123cd)Pyrene	ug/l	0.00017		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Sum of 4DW PAHs	ug/l	-		<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5
Phthalates													
Bis(2-ethylhexyl) phthalate	ug/l	1.3		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
Butylbenzyl phthalate	ug/l	20		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Diethyl phthalate	ug/l	200		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Dimethyl phthalate	ug/l	800		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Di-n-butyl phthalate	ug/l	8		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
Di-n-Octyl phthalate	ug/l	20		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Amines													
N-nitrosodi-n-propylamine	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Anilines													
4-Chloroaniline	ug/l	232		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
2-Nitroaniline	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
3-Nitroaniline	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Nitroaniline	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Other SVOCs													
Azobenzene	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Bis(2-chloroethoxy)methane	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Carbazole	ug/l	n.v.		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Dibenzofuran	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,4-Dinitrotoluene	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
2,6-Dinitrotoluene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobutadiene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorocyclopentadiene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Isophorone	ug/l	-		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Nitrobenzene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Bis(2-chloroethyl)ether	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Bromophenylphenylether	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
4-Chlorophenylphenylether	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachloroethane	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Hexachlorobenzene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2,4-Trichlorobenzene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,2-Dichlorobenzene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,3-Dichlorobenzene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
1,4-Dichlorobenzene	ug/l	-		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
Metals													
Dissolved Arsenic	ug/l	50		<2.5	<2.5	5.2	<2.5	3	<2.5	12.8	<2.5	3.6	<2.5

Table C3: Wrexham Groundwater Analytical Results

			Sample Name	BH1040315WG	BH2040315WG	BH3-270315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG
			Location	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	DUP1
			Date	04/03/2015	04/03/2015	27/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015
Dissolved Cadmium	ug/l	5		<0.5	<0.5	0.36	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Total Dissolved Chromium	ug/l	175		<1.5	<1.5	<0.2	<1.5	<1.5	2.1	<1.5	<1.5	<1.5	<1.5
Dissolved Copper	ug/l	6		<7	<7	<3	<7	<7	<7	<7	<7	<7	<7
Dissolved Lead	ug/l	7.2		<5	<5	1.2	<5	<5	<5	<5	<5	<5	<5
Dissolved Mercury	ug/l	0.05		<1	<1	<0.5	<1	<1	<1	<1	<1	<1	<1
Dissolved Nickel	ug/l	20		<2	<2	1.5	<2	<2	3	<2	<2	<2	<2
Dissolved Selenium	ug/l	1×		6	<3	<1.2	<3	<3	29	<3	<3	<3	<3
Dissolved Zinc	ug/l	50		17	11	33.6	<3	<3	14	<3	<3	<3	16
TPH CWG													
Aliphatics													
>C5-C6	ug/l	15000*		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C6-C8	ug/l			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C8-C10	ug/l			<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C10-C12	ug/l	300*		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C12-C16	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C16-C21	ug/l	6000*		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C21-C35	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aliphatics C5-35	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C5-C8	ug/l	See above		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>C8-C16	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>C16-C35	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Aromatics													
>C5-EC7	ug/l	10		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>EC7-EC8	ug/l	50		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>EC8-EC10	ug/l	100*		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>EC10-EC12	ug/l	100*		<5	<5	<5	<5	<5	<5	<5	<5	<5	<5
>EC12-EC16	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC16-EC21	ug/l	90		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC21-EC35	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aromatics C5-35	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC10-EC16	ug/l	See above		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
>EC16-EC35	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Total aliphatics and aromatics(C5-35)	ug/l			<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
BTEX / MTBE													
Benzene	ug/l	10		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Toluene	ug/l	50		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	ug/l	20		<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Xylenes (sum of isomers)	ug/l	30		<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5
p/m-Xylene	ug/l	See above		<1	<1	<1	<1	<1	<1	<1	<1	<1	<1
o-Xylene	ug/l			<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
Methyl Tertiary Butyl Ether	ug/l	2600		<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Dissolved Boron	ug/l	2000*		59	43	43	48	38	28	66	38	23	65
Total Hardness Dissolved (as CaCO3)	ug/l	-		360000	277000	240000	372000	141000	181000	546000	457000	414000	338000
Surrogate Recovery Toluene D8	%	-		102	100	98	99	100	99	104	100	100	100
Surrogate Recovery 4-Bromofluorobenzene	%	-		97	105	104	91	105	105	101	106	105	106

Table C3: Wrexham Groundwater Analytical Results

			Sample Name	BH1040315WG	BH2040315WG	BH3-270315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG
			Location	BH1	BH2	BH3	BH4	BH5	BH6	BH7	BH8	BH9	DUP1
			Date	04/03/2015	04/03/2015	27/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015
2-Fluorobiphenyl	%	n.v		NT	NT	80	NT	NT	NT	NT	NT	NT	NT
p-Terphenyl-d14	%			NT	NT	104	NT	NT	NT	NT	NT	NT	NT
Sulphate	ug/l	400000		65420	31680	73550	52390	34760	50620	99150	93300	130160	64530
Total Cyanide	ug/l	10		<10	<10	<10	<10	<10	<10	<10	<10	<10	<10
Ammoniacal Nitrogen as N	ug/l	778		190	50	320	60	50	110	100	<30	50	190
Sulphide	ug/l	0.25		<300	<300	<300	<300	<300	<300	<300	<300	<300	<300
Thiocyanate				<20	<20	<20	<20	<20	<20	<20	<20	<20	<20
pH				7.72	7.12	8.19	7.69	8.03	7.9	7.48	7.11	7.11	7.7
Total Organic Carbon				6000	7000	3000	4000	6000	11000	4000	8000	10000	4000

	Exceeds EQS
n.v.	no value available
*	WHO DWS (in absence of EQS value)
ˣ	USEPA
NT	Not tested for

Table C4: Wrexham Groundwater RPD Report

	BH1	DUP1	RPD
VOC MS			
BTEX			
Benzene	<0.5	<0.5	
Toluene	<0.5	<0.5	
Ethylbenzene	<0.5	<0.5	
Xylenes (sum of isomers)	<1.5	<1.5	
p/m-Xylene	<1	<1	
o-Xylene	<0.5	<0.5	
Chloroethenes			
Tetrachloroethene (PCE)	<3	<3	
Trichloroethene (TCE)	<3	<3	
1,1-Dichloroethene (1,1 DCE)	<3	<3	
cis-1-2-Dichloroethene	<3	<3	
trans-1-2-Dichloroethene	<3	<3	
Vinyl Chloride	<0.1	<0.1	
Chloroethanes			
1,1,1,2-Tetrachloroethane	<2	<2	
1,1,2,2-Tetrachloroethane	<4	<4	
1,1,1-Trichloroethane	<2	<2	
1,1,2-Trichloroethane	<2	<2	
1,1-Dichloroethane	<3	<3	
1,2-Dichloroethane	<2	<2	
Chloroethane	<3	<3	
Chlorobenzenes			
1,2,3-Trichlorobenzene	<3	<3	
1,2,4-Trichlorobenzene	<3	<3	
1,2-Dichlorobenzene	<3	<3	
1,3-Dichlorobenzene	<3	<3	
1,4-Dichlorobenzene	<3	<3	
Chlorobenzene	<2	<2	
Chloromethanes			
Carbon tetrachloride	<2	<2	
Chloroform	<2	<2	
Dichloromethane (DCM)	<3	<3	
Chloromethane	<3	<3	
Chloropropanes			
1,2,3-Trichloropropane	<3	<3	
1,2-Dichloropropane	<2	<2	
2,2-Dichloropropane	<1	<1	
1,3-Dichloropropane	<2	<2	
Chloropropenes			
1,1-Dichloropropene	<3	<3	
cis-1-3-Dichloropropene	<2	<2	
trans-1-3-Dichloropropene	<2	<2	
Other VOCs			
Bromobenzene	<2	<2	
Bromochloromethane	<2	<2	
Bromodichloromethane	<2	<2	
Bromoform	<2	<2	
Bromomethane	<1	<1	
n-Butylbenzene	<3	<3	
sec-Butylbenzene	<3	<3	
tert-Butylbenzene	<3	<3	
2-Chlorotoluene	<3	<3	
4-Chlorotoluene	<3	<3	

	BH1	DUP1	RPD
Isopropylbenzene	<3	<3	
1,2-Dibromo-3-chloropropane	<2	<2	
Dibromochloromethane	<2	<2	
1,2-Dibromoethane	<2	<2	
Dibromomethane	<3	<3	
Dichlorodifluoromethane	<2	<2	
4-Isopropyltoluene	<3	<3	
Propylbenzene	<3	<3	
Styrene	<2	<2	
Trichlorofluoromethane	<3	<3	
1,2,4-Trimethylbenzene	<3	<3	
1,3,5-Trimethylbenzene	<3	<3	
Methyl Tertiary Butyl Ether	<0.1	<0.1	
Hexachlorobutadiene	<3	<3	
Naphthalene	<2	<2	
Surrogate Recovery Toluene D8	102	100	-1.98%
Surrogate Recovery 4-Bromofluorobenzene	97	106	8.87%
SVOC MS			
Phenols			
4-Chloro-3-methylphenol	<0.5	<0.5	
2-Chlorophenol	<1	<1	
2-Methylphenol	<0.5	<0.5	
4-Methylphenol	<1	<1	
2,4-Dichlorophenol	<0.5	<0.5	
2,4-Dimethylphenol	<1	<1	
2-Nitrophenol	<0.5	<0.5	
4-Nitrophenol	<10	<10	
Pentachlorophenol	<1	<1	
Phenol	<1	<1	
2,4,5-Trichlorophenol	<0.5	<0.5	
2,4,6-Trichlorophenol	<1	<1	
PAHs			
Acenaphthene	<1	<1	
Acenaphthylene	<0.5	<0.5	
Anthracene	<0.5	<0.5	
Benzo(a)anthracene	<0.5	<0.5	
Benzo(bk)fluoranthene	<1	<1	
Benzo(a)pyrene	<1	<1	
Benzo(ghi)perylene	<0.5	<0.5	
2-Chloronaphthalene	<1	<1	
Chrysene	<0.5	<0.5	
Dibenzo(ah)anthracene	<0.5	<0.5	
Fluoranthene	<0.5	<0.5	
Fluorene	<0.5	<0.5	
Indeno(123cd)pyrene	<1	<1	
2-Methylnaphthalene	<1	<1	
Naphthalene	<1	<1	
Phenanthrene	<0.5	<0.5	
Pyrene	<0.5	<0.5	
B(ghi)Perylene + I(123cd)Pyrene	<1.5	<1.5	
Sum of 4DW PAHs	<2.5	<2.5	
Phthalates			
Bis(2-ethylhexyl) phthalate	<5	<5	
Butylbenzyl phthalate	<1	<1	
Diethyl phthalate	<1	<1	

	BH1	DUP1	RPD
Dimethyl phthalate	<1	<1	
Di-n-butyl phthalate	<1.5	<1.5	
Di-n-Octyl phthalate	<1	<1	
Amines			
N-nitrosodi-n-propylamine	<0.5	<0.5	
Anilines			
4-Chloroaniline	<1	<1	
2-Nitroaniline	<1	<1	
3-Nitroaniline	<1	<1	
4-Nitroaniline	<0.5	<0.5	
Other SVOCs			
Azobenzene	<0.5	<0.5	
Bis(2-chloroethoxy)methane	<0.5	<0.5	
Carbazole	<0.5	<0.5	
Dibenzofuran	<0.5	<0.5	
2,4-Dinitrotoluene	<0.5	<0.5	
2,6-Dinitrotoluene	<1	<1	
Hexachlorobutadiene	<1	<1	
Hexachlorocyclopentadiene	<1	<1	
Isophorone	<0.5	<0.5	
Nitrobenzene	<1	<1	
Bis(2-chloroethyl)ether	<1	<1	
4-Bromophenylphenylether	<1	<1	
4-Chlorophenylphenylether	<1	<1	
Hexachloroethane	<1	<1	
Hexachlorobenzene	<1	<1	
1,2,4-Trichlorobenzene	<1	<1	
1,2-Dichlorobenzene	<1	<1	
1,3-Dichlorobenzene	<1	<1	
1,4-Dichlorobenzene	<1	<1	
Metals			
Dissolved Arsenic	<2.5	<2.5	
Dissolved Cadmium	<0.5	<0.5	
Total Dissolved Chromium	<1.5	<1.5	
Dissolved Copper	<7	<7	
Dissolved Lead	<5	<5	
Dissolved Mercury	<1	<1	
Dissolved Nickel	<2	<2	
Dissolved Selenium	6	<3	
Dissolved Zinc	17	16	-6.06%
TPH CWG			
Aliphatics			
>C5-C6	<5	<5	
>C6-C8	<5	<5	
>C8-C10	<5	<5	
>C10-C12	<5	<5	
>C12-C16	<10	<10	
>C16-C21	<10	<10	
>C21-C35	<10	<10	
Total aliphatics C5-35	<10	<10	
>C5-C8	<5	<5	
>C8-C16	<10	<10	
>C16-C35	<10	<10	
Aromatics			

	BH1	DUP1	RPD
>C5-EC7	<5	<5	
>EC7-EC8	<5	<5	
>EC8-EC10	<5	<5	
>EC10-EC12	<5	<5	
>EC12-EC16	<10	<10	
>EC16-EC21	<10	<10	
>EC21-EC35	<10	<10	
Total aromatics C5-35	<10	<10	
>EC10-EC16	<10	<10	
>EC16-EC35	<10	<10	
Total aliphatics and aromatics(C5-35)	<10	<10	
BTEX / MTBE			
Benzene	<0.5	<0.5	
Toluene	<0.5	<0.5	
Ethylbenzene	<0.5	<0.5	
Xylenes (sum of isomers)	<1.5	<1.5	
p/m-Xylene	<1	<1	
o-Xylene	<0.5	<0.5	
Methyl Tertiary Butyl Ether	<0.1	<0.1	
Dissolved Boron	59	65	9.68%
Total Hardness Dissolved (as CaCO3)	360000	338000	-6.30%
Surrogate Recovery Toluene D8	102	100	-1.98%
Surrogate Recovery 4-Bromofluorobenzene	97	106	8.87%
Sulphate	65420	64530	-1.37%
Total Cyanide	<10	<10	
Ammoniacal Nitrogen as N	190	190	0.00%
Sulphide	<300	<300	
Thiocyanate	<20	<20	
pH	7.72	7.7	-0.26%
Total Organic Carbon	6000	4000	-40.00%

Table C5a - QRA - Soil Gas Results CH4

Location	Date	Baro Press mb	Flow L/hour	CH4 %	Max Flow Rate	Max Concentration CH4	Calculated GSV CH4	Characteristic Situation	Comments
BH1	03/03/2015	1004	-1.1	0.0					
BH2	03/03/2015	1004	-0.4	0.0					
BH3	27/03/2015	1008	1.1	0.0					
BH4	03/03/2015	1004	-0.4	0.0					
BH5	03/03/2015	1005	-0.9	0.0	**-1.1**	**0.0**	**0.00**	**1**	**Very Low risk**
BH6	03/03/2015	1004	-1.1	0.0					
BH7	03/03/2015	1004	-0.9	0.0					
BH8	03/03/2015	1005	-1.3	0.0					
BH9	03/03/2015	1005	-1.1	0.0					

Table C5b - QRA - Soil Gas Results CO2

Location	Date	Baro Press mb	Flow L/hour	CO2 %	Max Flow Rate	Max Concentration CO2	Calculated GSV CO2	Characteristic Situation	Comments
BH1	03/03/2015	1004	-1.1	0.0					
BH2	03/03/2015	1004	-0.4	2.4					
BH3	27/03/2015	1008	1.1	0.0					
BH4	03/03/2015	1004	-0.4	0.3					
BH5	03/03/2015	1005	-0.9	0.1	**-1.1**	**2.4**	**-0.03**	**1**	**Very Low risk**
BH6	03/03/2015	1004	-1.1	0.0					
BH7	03/03/2015	1004	-0.9	0.1					
BH8	03/03/2015	1005	-1.3	0.1					
BH9	03/03/2015	1005	-1.1	0.1					

Enboldened values used in GSV calculation
Less than limit of detection
Concentration greater than typical of CS1

Table F2	**All Other Development Types (after CIRIA C659)**			
Characteristic Gas Situation	Typical Source of Generation	Hazard Potential	**Gas Screening Value (l/hr)**	Additional Factors
1	natural soils with low organic content "typical Made Ground"	Very Low	**<0.07**	Typically methane ≤1% and Carbon dioxide ≤ 5%. Otherwise consider increase to situation 2.
2	natural soils with high organic content "typical Made Ground"	Low	**<0.7**	Borehole flow rate not to exceed 70l/hour. Otherwise consider increase to situation 3.
3	Old landfill, inert waste, flooded mine workings	Moderate	**<3.5**	
4	Mine working susceptible to flooding, completed landfill	Moderate to High	**<15**	Quantitative Risk Assessment Required to evaluate scope of protective
5	Mine working unflooded, inactive with shallow workings near	High	**<70**	Quantitative Risk Assessment Required to evaluate scope of protective
6	Recent Landfill	Very High	**>70**	Quantitative Risk Assessment Required to evaluate scope of protective

Annex D

ERM GAC Derivation Text

1.1 GENERAL RATIONALE

ERM GAC have been developed in general accordance with the guidance published by the Environment Agency for undertaking the assessment of chronic risks to human health from land contamination collectively commonly referred to as the 'CLEA framework' as contained in the following documents:

- Updated technical background to the CLEA model (SR3), Environment Agency, January 2009;
- Human health toxicological assessment of contaminants in soil (SR2), Environment Agency, January 2009;
- Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values (SR7), November 2008; and
- CLEA software (version 1.06) and handbook (SR4 version 1.05), Environment Agency, September 2009.

During 2009, the Environment Agency published a number of Soil Guideline Values (SGVs) using the 'CLEA Framework'. The SGVs are an example of authoritative generic assessment criteria used in the preliminary evaluation of the risk to human health from long term exposure to chemicals in soil. However, only a limited number of SGVs have been published to date, (As, Cd, Hg, Ni, Se, benzene, toluene, ethylbenzene, phenol, Dioxins/Furans & Dioxin like PCB's).

Environment Agency document "*Using Soil Guideline Values*" published in March 2009 states that in the absence of an SGV the simplest option might be to derive a generic assessment criterion using (where appropriate) the generic models used to define SGVs, and based on appropriately sourced physical-chemical and toxicity data.

Due to the limited number of published SGVs, ERM has developed an expanded set of Generic Assessment Criteria (GACs) in accordance with the techniques and protocols set out in the CLEA Framework of publications detailed above. The intention is that these GACs are used in an equivalent way to SGVs in terms of being applicable to the majority of sites and a means of undertaking a generic assessment of chronic risks to human health and help refine any requirement for further DQRA.

The SGVs and ERMs GACs are considered to represent "cautious estimates of levels of contaminants in soil at which there is considered to be no risk to health or, at most, a minimal risk to health" (1). SGVs and GACs are not levels which indicate a significant possibility of **significant harm or levels which describe the boundary between categories 3 and 4, as detailed** within the statutory Guidance (1), neither are they indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2a. SGV's and GAC do however describe levels of contamination which are comfortably within category 4 of the statutory guidance.

The CLEA framework does not currently include specific guidance for assessing the potential risks to human health via the inhalation of groundwater-derived vapours. In the absence of UK specific guidance ERM has followed the spirit of the methodology to derive a set of GAC_{GW} for groundwater adopting where applicable the same standard land use assumptions detailed within SR3 and the fate and transport algorithms adopted within the software RISC V4.5.

The SGVs and GACs rely on predicting the concentration of vapours within the unsaturated zone using partitioning equations. However, due to the inherent uncertainty with estimating vapour partitioning there is growing international consensus that when assessing vapour inhalation risks from land contamination less reliance is placed on predicting contaminant partitioning and greater emphasis on directly measured soil vapour concentrations. Therefore, ERM has also produced Soil Vapour GACs (GAC_{SV}) with respect to assessing the vapour

(1) Environmental Protection Act 1990: Part 2A, Contaminated Land Statutory Guidance, DEFRA, April 2012.

inhalation pathway. The GAC_{SV} have been based on the standard land use assumptions detailed within SR3 and modelling the migration of vapours through the unsaturated zone and subsequent flow inside buildings and into ambient air. The GAC_{SV} enable a tiered approach to assessing vapour inhalation to be adopted involving an initial assessment based on calculating partitioning from soil and groundwater phases, supplemented where appropriate by the assessment of directly measured soil vapour concentrations. This tiered approach to the assessment of vapour inhalation is consistent with the approach suggested within DEFRA way forward publication CLAN 6/06 and CIRIA C682 (The VOC Handbook).

1.2 *CONCEPTUAL EXPOSURE MODEL*

Harmful effects from exposure to hazardous substances may occur as a result of either short-term exposure (acute effects) or long-term exposure (chronic effects). Generally for the vast majority of contaminants the long-term exposure to relatively low levels of the substance is of greatest concern since short-term effects generally occur at much higher concentrations. Any assessment based on the effects of long-term exposure is also likely to be overly protective with respect to the effects from short-term exposure. The assessment of risks to human health for the vast majority of the contaminants of concern is, therefore, based on the assessment of chronic exposure. However, free cyanide may elicit harmful effects from short-term exposure at relatively low concentrations. Therefore, GAC for free cyanide have been derived for both chronic and acute exposure.

The land use behaviour will significantly influence the exposure of end users to soil contaminants and should be reflected in any site specific assessment of those contaminants which represent a hazard as a result of chronic exposure. Influencing factors include: the age and gender of site users; the number of visits to the site; the duration of each visit; and the likely activities that could bring about contact with soil contamination. In the derivation of ERM's GACs three types of 'generic' land use have been included:

- Residential including Consumption of Home-grown Vegetables;
- Residential excluding the Consumption of Home-grown Vegetables; and
- Commercial/Industrial.

The generic land use conceptual exposure models presented within SR3 have been adopted in the derivation of the GAC. *Table 1* presents the exposure pathways included in the derivation of ERMs GAC for each land use.

Table 1 Exposure Pathways Included For Land Use

	Residential Land Use with Gardens	Residential Land Use without Gardens	Commercial Land Use
GAC_{Soil} - Exposure from Substances Present in Soils			
Ingestion of Soil and Dust	✓	✓	✓
Ingestion of Home grown Vegetables	✓	-	-
Ingestion of Soil Attached to Vegetables	✓	-	-
Inhalation of Fugitive Dust – Indoors	✓	✓	✓
Inhalation of Fugitive Dust – Outdoors	✓	✓	✓
Inhalation of Vapours – Indoors	✓	✓	✓
Inhalation of Vapours – Outdoors	✓	✓	✓
Dermal contact – Indoors	✓	✓	✓
Dermal contact – Outdoors	✓	✓	✓
GAC_{GW} - Exposure from Substances Present in Groundwaters			
Inhalation of Vapours – Indoors	✓	✓	✓
Inhalation of Vapours – Outdoors	✓	✓	✓
GAC_{SV} - Exposure from Substances Present in Soil Vapours			
Inhalation of Vapours – Indoors	✓	✓	✓
Inhalation of Vapours – Outdoors	✓	✓	✓

The generic human exposure assumptions and building parameters detailed within SR3 for each standard land use have been adopted in the derivation of the GAC.

1.3 CONTAMINANT SPECIFIC PROPERTIES

Toxicological Parameters

Health criteria values (HCV) used to benchmark exposure have been compiled from a review of the scientific and technical literature. Where several health criteria values have been identified, preference has been given to authoritative UK sources where available, as per SR2. In the absence of any appropriate authoritative UK sources, the selection of the most appropriate value has been made with consideration of the following hierarchy:

1. Authoritative UK Sources (e.g. Environment Agency TOX reports, UK Drinking Water Inspectorate, UK Air Quality Strategy);
2. European/International Authoritative Sources (e.g. WHO Drinking Water Guidelines (underlying toxicological data), WHO Air Quality Guidelines for Europe, International Programme on Chemical Safety (IPCS) Environmental Health Criteria Monographs (EHC), IPCS Concise International Chemical Assessment Documents (CICADs));
3. Other National Organisations (e.g. USEPA, RIVM)

In deriving HCVs for non threshold substances, preference was given to the use of an Index Dose (ID) where these were available. Where ID were not available slope factors have been used and amended by multiplying by an appropriate level of excess lifetime cancer risk. SR2 states that, when using human data, the ID is based on estimates of the daily dose corresponding to an excess lifetime cancer risk of 1 in 100,000. This has been used, where required for slope factors in the absence of an ID.

In the absence of appropriate dermal or inhalation HCVs, extrapolated oral values have been adopted as described within SR2. Where available, the dermal absorption fractions presented within SR3 have been adopted. In their absence the default approach adopted within the CLEA model, as outlined within SR3, has been adopted (0.1 for all organic chemicals and zero for inorganic chemicals).

Where required, inhalation HCVs have been converted from reference concentrations quoted in mg/m-^{3} unit risk factors by assuming a 70kg adult typically inhales 20m^3 of air per day.

Where available, the mean daily intakes (MDI) have been sourced from UK diet studies and the Food Standard Agency. In the absence of any UK sources, the IPCS EHC and CICADs have been reviewed to help determine potential background exposure. In accordance with SR2, if no data or information on background information are available, background exposure is considered to be negligible and MDI set to zero for all age groups. If qualitative information is available suggesting background exposure may significantly contribute to overall exposure the pragmatic default outlined within SR2, that land should be allowed to contribute at least half the tolerable daily intake (TDI), has been applied.

Toxicological Equivalents

For non threshold PAHs the index dose has been calculated from published(1) estimated relative potencies to benzo(a)pyrene, and calculated from the ID for benzo(a)pyrene detailed within the DEFRA/EA toxicity report.

Polychlorinated Biphenyls (PCBs) have been assessed according to the Toxicity Equivalency Factor (TEF) approach(2) for dioxin-like PCBs (the PCBs considered to represent the greatest health risk). Each of the PCBs toxicity is related to 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-

(1) Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons. USEPA, July 1993

(2) Environment Agency 'Contaminants In Soil: Updated collation of toxicological data and intake values for humans. Dioxins, furans and dioxin-like PCBs'. SC050021/TOX 12. September 2009.

TCDD), which is considered to be the most carcinogenic dioxin, using a multiplication factor (the TEF). The concentration of each PCB is multiplied by its respective TEF giving a 2,3,7,8-TCDD toxic equivalent (TEQ). The total TEQ for the mixture is compared with the GAC for 2,3,7,8-TCDD.

The toxicity assumptions presented within the TPH Criteria Working Group have been adopted in the derivation of the GAC for aliphatic and aromatic TPH fractions. The TPH fractions are therefore protective of threshold human health effects and indicator compounds are used to assess non-threshold health effects (in line with Environment Agency publication on assessing petroleum hydrocarbons). An attenuation factor of 10 has been adopted for petroleum hydrocarbons in accordance with the recommendations contained within SR3.

Physico-chemical Parameters

Physico-chemical properties have been compiled from a review of the scientific and technical literature. Where available, the physico-chemical properties have been adopted from the Environment Agency Report SR7 (1). In their absence, parameters have been sourced from the references detailed within SR7, where available.

Many of the references present a range of values from numerous scientific studies, with the same studies being presented within each reference. Based upon the values presented within the studies and their own professional expertise, Mackay et al (2) provide recommended values for many parameters and have been adopted where available.

Where a range of values have been sourced, consideration has been given to the selection hierarchy detailed within SR7:

1. If all values the same, select this value;
2. Select Value from consistent range;
3. Central value from consistent range;
4. Newest value (if there is no consistent range or no single central value)

Where available, parameters have been sourced at 10^0C, which is the assumed annual average temperature of UK soils (SR3) and required for the CLEA model.

Where chemical data was unavailable in the literature, or adjustments needed for temperature (i.e. literature source not at 10^0C), property estimation methods and adjustment calculations detailed within SR7 have been used.

1.4 SOIL PROPERTIES

ERM GAC have been developed using a generic set of soil properties which are considered to represent a reasonable conservative scenario. SR3 states that although the sand soil type represents the most conservative choice for modelling diffusion and advection transport processes, it is not geographically widespread. Most common UK sandy soils are closer to a sandy loam and it is this default soil type that is used in the derivation of SGVs by the Environment Agency and has been adopted in the derivation of ERM GAC.

In deriving SGVs, the Environment Agency, have adopted a soil organic matter content of 6%. ERM do not consider this value to be sufficiently conservative for the production of GAC. Therefore, a SOM of 1% (or TOC 0.58%) has been adopted in the derivation of ERM GAC.

(1) Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values (SR7). Environment Agency, November 2008.
(2) Handbook of Physical-Chemical Properties and Environmental fate for Organic Chemicals. 2nd edition. Mackay et al, 2006.

1.5 MODELLING APPROACH

In deriving human health GAC for soils, ERM have adopted the CLEA software version 1.06, which implements the modelling approach detailed within SR3 and is used by the Environment Agency to derive Soil Guideline Values.

The ERM soil vapour GAC (GAC_{SV}) have been back calculated from the indoor and outdoor vapour inhalation soil criteria derived using the CLEA software using the soil to soil vapour partioning approach detailed within Section 5 of SR3. The results have been directly compared to the soil gas media concentration provided within the CLEA outputs when running the model for vapour inhalation pathways only, to ensure parity.

The ERM GAC for groundwater derived vapours (GAC_{GW}) have been calculated using the groundwater vapour transport algorithms developed by the ASTM (E1739), used by RISC V4.05 and outlined within Appendix E of the RISC user manual. Where applicable the standard CLEA receptor, soil and building properties have been utilised.

For acute exposure to free cyanide the conceptual exposure model assumes a one off ingestion of 2000mg of soil by a 1 to 2 year old female child using the algorithms presented by Beck et al 2006 (1) and SNIFFER 2000 (2) .

1.6 ESTIMATING COMBINED EXPOSURE FROM ALL RELEVANT PATHWAYS

For some chemicals, intake and/or uptake via different routes (via the nose, mouth, or through the skin) may lead to different local effects or may affect different organs. People using a contaminated site may be exposed to the same chemical via all three routes of exposure. If the contaminant exhibits systemic toxicity (i.e. reaches the main blood circulation system unchanged following absorption), each route of exposure may contribute to an aggregate total systemic load that results in adverse systemic effects. The ERM GAC takes this possible effect into account by automatically adopting the methodology used by the CLEA software and the Environment Agency, and combining the reciprocal from each relevant exposure pathway. This helps ensure that the assessment criteria is set at a concentration where the total risk via all relevant routes of entry into the body is mathematically no greater than the risk due to exposure by any single route of entry. The only exception is where an Environment Agency Soil Guideline Value (SGV) report identifies that a single exposure route is more appropriate for an individual contaminant, in such cases the same exposure routes used by the Environment Agency in deriving the SGV have been adopted by ERM in deriving the GAC for the same contaminant.

Environment Agency report SR4, states that an important assumption used in the CLEA model is that of simple linear partitioning of a chemical in the soil between the sorbed, dissolved, and vapour phases. The theoretical upper boundaries to this behaviour are represented by the maximum aqueous solubility and pure saturated vapour concentration of the chemical. Environment Agency report SR3 presents equations for using these chemical properties to estimate the saturated soil concentrations where these limits are reached. These boundaries are important when considering vapour phase transport of chemicals into ambient and indoor air.

The CLEA software uses a traffic-light system to identify when individual and/or combined assessment criteria exceed the lower of either the aqueous or vapour based saturation limit.

In instances where the combined assessment criteria of all relevant pathways outputted from the CLEA software is highlighted green or amber and the vapour pathway is not an important contributor, these have been adopted as ERM GAC.

(1) Human Health Risk Assessment of Cyanide in Water and Soil. Beck et al. *Published in Cyanide in water and Soil, Chemistry Risk and Management, Dzombak et al 2006.*
(2) Framework for Deriving Numeric Targets to Minimise the Adverse Human Health Effects of Long-term Exposure to Contaminants in Soil. SR99(02)F. SNIFFER April 2000.

Where the combined assessment criteria exceeds the theoretical saturation limits (aqueous or vapour based) and the vapour pathway is an important contributor to exposure, the methodology detailed within the CLEA Software Handbook for such circumstances has been adopted:

1. Determining the relevant inhalation ADE/HCV ratio at the lower saturation limit;
2. Estimate relevant contribution required from other pathways by subtracting this value by 1 (since the contribution from the vapour pathway is capped at the saturation limit);
3. Determine the soil concentration at which the relevant combined HCV/ADE ratio is equal to the value calculated in (2) without the vapour inhalation pathways.

1.7 ASSESSING MIXTURES

Knowledge about the toxicology of a chemical comes, in the main, from studies involving the exposure of relatively large doses to a single substance. In contrast, an individual may be exposed to many different chemicals every day, including priority soil contaminants. The possibility exists, therefore, that the mixture of chemicals to which any one individual may be exposed may have a greater cumulative effect on health than that predicted by toxicological risk assessment of individual chemicals. Environment Agency report SR2 states that 'where there is evidence for chemical interaction, this should be taken into account: when such evidence is not available, each chemical should be assumed to be acting independently. SR2 goes on to identify that interactions between chemicals are however unlikely at exposures below the HCVs.

Environment Agency Guidance does however identify two groups of similar substances where additive affects should be considered:

1.7.1 Dioxins Furans & Dioxin Like PCBs

The assessment of Dioxin like PCB's assumes the effect from exposure to any individual dioxin like PCB will potentially be additive to exposure to other dioxin like PCB's (as well as similarly acting dioxins/furans) and therefore when assessing risks to human health the 12 congeners should be considered as a mixture rather than isolated substances (1) . The assessment of the PCB mixture is undertaken by calculating the Hazard Quotient (HQ) for each individual congener (ratio of soil concentration and congener specific GAC) and summing the individual HQ to derive a Hazard Index (HI) for the mixture. Where the HI for the mixture is greater than 1 a potentially significant risk may arise and further investigation and or assessment is likely to be required.

1.7.2 Petroleum Hydrocarbons

When assessing the significance of petroleum hydrocarbon mixtures the assessment should consider both indicator compounds and petroleum fractions. Environment Agency report P5-080/TR3 (2) identifies 16 Petroleum Hydrocarbon fractions for use in UK human health risk assessments based on equivalent carbon numbers corresponding to the 13 fractions proposed by the TPHCWG (3) up to EC35 but with the addition of 3 further heavier hydrocarbon fractions (pending further review/evaluation). When assessing petroleum hydrocarbon fractions P5-080/TR3 also identifies the potential for additivity across fractions and that a Hazard Index approach should be adopted for fractions exhibiting similar toxicological properties and that further guidance would be published on this issue. The TPHCWG identified 6 toxicological fractions between C5 - C35 and pending the release of the further guidance ERM

(1) Environment Agency, October 2009. Soil Guideline values for dioxins, furans and dioxin like PCBs in soil. Science Report SC050021/Dioxins SGV.
(2) Environment Agency, February 2005. The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils. Science Report P5-080/TR3.
(3) Total Petroleum Hydrocarbon Criteria Working Group Series Volumes 1 to 5.

approach to Petroleum Hydrocarbon mixtures will be to treat the 13 TPH fractions as essentially 6 Petroleum Hydrocarbon mixtures based on the 6 toxicological fractions.

The assessment of each Petroleum Hydrocarbon mixture is undertaken by calculating the Hazard Quotient (HQ) for each individual fraction (ratio of soil concentration and fraction specific GAC) and summing the relevant individual HQ within each mixture to derive a Hazard Index (HI) for each mixture. Where the HI for the mixture is greater than 1 a potentially significant risk may arise and further investigation and or assessment is likely to be required.

1.8 UNCERTAINTY

As with any form of modelling of the interaction between humans and the wider environment, there is a substantial amount of uncertainty involved. This relates both to the way in which the interaction is modelled (the pathway algorithms) and the input parameters defining the substances, the pathways and the receptors. The CLEA model is deterministic, meaning that in any calculation a single value is assigned to each variable. Many of these values are assigned on the basis of average or conservative (the most health protective) measurements and by expert judgement.

Historically, in dealing with parameter uncertainty and variability in a deterministic model, it has been good practice to select values representative of a worst case exposure scenario. This has the assumed comfort of being more protective against an unforeseen situation or risks to sensitive individuals. However, the problem with this approach can be that such choices, however defensible individually, tend to be implausible collectively.

Over the recent years there has been an increasing desire on the part of authoritative bodies to move away from modelling a worst case individual to more realistic or reasonable exposure scenarios. This is the approach adopted by the CLEA model and takes into account not only the degree of conservatism from individual choices, but also the collective effect of these choices.

It should be noted that ERM's GACs are not a static set of values, but are reviewed on a regular basis and reissued as more guidance is made available by the Environment Agency, or when improved knowledge of toxicity is published.

Annex E

Laboratory Certificates

Jones Environmental Laboratory

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4225

Attention :	Chris Rice
Date :	9th March, 2015
Your reference :	0265147
Our reference :	Test Report 15/4216 Batch 1
Location :	Wrexham
Date samples received :	28th February, 2015
Status :	Final report
Issue :	1

Twelve samples were received for analysis on 28th February, 2015 of which twelve were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Paul Lee-Boden BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	TP3-260215-1.0-SO	TP2-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH2-250215-1.0-SO	BH6-250215-0.5-SO	BH9-250215-0.1-SO	BH8-250215-0.5-SO			
Depth	1.00	1.00	1.00	0.80	0.80	1.00	1.00	0.50	0.10	0.50			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015			
Metals													
Arsenic #	10.8	11.7	11.9	9.4	12.8	25.3	8.3	9.4	13.6	8.3	<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	<0.1	<0.1	mg/kg	TM30/PM15
Chromium #	48.7	44.8	47.7	44.5	46.6	62.4	32.6	32.8	45.7	23.4	<0.5	mg/kg	TM30/PM15
Copper #	29	30	34	23	26	17	14	12	10	9	<1	mg/kg	TM30/PM15
Lead #	23	30	31	26	30	24	26	33	29	23	<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM30/PM15
Nickel #	46.5	50.5	52.7	42.1	49.3	49.7	19.7	19.3	18.5	14.5	<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	<1	mg/kg	TM30/PM15
Zinc #	93	100	92	77	92	86	42	60	65	42	<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM16
>C12-C16 #	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM16
>C16-C21 #	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM16
>C21-C35 #	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM16
>C16-C35 #	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	<14	mg/kg	TM5/PM16
>C35-C44	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM16
Total aliphatics C5-35	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics C5-44	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	mg/kg	TM5/TM36/PM16
Aromatics													
>C5-EC7	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	mg/kg	TM36/PM12
>EC10-EC12	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	<0.2	mg/kg	TM5/PM16
>EC12-EC16	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	<4	mg/kg	TM5/PM16
>EC16-EC21	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM16
>EC21-EC35	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM16
>EC35-EC44	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	<7	mg/kg	TM5/PM16
Total aromatics C5-35	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics and aromatics(C5-35)	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	<38	mg/kg	TM5/TM36/PM12/PM16
Total aromatics C5-44	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	<26	mg/kg	TM5/TM36/PM16
Total aliphatics and aromatics(C5-44)	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	<52	mg/kg	TM5/TM36/PM16

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	TP3-260215-1.0-SO	TP2-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH2-250215-1.0-SO	BH6-250215-0.5-SO	BH9-250215-0.1-SO	BH8-250215-0.5-SO			
Depth	1.00	1.00	1.00	0.80	0.80	1.00	1.00	0.50	0.10	0.50			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015			
BTEX / MTBE													
Benzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Toluene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Ethylbenzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Xylenes (sum of isomers) #	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	mg/kg	TM15/PM10
p/m-Xylene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM15/PM10
o-Xylene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	80	79	86	91	79	87	78	83	90	86	<0	%	TM4/PM8
Surrogate Recovery Toluene D8	109	107	104	104	91	104	106	104	96	105	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	97	103	103	87	105	105	99	81	97	<0	%	TM15/PM10
PCB 77	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 81	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 105	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 114	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 118	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 123	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 126	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 156	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 157	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 167	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
PCB 169	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	TP3-260215-1.0-SO	TP2-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH2-250215-1.0-SO	BH6-250215-0.5-SO	BH9-250215-0.1-SO	BH8-250215-0.5-SO			
Depth	1.00	1.00	1.00	0.80	0.80	1.00	1.00	0.50	0.10	0.50			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015			
PCB 189	-	-	-	-	-	-	-	<0.005	-	-	<0.005	mg/kg	TM16/PM8
Total 12 PCBs	-	-	-	-	-	-	-	<0.06	-	-	<0.06	mg/kg	TM16/PM8
Phenol #	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	mg/kg	TM26/PM21
Natural Moisture Content	15.6	17.6	19.5	16.6	19.4	23.3	10.8	25.6	36.0	25.6	<0.1	%	PM4/PM0
Ammoniacal Nitrogen as N	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	<0.6	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0048	0.0140	0.0101	0.0075	0.0087	0.0209	0.0113	0.0015	0.0097	<0.0015	<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	0.9	<0.5	<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	-	-	-	-	-	-	0.20	0.29	0.29	0.51	<0.02	%	TM21/PM24
Sulphide	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	<10	mg/kg	TM106/PM45
pH #	8.32	8.17	7.57	7.39	8.06	7.01	7.27	6.45	6.45	6.42	<0.01	pH units	TM73/PM11
Mass of Dry Sample	43.0	46.3	44.2	44.5	43.6	42.1	52.3	43.1	42.9	43.8	<0.1	g	PM4/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	35-38	39-42									LOD/LOR	Units	Method No.
Sample ID	BH7-250215-0.2-SO	BH1-260215-1.0-SO											
Depth	0.20	1.00											
COC No / misc													
Containers	V J	V J											
Sample Date	25/02/2015	26/02/2015											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	28/02/2015	28/02/2015											
Metals													
Arsenic #	8.9	12.0									<0.5	mg/kg	TM30/PM15
Cadmium #	0.2	<0.1									<0.1	mg/kg	TM30/PM15
Chromium #	42.2	54.3									<0.5	mg/kg	TM30/PM15
Copper #	14	29									<1	mg/kg	TM30/PM15
Lead #	40	27									<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1									<0.1	mg/kg	TM30/PM15
Nickel #	20.2	54.5									<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1									<1	mg/kg	TM30/PM15
Zinc #	74	104									<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2									<0.2	mg/kg	TM5/PM16
>C12-C16 #	<4	<4									<4	mg/kg	TM5/PM16
>C16-C21 #	<7	<7									<7	mg/kg	TM5/PM16
>C21-C35 #	<7	<7									<7	mg/kg	TM5/PM16
>C16-C35 #	<14	<14									<14	mg/kg	TM5/PM16
>C35-C44	<7	<7									<7	mg/kg	TM5/PM16
Total aliphatics C5-35	<19	<19									<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics C5-44	<26	<26									<26	mg/kg	TM5/TM36/PM16
Aromatics													
>C5-EC7	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1	<0.1									<0.1	mg/kg	TM36/PM12
>EC10-EC12	<0.2	<0.2									<0.2	mg/kg	TM5/PM16
>EC12-EC16	<4	<4									<4	mg/kg	TM5/PM16
>EC16-EC21	<7	<7									<7	mg/kg	TM5/PM16
>EC21-EC35	<7	<7									<7	mg/kg	TM5/PM16
>EC35-EC44	<7	<7									<7	mg/kg	TM5/PM16
Total aromatics C5-35	<19	<19									<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics and aromatics(C5-35)	<38	<38									<38	mg/kg	TM5/TM36/PM12/PM16
Total aromatics C5-44	<26	<26									<26	mg/kg	TM5/TM36/PM16
Total aliphatics and aromatics(C5-44)	<52	<52									<52	mg/kg	TM5/TM36/PM16

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	35-38	39-42									LOD/LOR	Units	Method No.
Sample ID	BH7-250215-0.2-SO	BH1-260215-1.0-SO											
Depth	0.20	1.00											
COC No / misc													
Containers	V J	V J											
Sample Date	25/02/2015	26/02/2015											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	28/02/2015	28/02/2015											
BTEX / MTBE													
Benzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Toluene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Ethylbenzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Xylenes (sum of isomers) #	<0.008	<0.008									<0.008	mg/kg	TM15/PM10
p/m-Xylene #	<0.005	<0.005									<0.005	mg/kg	TM15/PM10
o-Xylene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
PAH MS													
Naphthalene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03									<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06									<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02									<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07									<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04									<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6									<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05									<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02									<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	77	79									<0	%	TM4/PM8
Surrogate Recovery Toluene D8	100	105									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	87	103									<0	%	TM15/PM10
PCB 77	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 81	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 105	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 114	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 118	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 123	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 126	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 156	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 157	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 167	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
PCB 169	<0.005	<0.005									<0.005	mg/kg	TM16/PM8

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	35-38	39-42									LOD/LOR	Units	Method No.
Sample ID	BH7-250215-0.2-SO	BH1-260215-1.0-SO											
Depth	0.20	1.00											
COC No / misc													
Containers	V J	V J											
Sample Date	25/02/2015	26/02/2015											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	28/02/2015	28/02/2015											
PCB 189	<0.005	<0.005									<0.005	mg/kg	TM16/PM8
Total 12 PCBs	<0.06	<0.06									<0.06	mg/kg	TM16/PM8
Phenol #	<0.01	<0.01									<0.01	mg/kg	TM26/PM21
Natural Moisture Content	24.0	21.9									<0.1	%	PM4/PM0
Ammoniacal Nitrogen as N	<0.6	<0.6									<0.6	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	<0.0015	0.0068									<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5									<0.5	mg/kg	TM89/PM45
Total Cyanide #	0.7	<0.5									<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	0.19	0.65									<0.02	%	TM21/PM24
Sulphide	<10	<10									<10	mg/kg	TM106/PM45
pH #	7.29	8.23									<0.01	pH units	TM73/PM11
Mass of Dry Sample	42.1	42.0									<0.1	g	PM4/PM0

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

VOC Report : **Solid**

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34	LOD/LOR	Units	Method No.
Sample ID	TP3-260215-1.0-SO	TP2-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH2-250215-1.0-SO	BH6-250215-0.5-SO	BH9-250215-0.1-SO	BH8-250215-0.5-SO			
Depth	1.00	1.00	1.00	0.80	0.80	1.00	1.00	0.50	0.10	0.50			
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015			
VOC MS													
BTEX													
Benzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Toluene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Ethylbenzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Xylenes (sum of isomers) #	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	<0.008	mg/kg	TM15/PM10
p/m-Xylene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM15/PM10
o-Xylene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Chloroethenes													
Tetrachloroethene (PCE) #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Trichloroethene (TCE) #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/kg	TM15/PM10
cis-1-2-Dichloroethene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
trans-1-2-Dichloroethene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Vinyl Chloride	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
Chloroethanes													
1,1,1,2-Tetrachloroethane	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,1,1-Trichloroethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,1,2-Trichloroethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,1-Dichloroethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,2-Dichloroethane #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Chloroethane #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
Chlorobenzenes													
1,2,3-Trichlorobenzene #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	mg/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	mg/kg	TM15/PM10
1,2-Dichlorobenzene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
1,3-Dichlorobenzene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
1,4-Dichlorobenzene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Chlorobenzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Chloromethanes													
Carbon tetrachloride #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Chloroform #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Dichloromethane (DCM) #	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	<0.007	mg/kg	TM15/PM10
Chloromethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Chloropropanes													
1,2,3-Trichloropropane #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
1,2-Dichloropropane #	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/kg	TM15/PM10
2,2-Dichloropropane	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
1,3-Dichloropropane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Chloropropenes													
1,1-Dichloropropene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
cis-1-3-Dichloropropene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
trans-1-3-Dichloropropene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

VOC Report : **Solid**

J E Sample No.	1-3	4-6	7-9	10-12	13-15	16-18	19-22	23-26	27-30	31-34			
Sample ID	TP3-260215-1.0-SO	TP2-260215-1.0-SO	TP4-260215-1.0-SO	TP5-260215-0.8-SO	TP6-260215-0.8-SO	TP9-260215-1.0-SO	BH2-250215-1.0-SO	BH6-250215-0.5-SO	BH9-250215-0.1-SO	BH8-250215-0.5-SO			
Depth	1.00	1.00	1.00	0.80	0.80	1.00	1.00	0.50	0.10	0.50	Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J	V J	V J	V J	V J	V J	V J	V J	V J	V J			
Sample Date	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	26/02/2015	25/02/2015	25/02/2015	25/02/2015	25/02/2015			
Sample Type	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil			
Batch Number	1	1	1	1	1	1	1	1	1	1			
Date of Receipt	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	28/02/2015	LOD/LOR	Units	Method No.
VOC MS													
Other VOCs													
Bromobenzene	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
Bromochloromethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Bromodichloromethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Bromoform	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Bromomethane	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	mg/kg	TM15/PM10
n-Butylbenzene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
sec-Butylbenzene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
tert-Butylbenzene #	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	mg/kg	TM15/PM10
2-Chlorotoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
4-Chlorotoluene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Isopropylbenzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Dibromochloromethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
1,2-Dibromoethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Dibromomethane #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Dichlorodifluoromethane	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
4-Isopropyltoluene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Propylbenzene #	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Styrene	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Trichlorofluoromethane #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	<0.006	mg/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	<0.003	mg/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	mg/kg	TM15/PM10
Hexachlorobutadiene	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	<0.004	mg/kg	TM15/PM10
Naphthalene	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	<0.027	mg/kg	TM15/PM10
Surrogate Recovery Toluene D8	109	107	104	104	91	104	106	104	96	105	<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	105	97	103	103	87	105	105	99	81	97	<0	%	TM15/PM10

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

VOC Report : **Solid**

J E Sample No.	35-38	39-42											
Sample ID	BH7-250215-0.2-SO	BH1-260215-1.0-SO											
Depth	0.20	1.00									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J	V J											
Sample Date	25/02/2015	26/02/2015											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	28/02/2015	28/02/2015									LOD/LOR	Units	Method No.
VOC MS													
BTEX													
Benzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Toluene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Ethylbenzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Xylenes (sum of isomers) #	<0.008	<0.008									<0.008	mg/kg	TM15/PM10
p/m-Xylene #	<0.005	<0.005									<0.005	mg/kg	TM15/PM10
o-Xylene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Chloroethenes													
Tetrachloroethene (PCE) #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Trichloroethene (TCE) #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<0.006	<0.006									<0.006	mg/kg	TM15/PM10
cis-1-2-Dichloroethene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
trans-1-2-Dichloroethene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Vinyl Chloride	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
Chloroethanes													
1,1,1,2-Tetrachloroethane	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,1,1-Trichloroethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,1,2-Trichloroethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,1-Dichloroethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,2-Dichloroethane #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Chloroethane #	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
Chlorobenzenes													
1,2,3-Trichlorobenzene #	<0.007	<0.007									<0.007	mg/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<0.007	<0.007									<0.007	mg/kg	TM15/PM10
1,2-Dichlorobenzene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
1,3-Dichlorobenzene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
1,4-Dichlorobenzene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Chlorobenzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Chloromethanes													
Carbon tetrachloride #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Chloroform #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Dichloromethane (DCM) #	<0.007	<0.007									<0.007	mg/kg	TM15/PM10
Chloromethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Chloropropanes													
1,2,3-Trichloropropane #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
1,2-Dichloropropane #	<0.006	<0.006									<0.006	mg/kg	TM15/PM10
2,2-Dichloropropane	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
1,3-Dichloropropane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Chloropropenes													
1,1-Dichloropropene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
cis-1-3-Dichloropropene	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
trans-1-3-Dichloropropene	<0.003	<0.003									<0.003	mg/kg	TM15/PM10

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4216

VOC Report : **Solid**

J E Sample No.	35-38	39-42											
Sample ID	BH7-250215-0.2-SO	BH1-260215-1.0-SO											
Depth	0.20	1.00									Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V J	V J											
Sample Date	25/02/2015	26/02/2015											
Sample Type	Soil	Soil											
Batch Number	1	1											
Date of Receipt	28/02/2015	28/02/2015									LOD/LOR	Units	Method No.
VOC MS													
Other VOCs													
Bromobenzene	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
Bromochloromethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Bromodichloromethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Bromoform	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Bromomethane	<0.001	<0.001									<0.001	mg/kg	TM15/PM10
n-Butylbenzene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
sec-Butylbenzene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
tert-Butylbenzene #	<0.005	<0.005									<0.005	mg/kg	TM15/PM10
2-Chlorotoluene	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
4-Chlorotoluene	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Isopropylbenzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Dibromochloromethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
1,2-Dibromoethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Dibromomethane #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Dichlorodifluoromethane	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
4-Isopropyltoluene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Propylbenzene #	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Styrene	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Trichlorofluoromethane #	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<0.006	<0.006									<0.006	mg/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<0.003	<0.003									<0.003	mg/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.002	<0.002									<0.002	mg/kg	TM15/PM10
Hexachlorobutadiene	<0.004	<0.004									<0.004	mg/kg	TM15/PM10
Naphthalene	<0.027	<0.027									<0.027	mg/kg	TM15/PM10
Surrogate Recovery Toluene D8	100	105									<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	87	103									<0	%	TM15/PM10

Client Name: ERM
Reference: 265147
Location: Wrexham
Contact: Chris Rice

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Description	Asbestos Containing Material	Asbestos Results	Asbestos Level	Comments
15/4216	1	TP3-260215-1.0-SO	1.00	3	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	TP2-260215-1.0-SO	1.00	6	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	TP4-260215-1.0-SO	1.00	9	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	TP5-260215-0.8-SO	0.80	12	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	TP6-260215-0.8-SO	0.80	15	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	TP9-260215-1.0-SO	1.00	18	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	BH2-250215-1.0-SO	1.00	21	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	BH6-250215-0.5-SO	0.50	25	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	BH9-250215-0.1-SO	0.10	29	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	BH8-250215-0.5-SO	0.50	33	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	BH7-250215-0.2-SO	0.20	37	04/03/15	Soil/Stone	None	NAD	NAD	
15/4216	1	BH1-260215-1.0-SO	1.00	41	04/03/15	Soil/Stone	None	NAD	NAD	

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Analysis	Reason
No deviating sample report results for job 15/4216						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating.
Only analyses which are accredited are recorded as deviating if set criteria are not met.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4216

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/4216

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM12/PM16	CWG GC-FID			AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

JE Job No: 15/4216

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

JE Job No: 15/4216

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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ERM
11th Floor
5 Exchange Quay
Salford
Manchester
M5 3EF

4225

Attention :	Chris Rice
Date :	11th March, 2015
Your reference :	0265147
Our reference :	Test Report 15/4385 Batch 1
Location :	Wrexham
Date samples received :	4th March, 2015
Status :	Final report
Issue :	1

Three samples were received for analysis on 4th March, 2015 of which three were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Paul Lee-Boden BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4385

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-4	5-8	9-12								LOD/LOR	Units	Method No.
Sample ID	BH4	BH5	DUP A										
Depth	1.0	0.5											
COC No / misc													
Containers	V J	V J	V J										
Sample Date	02/03/2015	02/03/2015	02/03/2015										
Sample Type	Soil	Soil	Soil										
Batch Number	1	1	1										
Date of Receipt	04/03/2015	04/03/2015	04/03/2015										
Metals													
Arsenic #	12.4	12.1	12.3								<0.5	mg/kg	TM30/PM15
Cadmium #	<0.1	<0.1	<0.1								<0.1	mg/kg	TM30/PM15
Chromium #	51.1	52.5	56.5								<0.5	mg/kg	TM30/PM15
Copper #	33	30	29								<1	mg/kg	TM30/PM15
Lead #	33	33	31								<5	mg/kg	TM30/PM15
Mercury #	<0.1	<0.1	<0.1								<0.1	mg/kg	TM30/PM15
Nickel #	49.8	56.7	52.2								<0.7	mg/kg	TM30/PM15
Selenium #	<1	<1	<1								<1	mg/kg	TM30/PM15
Zinc #	99	89	87								<5	mg/kg	TM30/PM15
TPH CWG													
Aliphatics													
>C5-C6 #	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C6-C8 #	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C8-C10	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>C10-C12 #	<0.2	<0.2	<0.2								<0.2	mg/kg	TM5/PM16
>C12-C16 #	<4	<4	<4								<4	mg/kg	TM5/PM16
>C16-C21 #	<7	<7	<7								<7	mg/kg	TM5/PM16
>C21-C35 #	<7	<7	<7								<7	mg/kg	TM5/PM16
>C16-C35 #	<14	<14	<14								<14	mg/kg	TM5/PM16
>C35-C44	<7	<7	<7								<7	mg/kg	TM5/PM16
Total aliphatics C5-35	<19	<19	<19								<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics C5-44	<26	<26	<26								<26	mg/kg	TM5/TM36/PM16
Aromatics													
>C5-EC7	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC7-EC8	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC8-EC10 #	<0.1	<0.1	<0.1								<0.1	mg/kg	TM36/PM12
>EC10-EC12	<0.2	<0.2	<0.2								<0.2	mg/kg	TM5/PM16
>EC12-EC16	<4	<4	<4								<4	mg/kg	TM5/PM16
>EC16-EC21	<7	<7	<7								<7	mg/kg	TM5/PM16
>EC21-EC35	<7	<7	<7								<7	mg/kg	TM5/PM16
>EC35-EC44	<7	<7	<7								<7	mg/kg	TM5/PM16
Total aromatics C5-35	<19	<19	<19								<19	mg/kg	TM5/TM36/PM12/PM16
Total aliphatics and aromatics(C5-35)	<38	<38	<38								<38	mg/kg	TM5/TM36/PM12/PM16
Total aromatics C5-44	<26	<26	<26								<26	mg/kg	TM5/TM36/PM16
Total aliphatics and aromatics(C5-44)	<52	<52	<52								<52	mg/kg	TM5/TM36/PM16

Please see attached notes for all abbreviations and acronyms

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4385

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-4	5-8	9-12									
Sample ID	BH4	BH5	DUP A									
Depth	1.0	0.5										
COC No / misc												
Containers	V J	V J	V J									
Sample Date	02/03/2015	02/03/2015	02/03/2015									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/03/2015	04/03/2015	04/03/2015									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
BTEX / MTBE													
Benzene #	<0.003	<0.003	<0.003								<0.003	mg/kg	TM15/PM10
Toluene #	<0.003	<0.003	<0.003								<0.003	mg/kg	TM15/PM10
Ethylbenzene #	<0.003	<0.003	<0.003								<0.003	mg/kg	TM15/PM10
Xylenes (sum of isomers) #	<0.008	<0.008	<0.008								<0.008	mg/kg	TM15/PM10
p/m-Xylene #	<0.005	<0.005	<0.005								<0.005	mg/kg	TM15/PM10
o-Xylene #	<0.003	<0.003	<0.003								<0.003	mg/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.002	<0.002	<0.002								<0.002	mg/kg	TM15/PM10
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	<0.03								<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Fluorene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Phenanthrene #	<0.03	<0.03	<0.03								<0.03	mg/kg	TM4/PM8
Anthracene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Fluoranthene #	<0.03	<0.03	<0.03								<0.03	mg/kg	TM4/PM8
Pyrene #	<0.03	<0.03	<0.03								<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	<0.06	<0.06	<0.06								<0.06	mg/kg	TM4/PM8
Chrysene #	<0.02	<0.02	<0.02								<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	<0.07	<0.07	<0.07								<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	<0.04	<0.04	<0.04								<0.04	mg/kg	TM4/PM8
PAH 16 Total	<0.6	<0.6	<0.6								<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	<0.05	<0.05	<0.05								<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	<0.02	<0.02	<0.02								<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	100	97	100								<0	%	TM4/PM8
Surrogate Recovery Toluene D8	113	111	113								<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	127	127	128								<0	%	TM15/PM10
PCB 77	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 81	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 105	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 114	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 118	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 123	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 126	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 156	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 157	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 167	-	<0.005	-								<0.005	mg/kg	TM16/PM8
PCB 169	-	<0.005	-								<0.005	mg/kg	TM16/PM8

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4385

Report : Solid

Solids: V=60g VOC jar, J=250g glass jar, T=plastic tub

J E Sample No.	1-4	5-8	9-12									
Sample ID	BH4	BH5	DUP A									
Depth	1.0	0.5										
COC No / misc												
Containers	V J	V J	V J									
Sample Date	02/03/2015	02/03/2015	02/03/2015									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/03/2015	04/03/2015	04/03/2015									

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
PCB 189	-	<0.005	-								<0.005	mg/kg	TM16/PM8
Total 12 PCBs	-	<0.06	-								<0.06	mg/kg	TM16/PM8
Phenol #	<0.01	<0.01	<0.01								<0.01	mg/kg	TM26/PM21
Natural Moisture Content	17.8	20.5	22.2								<0.1	%	PM4/PM0
Ammoniacal Nitrogen as N	<0.6	<0.6	<0.6								<0.6	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0107	0.0195	0.0295								<0.0015	g/l	TM38/PM20
Free Cyanide	<0.5	<0.5	<0.5								<0.5	mg/kg	TM89/PM45
Total Cyanide #	<0.5	<0.5	<0.5								<0.5	mg/kg	TM89/PM45
Total Organic Carbon #	0.17	0.21	0.29								<0.02	%	TM21/PM24
Sulphide	<10	<10	<10								<10	mg/kg	TM106/PM45
pH #	8.24	7.60	7.62								<0.01	pH units	TM73/PM11
Mass of Dry Sample	43.7	42.3	45.1								<0.1	g	PM4/PM0

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4385

VOC Report : **Solid**

J E Sample No.	1-4	5-8	9-12									
Sample ID	BH4	BH5	DUP A									
Depth	1.0	0.5								Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V J	V J	V J									
Sample Date	02/03/2015	02/03/2015	02/03/2015									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/03/2015	04/03/2015	04/03/2015									
										LOD/LOR	Units	Method No.
VOC MS												
BTEX												
Benzene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Toluene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Ethylbenzene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Xylenes (sum of isomers) #	<0.008	<0.008	<0.008							<0.008	mg/kg	TM15/PM10
p/m-Xylene #	<0.005	<0.005	<0.005							<0.005	mg/kg	TM15/PM10
o-Xylene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Chloroethenes												
Tetrachloroethene (PCE) #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Trichloroethene (TCE) #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<0.006	<0.006	<0.006							<0.006	mg/kg	TM15/PM10
cis-1-2-Dichloroethene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
trans-1-2-Dichloroethene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Vinyl Chloride	<0.002	<0.002	<0.002							<0.002	mg/kg	TM15/PM10
Chloroethanes												
1,1,1,2-Tetrachloroethane	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,1,2,2-Tetrachloroethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,1,1-Trichloroethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,1,2-Trichloroethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,1-Dichloroethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,2-Dichloroethane #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Chloroethane #	<0.002	<0.002	<0.002							<0.002	mg/kg	TM15/PM10
Chlorobenzenes												
1,2,3-Trichlorobenzene #	<0.007	<0.007	<0.007							<0.007	mg/kg	TM15/PM10
1,2,4-Trichlorobenzene #	<0.007	<0.007	<0.007							<0.007	mg/kg	TM15/PM10
1,2-Dichlorobenzene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
1,3-Dichlorobenzene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
1,4-Dichlorobenzene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Chlorobenzene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Chloromethanes												
Carbon tetrachloride #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Chloroform #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Dichloromethane (DCM) #	<0.007	<0.007	<0.007							<0.007	mg/kg	TM15/PM10
Chloromethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Chloropropanes												
1,2,3-Trichloropropane #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
1,2-Dichloropropane #	<0.006	<0.006	<0.006							<0.006	mg/kg	TM15/PM10
2,2-Dichloropropane	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
1,3-Dichloropropane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Chloropropenes												
1,1-Dichloropropene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
cis-1-3-Dichloropropene	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
trans-1-3-Dichloropropene	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4385

VOC Report : **Solid**

J E Sample No.	1-4	5-8	9-12									
Sample ID	BH4	BH5	DUP A									
Depth	1.0	0.5								Please see attached notes for all abbreviations and acronyms		
COC No / misc												
Containers	V J	V J	V J									
Sample Date	02/03/2015	02/03/2015	02/03/2015									
Sample Type	Soil	Soil	Soil									
Batch Number	1	1	1									
Date of Receipt	04/03/2015	04/03/2015	04/03/2015									
VOC MS										LOD/LOR	Units	Method No.
Other VOCs												
Bromobenzene	<0.002	<0.002	<0.002							<0.002	mg/kg	TM15/PM10
Bromochloromethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Bromodichloromethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Bromoform	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Bromomethane	<0.001	<0.001	<0.001							<0.001	mg/kg	TM15/PM10
n-Butylbenzene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
sec-Butylbenzene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
tert-Butylbenzene #	<0.005	<0.005	<0.005							<0.005	mg/kg	TM15/PM10
2-Chlorotoluene	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
4-Chlorotoluene	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Isopropylbenzene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,2-Dibromo-3-chloropropane #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Dibromochloromethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
1,2-Dibromoethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Dibromomethane #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Dichlorodifluoromethane	<0.002	<0.002	<0.002							<0.002	mg/kg	TM15/PM10
4-Isopropyltoluene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Propylbenzene #	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Styrene	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Trichlorofluoromethane #	<0.002	<0.002	<0.002							<0.002	mg/kg	TM15/PM10
1,2,4-Trimethylbenzene #	<0.006	<0.006	<0.006							<0.006	mg/kg	TM15/PM10
1,3,5-Trimethylbenzene #	<0.003	<0.003	<0.003							<0.003	mg/kg	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.002	<0.002	<0.002							<0.002	mg/kg	TM15/PM10
Hexachlorobutadiene	<0.004	<0.004	<0.004							<0.004	mg/kg	TM15/PM10
Naphthalene	<0.027	<0.027	<0.027							<0.027	mg/kg	TM15/PM10
Surrogate Recovery Toluene D8	113	111	113							<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	127	127	128							<0	%	TM15/PM10

Client Name: ERM
Reference: 265147
Location: Wrexham
Contact: Chris Rice

Note:

Analysis was carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Samples are retained for not less than 6 months from the date of analysis unless specifically requested.

Opinions lie outside the scope of our UKAS accreditation.

Where the sample is not taken by a Jones Environmental Laboratory consultant, Jones Environmental Laboratory cannot be responsible for inaccurate or unrepresentative sampling.

If asbestos fibres are reported at trace levels there will not be enough fibres to quantify and will be less than 0.001%.

Signed on behalf of Jones Environmental Laboratory:

Ryan Butterworth
Asbestos Team Leader

J E Job No.	Batch	Sample ID	Depth	J E Sample No.	Date Of Analysis	Description	Asbestos Containing Material	Asbestos Results	Asbestos Level	Comments
15/4385	1	BH4	1.0	3	06/03/15	Soil/Stone/Clay	None	NAD	NAD	
15/4385	1	BH5	0.5	7	06/03/15	Soil/Stone/Clay	None	NAD	NAD	
15/4385	1	DUP A		11	06/03/15	Soil/Stone/Clay	None	NAD	NAD	

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4385

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/4385

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.				
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465 and BS1377.	PM0	No preparation is required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270 method for the solvent extraction and determination of 16 PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.	Yes		AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM12/PM16	CWG GC-FID			AR	Yes
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM16	Fractionation into aliphatic and aromatic fractions using a Rapid Trace SPE.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes

JE Job No: 15/4385

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM21	Modified USEPA 415.1. Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21	As received solid or water samples are extracted in Methanol: Sodium Hydroxide (0.1M NaOH) (60:40) by orbital shaker.	Yes		AR	Yes
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.			AR	Yes
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes		AR	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM20	Extraction of dried and ground samples with deionised water in a 2:1 water to solid ratio for anions. Extraction of as received samples with deionised water in a 2:1 water to solid ratio for ammoniacal nitrogen. Samples are extracted using an orbital shaker.			AR	Yes
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.			AR	
TM65	Asbestos Bulk Identification method based on HSG 248.	PM42	Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

JE Job No: 15/4385

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.	Yes		AR	Yes
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM45	As received solid samples are extracted with 1M NaOH by orbital shaker for Cyanide and Thiocyanate analysis.			AR	Yes

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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Zone 3
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ERM
11th Floor
5 Exchange Quay
Salford
Manchester
M5 3EF

4225

Attention :	Chris Rice
Date :	12th March, 2015
Your reference :	0265147
Our reference :	Test Report 15/4410 Batch 1
Location :	Wrexham
Date samples received :	5th March, 2015
Status :	Final report
Issue :	1

Nine samples were received for analysis on 5th March, 2015 of which nine were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Paul Lee-Boden BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4410

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		LOD/LOR	Units	Method No.
Sample ID	BH1040315WG	BH2040315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG				
Depth													
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G				
Sample Date	04/03/2015	04/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015				
Metals													
Dissolved Arsenic #	<2.5	<2.5	<2.5	3.0	<2.5	12.8	<2.5	3.6	<2.5		<2.5	ug/l	TM30/PM14
Dissolved Cadmium #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM30/PM14
Total Dissolved Chromium #	<1.5	<1.5	<1.5	<1.5	2.1	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM30/PM14
Dissolved Copper #	<7	<7	<7	<7	<7	<7	<7	<7	<7		<7	ug/l	TM30/PM14
Dissolved Lead #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM30/PM14
Dissolved Mercury #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM30/PM14
Dissolved Nickel #	<2	<2	<2	<2	3	<2	<2	<2	<2		<2	ug/l	TM30/PM14
Dissolved Selenium #	6	<3	<3	<3	29	<3	<3	<3	<3		<3	ug/l	TM30/PM14
Dissolved Zinc #	17	11	<3	<3	14	<3	<3	<3	16		<3	ug/l	TM30/PM14
TPH CWG													
Aliphatics													
>C5-C6 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>C6-C8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>C8-C10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>C10-C12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM5/PM30
>C12-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>C16-C21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>C21-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/TM36/PM30
>C5-C8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>C8-C16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>C16-C35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
Aromatics													
>C5-EC7 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>EC7-EC8 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>EC8-EC10 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM36/PM12
>EC10-EC12 #	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM5/PM30
>EC12-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>EC16-EC21 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>EC21-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>EC10-EC16 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
>EC16-EC35 #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM5/TM36/PM30

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4410

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, $HN=HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		LOD/LOR	Units	Method No.
Sample ID	BH1040315WG	BH2040315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG				
Depth													
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G				
Sample Date	04/03/2015	04/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015				
BTEX / MTBE													
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Xylenes (sum of isomers) #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	ug/l	TM15/PM10
Dissolved Boron	59	43	48	38	28	66	38	23	65		<12	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	360000	277000	372000	141000	181000	546000	457000	414000	338000		<1000	ug/l	TM30/PM14
Surrogate Recovery Toluene D8	102	100	99	100	99	104	100	100	100		<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	97	105	91	105	105	101	106	105	106		<0	%	TM15/PM10
Sulphate #	65420	31680	52390	34760	50620	99150	93300	130160	64530		<50	ug/l	TM38/PM0
Total Cyanide #	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM89/PM0
Ammoniacal Nitrogen as N #	190	50	60	50	110	100	<30	50	190		<30	ug/l	TM38/PM0
Sulphide	<300	<300	<300	<300	<300	<300	<300	<300	<300		<300	ug/l	TM106/PM0
Thiocyanate	<20	<20	<20	<20	<20	<20	<20	<20	<20		<20	ug/l	TM107/PM0
pH #	7.72	7.12	7.69	8.03	7.90	7.48	7.11	7.11	7.70		<0.01	pH units	TM73/PM0
Total Organic Carbon #	6000	7000	4000	6000	11000	4000	8000	10000	4000		<2000	ug/l	TM60/PM0

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4410

SVOC Report : **Liquid**

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90				
Sample ID	BH1040315WG	BH2040315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG				
Depth										Please see attached notes for all abbreviations and acronyms			
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G				
Sample Date	04/03/2015	04/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015				
SVOC MS													
Phenols													
4-Chloro-3-methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
2-Chlorophenol #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
4-Methylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
2-Nitrophenol	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
4-Nitrophenol	<10	<10	<10	<10	<10	<10	<10	<10	<10		<10	ug/l	TM16/PM30
Pentachlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Phenol	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
PAHs													
Acenaphthene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Acenaphthylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Anthracene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Benzo(a)anthracene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Benzo(bk)fluoranthene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Benzo(a)pyrene	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Benzo(ghi)perylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
2-Chloronaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Chrysene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Dibenzo(ah)anthracene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Fluoranthene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Fluorene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Indeno(123cd)pyrene	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Naphthalene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Phenanthrene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Pyrene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
B(ghi)Perylene + I(123cd)Pyrene	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM16/PM30
Sum of 4DW PAHs	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5	<2.5		<2.5	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5	<5	<5	<5	<5	<5	<5	<5	<5		<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Diethyl phthalate #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Dimethyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Amines													
N-nitrosodi-n-propylamine #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Anilines													
4-Chloroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
2-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
3-Nitroaniline	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4410

SVOC Report : **Liquid**

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		LOD/LOR	Units	Method No.
Sample ID	BH1040315WG	BH2040315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG				
Depth										Please see attached notes for all abbreviations and acronyms			
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G				
Sample Date	04/03/2015	04/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015				
SVOC MS													
Other SVOCs													
Azobenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Carbazole #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Isophorone #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Hexachloroethane #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
Hexachlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
1,2-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM16/PM30

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4410

VOC Report : **Liquid**

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90		LOD/LOR	Units	Method No.
Sample ID	BH1040315WG	BH2040315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG				
Depth										Please see attached notes for all abbreviations and acronyms			
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G				
Sample Date	04/03/2015	04/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015				
VOC MS													
BTEX													
Benzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Toluene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Xylenes (sum of isomers) #	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5	<1.5		<1.5	ug/l	TM15/PM10
p/m-Xylene #	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM15/PM10
o-Xylene #	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5		<0.5	ug/l	TM15/PM10
Chloroethenes													
Tetrachloroethene (PCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	ug/l	TM15/PM10
Chloroethanes													
1,1,1,2-Tetrachloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4	<4	<4	<4	<4	<4	<4	<4	<4		<4	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
1,1-Dichloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,2-Dichloroethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Chloroethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Chlorobenzenes													
1,2,3-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Chlorobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Chloromethanes													
Carbon tetrachloride #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Chloroform #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Chloromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Chloropropanes													
1,2,3-Trichloropropane #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
2,2-Dichloropropane	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM15/PM10
1,3-Dichloropropane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Chloropropenes													
1,1-Dichloropropene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10

Client Name: ERM
Reference: 0265147
Location: Wrexham
Contact: Chris Rice
JE Job No.: 15/4410

VOC Report : **Liquid**

J E Sample No.	1-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90				
Sample ID	BH1040315WG	BH2040315WG	BH4040315WG	BH5040315WG	BH6040315WG	BH7030315WG	BH8030315WG	BH9030315WG	DUP1040315WG				
Depth										Please see attached notes for all abbreviations and acronyms			
COC No / misc													
Containers	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G	V H HN N Z P G				
Sample Date	04/03/2015	04/03/2015	04/03/2015	04/03/2015	04/03/2015	03/03/2015	03/03/2015	03/03/2015	04/03/2015				
Sample Type	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water	Ground Water				
Batch Number	1	1	1	1	1	1	1	1	1				
Date of Receipt	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015	05/03/2015				
VOC MS													
Other VOCs													
Bromobenzene #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Bromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Bromodichloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Bromoform #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Bromomethane	<1	<1	<1	<1	<1	<1	<1	<1	<1		<1	ug/l	TM15/PM10
n-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Isopropylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Dibromochloromethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Dibromomethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Dichlorodifluoromethane	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
4-Isopropyltoluene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Propylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Styrene	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Trichlorofluoromethane #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1		<0.1	ug/l	TM15/PM10
Hexachlorobutadiene	<3	<3	<3	<3	<3	<3	<3	<3	<3		<3	ug/l	TM15/PM10
Naphthalene	<2	<2	<2	<2	<2	<2	<2	<2	<2		<2	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	102	100	99	100	99	104	100	100	100		<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	97	105	91	105	105	101	106	105	106		<0	%	TM15/PM10

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/4410

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/4410

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			

JE Job No: 15/4410

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Jones Environmental Laboratory

Registered Address : Unit 3 Deeside Point, Zone 3, Deeside Industrial Park, Deeside, CH5 2UA. UK

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ERM
11th Floor
5 Exchange Quay
Salford
Manchester
M5 3EF

4225

Attention :	Chris Rice
Date :	7th April, 2015
Your reference :	0265147
Our reference :	Test Report 15/5483 Batch 1
Location :	Cytec Wrexham
Date samples received :	28th March, 2015
Status :	Final report
Issue :	1

One sample were received for analysis on 28th March, 2015 of which one were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Compiled By:

Paul Lee-Boden BSc
Project Manager

Bob Millward BSc FRSC
Principal Chemist

Client Name: ERM
Reference: 0265147
Location: Cytec Wrexham
Contact: Chris Rice
JE Job No.: 15/5483

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
$H=H_2SO_4$, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-8										LOD/LOR	Units	Method No.
Sample ID	BH3-270315WG												
Depth													
COC No / misc													
Containers	V H N Z P G												
Sample Date	27/03/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	28/03/2015												
Metals													
Dissolved Arsenic #	5.2										<0.9	ug/l	TM30/PM14
Dissolved Cadmium #	0.36										<0.03	ug/l	TM30/PM14
Total Dissolved Chromium #	<0.2										<0.2	ug/l	TM30/PM14
Dissolved Copper #	<3										<3	ug/l	TM30/PM14
Dissolved Lead #	1.2										<0.4	ug/l	TM30/PM14
Dissolved Mercury #	<0.5										<0.5	ug/l	TM30/PM14
Dissolved Nickel #	1.5										<0.2	ug/l	TM30/PM14
Dissolved Selenium #	<1.2										<1.2	ug/l	TM30/PM14
Dissolved Zinc #	33.6										<1.5	ug/l	TM30/PM14
TPH CWG													
Aliphatics													
>C5-C6 #	<5										<5	ug/l	TM36/PM12
>C6-C8 #	<5										<5	ug/l	TM36/PM12
>C8-C10 #	<5										<5	ug/l	TM36/PM12
>C10-C12 #	<5										<5	ug/l	TM5/PM30
>C12-C16 #	<10										<10	ug/l	TM5/PM30
>C16-C21 #	<10										<10	ug/l	TM5/PM30
>C21-C35 #	<10										<10	ug/l	TM5/PM30
Total aliphatics C5-35 #	<10										<10	ug/l	TM5/TM36/PM30
>C5-C8 #	<5										<5	ug/l	TM36/PM12
>C8-C16 #	<10										<10	ug/l	TM5/PM30
>C16-C35 #	<10										<10	ug/l	TM5/PM30
Aromatics													
>C5-EC7 #	<5										<5	ug/l	TM36/PM12
>EC7-EC8 #	<5										<5	ug/l	TM36/PM12
>EC8-EC10 #	<5										<5	ug/l	TM36/PM12
>EC10-EC12 #	<5										<5	ug/l	TM5/PM30
>EC12-EC16 #	<10										<10	ug/l	TM5/PM30
>EC16-EC21 #	<10										<10	ug/l	TM5/PM30
>EC21-EC35 #	<10										<10	ug/l	TM5/PM30
Total aromatics C5-35 #	<10										<10	ug/l	TM5/PM30
>EC10-EC16 #	<10										<10	ug/l	TM5/PM30
>EC16-EC35 #	<10										<10	ug/l	TM5/PM30
Total aliphatics and aromatics(C5-35) #	<10										<10	ug/l	TM5/TM36/PM30

Client Name: ERM
Reference: 0265147
Location: Cytec Wrexham
Contact: Chris Rice
JE Job No.: 15/5483

Report : Liquid

Liquids/products: V=40ml vial, G=glass bottle, P=plastic bottle
H=H_2SO_4, Z=ZnAc, N=NaOH, HN=$HN0_3$

Please see attached notes for all abbreviations and acronyms

J E Sample No.	1-8												
Sample ID	BH3-270315WG												
Depth													
COC No / misc													
Containers	V H N Z P G												
Sample Date	27/03/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	28/03/2015												

											LOD/LOR	Units	Method No.
BTEX / MTBE													
Benzene #	<0.5										<0.5	ug/l	TM15/PM10
Toluene #	<0.5										<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5										<0.5	ug/l	TM15/PM10
Xylenes (sum of isomers) #	<1.5										<1.5	ug/l	TM15/PM10
p/m-Xylene #	<1										<1	ug/l	TM15/PM10
o-Xylene #	<0.5										<0.5	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1										<0.1	ug/l	TM15/PM10
Dissolved Boron	43										<2	ug/l	TM30/PM14
Total Hardness Dissolved (as CaCO3)	240000										<1000	ug/l	TM30/PM14
Surrogate Recovery Toluene D8	98										<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	104										<0	%	TM15/PM10
Sulphate #	73550										<50	ug/l	TM38/PM0
Total Cyanide #	<10										<10	ug/l	TM89/PM0
Ammoniacal Nitrogen as N #	320										<30	ug/l	TM38/PM0
Sulphide	<300										<300	ug/l	TM106/PM0
Thiocyanate	<20										<20	ug/l	TM107/PM0
pH #	8.19										<0.01	pH units	TM73/PM0
Total Organic Carbon #	3000										<2000	ug/l	TM60/PM0

Client Name: ERM
Reference: 0265147
Location: Cytec Wrexham
Contact: Chris Rice
JE Job No.: 15/5483

SVOC Report : **Liquid**

J E Sample No.	1-8												
Sample ID	BH3-270315WG												
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N Z P G												
Sample Date	27/03/2015												
Sample Type	Ground Water												
Batch Number	1										LOD/LOR	Units	Method No.
Date of Receipt	28/03/2015												
SVOC MS													
Phenols													
4-Chloro-3-methylphenol #	<0.5										<0.5	ug/l	TM16/PM30
2-Chlorophenol #	<1										<1	ug/l	TM16/PM30
2-Methylphenol #	<0.5										<0.5	ug/l	TM16/PM30
4-Methylphenol	<1										<1	ug/l	TM16/PM30
2,4-Dichlorophenol #	<0.5										<0.5	ug/l	TM16/PM30
2,4-Dimethylphenol	<1										<1	ug/l	TM16/PM30
2-Nitrophenol	<0.5										<0.5	ug/l	TM16/PM30
4-Nitrophenol	<10										<10	ug/l	TM16/PM30
Pentachlorophenol	<1										<1	ug/l	TM16/PM30
Phenol	<1										<1	ug/l	TM16/PM30
2,4,5-Trichlorophenol #	<0.5										<0.5	ug/l	TM16/PM30
2,4,6-Trichlorophenol	<1										<1	ug/l	TM16/PM30
PAHs													
Acenaphthene #	<1										<1	ug/l	TM16/PM30
Acenaphthylene #	<0.5										<0.5	ug/l	TM16/PM30
Anthracene #	<0.5										<0.5	ug/l	TM16/PM30
Benzo(a)anthracene #	<0.5										<0.5	ug/l	TM16/PM30
Benzo(bk)fluoranthene #	<1										<1	ug/l	TM16/PM30
Benzo(a)pyrene	<1										<1	ug/l	TM16/PM30
Benzo(ghi)perylene #	<0.5										<0.5	ug/l	TM16/PM30
2-Chloronaphthalene #	<1										<1	ug/l	TM16/PM30
Chrysene #	<0.5										<0.5	ug/l	TM16/PM30
Dibenzo(ah)anthracene #	<0.5										<0.5	ug/l	TM16/PM30
Fluoranthene #	<0.5										<0.5	ug/l	TM16/PM30
Fluorene #	<0.5										<0.5	ug/l	TM16/PM30
Indeno(123cd)pyrene	<1										<1	ug/l	TM16/PM30
2-Methylnaphthalene #	<1										<1	ug/l	TM16/PM30
Naphthalene #	<1										<1	ug/l	TM16/PM30
Phenanthrene #	<0.5										<0.5	ug/l	TM16/PM30
Pyrene #	<0.5										<0.5	ug/l	TM16/PM30
B(ghi)Perylene + I(123cd)Pyrene	<1.5										<1.5	ug/l	TM16/PM30
Sum of 4DW PAHs	<2.5										<2.5	ug/l	TM16/PM30
Phthalates													
Bis(2-ethylhexyl) phthalate	<5										<5	ug/l	TM16/PM30
Butylbenzyl phthalate	<1										<1	ug/l	TM16/PM30
Diethyl phthalate #	<1										<1	ug/l	TM16/PM30
Dimethyl phthalate	<1										<1	ug/l	TM16/PM30
Di-n-butyl phthalate #	<1.5										<1.5	ug/l	TM16/PM30
Di-n-Octyl phthalate	<1										<1	ug/l	TM16/PM30
Amines													
N-nitrosodi-n-propylamine #	<0.5										<0.5	ug/l	TM16/PM30
Anilines													
4-Chloroaniline	<1										<1	ug/l	TM16/PM30
2-Nitroaniline	<1										<1	ug/l	TM16/PM30
3-Nitroaniline	<1										<1	ug/l	TM16/PM30
4-Nitroaniline	<0.5										<0.5	ug/l	TM16/PM30

Client Name: ERM
Reference: 0265147
Location: Cytec Wrexham
Contact: Chris Rice
JE Job No.: 15/5483

SVOC Report : **Liquid**

J E Sample No.	1-8												
Sample ID	BH3-270315WG												
Depth													
COC No / misc													
Containers	V H N Z P G												
Sample Date	27/03/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	28/03/2015												

Please see attached notes for all abbreviations and acronyms

											LOD/LOR	Units	Method No.
SVOC MS													
Other SVOCs													
Azobenzene #	<0.5										<0.5	ug/l	TM16/PM30
Bis(2-chloroethoxy)methane #	<0.5										<0.5	ug/l	TM16/PM30
Carbazole #	<0.5										<0.5	ug/l	TM16/PM30
Dibenzofuran #	<0.5										<0.5	ug/l	TM16/PM30
2,4-Dinitrotoluene #	<0.5										<0.5	ug/l	TM16/PM30
2,6-Dinitrotoluene	<1										<1	ug/l	TM16/PM30
Hexachlorobutadiene #	<1										<1	ug/l	TM16/PM30
Hexachlorocyclopentadiene	<1										<1	ug/l	TM16/PM30
Isophorone #	<0.5										<0.5	ug/l	TM16/PM30
Nitrobenzene #	<1										<1	ug/l	TM16/PM30
Bis(2-chloroethyl)ether #	<1										<1	ug/l	TM16/PM30
4-Bromophenylphenylether #	<1										<1	ug/l	TM16/PM30
4-Chlorophenylphenylether #	<1										<1	ug/l	TM16/PM30
Hexachloroethane #	<1										<1	ug/l	TM16/PM30
Hexachlorobenzene #	<1										<1	ug/l	TM16/PM30
1,2,4-Trichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,2-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,3-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
1,4-Dichlorobenzene #	<1										<1	ug/l	TM16/PM30
Other SVOCs													
2-Fluorobiphenyl	80										<0	%	TM16/PM30
p-Terphenyl-d14	104										<0	%	TM16/PM30

Client Name: ERM
Reference: 0265147
Location: Cytec Wrexham
Contact: Chris Rice
JE Job No.: 15/5483

VOC Report : **Liquid**

J E Sample No.	1-8												
Sample ID	BH3-270315WG												
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N Z P G												
Sample Date	27/03/2015												
Sample Type	Ground Water												
Batch Number	1										LOD/LOR	Units	Method No.
Date of Receipt	28/03/2015												
VOC MS													
BTEX													
Benzene #	<0.5										<0.5	ug/l	TM15/PM10
Toluene #	<0.5										<0.5	ug/l	TM15/PM10
Ethylbenzene #	<0.5										<0.5	ug/l	TM15/PM10
Xylenes (sum of isomers) #	<1.5										<1.5	ug/l	TM15/PM10
p/m-Xylene #	<1										<1	ug/l	TM15/PM10
o-Xylene #	<0.5										<0.5	ug/l	TM15/PM10
Chloroethenes													
Tetrachloroethene (PCE) #	<3										<3	ug/l	TM15/PM10
Trichloroethene (TCE) #	<3										<3	ug/l	TM15/PM10
1,1-Dichloroethene (1,1 DCE) #	<3										<3	ug/l	TM15/PM10
cis-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
trans-1-2-Dichloroethene #	<3										<3	ug/l	TM15/PM10
Vinyl Chloride #	<0.1										<0.1	ug/l	TM15/PM10
Chloroethanes													
1,1,1,2-Tetrachloroethane #	<2										<2	ug/l	TM15/PM10
1,1,2,2-Tetrachloroethane	<4										<4	ug/l	TM15/PM10
1,1,1-Trichloroethane #	<2										<2	ug/l	TM15/PM10
1,1,2-Trichloroethane #	<2										<2	ug/l	TM15/PM10
1,1-Dichloroethane #	<3										<3	ug/l	TM15/PM10
1,2-Dichloroethane #	<2										<2	ug/l	TM15/PM10
Chloroethane #	<3										<3	ug/l	TM15/PM10
Chlorobenzenes													
1,2,3-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
1,2,4-Trichlorobenzene	<3										<3	ug/l	TM15/PM10
1,2-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,3-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
1,4-Dichlorobenzene #	<3										<3	ug/l	TM15/PM10
Chlorobenzene #	<2										<2	ug/l	TM15/PM10
Chloromethanes													
Carbon tetrachloride #	<2										<2	ug/l	TM15/PM10
Chloroform #	<2										<2	ug/l	TM15/PM10
Dichloromethane (DCM) #	<3										<3	ug/l	TM15/PM10
Chloromethane #	<3										<3	ug/l	TM15/PM10
Chloropropanes													
1,2,3-Trichloropropane #	<3										<3	ug/l	TM15/PM10
1,2-Dichloropropane #	<2										<2	ug/l	TM15/PM10
2,2-Dichloropropane	<1										<1	ug/l	TM15/PM10
1,3-Dichloropropane #	<2										<2	ug/l	TM15/PM10
Chloropropenes													
1,1-Dichloropropene #	<3										<3	ug/l	TM15/PM10
cis-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10
trans-1-3-Dichloropropene	<2										<2	ug/l	TM15/PM10

Client Name: ERM
Reference: 0265147
Location: Cytec Wrexham
Contact: Chris Rice
JE Job No.: 15/5483

VOC Report : **Liquid**

J E Sample No.	1-8												
Sample ID	BH3-270315WG												
Depth											Please see attached notes for all abbreviations and acronyms		
COC No / misc													
Containers	V H N Z P G												
Sample Date	27/03/2015												
Sample Type	Ground Water												
Batch Number	1												
Date of Receipt	28/03/2015											LOD/LOR	Units	Method No.
VOC MS														
Other VOCs														
Bromobenzene #	<2											<2	ug/l	TM15/PM10
Bromochloromethane #	<2											<2	ug/l	TM15/PM10
Bromodichloromethane #	<2											<2	ug/l	TM15/PM10
Bromoform #	<2											<2	ug/l	TM15/PM10
Bromomethane	<1											<1	ug/l	TM15/PM10
n-Butylbenzene #	<3											<3	ug/l	TM15/PM10
sec-Butylbenzene #	<3											<3	ug/l	TM15/PM10
tert-Butylbenzene #	<3											<3	ug/l	TM15/PM10
2-Chlorotoluene #	<3											<3	ug/l	TM15/PM10
4-Chlorotoluene #	<3											<3	ug/l	TM15/PM10
Isopropylbenzene #	<3											<3	ug/l	TM15/PM10
1,2-Dibromo-3-chloropropane	<2											<2	ug/l	TM15/PM10
Dibromochloromethane #	<2											<2	ug/l	TM15/PM10
1,2-Dibromoethane #	<2											<2	ug/l	TM15/PM10
Dibromomethane #	<3											<3	ug/l	TM15/PM10
Dichlorodifluoromethane	<2											<2	ug/l	TM15/PM10
4-Isopropyltoluene #	<3											<3	ug/l	TM15/PM10
Propylbenzene #	<3											<3	ug/l	TM15/PM10
Styrene	<2											<2	ug/l	TM15/PM10
Trichlorofluoromethane #	<3											<3	ug/l	TM15/PM10
1,2,4-Trimethylbenzene #	<3											<3	ug/l	TM15/PM10
1,3,5-Trimethylbenzene #	<3											<3	ug/l	TM15/PM10
Methyl Tertiary Butyl Ether #	<0.1											<0.1	ug/l	TM15/PM10
Hexachlorobutadiene	<3											<3	ug/l	TM15/PM10
Naphthalene	<2											<2	ug/l	TM15/PM10
Surrogate Recovery Toluene D8	98											<0	%	TM15/PM10
Surrogate Recovery 4-Bromofluorobenzene	104											<0	%	TM15/PM10

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

JE Job No.: 15/5483

SOILS

Please note we are only MCERTS accredited for sand, loam and clay and any other matrix is outside our scope of accreditation.

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation has been performed on clay, sand and loam, only samples that are predominantly these matrices, or combinations of them will be within our MCERTS scope. If samples are not one of a combination of the above matrices they will not be marked as MCERTS accredited.

It is assumed that you have taken representative samples on site and require analysis on a representative subsample. Stones will generally be included unless we are requested to remove them.

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. If we are instructed to keep samples, a storage charge of £1 (1.5 Euros) per sample per month will be applied until we are asked to dispose of them.

If you have not already done so, please send us a purchase order if this is required by your company.

Where appropriate please make sure that our detection limits are suitable for your needs, if they are not, please notify us immediately.

All analysis is reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

Where a CEN 10:1 ZERO Headspace VOC test has been carried out, a 10:1 ratio of water to wet (as received) soil has been used.

% Asbestos in Asbestos Containing Materials (ACMs) is determined by reference to HSG 264 The Survey Guide - Appendix 2 : ACMs in buildings listed in order of ease of fibre release.

WATERS

Please note we are not a Drinking Water Inspectorate (DWI) Approved Laboratory . It is important that detection limits are carefully considered when requesting water analysis.

UKAS accreditation applies to surface water and groundwater and one other matrix which is analysis specific, any other liquids are outside our scope of accreditation

As surface waters require different sample preparation to groundwaters the laboratory must be informed of the water type when submitting samples.

Where Mineral Oil or Fats, Oils and Grease is quoted, this refers to Total Aliphatics C10-C40.

DEVIATING SAMPLES

Samples must be received in a condition appropriate to the requested analyses. All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. If this is not the case you will be informed and any test results that may be compromised highlighted on your deviating samples report.

SURROGATES

Surrogate compounds are added during the preparation process to monitor recovery of analytes. However low recovery in soils is often due to peat, clay or other organic rich matrices. For waters this can be due to oxidants, surfactants, organic rich sediments or remediation fluids. Acceptable limits for most organic methods are 70 - 130% and for VOCs are 50 - 150%. When surrogate recoveries are outside the performance criteria but the associated AQC passes this is assumed to be due to matrix effect. Results are not surrogate corrected.

DILUTIONS

A dilution suffix indicates a dilution has been performed and the reported result takes this into account. No further calculation is required.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.

ABBREVIATIONS and ACRONYMS USED

#	UKAS accredited.
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
++	Result outside calibration range, results should be considered as indicative only and are not accredited.
*	Analysis subcontracted to a Jones Environmental approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
OC	Outside Calibration Range

JE Job No: 15/5483

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM5	Modified USEPA 8015B method for the determination of solvent Extractable Petroleum Hydrocarbons (EPH) with carbon banding within the range C8-C40 GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM5/TM36	TM005: Modified USEPA 8015B. Determination of solvent Extractable Petroleum Hydrocarbons (EPH) including column fractionation in the carbon range of C10-35 into aliphatic and aromatic fractions by GC-FID. TM036: Modified USEPA 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C5-10 by headspace GC-FID.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.				
TM15	Modified USEPA 8260. Quantitative Determination of Volatile Organic Compounds (VOCs) by Headspace GC-MS.	PM10	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.				
TM16	Modified USEPA 8270. Quantitative determination of Semi-Volatile Organic compounds (SVOCs) by GC-MS.	PM30	Water samples are extracted with solvent using a magnetic stirrer to create a vortex.	Yes			
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.				
TM30	Determination of Trace Metal elements by ICP-OES (Inductively Coupled Plasma - Optical Emission Spectrometry). Modified US EPA Method 200.7	PM14	Analysis of waters and leachates for metals by ICP OES. Samples are filtered for dissolved metals and acidified if required.	Yes			
TM36	Modified US EPA method 8015B. Determination of Gasoline Range Organics (GRO) in the carbon chain range of C4-12 by headspace GC-FID.	PM12	Modified US EPA method 5021. Preparation of solid and liquid samples for GC headspace analysis.	Yes			
TM38	Soluble Ion analysis using the Thermo Aquakem Photometric Automatic Analyser. Modified US EPA methods 325.2, 375.4, 365.2, 353.1, 354.1	PM0	No preparation is required.	Yes			

JE Job No: 15/5483

Test Method No.	Description	Prep Method No. (if appropriate)	Description	UKAS	MCERTS (soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM60	Modified USEPA 9060. Determination of TOC by calculation from Total Carbon and Inorganic Carbon using a TOC analyser, the carbon in the sample is converted to CO2 and then passed through a non-dispersive infrared gas analyser (NDIR).	PM0	No preparation is required.	Yes			
TM73	Modified US EPA methods 150.1 and 9045D. Determination of pH by Metrohm automated probe analyser.	PM0	No preparation is required.	Yes			
TM89	Modified USEPA method OIA-1667. Determination of cyanide by Flow Injection Analyser.	PM0	No preparation is required.	Yes			
TM106	Determination of Sulphide by Skalar Continuous Flow Analyser	PM0	No preparation is required.				
TM107	Determination of Thiocyanate by Skalar Continuous Flow Analyser	PM0	No preparation is required.				

Annex F

Applied Geology Report

REPORT ON GEOTECHNICAL GROUND INVESTIGATION AT ABENBURY WAY, WREXHAM

Report No: AG2200-15-V63
Date: April 2015
Status: Validated Issue 2

Prepared on behalf of Environmental Resources Management

REPORT STATUS SHEET

Client:	Environmental Resources Management (ERM)
Report Title:	Report on Geotechnical Ground Investigation at Abenbury Way, Wrexham.
Report Type:	Geotechnical Ground Investigation
Report Number:	AG2200-15-V63
Report Status:	Validated Issue 2
Date:	April 2015



	One Copy Issued	Date	Signed for and on behalf of Applied Geology Limited
Report Author	A T Perks MGeol (Hons) FGS Senior Engineering Geologist	30/04/2015	
Checked	G P Wiggin BSc (Hons) MSc FGS Principal Engineer	30/04/2015	
Authorised	S Day BSc (Hons) MSc CGeol FGS SiLC Director	30/04/2015	

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1.0 INTRODUCTION

1.1 Objectives and Scope of Investigation

An unoccupied parcel of land located off Abenbury Way on Wrexham Industrial Estate, Wrexham is being considered for redevelopment by Cytec Industries Incorporated. Environmental Resources Management (ERM), the Client, are acting as Environmental Consultants directing the investigation of the site on behalf of Cytec Industries Incorporated. The development will comprise the construction of a new adhesives processing unit together with associated hardstanding and car parking. This report presents the results of a Geotechnical Ground Investigation, undertaken on behalf of ERM, which was undertaken in conjunction with their own geoenvironmental investigation.

A Phase I Desk Study repot has been prepared for the site by ERM under reference 'Plot for Development, Abenbury Way, Wrexham – Phase I Environmental Site Assessment', ERM Project No. E1527-13, Issue 1 (draft) dated 25th of July 2014. A Geoenvironmental Phase II report is being undertaken for the site by ERM and reference should be made to this report for geoenvironmental aspects.

This intrusive geotechnical ground investigation was undertaken to establish geological conditions and geotechnical parameters to assist in safe and economic development design.

The terms of reference/brief for the works were initially developed by ERM, the Client, with input from Applied Geology as regards geotechnical aspects and are outlined Applied Geology estimate AG14-4430-01 of the 1st of August 2014. The main fieldwork was undertaken between the 24th of February and 2nd of March 2015, with a supplementary phase of work carried out between the 23rd and 25th of March 2015 including a deeper Cable Percussion borehole, further trial pits and laboratory earthworks testing.

Limited statutory service plans were procured by Applied Geology where available and a service clearance survey was conducted under the instruction of ERM, prior to the fieldworks being conducted. Topographic survey information was provided by Fluor, civil and structural engineers to Cytec Industries Incorporated forming the base of their drawing A6CI-100-10-DW-004, dated 15th of January 2015 and included in Appendix A.

1.2 Report Layout

This report presents a brief description of the site and the factual results of the intrusive investigations carried out. An interpretation of the ground conditions and a discussion/assessment of the findings are presented in the later report text sections. The main text of the report has been produced in a concise format, including the use of data tables to summarise key information where possible. The report should be read in conjunction with the general procedures detailed in Appendix E and General Notes given at the end of the main text, which provide details of investigation techniques, assessment methodology and standards, health & safety and limitations and exceptions of the report. Drawings and factual data including exploratory hole records and laboratory testing results are presented in the other Appendices.

2.0 SITE LOCATION AND DESCRIPTION

2.1 General

The site is located off Abenbury Way on Wrexham Industrial Estate, approximately 3.5km east of Wrexham town centre. The Ordnance Survey grid reference for the centre of the site is SJ 373 505 as shown on the Site Location Plan in Appendix A.

The site is approximately a rectangular parcel of land 165m wide from northwest to southeast by 100m wide from northeast to southwest and covers an area of 1.66Ha. The site is bordered to the north by fields, to the northeast by a commercial unit located off Abenbury Way and to the east by Abenbury Way, which runs from approximately northeast to southwest. The southern boundary of the site is defined by a stream flowing from west to east and to the west by Erlas Lane which runs from approximately southwest to northeast.

A site inspection/walkover was undertaken by Applied Geology on the 24th of February 2015. Access to the site was gained off Abenbury Way. At the time of the inspection, the site comprised an undeveloped and largely grass covered field with numerous mature deciduous trees along the southern, western and eastern boundaries. An approximately 15m wide and 80m long strip of trees was formerly present in the southern centre of the site, parallel with the southern boundary, with the area defined by numerous tree stumps.

The site was topographically variable but in general the northern portion of the site comprised a higher 'plateau' area separated from the lower southern portion, which lead to the stream, by an approximately 1.5 to 2.0m high slope located along the northern edge of the area of removed trees. A slope was also present in the southeast of the site, where the site rose up by approximately 2.5m to the level of Abenbury Way. Reference to the topographic information provided by Fluor on their drawing 6CI-100-10-DW-004, included in Appendix A, indicates site levels dropped gently from approximately 42m AOD in the west to 40.5m AOD in the east along the higher northern portion of the site. In the southern portion site levels dropped from north to south from approximately 40m AOD to 38m AOD towards the stream.



A view SE at site access to higher northern portion of the site



A view SE from the centre of the site with the area of removed trees in the right of view.

	
A view NW from the topographically lower southern portion of the site with the stream out of shot to the left.	A view NE towards boundary of the site along Abenbury Way.

During the fieldwork soft ground was encountered in the north-western part of the site particularly adjacent to the area where newt ponds were being constructed. Additionally, soft ground was present associated with the peat in the low lying areas close to the stream along the southern/south-western part of the site.

2.2 Proposed Development

The proposals for the site comprise the development of the existing site into a new adhesive processing unit including receiving /shipping, process and storage areas together with offices and associated parking and delivery yard. An ecological zone will also be created in the west of the site. The proposals are shown on a series of drawings (Drawing No's A6CI-100-10-DW-002 Rev.B, A6CI-100-10-DW-003 Rev.A and A6CI-100-10-DW-004 Rev.B), by Fluor Limited, dated 15th of January to 2nd February 2015. Copies of these are presented in Appendix A.

3.0 ANTICIPATED GEOLOGY

Reference to the published 1:50,000 scale British Geological Survey (BGS) map, Sheet 121 'Wrexham' solid and drift edition indicates the site to be underlain by superficial deposits in the form of Glacial Till. The solid geology beneath the site is the Kinnerton Sandstone Formation of the Early Triassic epoch and is described as 'red-brown to yellow, generally pebble free, fine to medium grained sandstone'.

In addition, some Topsoil is anticipated to be present on site as a result of its current configuration as a grassed field. Alluvium and / or peat may also be present in proximity to the stream.

With reference to the historical BGS borehole database there are two boreholes in or adjacent to the site. The first of which is located inside the site boundary and was drilled in 1976-1977 as part of a sand and gravel survey and recorded 'boulder clay' to the full depth of the borehole at 41.7m below ground level (bgl). The second borehole was located on the northwest margin of the site comprising a Cable Percussion borehole drilled in April 1977 and recorded 'soil' to 0.3m bgl overlying 'boulder clay' described as 'clay, reddish brown, firm, silty with occasional striated sub-rounded clasts of igneous material, quartzite and traces of coal' to 17.7m bgl. Details of the historical BGS boreholes are included in Appendix B.

4.0 GROUND INVESTIGATION WORKS

4.1 Fieldwork

The following scope of fieldwork was undertaken between the 24th of February and 2nd of March 2015:

- 3 No 150mm diameter Cable Percussion boreholes (ref. BH1, BH2 and BH4) to depths of between 15 and 20m bgl
- 5 No Driven Continuous Sampling boreholes (ref BH5 to BH9) to depths of 5.45m bgl
- 8 No Machine Excavated Trial Pits (ref. TP2 to TP6 and TP8, TP9 and TP9A) to depths of between 0.8 and 3.0m bgl.

Due to the ground conditions encountered, re-mobilisation of the CP rig with 200mm diameter equipment was necessary and the following scope of fieldwork was carried out during a supplementary phase of works between the 23rd and 25th of March 2015:

- 1 No 200mm diameter Cable Percussion boreholes (ref. BH3) to a depth of 30m bgl
- 12 No Machine Excavated Trial Pits (ref. TP1 and TP101 to TP111) to depths of between 1.0 and 3.1m bgl.

Thin walled UT100 samples were collected from cohesive strata where practical during formation of the Cable Percussion boreholes. Standard penetration Tests (SPTs) were undertaken at selected depths to determine the relative densities or shear strengths (by empirical correlation) of the deposits.

Environmental samples were collected by ERM during the fieldwork and reference should be made to the ERM report for details. ERM also carried out head space tests using a Photo Ionisation Detector (PID), which records the level of Volatile Organic Compounds (VOC's) in parts per million (ppm), at selected depths and locations and the results of these tests are detailed on the exploratory hole logs, which are included in Appendix C.

The locations of the exploratory holes were selected and set out on site by ERM, however, due to site constraints and access some positions were re-located as necessary. ERM carried out services clearance scanning at all of the intended exploratory hole locations and service avoidance hand starter pits were dug to 1.5m bgl by Applied Geology using anti-shock tools.

An unexploded ordnance threat assessment was carried out during the fieldwork involving clearance using a magnetometer at intervals during the trial pits and boreholes.

The positions of the exploratory holes were defined by taping from identifiable features on the site plan provided by ERM. The elevations of BH2 to BH9 were surveyed in by others with the levels supplied by ERM. The locations are presented on Drawing No. AG2200-15-01 in Appendix A.

4.2 Instrumentation and Monitoring

On completion of boring, 50mm inside diameter HDPE standpipes were installed in selected boreholes as follows, with further details included in the relevant borehole logs in Appendix C:

- BH1, 1.0 to 8.0m bgl
- BH2, 1.0 to 8.0m bgl
- BH4, 1.0 to 8.0m bgl
- BH5, 1.0 to 4.0m bgl
- BH6, 1.0 to 5.0m bgl
- BH7, 1.0 to 5.0m bgl
- BH8, 1.0 to 4.5m bgl
- BH9, 1.0 to 5.0m bgl.

Washed silica gravel (6-10mm) was used as the filter medium and a 250 micron filter sock was wrapped around the slotted section of the standpipe. Each standpipe was fitted with a push-in bung and single gas tap and was finished with flush metal cover concreted in place.

On completion of BH3 a 19mm inside diameter PVC standpipe was installed from 25.3m bgl to 1m above ground level, with a filter tip in a 6-10mm washed silica gravel surround at its base, in order to monitor flowing artesian groundwater.

Ground gas and groundwater monitoring visits were undertaken by ERM and reference should be made to their report for full details, however, groundwater level monitoring data recorded by ERM has been incorporated into this report (Section 5.5 refers).

4.3 Laboratory Testing

Geotechnical laboratory testing was undertaken on selected samples from the first phase of fieldworks and comprised the following:

- 23 No natural moisture content tests
- 15 No Atterberg limit tests
- 13 No quick undrained triaxial compression tests
- 5 No particle size distribution tests
- 9 No BRE SD1 – Greenfield (no pyrite) suite tests.

Supplementary geotechnical testing on the deeper strata of BH3 and for earthworks classification on samples from TP101-TP111 was undertaken and comprised:

- 9 No natural moisture content tests
- 8 No Atterberg limit tests
- 5 No quick undrained triaxial compression tests
- 4 No particle size distribution tests
- 4 No moisture content / dry density relationship
- 2 No particle density
- 1 No consolidation test by oedometer (7 stages)
- 4 No BRE SD1 – Greenfield (no pyrite) suite tests.

Chemical testing was undertaken on environmental samples collected by ERM during the fieldwork and reference should be made to the ERM report for details of the suites tested and the subsequent results. However, pH and sulphate results from groundwater testing carried out by ERM have been incorporated in to the concrete classification recommendations of this report (Section 5.6 refers).

Geotechnical laboratory test results are included in Appendix D.

5.0 GROUND CONDITIONS

5.1 Strata Encountered

Up to 1.5m of Made Ground or up to 0.4m of Topsoil was encountered overlying interbedded cohesive and granular Glacial Deposits. Peat was also recorded in the topographically lower southern portion of the site from ground level to between 0.3m and 1.7m bgl. Groundwater was recorded as seepages and slight strikes between 0.6m and 15.2m bgl with fast inflow related to artesian groundwater at 15m bgl. Full details of the strata encountered are given on the borehole records presented in Appendix B. A generalised ground profile is presented below to summarise the information.

Stratum	Depth to Top of Strata (m bgl)	Thickness (range) (m)	Comments
Made Ground	GL	0.6 – 1.5	Only recorded in BH7, BH9, TP9 and TP9A.
Topsoil	GL	0.1 – 0.4	Absent in BH7, BH9, TP8, TP9, TP9A and TP104 to TP111.
Peat / Alluvium	GL	0.3 – 2.5	Only in TP8, TP104, TP105 and TP108 to TP111.
Cohesive Glacial Deposits	0.1 – 1.7	0.75 – 10.8	Base not proven.
Granular Glacial Deposits	3 – 15	0.25 – 7.4	Encountered interbedded between cohesive strata but generally as a relatively consistent horizon 1m thick at between 3-4m bgl and as an up to 7.4m thick horizon from 15m bgl.

5.2 Made Ground

Made Ground was encountered in BH7, BH9, TP6, TP9 and TP9A to depths of between 0.6m and 1.5m bgl and comprised either firm sandy clay, clayey sandy gravel or gravelly sand containing a range of gravel and cobble sized material fragments including construction / demolition discard (brick, concrete, wood and rare metal) together with quartzite and rare coal gravel. Possible asbestos was noted in TP6 and some fragments of slag/burnt shale was noted in BH7.

5.3 Topsoil

Topsoil comprising soft to firm sandy clay containing quartzite gravel was recorded from ground level to depths of between 0.1m and 0.4m bgl in all of the exploratory holes with the exception of BH7, BH9, TP8, TP9, TP9A and TP104, TP105 and TP108 to TP111.

5.4 Peat/Alluvium

Peat was recorded in TP8, TP104, TP105 and TP108 to TP111 in the low lying southern portion of the site from ground level to depths of between 0.3m and 2.5m bgl and comprised spongy amorphous and plastic fibrous peat with horizons of soft sandy silt and very silty fine sand with wood fragments and organic debris. The indicative extent of these materials has been marked on drawing AG2200-15-01 in Appendix A.

5.5 Glacial Deposits

Glacial Deposits were recorded beneath the Made Ground, Topsoil or Peat to the base of all of the exploratory holes with the exception of TP8. The strata comprised interbedded horizons of granular and cohesive materials. Although there were local variations, a generally consistent sequence was observed comprising firm through to stiff laminated clays to depths of between approximately 3m and 4m bgl (0.75m to 3.45m thick) overlying a 1m thick horizon of silty fine sand. Firm laminated clay continued below the first granular horizon and was recorded to depths of between 15m and 15.1m (10.8m thick) bgl at which depths a second granular horizon was recorded to a depth of 22.5m bgl (7.4m thick) in BH3. This second granular horizon was recorded to be saturated with an associated sub-artesian groundwater strike (Section 5.6 refers). BH3 subsequently recorded a third granular horizon between 24.2m and 26.1m bgl (1.9m thick) in between firm to stiff sandy clay with mudstone and sandstone gravel, which was associated with a flowing artesian groundwater strike.

The results of 22no. Atterberg limit tests carried out as part of this investigation have given liquid limits generally of between 25% and 59% (all samples register 100% passing 425µm sieve and therefore, do not require correction) and plasticity index values of between 14% and 38% indicating the materials to be of low through to high plasticity and low to intermediate shrinkage potential. Moisture contents of between 18% and 29% were also recorded and moisture content versus depth plot is included in Appendix A. Although there is some scatter to the results there is a generally decreasing trend with depth. In addition based on the visual assessments and a comparison of moisture content with 0.4 x liquid limit it is considered that the cohesive Glacial Deposits tested are generally not desiccated.

Standard Penetration Tests carried out in the cohesive stratum recorded SPT ‘N’ values generally of between 5 and 43. Applying the empirical relationship between SPT ‘N’ values versus mass shear strength and using the average plasticity index of 27% and a corresponding f_1 value of 4.8, these correlate to mass shear strengths of between approximately 25 and 200kN/m^2 (low to very high strength). However, lower values of between 1 and 4 were recorded within BH3 (12m bgl), BH4 (4m bgl), BH6 (4m bgl), BH7 (5m bgl) and BH8 (5m bgl). The low N values were often associated with water strikes. An SPT ‘N’ values versus depth plot is included within

Appendix A and although there is significant scatter in the results a generally increasing trend with depth is apparent from 5m bgl.

Hand shear vane tests conducted in the cohesive Glacial Deposits during excavation of TP101 to TP107, at depths of between 1m and 2.4m bgl, recorded shear strengths of between 100kN/m^2 and 220kN/m^2 (high to very high strength). A total of 18no. quick undrained triaxial compression tests were carried out on samples of the cohesive Glacial Deposits. These recorded undrained shear strengths of between 26kN/m^2 and 166kN/m^2 (low to very high strength), which generally correspond with the visually observed consistencies of firm through to stiff. Shear strength versus depth and reduced level plots are included in Appendix A. There are no discernible trends with increasing depth.

One oedometer one-dimensional consolidation test on the cohesive Glacial Deposits from BH3 at 6m bgl gave an m_v value of 0.18m^2/MN for a stress range equivalent to effective overburden pressure + 100kN/m^2. This indicates the materials to be of medium compressibility.

Five particle size distribution analyses were carried out on samples of the granular Glacial Deposits. The samples from BH1 at 4m bgl and from BH2 at 5m bgl were recorded to comprise sandy (36.7-47.3%) silt/clay (52.7-63%) whilst the samples from BH1 at 16m bgl, BH4 at 4m bgl and TP3 at 2.6m bgl were recorded to comprise silty/clayey to very silty/clayey (18.7-41.6%) fine to coarse sand (58.3-81.3%). These results suggest significant fines content and possible cohesive layers within the granular deposits.

Standard Penetration Tests carried out in the granular Glacial Deposits recorded SPT 'N' values generally of between 12 and 43 (medium dense to dense) however, lower values of 2 (BH5 at 4m bgl), 4 (BH7 at 4m bgl) and 5-8 (BH1 at 16-19m bgl) were also recorded, again possibly due to water strikes. An SPT versus depth plot is included within Appendix A and shows a generally increasing trend with depth.

5.6 Groundwater

Groundwater strikes were encountered during the fieldwork in some of the exploratory holes at various depths. The details of these occurrences of groundwater are summarised in the table below.

Exploratory Hole	Depth of Groundwater (m bgl)	Qualitative Comment
BH1	3 rising to 2.8	Slight inflow
	12.5 rising to 12.3	Slight inflow
	15 rising to 5.1	Fast inflow – sub-artesian
	2.7	Overnight level
BH2	1.2	No rise
	3.4 rising to 3.3	Slight seepage
	4.6	Slight seepage
BH3	10.5 rising to 6.1	Not recorded
	15 not sealed	Fast inflow – sub-artesian
	Ground Level	Overnight level (artesian)
BH4	3.5 rising to 3.2	Slight inflow
	14.7 rising to 14.2	Slight inflow
BH5	1.2	Not recorded
BH6	0.8	Seepage

Exploratory Hole	Depth of Groundwater (m bgl)	Qualitative Comment
BH7	4	Inflow
BH8	1	Not recorded
TP102	1	Seepage
TP102	1.8	Heavy seepage
TP103	1.9	Slight seepage
	3	Slight seepage
TP104	0.8	Inflow
TP105	0.6	Heavy inflow
TP106	1.4	Inflow with running sand
TP107	1.3	Seepage
TP108	0.0	Flooded to above ground level
TP109	1.4	Seepage
TP111	0.8	Heavy seepages
BH9, TP1 – TP9A, TP101 & TP110	No groundwater encountered	N/A

The shallow groundwater strikes above are considered to represent perched pockets within the interbedded Glacial Deposits and also surface water retained in Peat and on top of cohesive Glacial Deposits at shallow depth. Running sand was recorded in TP106 at 1.4m bgl and TP108, located in the low lying southern portion of the site, was filled by surface water influx following wet weather and run-off. The borehole installations were subsequently monitored by ERM and the water levels recorded, as provided by ERM, are summarised in the table below.

Location	Ground Level (m AOD)	Depth to Water (m bgl)	Depth to Base (m bgl)	Stratum	Groundwater Elevation (m AOD)
BH1	NR	0.82	7.42	Cohesive & granular Glacial Deposits	N/A
BH2	41.529	1.69	8.09		39.839
BH3	39.724	+0.7*[1]	25.3	Granular Glacial Deposits	40.424
BH4	41.254	2.09	7.6	Cohesive & granular Glacial Deposits	39.164
BH5	40.751	1.3	3.9		39.451
BH6	40.733	0.59	4.82		40.143
BH7	40.474	2.58	5.03		37.894
BH8	38.056	0.58	4.36	Cohesive Glacial Deposits	37.476
BH9	38.794	0.18	4.95	Cohesive & granular Glacial Deposits	38.614

*[1]: Flowing artesian groundwater in 19mm ID PVC pipe, potentiometric surface recorded as 0.7m above ground level (40.424m AOD).

Sub-artesian groundwater was recorded within the granular Glacial Deposits in BH1 and BH3 at a depth of 15m bgl. Flowing artesian groundwater was recorded in BH3 from 24.2m bgl. The 19mm ID PVC pipe installed at 25.3m bgl in BH3 was raised 1m above ground level in an attempt to allow measurement of the head of water from the artesian pressure. Water level in this pipe was recorded as 0.3m below the top of the pipe meaning the potentiometric surface was at 0.7m above ground level (40.424m AOD) giving a head of water of 26m and equivalent to a pressure of approximately 2.5 bar.

6.0 GEOTECHNICAL ASSESSMENT

6.1 General

Site Proposals

The proposals for the site comprise the development of a new adhesive processing unit including receiving /shipping, process and storage areas together with offices and associated parking and delivery yard. Storm water attenuation is planned beneath the parking and hardstanding before the water is then discharged into the stream to the south of the site. An ecological zone will also be created in the west of the site. Site levels will be modified to achieve proposed development levels and from information supplied by Fluor it is understood between approximately 0.4m and 2.3m of material will be cut beneath the proposed processing unit located on the topographically higher northern 'plateau' portion of the site. Some fill is also anticipated in low lying areas of the site. The proposals, including proposed finished levels, are shown on a series of drawings (Drawing No's A6CI-100-10-DW-002 Rev.B, A6CI-100-10-DW-003 Rev.A and A6CI-100-10-DW-004 Rev.B), by Fluor Limited, dated 15th of January to 2nd February 2015. In addition it is understood from information supplied by Fluor, that preliminary column loads for the proposed processing unit are anticipated to be in the order of 2000kN with a blanket floor slab design load of 30kN/m^2.

Summary of Ground Conditions

Up to 1.5m of Made Ground or up to 0.4m of Topsoil was encountered overlying interbedded cohesive and granular Glacial Deposits. Peat/alluvial deposits were also recorded in the topographically lower southern portion of the site from ground level to between 0.3m and 2.5m bgl. Groundwater was recorded as seepages and slow strikes between 0.6m and 15.2m bgl, with fast inflow inferred to be sub-artesian groundwater at 15m and flowing artesian at c.24.5m bgl. The flowing artesian groundwater was subsequently monitored to comprise a 26m column of water with the potentiometric surface at 0.7m above ground level.

6.2 Foundation Design

The Made Ground, Topsoil are considered to be too variable in material content and strength to constitute a reliable bearing stratum. The Peat is likely to be of very low strength and very highly compressible and should be removed from beneath proposed structures, hardstanding or engineered fill prior to development.

It will be necessary to support the line and column loads of the proposed processing units on piled foundations carrying their working load in a combination of end bearing and skin friction within the firm through to stiff cohesive and loose through to medium dense granular Glacial Deposits. The proposed site re-profiling earthworks in the southern portion of the site, where levels are being raised, may result in mobilisation of negative skin friction forces within the recently placed fill, which should be taken into account in the design of any piled foundations in the southern portion of the site.

The advice of a specialist and experienced piling contractor should be sought in relation to suitable piling techniques and designs for the ground conditions at the site. **It should be particularly noted that sub-artesian groundwater was recorded in BH1 and BH3 at 15m bgl and flowing artesian water was also recorded at approximately 24.5m bgl in BH3, which could pose construction difficulties for some types of piles.** Should cast in-situ piles not be preferred due to the groundwater issues then pre-cast driven piles may be more appropriate, however, the advice of a specialist piling contractor should be sought in the final choice of technique and design of piles for the site. Plots of SPT 'N' and shear strength versus are included in Appendix A and may also be useful in the design of piles at the site. An appropriate number of pile tests should be carried out in order to confirm the load capacities and help economical and detailed pile design.

The following summary of Geotechnical Properties and suggested preliminary design parameters in the table below are presented for use in determining the carrying capacity for a proposed piled foundation solution.

Parameter	Cohesive Glacial Deposits	Granular Glacial Deposits
SPT 'N' Range*[1]	1 – 43	2 – 43
SPT 'N' Suggested Design	-	See SPT N v Depth Plot
Plasticity Index Range	14 – 38 (mean = 27%)	-
Φ' (degrees)	-	32*[2]
Cu Range (kN/m^2)	26 – 166	-
Cu Suggested Design	See Cu v Depth Plot	-

*[1] Uncorrected N.
*[2] Value excludes tests from the top 2m bgl and is derived from relationship between mean uncorrected SPT 'N' value and angle of shearing resistance *after Peck et al*.

As a preliminary guide, working loads for different pile lengths and diameters is given in the table below assuming that the finished site level will be cut by approximately 2m from existing ground level. The working loads have initially been based on CFA type piles as a guide to what is potentially achievable and have been calculated using a Cu of 65kN/m^2, using an adhesion factor of 0.45, SPT N for the corresponding depths, K_s value of 2.0 (assuming high density concrete) and angle of wall friction (δ) of ¾Ø and include a global factor of safety of 2.5.

Pile Diameter (mm)	Pile Length (m)*[1]	Working Load per Pile (kN)	No. of Piles in Group for 2000kN Column	Remarks
450	11.5	225	9	Toe in cohesive Glacial Deposits Above sub-artesian water strike
	16	1100	2	Toe in granular Glacial Deposits Below sub-artesian water strike
600	11.5	320	7	Toe in cohesive Glacial Deposits Above sub-artesian water strike
	14	880	3	Toe in granular Glacial Deposits Below sub-artesian water strike
	18	2100	1	Toe in granular Glacial Deposits Below sub-artesian water strike
900	11.5	525	4	Toe in cohesive Glacial Deposits Above sub-artesian water strike
	14	1600	2	Toe in granular Glacial Deposits Below sub-artesian water strike

*[1]: Pile depth based on ground conditions following approximately 2m of site cut.

6.3 Floor Slab

As described in Section 6.1, between 0.4m and 2.3m of cut is proposed beneath the proposed processing unit and it is understood the floor slab load will be in the order of 30kN/m^2. Given the nature of the development it is anticipated that a ground bearing design will be required for the proposed unit. The soils at formation following the cut will comprise shrinkable subsoil in the form of cohesive Glacial Deposits or a combination of these soils and engineered fill depending on final proposed levels. A granular mattress of appropriate thickness will be required beneath the slab to account for seasonal variation in moisture conditions. Prior to placing the granular mattress, the formation should be proof rolled and any soft spots removed and replaced with suitable granular fill. Where the floor slab will span different strata in the form of natural in-situ Glacial Till and engineered fill, it is recommended that light mesh reinforcements are incorporated to mitigate tensional forces developed as a result of possible differential settlement between different founding media.

6.4 Earthworks

Samples from the cohesive Glacial Deposits strata encountered in areas of possible cut have been tested for earthworks suitability and the results of the testing are included within Appendix D.

The classification of soils has been made with respect to the general requirements given in the Manual of Contract Documents for Highway Works, Specification for Highway Works: Volume 1: 2009 [SHW] for use as Earthworks Material and BS 6031:2009 'Code of Practise for Earthworks'. It should be noted and clear reference made to the fact that the engineering performance of an earthworks material can be greatly influenced by the moisture content at time of assessment and excavation/placement and compaction. With variation in the moisture content, the end performance of a material can be both improved and reduced, and consideration should be given to the management of the moisture as a key element of any earthworks control. With respect to this, the information included in the following sections should be used for guidance on the potential use of the material, with additional testing required prior to use to confirm acceptability.

The grading limits chosen for comparison to the results of the laboratory analysis were taken from the SHW Table 6/2, with the description of the material being referenced from SHW Table 6/1 and Table 6/2. Standard 2.5kg rammer compaction tests together with grading and Atterberg limit analyses were carried out on four samples of the cohesive Glacial Deposits strata.

Atterberg limit tests carried out in the cohesive Glacial Deposits recorded plastic limits of between 11% and 23% and moisture content values of between 18% and 29%. The liquid limit results were recorded close to and just above 50%

The results of two particle density tests on the samples from TP101 at 2m bgl and TP102 at 0.8m bgl were both recorded at 2.67 Mg/m^3.

The results of four 2.5kg rammer tests indicated maximum dry densities of between 1.64Mg/m^3 and 1.70Mg/m^3 and optimum moisture contents of between 20.1% and 22.1%. Assuming 95% dry density (1.57 Mg/m^3 and 1.61Mg/m^3) and less than 5% air voids, the results of the natural moisture contents indicate the results fall within

the acceptability envelope based on an average of all four tests. The results of the grading analysis and compaction testing are summarised in the table below.

Sample reference	Material description	Plastic Limit (%)	Natural moisture content (%)	Optimum moisture content (%)	Maximum dry density (Mg/m3)	Material class (SHW Table 6/2)	SHW description (SHW Table 6/1)
TP101 at 0.9m bgl	Stiff to very stiff Cohesive Glacial Deposits	20	22	20.1	1.70	2A	Wet cohesive – general fill
TP101 at 2m bgl	Stiff to very stiff Cohesive Glacial Deposits	19	21	20.6	1.70	2A	Wet cohesive – general fill
TP102 at 0.8m bgl	Stiff Cohesive Glacial Deposits	23	26	21.1	1.64	2A	Wet cohesive – general fill
TP103 at 1m bgl	Very stiff Cohesive Glacial Deposits	20	22	22.1	1.65	2A	Wet cohesive – general fill

The results indicate that at least some of the cohesive Glacial Deposit materials on site, are currently within an acceptable range of moisture contents for use as general fill. However, ultimate acceptability may also be dictated by meeting minimum undrained shear strength or CBR requirements set by an earthworks specification.

It will be necessary to produce a detailed specification for the earthworks detailing methods, controls and verification testing with target end performance criteria. This could initially be based upon the guidance in the Manual of Contract Documents for Highway Works, Specification for Highway Works: Volume 1: 2009 [SHW] and BS 6031:2009. Topsoil and any Peat encountered should be removed prior to earthworks commencing. Further laboratory testing to assess the acceptability of materials should be required prior to filling. Where earthworks filling is carried out on slopes the slope should be benched to a safe ratio to allow full compaction of layers. Following excavations all formations should be protected from softening from surface water or tracking of heavy plant.

It is recommended that validation of the earthworks is carried out by an independent party.

6.5 Excavations

Excavations up to 2.5m deep are envisaged for earthworks and service trenches. At these depths excavations are expected to be in a combination of cohesive and granular Glacial Deposits. In addition Peat can be expected in the low lying areas of the site. These materials may be prone to some short term instability and spalling and may need to be graded back to a stable angle or trench support should be provided. In addition, running sand was recorded in TP106 at 1.4m bgl. Trench support or the angle of batter should be designed by an appropriately qualified

engineer or competent person to suit the required depth and the ground and groundwater conditions. Significant groundwater ingress is expected below 0.5m and from ground level in some areas (TP108 became flooded to ground level by surface/groundwater during wet weather), which could lead to trench instability. Suitable forms of groundwater control may include pumping from sumps in the bottom of trenches, wellpoint dewatering or pumped wells. In granular soils, sump pumping can lead to loss of fines or 'boiling' silt or sand which can lead to instability. In such cases, trench sheeting where provided should penetrate sufficiently deep below the base of the trench. Alternatively, battered excavations to shallow angles may be suitable.

Dewatering can lead to settlement of ground which could affect neighbouring structures. Any groundwater control measures should be designed by an appropriately qualified engineer or competent person to take into account the required drawdown, support methods, and adjacent structures.

6.6 Pavement Design

Based on the exploratory hole logs of this investigation and the proposed cut levels provided it is anticipated the ground bearing floor slab for the proposed unit, and hardstanding areas in the north of the site, will bear upon firm to stiff cohesive Glacial Deposits. Areas of proposed hardstanding in the south of the site are likely to bear upon engineered fill.

Taking into account the nature of the strata encountered, field descriptions, laboratory and in-situ test results, a preliminary equilibrium CBR design value of 3% is suggested for the in-situ Glacial Deposits strata. This is based on IAN 73/06 Revision 1 2009, the average plasticity index of 27% (unmodified) and assuming groundwater at <600mm below pavement construction.

CBR values for the southern portion of the site following the cut/fill earthworks will be entirely governed by the earthworks specification, quality of the engineered fill placed and subsequent validation, though we would envisage typical values in the range 3% to 5%.

Due to the inherent variability of the Made Ground, an equilibrium CBR value of 2% is recommended for this stratum.

The granular Glacial Deposits strata was recorded to contain up to 41.6% fines and as such should be considered to be frost susceptible and should not be present within 450mm of pavement construction.

6.7 Buried Concrete

The results of the testing in the soils on site indicate characteristic values as following:

- water soluble sulphate: 150mg/l,
- pH: 7.1.

The results of the sulphate tests carried out have identified the Design Sulphate Class to be DS-1 with the Aggressive Chemical Environment for Concrete (ACEC) being AC-1 as defined by the BRE Special Digest 1, Concrete Aggressive Ground,

2005 for a greenfield site and mobile groundwater regime. Further reference should be made to BRE Special Digest 1 for requirements in respect of types of cement and aggregate to be used and variations in type of concrete construction.

6.8 Conclusions and Recommendations

Based upon the column loads provided piled foundations are considered necessary for the proposed unit bearing within the Glacial Deposits. Sub-artesian groundwater was recorded at 15m bgl and flowing artesian groundwater was recorded at 24.5m bgl and may cause construction difficulties for piling. As an initial guide based on CFA type piles, and the parameters in Section 6.2, likely pile groups could comprise 2no. 450mm diameter piles to 16m, 3no. 600mm diameter piles to 14m, or 4no. 900mm diameter piles to 11.5m below approximate cut levels.

A ground bearing floor slab is anticipated and should be cast upon an appropriate granular blanket to allow for seasonal changes in moisture conditions given that the formation will comprise shrinkable subsoil. Any Peat encountered should be removed before development and groundwater ingress can be expected in earthworks cut / excavations.

The Glacial Till in areas of cut classifies as Class 1A ‘Wet Cohesive Fill’ and generally appears suitable for re-use in its current condition.

No special precautions regarding buried concrete are envisaged.

Applied Geology Limited
Unit 23
Abbey Park
Stareton
Kenilworth
Warwickshire
CV8 2LY

April 2015

GENERAL NOTES

A) The assessment made in this report is based on the site terrain and ground conditions revealed by the various field investigations undertaken and also any other relevant data for the site including previous site investigation reports (if available) and desk study data. There may be special conditions appertaining to the site, however, which have not been revealed by the investigation and which have not, therefore, been taken into account in the report. The assessment may be subject to amendment in the light of additional information becoming available. It must be recognised that many of the Environmental Searches obtained during the course of the desk study are often lengthy. Applied Geology have, where appropriate and in the interests of simplicity, only reproduced the summary of the searches within the report. A full copy of all the search data is held at the Applied Geology office and is available for inspection if required.

B) The services provided are defined within our proposal and are carried out in line with the terms of appointment between Applied Geology and the Client.

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D) Whilst the report may express an opinion on possible configurations of strata between or beyond the exploratory locations, or on the possible presence of features based on either visual, verbal or published evidence this is for guidance only and no liability can be accepted for the accuracy.

E) Comments on groundwater (and landfill gas) conditions are based on observations made during the course of the present and past investigations or with reference to published data unless otherwise stated. It should be noted, however, that groundwater (and landfill gas) levels vary due to seasonal (or atmospheric conditions) or other effects.

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G) This report is prepared and written in the context of the proposals stated in the introduction to the report and should not be used in a differing context. Furthermore, new information, improved practices and legislation may necessitate an alteration to the report in whole or in part after its submission. Therefore with any change in circumstances or after the expiry of one year from the date of the report, the report should be referred to Applied Geology for re-assessment and if necessary, re-appraisal.

H) The survey was conducted and this report was prepared for the sole internal use and reliance of the Client. This report shall not be relied upon or transferred to any other parties without the express written authorisation of Applied Geology. If an unauthorised third party comes into possession of this report they rely on it at their peril and Applied Geology owes them no duty of care and skill.

I) Ground conditions should be monitored during the construction of the works and the recommendations of the report re-evaluated in the light of this data by the supervising geotechnical or geo-environmental engineers.

J) Unless specifically stated, the investigation has not taken into account the possible effects of mineral extraction.

K) The works performed are not a comprehensive site characterisation and should not be construed as being such.

L) The findings of the geo-environmental risk assessment are based on information obtained from a variety of sources which Applied Geology believe to be correct. Applied Geology cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

M) The report represents the findings and opinions of experienced geo-environmental consultants. Applied Geology does not provide legal advice and the advice of lawyers may be required.

N) Conditions at the site are subject to change from the time of the site inspection.

O) It is possible that researches carried out by Applied Geology, whilst fully appropriate for a phase 1 desk study, failed to indicate the existence of important information sources. Assuming such indicators actually exist, their information could not have been considered in the formulation of Applied Geology findings and opinions.

P) The economic viability of the proposals referred to in the report, or of the solutions put forward to any problems encountered, depends on very many factors in addition to geotechnical considerations and hence its evaluation is outside the scope of this report.

Q) Applied Geology operates as a Consultancy and does not operate it's own laboratory for soil testing, this work being sub contracted to known and respected, generally UKAS accredited, laboratories. Applied Geology can therefore not be held responsible for the testing carried out.

GENERAL NOTES

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LIST OF REFERENCES COMMONLY USED BY APPLIED GEOLOGY IN REPORTS

SECTION/TITLE	AUTHOR/PUBLICATION
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Control of Substances Hazardous to Health Regulations 2002	Health & Safety Executive
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Trenching Practice. Guidance on Groundwater Control (Report 97)	CIRIA
Control of Groundwater for Temporary Works (Report 113)	CIRIA

20/02/12

APPENDIX A

Site Location Plan

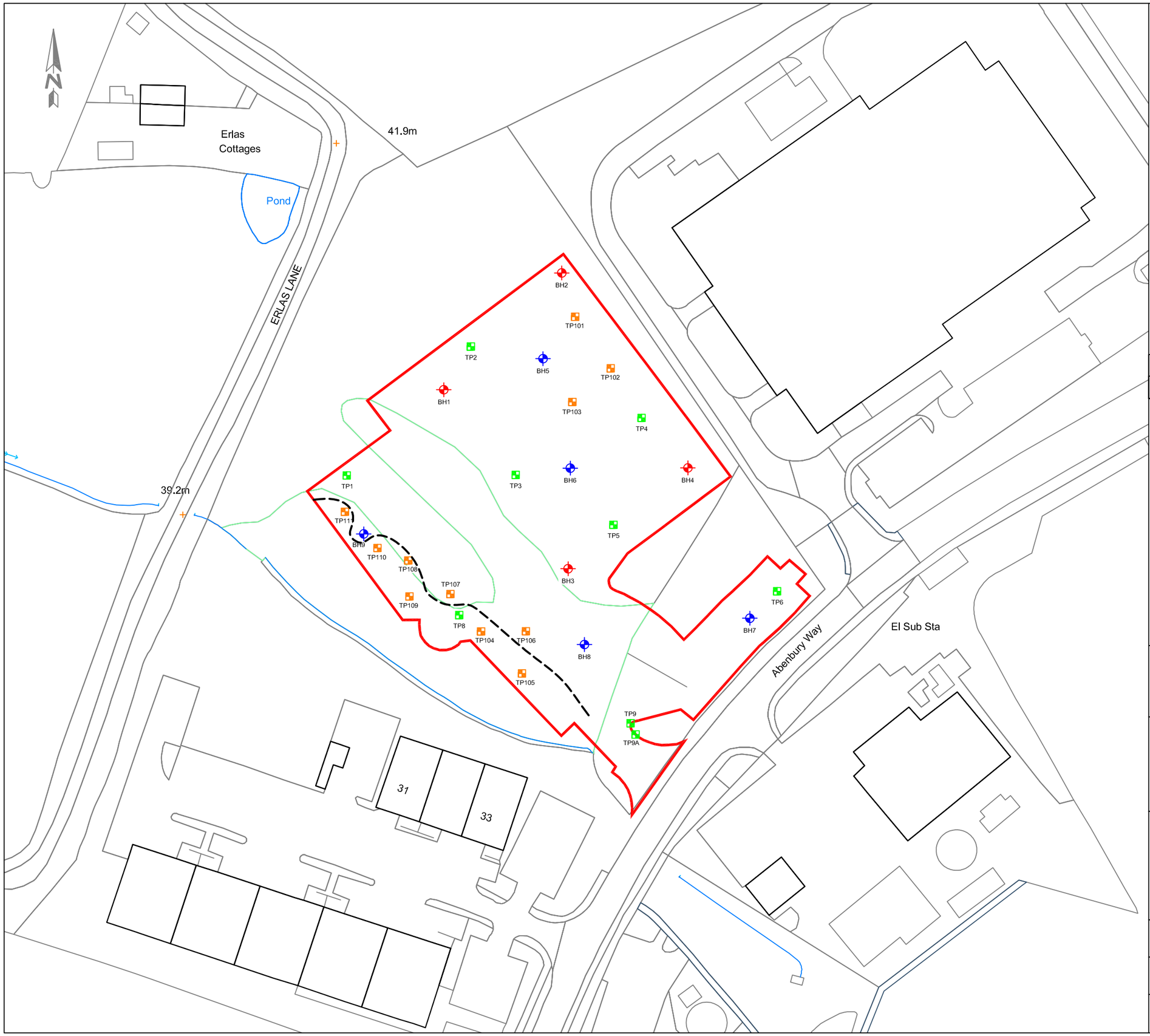
Site: **Abenbury Way, Wrexham**
Title: **Taken from Ordnance Survey (1:50,000) Map 117, Chester, Wrexham and surrounding area**

NGR: **SJ 373 505** Project No: **AG2200-15**



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APPLiED GEOLOGY



KEY:

- Cable Percussion Boreholes
- Driven Continuous Sampling Boreholes
- Machine ExcavatedTrial Pits (February 2015)
- Machine ExcavatedTrial Pits (March 2015)
- Site Boundary
- Aproximate Area of Peat

Drawing based on drawing supplied by client 268476_374580_OS_Mastermap.

Rev	Notes	Date	By
1	Addition of Approximate Area of Peat	13.02.2014	AP

APPLiED GEOLOGY

Unit 23
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CV8 2LY

Tel: 02476 511822
Fax: 02476 697682
email: admin@appliedgeology.co.uk

Client: ENVIRONMENTAL RESOURCES MANAGEMENT (ERM)

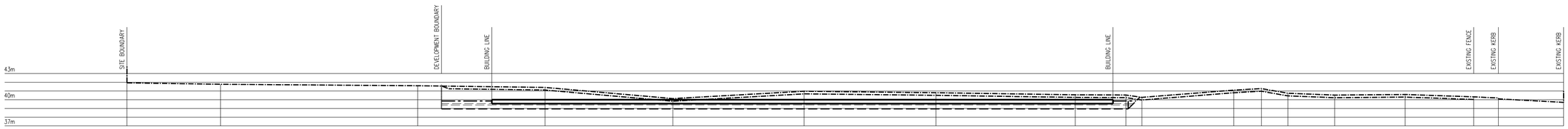
Project: ABENBURY WAY, WREXHAM

Title: EXPLORATORY HOLE LOCATION PLAN

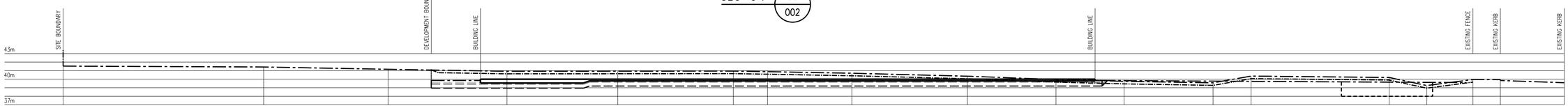
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JS	AP	A3

Scale:	Date:
1:1000	13.04.2015

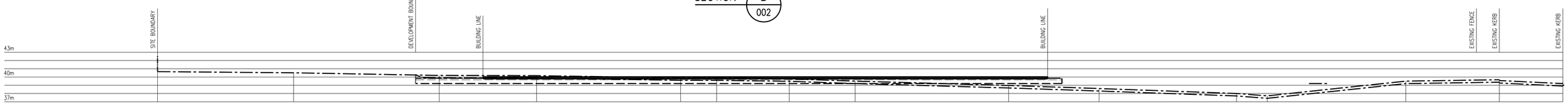
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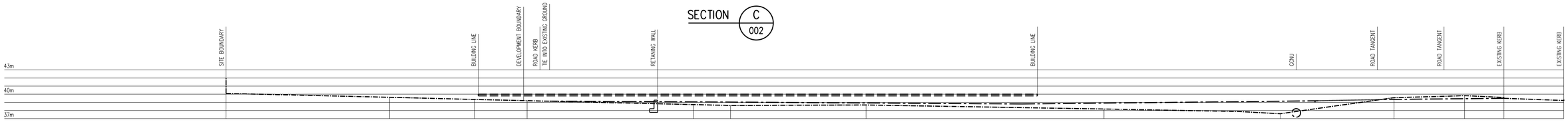
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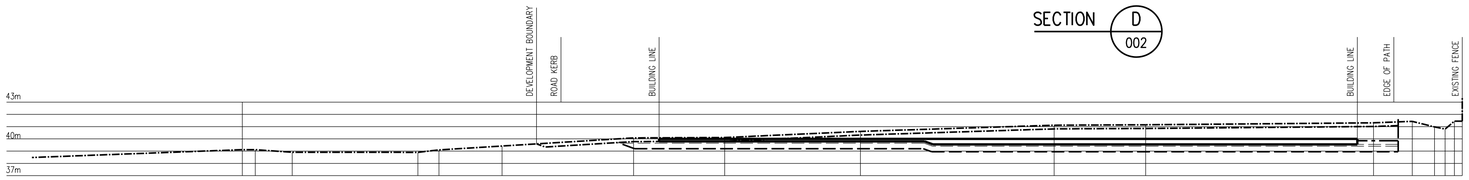
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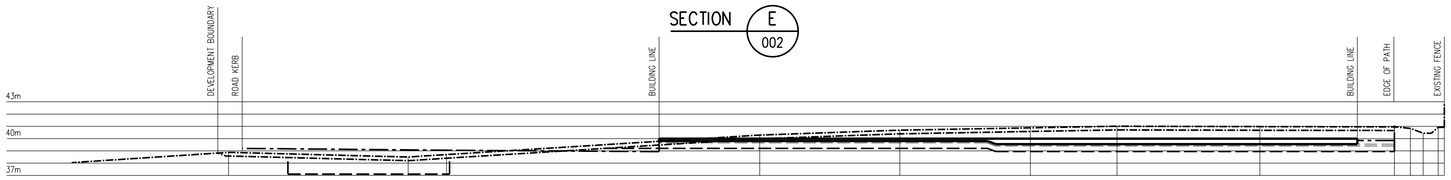
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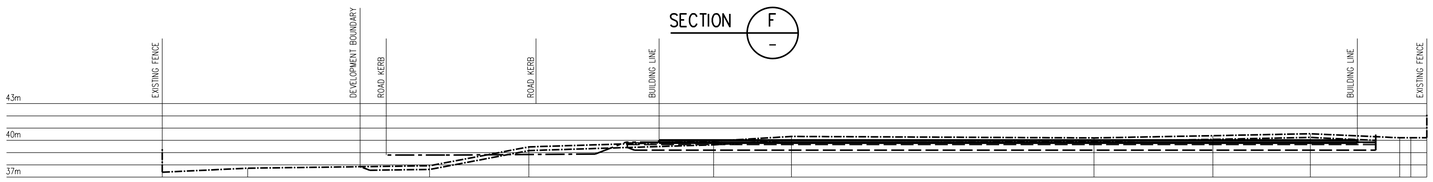
SECTION D 002



SECTION E 002



SECTION F –



SECTION G 002

MATERIAL TAKE OFF (MTO)	
ITEM	M^3
TOP SOIL REMOVAL (OVERALL DEVELOPMENT AREA EXCLUDING RPA)	2790
REDUCED LEVEL DIG (AREAS A, B, C & D)	7407
PILING MAT 450 TYPE 6F2 (AREAS C, D & E)	2346
CAPPING LAYER 150 TYPE 6F2 (AREAS C, D & E)	752

NOTE FOR LOCATION OF AREAS REFER TO DRAWING No. A6CI-10-DW-004

AREA FOR DEVELOPMENT EXCLUDING RPA – 9295 M^2
(INCUDES SCRUB PLANTING BELT)

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV
A	05.03.15	ISSUED FOR APPROVAL	GT	JH	SR

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS	REFERENCE DWG NUMBER	REFERENCE DRAWINGS

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CONTRACT	A6CI	
DESIGNED BY	C.TAYLOR	
CHECKED BY	J. HILL	
SUPERVISOR	S. RAI	APP DATE 02.02.15
LEAD ENGR/SPEC.	S. RAI	APP DATE
FLUOR	B. ROBINSON	APP DATE
CLIENT	R. GRIM	APP DATE

CYTEC

ADHESIVE CAPACITY EXPANSION WREXHAM WALES
SITE SECTIONS

SCALE	DRAWING NUMBER	REV
1:250	A6CI-100-10-DW-003	A

CAD FILE NAME



SITE AREA – 16514 M^2
DEVELOPED AREA – 8096 M^2

LEGEND

+39.30 FINISHED LEVELS

ISSUED FOR APPROVAL
02 Mar 2015

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
A	15.01.15	ISSUED FOR APPROVAL	GT	JH	SR										
B	27.02.15	LAYOUT UPDATED – ISSUED FOR APPROVAL	GT	JH	AJ										

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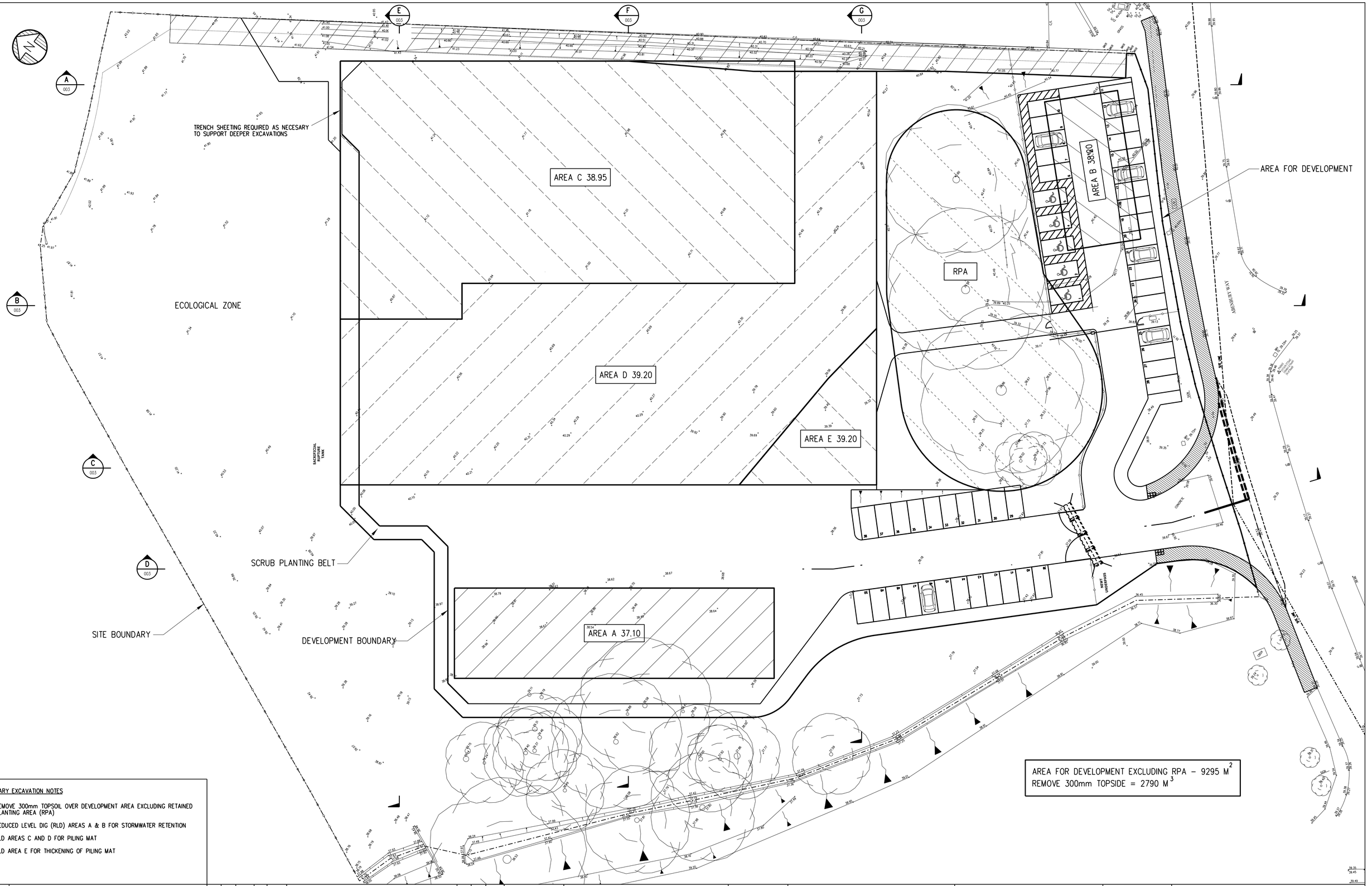
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DESIGNED BY G.TAYLOR	
CHECKED BY J. HILL	
SUPERVISOR S. RAI	APP DATE 15.01.15
LEAD ENGR/SPEC. S. RAI	APP DATE
FLUOR B. ROBINSON	APP DATE
CLIENT R. GRIM	APP DATE

CYTEC

ADEHESIVE CAPACITY EXPANSION WREXHAM WALES
SITE GRADING

SCALE	DRAWING NUMBER	REV
1:250	A6CI-100-10-DW-002	B

CAD FILE NAME: A6CI-100-10-DW-002.DGN



PRIMARY EXCAVATION NOTES

1. REMOVE 300mm TOPSOIL OVER DEVELOPMENT AREA EXCLUDING RETAINED PLANTING AREA (RPA)
2. REDUCED LEVEL DIG (RLD) AREAS A & B FOR STORMWATER RETENTION
3. RLD AREAS C AND D FOR PILING MAT
4. RLD AREA E FOR THICKENING OF PILING MAT

AREA FOR DEVELOPMENT EXCLUDING RPA – 9295 M^2
REMOVE 300mm TOPSIDE = 2790 M^3

REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REV	DATE	REVISION DESCRIPTION	BY	CHK	APPV	REFERENCE DWG NUMBER	REFERENCE DRAWINGS	REFERENCE DWG NUMBER	REFERENCE DRAWINGS
A	25.02.15	ISSUED FOR APPROVAL	GT	JH	SR										
B	05.03.15	UPDATED REISSUED FOR APPROVAL	GT	JH	JH										

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CONTRACT	A6CI	
DESIGNED BY	G.TAYLOR	
CHECKED BY	J. HILL	
SUPERVISOR	S. RAI	APP DATE 15.01.15
LEAD ENGR/SPEC.	S. RAI	APP DATE
FLUOR	B. ROBINSON	APP DATE
CLIENT	R. GRIM	APP DATE

CYTEC

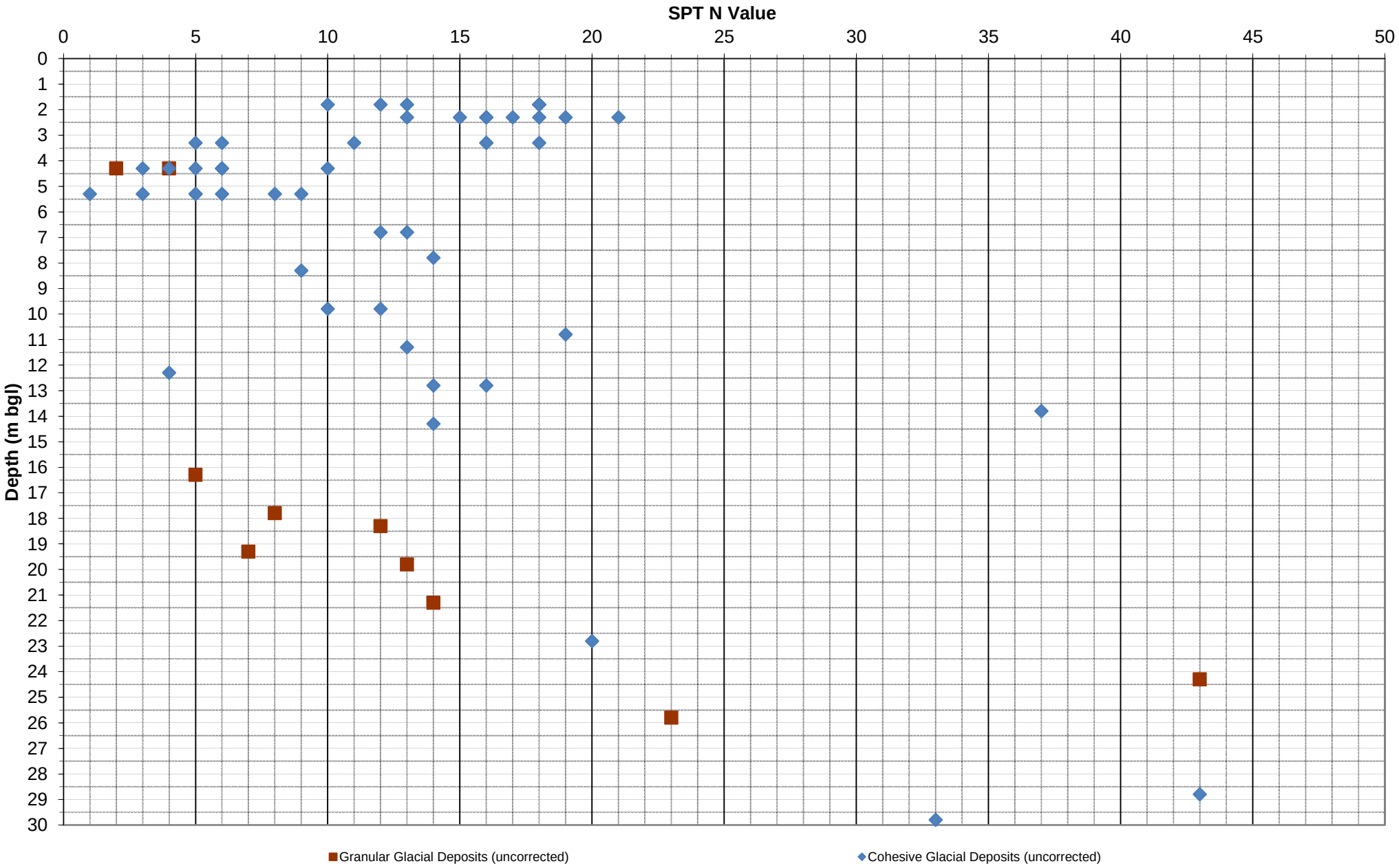
ADHESIVE CAPACITY EXPANSION WREXHAM WALES SITE PREPARATION LAYOUT

SCALE	DRAWING NUMBER	REV
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CAD FILE NAME: A6CI-100-10-DW-002.DGN

AG2200-15 Abenbury Way, Wrexham

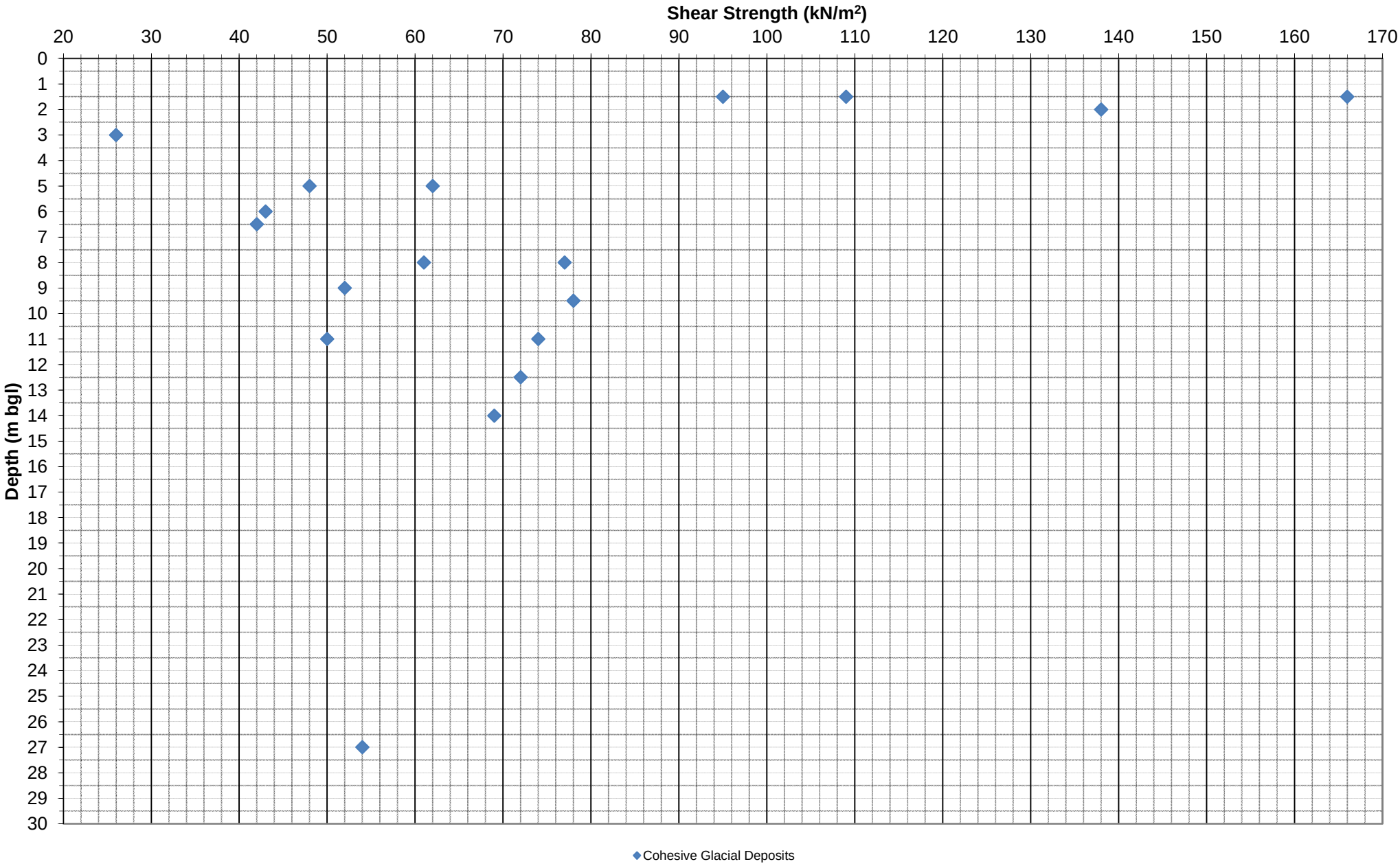
SPT 'N' Vs Depth (m bgl)



APPLiED GEOLOGY

AG2200-15 Abenbury Way, Wrexham

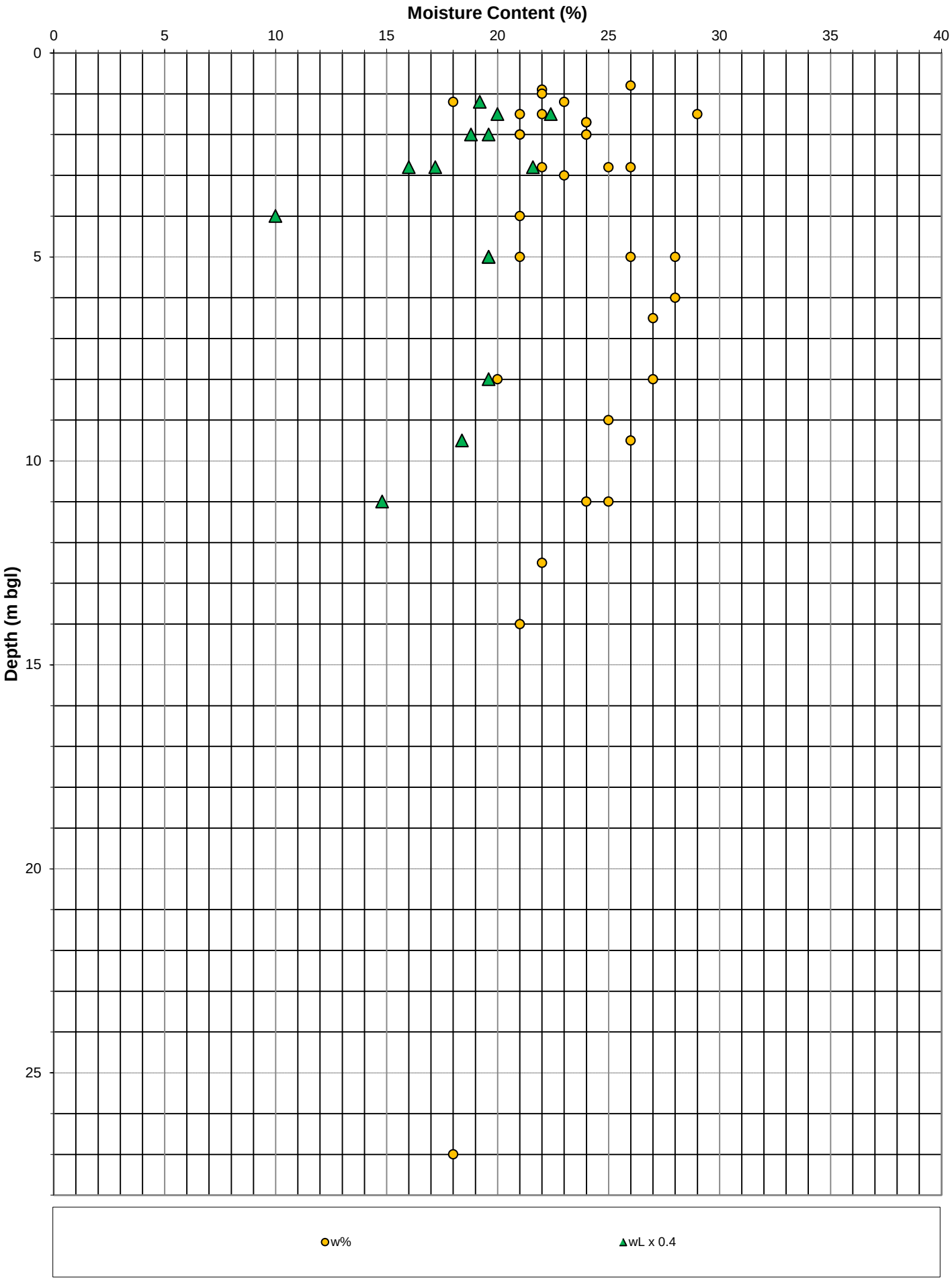
Shear Strength Vs Depth (m bgl)



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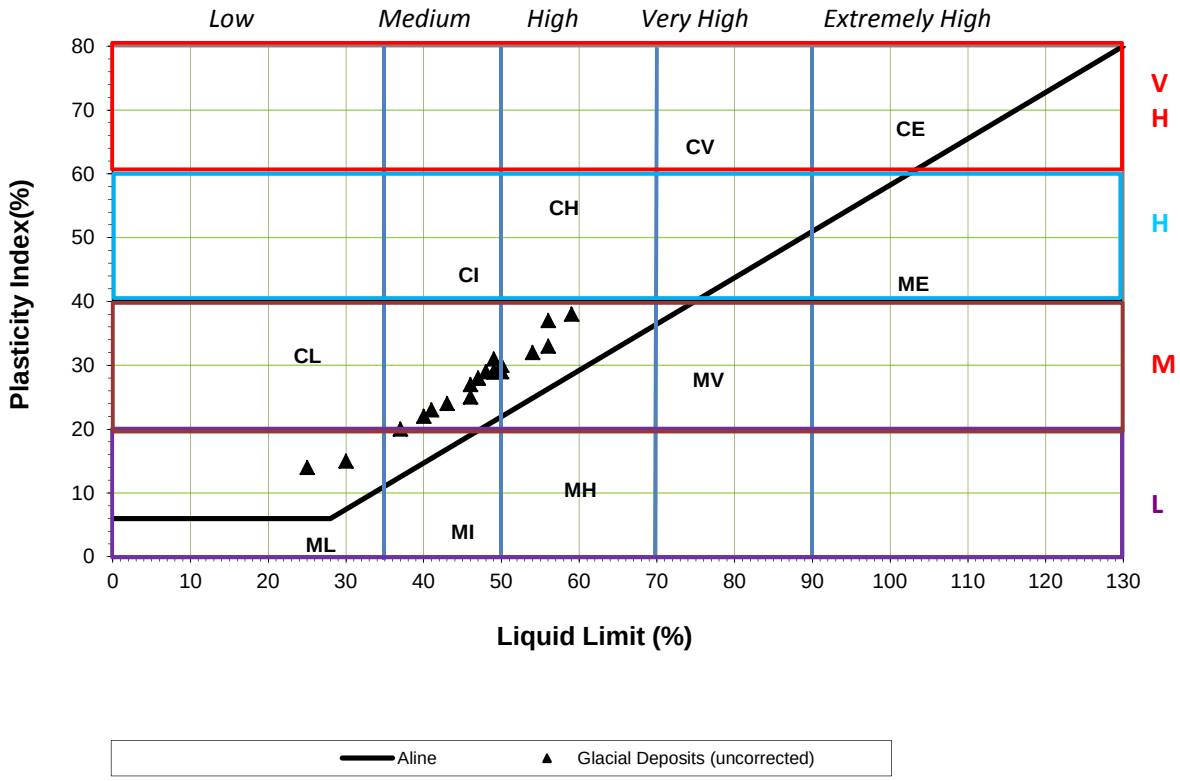
AG2200-15 Abenbury Way, Wrexham

Moisture Content Vs Depth (m bgl)



Project: Abenbury Way, Wrexham
Project Number: AG2200-15
Client: ERM

PLASTICITY CHART



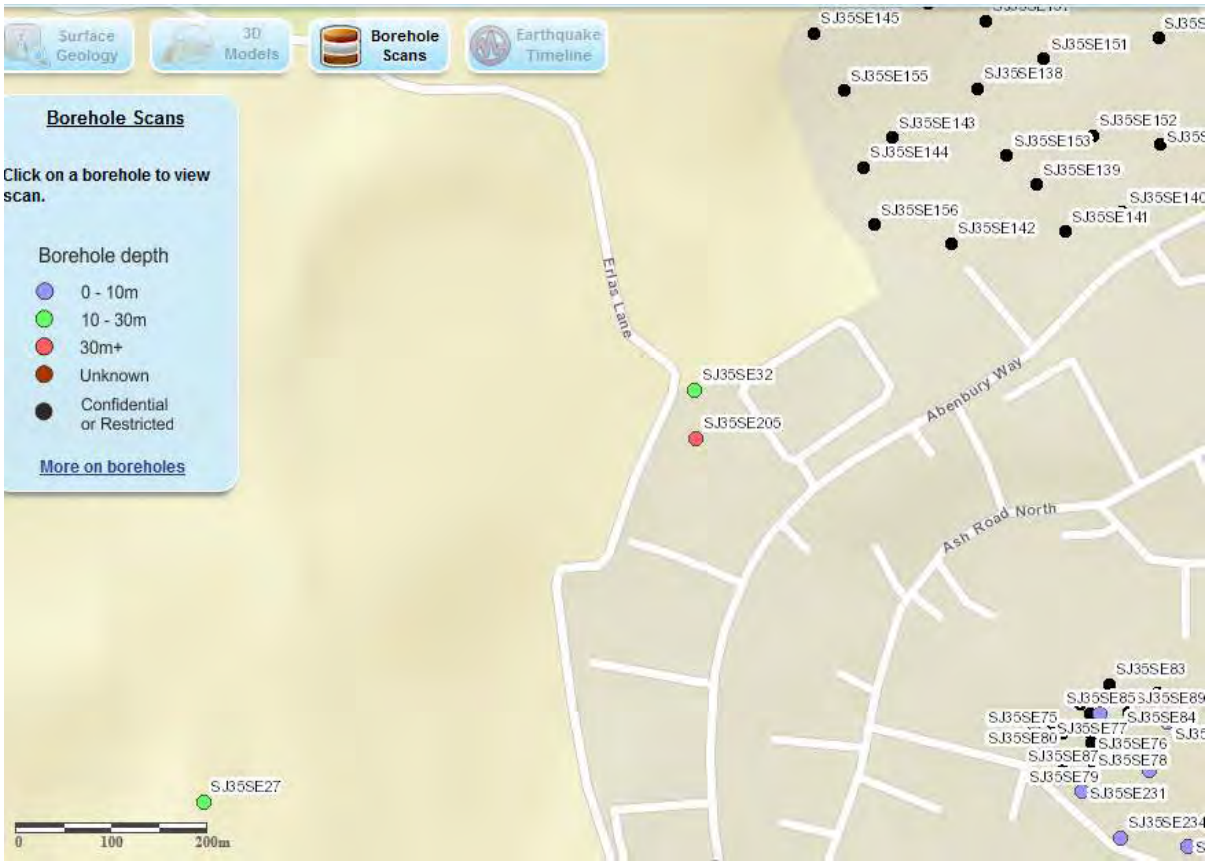
Shrinkability

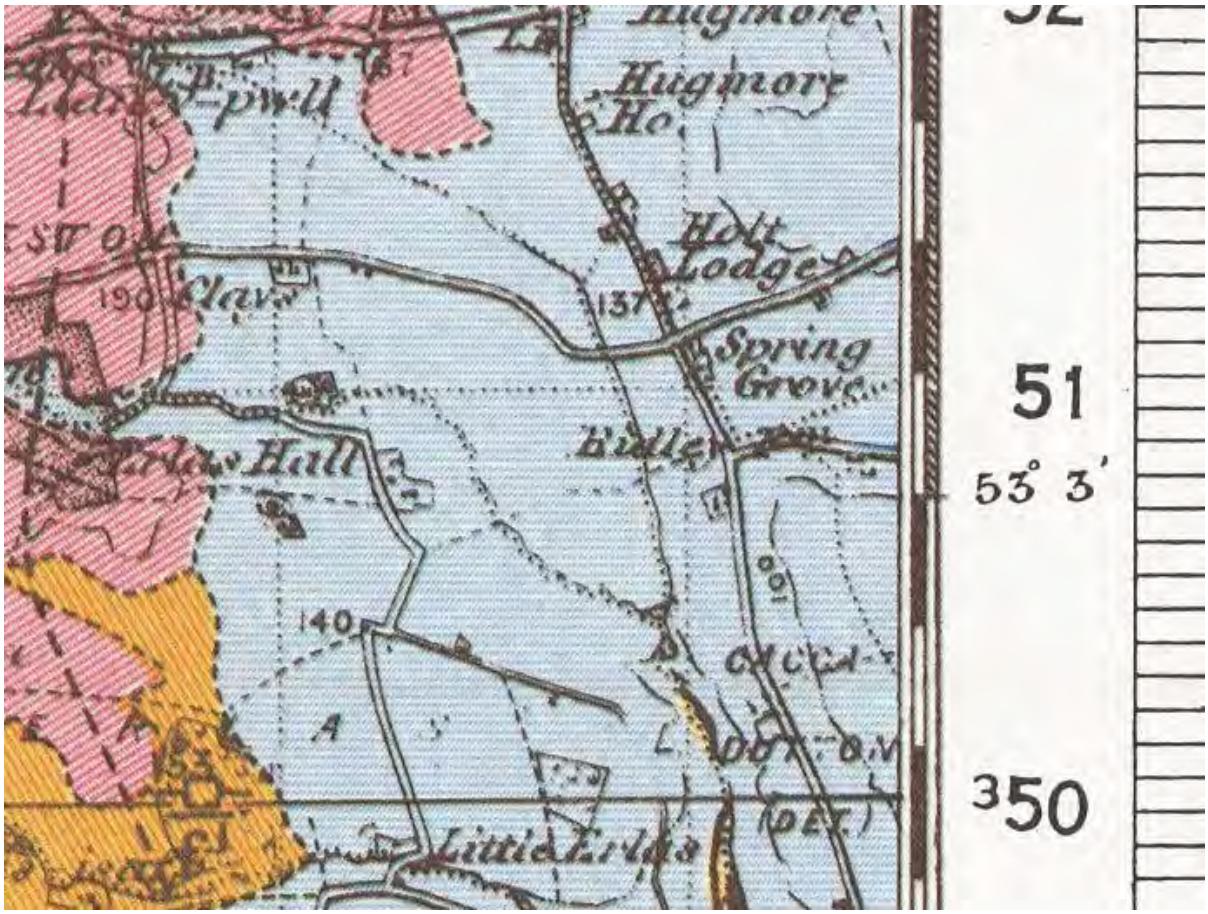
Very High Shrinkage Potential
High Shrinkage Potential
Medium Shrinkage Potential
Low Shrinkage Potential

Date: 27/04/2015

APPLiED GEOLOGY

APPENDIX B





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108-1-TIF

WELSH NATIONAL WATER DEVELOPMENT AUTHORITY

DEE AND CLWYD RIVER DIVISION

SJ35/108

DETAILED HYDROGEOLOGICAL RECORD SHEET : INDIVIDUAL SITE RECORD

D.C.R.D. REF. No. ~~01/25/10~~

NAME I.G.S borehole No. 15 BIESTON, DENBYS.

N.G.R. SJ 3735 5056 SJ 35 SE

EXACT SITE KNOWN YES/~~NO~~

LOCATION SKETCH ~~YES~~/NO

HEIGHT A.O.D. ....41:7.... METRES

ESTIMATED FROM ~~MAP~~/SURVEY/~~OTHER~~

REFERENCE POINT NONE/~~DETAILS~~/~~SKETCH~~

LOG YES/~~NO~~

LOCATION OF LOG HERE/I.G.S.

SUMMARY OF LOG

i) THICKNESS OF DRIFT ....741:7.... METRES

ii) TOTAL DEPTH .....41:7... METRES

iii) O.D. LEVEL OF ROCKHEAD ..... METRES

WATER QUALITY INFORMATION ~~YES~~/NO

WATER QUANTITY INFORMATION

ABSTRACTION ~~YES~~/NO/~~OCCASIONALLY~~/~~NOT KNOWN~~ LICENSED ABSTRACTION /HOUR /DAY /YEAR

LICENCE NO.

WATER LEVEL INFORMATION ~~YES~~/NO

DETAILS :

PUMPING TEST ~~YES~~/NO DATE

LOCATION OF DATA

WATER LEVELS RECORDED NONE/~~ISOLATED~~ READINGS/~~MONTHLY~~/~~AUTOGRAPHIC~~

LOCATION OF RECORDS I. G. S.

ACCESS

Probably filled-in. Borehole forms part of a sand and gravel survey carried out in 1976-77

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108-2 TIF

SHEET NO. 1

WELSH WATER AUTHORITY

DEE AND CLWYD DIVISION.

SJ35/108

BOREHOLE LOG DETAILS

NAME OF SITE: I.G.S. borehole No. 15

D.C.D. REF. NO. [redacted]

N.G.R. SJ. 3735. 5056

SURFACE LEVEL (m.A.O.D.) 41.7 R.W.L. (m.A.O.D.) .....

Description of Strata	Depth (m)	Reduced Level (m.A.O.D.)	Water Level (m)
Boulder Clay	41.7	0.0	

COMMENTS: .....

.....

.....

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SJ 35 SE 32 3735 5061 South of Erlas Hall, Abenbury, Wrexham 1" no. 121

Surface level (+41.7 m) +137 ft
Water not struck
Shell and auger 8-in (203 mm) diameter
April 1977

Waste 18.0 m +

LOG

Geological classification	Lithology	Thickness m	Depth m
	Soil	0.3	0.3
Boulder Clay	Clay, reddish brown, firm, silty with occasional striated subrounded clasts of igneous material, quartzite and traces of coal	17.7+	18.0

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IGS 1536 (1159) 2400 1/76 — Institute of Geological Sciences — Sheet 1 of 1

Borehole Reg No: SJ35 SE 32
Temp borehole No: SJ 35 SE 15
Nat Grid Ref: 3735 5061
Locality: SOFERAS HALL ABENBURY WXHM
Surface level: m O.D.(ft O.D.)
Drilled by: STRATA SURVEYS LTD
Drill type: 8" SHELL
Hole diameter: 8"
Depth(s) bailed:
Date started: //
Date finished:
Recorded by: A.R. CLAYTON

Classification of ground	Thickness m	Nature
WASTE	18.0+	UPPER BOULDER CLAY

Remarks

Explanation
▽ Groundwater depth first encountered
a▼ Morning water level
p▼ Evening water level
Casing depth
Borehole depth
w Water sample
U, sample; solid ornament shows fraction recovered
• Spot disturbed sample
Bulk sample
S.P.T. Standard Penetration Test

Geological Classification	Description of Strata	Depth to Base m	Thickness m	Sampling	Sample Nos	Water Level	Drilling and Casing progress
UPPER BOULDER CLAY ("YOUNGER TILL")	SOIL	0.3	0.3				
	CLAY, REDDISH BROWN, FIRM, SLIGHTLY SILTY WITH OCCASIONAL FINE TO COARSE STRIATED IGNEOUS PEBBLES TRACES OF SAND AND FINE GRAVEL-SIZED COAL. NO OBSERVABLE CHANGE WITH DEPTH.	18.0	17.7			4.5	
	BOREHOLE COMPLETED AT 18 m						

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APPENDIX C

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH1
Sheet 1 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
26/02/2015-27/02/2015	150mm to 20.00m	40.50m AOD	GM	AP	1:50
Method: Cable Percussion		Depth (m): 20.00	Co-ordinates: -		Ground Slope

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.10	D					Firm dark brown slightly gravelly sandy CLAY. Gravel is medium subrounded to rounded quartzite. Sand is fine to medium. (TOPSOIL)	40.30	0.20		
	0.50	D									
	1.00	D	0.00				Firm brown mottled reddish brown and orangish brown slightly sandy gravelly CLAY. Gravel is fine to coarse rounded quartzite. (GLACIAL DEPOSITS)	39.60	0.90		
								39.30	1.20		
1.50	1.50-1.95	U(63)		95	19/48	23.00	Stiff brown mottled light bluish grey slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded quartzite and mudstone. (GLACIAL DEPOSITS)				
	1.50	D				24.00					
	1.70	D									
	1.80	SPT	0.40	15N	19/47	21.00					
	2.00	D		15/300							
	2.00-2.45						Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely spaced with frequent sandy silt infill. (GLACIAL DEPOSITS)				
	2.80	D			18/40	22.00					
	3.00-3.45	U(39)	1.70				Brown silty fine SAND. (GLACIAL DEPOSITS)	37.50	3.00		
	3.00										
	3.50	D									
	3.80	D									
4.00	4.00	SPT	0.00	6N			Firm laminated brown slightly sandy CLAY. Laminations are extremely closely spaced with sand and silt infill. (GLACIAL DEPOSITS)	36.50	4.00		
	4.00-4.45	B		6/300							
		D									
4.50											
	4.80	D									
	5.00-5.45	U(43)	0.00	62	20/49	26.00					
	5.00										
	5.50	D									
6.00	6.00	D	0.30								
	6.50	SPT		13N							
	6.50-6.95	D		13/300							
			0.50								
7.50	7.50	D									
	8.00-8.45	U(42)	1.00	61		20.00					
	8.00										
	8.50	D									
9.00	9.00	D	0.10								
	9.50	SPT		12N							
	9.50-9.95	D		12/300							

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 10.0 - 8.0m and from GL -1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.00	1.50	2.80	-	26/02/2015	Slight
12.50	10.50	12.30	-	26/02/2015	Slight
15.00	13.00	5.10	-	26/02/2015	Fast inflow
15.00	15.00	2.70	-	27/02/2015	Overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH1 Sheet 2 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
26/02/2015-27/02/2015	150mm to 20.00m	40.50m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		20.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.20				Firm laminated brown slightly sandy CLAY. Laminations are extremely closely spaced with sand and silt infill. (GLACIAL DEPOSITS)				
10.50	10.50	D									
	11.00-11.45	U(43)	0.20	74	17/37	24.00					
	11.00										
	11.50	D									
			0.00								
	12.50	SPT		14N							
	12.50-12.95	B		14/300							
		D									
13.00			0.00								
	13.50	D									
	14.00-14.45	U(64)	0.10	69		21.00					
	14.00										
	14.50	D									
	15.00	D	0.10					25.50	15.00		
							Loose brown slightly silty fine SAND. (GLACIAL DEPOSITS)				
	15.50	D									
16.00	16.00	SPT	0.10	5N							
	16.00-16.45	B		5/300							
		D									
	17.00	D	0.10								
17.50	17.50	SPT		8N							
	17.50-17.95	D		8/300							
			0.10								
	18.50	D									
19.00	19.00	SPT	0.10	7N							
	19.00-19.45	B		7/300							

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 10.0 - 8.0m and from GL -1.0m and security cover concreted at surface.

End of Borehole at 20.00 m

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.00	1.50	2.80	-	26/02/2015	Slight
12.50	10.50	12.30	-	26/02/2015	Slight
15.00	13.00	5.10	-	26/02/2015	Fast inflow
15.00	15.00	2.70	-	27/02/2015	Overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH2 Sheet 1 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
24/02/2015-25/02/2015	150mm to 15.00m	41.53m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		15.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.30	D					Firm dark brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium rounded quartite. (TOPSOIL)	41.13	0.40		
	0.60	D					Firm brown mottled orangish brown sandy CLAY. Sand is fine to medium. (GLACIAL DEPOSITS)				
	1.10	D	1.00					40.53	1.00		
1.50	1.50	SPT		18N			Brown clayey SAND and GRAVEL. Gravel is medium to coarse rounded quartzite and mudstone. (GLACIAL DEPOSITS)	40.23	1.30		
	1.50-1.95	D		18/300							
	1.80	D									
	2.00-2.45	U(77)	1.00	138		24.00	Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely to very closely spaced with occasional sandy silt infill. (GLACIAL DEPOSITS)				
	2.00										
	2.50	D									
	2.80	D									
3.00	3.00	SPT	0.30	16N							
	3.00-3.45	D		16/300							
	3.80	D									
4.00	4.00-4.45	U(35)	0.10					37.53	4.00		
	4.00						Loose brown very silty SAND. (GLACIAL DEPOSITS)				
	4.50	D									
4.70	4.80	D									
	5.00	SPT	0.10	6N				36.53	5.00		
	5.00-5.45	B		6/300			Firm laminated brown sandy CLAY. Laminations are extremely closely to very closely spaced with silt and sand infill. (GLACIAL DEPOSITS)				
		D									
6.00	6.00	D	0.10								
	6.50-6.95	U(27)		42		27.00					
	6.50										
	7.00	D	0.10								
7.50 150mm	7.50	D									
	8.00	SPT	0.10	9N							
	8.00-8.45	D		9/300							
	9.00	D	0.10								
	9.50-9.95	U(41)		78	19/46	26.00					
	9.50										

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 9.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.20	-	1.20	-	24/02/2015	No rise
3.40	-	3.30	-	25/02/2015	Slight seepage

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH2 Sheet 2 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
24/02/2015-25/02/2015	150mm to 15.00m	41.53m AOD	GM	AP	1:50
Method: Cable Percussion		Depth (m): 15.00	Co-ordinates: -		Ground Slope

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	10.00	D	0.20				Firm laminated brown sandy CLAY. Laminations are extremely closely to very closely spaced with silt and sand infill. (GLACIAL DEPOSITS)				
	10.50	D									
	11.00	SPT	0.70	13N							
	11.00-11.45	B		13/300							
		D									
	12.00	D	5.00								
	12.50-12.95	U(41)		72		22.00					
	12.50										
	13.00	D	5.50								
	13.50	D									
	14.00	SPT	2.00	14N							
	14.00-14.45	B		14/300							
		D									
	15.00	D	1.60				End of Borehole at 15.00 m	26.53	15.00		

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 9.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.20	-	1.20	-	24/02/2015	No rise
3.40	-	3.30	-	25/02/2015	Slight seepage

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH3 Sheet 1 of 3

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
23/03/2015-24/03/2015	200mm to 10.50m 150mm to 30.00m	39.72m AOD	AS	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		30.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.20	D					Grass over soft brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Frequent small roots. (TOPSOIL)	39.62	0.10		
	0.50 0.50-1.00	D B						39.22	0.50		
			0.00				Firm orange-brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coasre subrounded quartzite and mudstone. Occasional small roots. (SUBSOIL)				
1.50	1.50-1.95 1.50	U(44)		109	21/46	21.00	Firm to stiff closely fissured brown mottled blue-grey silty slightly gravelly CLAY. Gravel is fine subrounded mudstone. Occasional root traces within fissures. (GLACIAL DEPOSITS) Below 2.00m bgl: Indistinctly thinly laminated.				
2.00	2.00 2.00-2.45	SPT D	0.00	16N 16/300							
3.00	3.00-3.45 3.00	U(90)	0.00	26		23.00		36.62	3.10		
	3.50	D					Grey-brown silty fine SAND. (GLACIAL DEPOSITS)				
4.00	4.00 4.00-4.45	SPT B		5N 5/300			Below 4.00m bgl: loose.				
4.50							Firm thinly to thickly laminated silty slightly sandy CLAY with fine sand between laminations. (GLACIAL DEPOSITS)	35.42	4.30		
	5.00 5.00-5.45	SPT D	0.00	8N 8/300							
6.00	6.00-6.45 6.00	U(26)	0.00	43	21/59	28.00					
	6.50	D									
7.50	7.50 7.50-7.95	SPT B		14N 14/300							
			0.00								
	9.00-9.45 9.00	U(22)		52	18/41	25.00					
	9.50	D					Below 9.50m bgl: very sandy with fine to medium sand between laminations.				
							Continued next sheet				

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. Water added from 15.00m to 26.00m bgl to assist boring. 50mm diameter piezo standpipe installed to 25.30m bgl. Backfilled with concrete ground level to 0.50m bgl, arisings to 3.00m bgl, gravel to 5.00m bgl, bentonite to 24.30m bgl, gravel to 25.50m bgl, bentonite to 27.00m bgl and gravel to 30.00m bgl.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
10.50	7.50	6.10	13.50	23/03/2015	
15.00	-	4.20	-	24/03/2015	overnight level
24.00	-	0.00	-	25/03/2015	overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH3 Sheet 2 of 3

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
23/03/2015-24/03/2015	200mm to 10.50m 150mm to 30.00m	39.72m AOD	AS	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		30.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.00				Firm thinly to thickly laminated silty slightly sandy CLAY with fine sand between laminations. (GLACIAL DEPOSITS)				
10.50 200mm	10.50 10.50-10.95	SPT D		19N 19/300				29.22	10.50		
			0.00				Firm brown-grey sandy SILT with occasional bands of silty fine sand. (GLACIAL DEPOSITS)				
12.00	12.00 12.00-12.45	SPT D		4N 4/300							
13.50	13.50 13.50-13.95	SPT D		37N 37/300							
							Firm to stiff thinly laminated brown slightly sandy silty CLAY with occasional fine sand between laminations. (GLACIAL DEPOSITS)	26.22	13.50		
15.00	15.00-15.45 15.00 15.10	U(117) D	0.00								
							Grey-brown very silty fine SAND. (GLACIAL DEPOSITS)	24.62	15.10		
	16.50	D									
							Medium dense brown and grey-brown slightly silty fine to medium SAND. (GLACIAL DEPOSITS)	23.22	16.50		
18.00	18.00 18.00-18.45	SPT D		12N 12/300							
19.50	19.50 19.50-19.95	SPT(C) B	0.00	13N 13/300							

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. Water added from 15.00m to 26.00m bgl to assist boring. 50mm diameter piezo standpipe installed to 25.30m bgl. Backfilled with concrete ground level to 0.50m bgl, arisings to 3.00m bgl, gravel to 5.00m bgl, bentonite to 24.30m bgl, gravel to 25.50m bgl, bentonite to 27.00m bgl and gravel to 30.00m bgl.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
10.50	7.50	6.10	13.50	23/03/2015	
15.00	-	4.20	-	24/03/2015	overnight level
24.00	-	0.00	-	25/03/2015	overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH3 Sheet 3 of 3

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
23/03/2015-24/03/2015	200mm to 10.50m 150mm to 30.00m	39.72m AOD	AS	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		30.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
							Medium dense brown and grey-brown slightly silty fine to medium SAND. (GLACIAL DEPOSITS)				
21.00	21.00	SPT(C)		14N 14/300							
	21.50	D									
22.50	22.50	SPT		20N				17.22	22.50		
	22.50-22.95	D		20/300			Firm brown-grey silty slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded mudstone and sandstone. (GLACIAL DEPOSITS)				
	23.00	D									
24.00 ▽	24.00	SPT		43N							
	24.00-24.45	D		43/300				15.52	24.20		
			0.00				Dense becoming medium dense brown silty fine to medium SAND with occasional fine bands of silt and clay. (GLACIAL DEPOSITS)				
25.50	25.50	SPT		23N							
	25.50-25.95	D		23/300							
	26.10	D						13.62	26.10		
			0.00				Firm to stiff brown-grey slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium occasionally coarse subrounded to subangular sandstone and mudstone. (GLACIAL DEPOSITS)				
27.00	27.00-27.45	U(70)		54	15/30	18.00					
	27.00										
	27.50	D									
			0.00								
28.50	28.50	SPT		43N							
	28.50-28.95	D		43/300							
29.50	29.50	SPT		33N							
	29.50-29.95	D		33/300							

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. Water added from 15.00m to 26.00m bgl to assist boring. 50mm diameter piezo standpipe installed to 25.30m bgl. Backfilled with concrete ground level to 0.50m bgl, arisings to 3.00m bgl, gravel to 5.00m bgl, bentonite to 24.30m bgl, gravel to 25.50m bgl, bentonite to 27.00m bgl and gravel to 30.00m bgl.

End of Borehole at 30.00 m

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
10.50	7.50	6.10	13.50	23/03/2015	
15.00	-	4.20	-	24/03/2015	overnight level
24.00	-	0.00	-	25/03/2015	overnight level

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH4 Sheet 1 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
27/02/2015-02/03/2015	150mm to 12.00m	41.25m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Cable Percussion		15.00	-		

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.20	D					Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)	40.95	0.30		
	0.50	D					Firm brown mottled orangish brown and light grey sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	40.55	0.70		
	1.00	D	0.10				Stiff laminated brown mottled light bluish grey slightly sandy CLAY. Laminations are extremely closely to very closely spaced with occasional sandy silt infill. (GLACIAL DEPOSITS)				
1.50	1.50-1.95 1.50	U(76) D		166	19/56	22.00 24.00					
	1.70 1.80 2.00 2.00-2.45	D SPT D	0.10	17N 17/300	20/55	23.00					
	2.80	D			22/54	26.00					
3.00	3.00-3.45 3.00	U(42)	0.10								
	3.50	D					Very loose brown silty fine SAND. (GLACIAL DEPOSITS)	37.75	3.50		
	3.80	D									
4.00	4.00 4.00-4.45	SPT B	0.10	3N 3/300							
4.50		D									
	4.80	D					Firm laminated brown slightly sandy CLAY. Laminations are very closely spaced with occasional silty sand infill. (GLACIAL DEPOSITS)	36.65	4.60		
	5.00-5.45 5.00	U(47)	0.10	48	20/49	28.00					
	5.50	D									
6.00	6.00	D	3.80								
	6.50 6.50-6.95	SPT D		12N 12/300							
			1.90								
7.50	7.50	D									
	8.00-8.45 8.00	U(44)	2.90	77	20/49	27.00					
	8.50	D									
9.00	9.00	D	0.20								
	9.50 9.50-9.95	SPT B D		10N 10/300							

Continued next sheet

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 12.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.50	3.00	3.20	-	27/02/2015	Slight
14.70	12.00	14.30	-	02/03/2015	Slight

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Borehole Log
BH4
Sheet 2 of 2

Date	Hole Diameter (mm)	Ground Level	Logged By	Checked By	Scale
27/02/2015-02/03/2015	150mm to 12.00m	41.25m AOD	GM	AP	1:50

Method	Depth (m)	Co-ordinates	Ground Slope
Cable Percussion	15.00	-	

Casing Date Depth & Diameter	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.10				Firm brown interbedded silty CLAY and sandy SILT. (GLACIAL DEPOSITS)	31.25	10.00		
10.50	10.50	D									
	11.00-11.45	U(43)	0.10	50		25.00					
	11.00										
	11.50	D									
12.00	12.00	D	0.40								
							Firm laminated brown slightly sandy CLAY with freqent silty sand laminae. (GLACIAL DEPOSITS)	28.95	12.30		
	12.50	SPT		16N							
	12.50-12.95	D		16/300							
			3.90								
	13.50	D									
	14.00-14.45	U(51)	3.40								
	14.00										
	14.50	D					Firm brown sandy CLAY. (GLACIAL DEPOSITS)	26.75	14.50		
	15.00	D	1.70				Firm laminated brown slightly sandy CLAY. Laminations are very closely spaced with occasional silty sand infill. (GLACIAL DEPOSITS)	26.35	14.90		
							End of Borehole at 15.00 m	26.25	15.00		

GENERAL REMARKS:

Hand excavated service avoidance pit to 1.5m bgl. 50mm ID HDPE gas/ groundwater monitoring standpipe installed to 8m bgl in a gravel filter medium. Bentonite seal from 12.0 - 8.0m and from 1.0m and security cover concreted at surface.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
3.50	3.00	3.20	-	27/02/2015	Slight
14.70	12.00	14.30	-	02/03/2015	Slight

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No.	Site:	Borehole Log
AG2200-15	Abenbury Way, Wrexham	BH5
	Client: ERM	Sheet 1 of 1
	Engineer:	

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
02/03/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	40.75m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Driven Continuous Sampling		5.45	-		

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
	0.40	D	0.30 0.50				Firm dark brown slightly gravelly sandy CLAY. Gravel is medium subrounded quartzite. (TOPSOIL)	40.50	0.25		
	1.00	D	0.80				Firm brown mottled orangish brown and light bluish grey sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	40.05	0.70		
	1.50 1.50-1.95	SPT D		13N 13/300			Stiff laminated brown mottled light bluish grey slightly sandy CLAY. Laminations are extremely closely spaced with occasional silt and fine sand infill. (GLACIAL DEPOSITS) At 1.50m bgl: Rare fine angular coal gravel.				
	2.00 2.00-2.45	SPT D	2.40	16N 16/300							
	2.80	D	2.50								
	3.00 3.00-3.45	SPT D		5N 5/300			At 3.00m bgl: Becoming firm.				
	3.80	D	2.90				Very loose brown slightly silty fine grained SAND. (GLACIAL DEPOSITS)	37.05	3.70		
	4.00 4.00-4.45	SPT D		2N 2/300			Firm brown slightly sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	36.45	4.30		
	5.00 5.00-5.45	SPT D	3.50	5N 5/300			End of Borehole at 5.45 m	35.30	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 4.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 4.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.20	-	-	-	02/03/2015	

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH6 Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
02/03/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	40.73m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Driven Continuous Sampling		5.45	-		

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
							Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)	40.53	0.20		
			0.20								
▽	0.80	D					Firm brown mottled orangish brown slightly gravelly sandy CLAY. Gravel is coarse rounded quartzite. (GLACIAL DEPOSITS)	40.03	0.70		
			0.10								
	1.50 1.50-1.95	SPT D	0.10	18N 18/300	21/50	29.00	Stiff laminated brown mottled light bluish grey slight sandy CLAY with rare cream calcareous silt pockets. Laminae are extremely closely spaced with occasional silt and fine grained sand infill. (GLACIAL DEPOSITS)				
	2.00 2.00-2.45	SPT D	5.70	18N 18/300	18/49	24.00					
	2.80	D	6.00		19/43	25.00					
	3.00 3.00-3.45	SPT D		6N 6/300			At 3.00m bgl: Becoming firm.				
	3.70	D					Brown silty fine grained SAND. (GLACIAL DEPOSITS)	37.13	3.60		
	4.00 4.00-4.45	SPT D	5.70	4N 4/300	11/25	21.00	Firm brown sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)	36.88	3.85		
	4.90	D									
	5.00 5.00-5.45	SPT D		5N 5/300		21.00					
							End of Borehole at 5.45 m	35.28	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 5.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 5.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
0.80	-	-	-	02/03/2015	Seepage

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH7 Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
25/02/2015	116mm to 2.00m 92mm to 3.00m 79mm to 4.00m 70mm to 5.00m	40.47m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Driven Continous Sampling		5.45	-		

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.90				Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite and rare brick fragments. (MADE GROUND)				
			1.40					39.42	1.05		
							Brown slightly sandy clayey GRAVEL of fine to coarse angular slag, burnt shale, brick and coal. Rare brick cobble. (MADE GROUND)	39.12	1.35		
	1.50	SPT	3.10	18N 18/300							
			3.60				Firm greyish brown mottled orangish brown slightly gravelly sandy CLAY. Sand is fine. Gravel is fine rounded mudstone and rare coal. (GLACIAL DEPOSITS)	38.77	1.70		
	2.00	SPT		21N 21/300							
			2.30				Stiff laminated brown mottled light blusih grey slightly sandy CLAY with rare cream calcareous silt pockets. Laminations are extremely closely spaced with silt and fine grained sand infill. (GLACIAL DEPOSITS)				
	3.00	SPT		16N 16/300							
▽			3.50					36.57	3.90		
	4.00	SPT		4N 4/300			Very loose to loose brown silty fine grained SAND. (GLACIAL DEPOSITS)				
			3.10					35.82	4.65		
	5.00	SPT		3N 3/300			Soft to firm brown sandy CLAY with occasional silty sand laminae. Sand is fine. (GLACIAL DEPOSITS)				
							End of Borehole at 5.45 m	35.02	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 5.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 5.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
4.00	-	-	0.00	20/02/2015	Inflow

APPLiED GEOLOGY
Tel: 02476511822
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Job No.	Site:	Borehole Log
AG2200-15	Abenbury Way, Wrexham	BH8
	Client: ERM	Sheet 1 of 1
	Engineer:	

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
25/02/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	38.06m AOD	GM	AP	1:50
Method: Driven Continous Sampling		Depth (m): 5.45	Co-ordinates: -		Ground Slope

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
							Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)	37.86	0.20		
	0.50	D	0.10				Firm brown mottled light bluish grey slightly gravelly sandy CLAY with occasional brown and reddish brown silty sand pockets. Sand is fine to medium. Gravel is fine to medium rounded mudstone and sandstone. (GLACIAL DEPOSITS)				
	1.00	D	0.10								
	1.50	SPT		10N				36.56	1.50		
		D		10/300			Stiff brown mottled light bluish grey slightly sandy CLAY with rare rootlets. (GLACIAL DEPOSITS)				
	1.90	D	0.10								
	2.00	SPT		13N							
		D		13/300							
	3.00	SPT	0.10	11N			At 3.00m bgl: Becoming firm.				
				11/300							
	3.80	D	0.20								
	4.00	SPT		6N							
		D		6/300							
	4.90	D									
	5.00	SPT		1N				33.06	5.00		
		D		1/300			Soft brown slightly sandy clayey SILT. (GLACIAL DEPOSITS)				
							End of Borehole at 5.45 m	32.61	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 4.50m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 4.50m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
1.00	-	0.80	-	25/02/2015	

APPLiED GEOLOGY Tel: 02476511822 Fax: 02476697682	Job No. AG2200-15	Site: Abenbury Way, Wrexham Client: ERM Engineer:	Borehole Log BH9 Sheet 1 of 1

Date	Diameter (mm)	Ground Level	Logged By	Checked By	Scale
25/02/2015	116mm to 2.00m 101mm to 3.00m 92mm to 4.00m 79mm to 5.00m	38.79m AOD	GM	AP	1:50
Method		**Depth (m)**	**Co-ordinates**		**Ground Slope**
Driven Continuous Sampling		5.45	-		

Date & Casing Depth	Depth (m)	Sample Type	PID (ppm)	SPT N or Cu	PL/ LL	NMC	Description of Strata	O.D Level	Depth (m)	Stand Pipe	Legend
			0.10				Soft dark brown slightly gravelly sandy CLAY. Gravel is fine to medium subrounded quartzite with rare brick fragments. (MADE GROUND)	38.54	0.25		
			0.10								
	0.55	D	0.10					38.29	0.50		
	0.80	D					Firm brown slightly gravelly sandy CLAY with occassional light brown silty sand pockets. Gravel is fine to coarse rounded quartzite and rare red clay tile. (MADE GROUND)	38.19	0.60		
			0.10								
	1.50	SPT		12N							
	1.50-1.95	D		12/300							
	1.80	D	0.10				Brown slightly silty slightly sandy GRAVEL of fine to coarse rounded quartzite. (GLACIAL DEPOSITS)				
	2.00	SPT		19N							
	2.00-2.45	D		19/300			Firm brown mottled light bluish grey sandy CLAY. Sand is fine. (GLACIAL DEPOSITS)				
			1.20								
	2.90	D									
	3.00	SPT		18N							
	3.00-3.45	D		18/300			Between 3.45m and 4.00m bgl: no recovery - possible loose sand.				
	4.00	SPT		10N				34.79	4.00		
	4.00-4.45	D		10/300			Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium rounded mudstone. (GLACIAL DEPOSITS)				
			0.30								
	4.80	D									
	5.00	SPT		9N							
	5.00-5.45	D		9/300							
							End of Borehole at 5.45 m	33.34	5.45		

GENERAL REMARKS:

Hand dug service inspection pit excavated to 1.50m bgl. 50mm diameter standpipe installed to 5.00m bgl, plain pipe ground level to 1.00m with bentonite seal and slotted pipe 1.00m to 5.00m with gravel pack.

GROUNDWATER

Struck	Cased	20 mins	Sealed	Date	Remarks
No Groundwater Encountered					

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP1
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS		1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.60	0.65	-	3.10	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Grass over soft light brown slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Frequent small roots. (TOPSOIL)		0.30	
						E	Firm closely fissured brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Occasional small to medium roots. (GLACIAL DEPOSITS)		0.55	
0.80	D		0.00			E-M	Stiff very closely fissured brown motled light grey slightly gravelly silty CLAY with occasional root traces and roots. Gravel is fine to medium subrounded quartzite. (GLACIAL DEPOSITS)			
1.70	D		0.00			H	Below 1.70m bgl: Hard and indistinctly thickly laminated.		2.70	
2.80	D		0.00			M	Firm to stiff closely fissured brown mottled grey silty CLAY with bands of light grey silt and fine sand. (GLACIAL DEPOSITS)			
							End of Trial Pit at 3.10 m		3.10	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP2
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	45	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)		0.20	
0.40	D		0.80				Firm brown mottled orangish brown and reddish brown slightly gravelly sandy CLAY. Gravel is medium to coarse rounded quartzite. (GLACIAL DEPOSITS)		0.70	
0.90	D		0.00			E	Stiff laminated brown mottled light bluish grey slightly sandy CLAY with rare cream calcareous silt pockets. Laminations are extremely closely spaced with occasional silt and fine grained sand infill. (GLACIAL DEPOSITS)			
			0.50			M				
1.90	D		0.50							
2.50-2.60	B		2.50							
3.00	D		0.10				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP3
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
JCB 3CX	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	3	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)		0.25	
0.50	D		0.60			E	Firm brown mottled orangish brown and reddish brown slightly gravelly sandy CLAY. Gravel is fine to coarse rounded quartzite and sandstone. (GLACIAL DEPOSITS)		0.80	
1.00	D		1.60				Stiff brown mottled light bluish grey slightly sandy CLAY with rare medium grained sand pockets and cream clacareous silt pockets. (GLACIAL DEPOSITS)			
			0.30			M				
2.00	D		2.20							
							Brown silty fine to medium grained SAND with rare black organic pockets. (GLACIAL DEPOSITS)		2.30	
2.50	D		1.10							
2.60-2.80	B					E				
							Firm laminated brown mottled light bluish grey slightly sandy CLAY. Laminae are extremely closely spaced with silt and sand infill. (GLACIAL DEPOSITS)		2.85	
3.00	D		1.10			E			3.00	
							End of Trial Pit at 3.00 m			

GROUNDWATER DETAILS:
Groundwater no encountered.

STABILITY OF PIT WALLS:
Slight spalling from 2.30m within sand.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP4
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	90	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm dark brown slightly gravelly sandy CLAY. Gravel is medium rounded quartzite. (TOPSOIL)		0.20	
0.40	D		0.30			E	Firm brown mottled orangish brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to medium rounded quartzite. (GLACIAL DEPOSITS)		0.70	
0.90	D		0.40			M	Stiff laminated brown mottled light bluish grey slightly sandy slightly gravelly CLAY with occasinal sand pockets and rare cream calcareous silt pockets with fine subrounded calcrete nodules. Gravel is fine to medium rounded mudstone and quartzite. (GLACIAL DEPOSITS)			
1.60	D		0.30							
			0.70							
2.50	D		0.70							
2.90	D		0.50				Brown silty fine to medium grained SAND. (GLACIAL DEPOSITS)		2.90	
							End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP5
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.80	0.50	3	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Firm brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (TOPSOIL)		0.20	
0.50	D		0.20			E	Firm brown mottled orangish brown and reddish brown slightly gravelly sandy CLAY. Gravel is fine rounded quartzite. (GLACIAL DEPOSITS)		0.60	
0.80	D		0.60				Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely spaced with occasional silt and fine grained sand infill. (GLACIAL DEPOSITS)			
			1.50			M				
1.50	D		0.90							
			0.00							
2.50	D		0.40							
2.90-3.00	B									
			0.60				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP6
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backohe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
3.00	0.50	90	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.00			M-H	Firm dark brown slightly sandy CLAY with frequent gravel, cobble and boulder size fragments of concrete slabs (up to 2.0m x 2.0m x 0.4m), wood, metal, brick, concrete and possible asbestos. (MADE GROUND)			
			0.00						0.90	
1.10	D		0.00				Stiff laminated brown mottled light bluish grey slightly sandy CLAY with occasional cream calcareous silt pockets. Laminations are extremely closely spaced with occasional infill of silt and fine grained sand. (GLACIAL DEPOSITS)			
			0.00			M				
2.00	D		0.00							
			0.00							
3.00	D		0.00				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not ecnountered.

STABILITY OF PIT WALLS:
Collapse in Made Ground up to 0.9m.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No.	Site:	Trial Pit Log
AG2200-15	Abenbury Way, Wrexham	TP8
	Client: ERM	Sheet 1 of 1
	Engineer:	

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
4.00	3.00	-	0.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Black spongy amorphous PEAT.			
							End of Trial Pit at 0.50 m		0.50	

GROUNDWATER DETAILS:
Grounwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
JCB became stuck in soft ground, log represents strata exposed in ruts. Trial pit backfilled with arisings on completion.

KEY

SAMPLES	B = Bulk	ES = Amber Glass Jar
	D = Tub	CBR = CBR Test
	W = Water	SPT = Insitu Penetration Test
SHEAR STRENGTH (kN/m2)	V=Hand Vane	P=Hand Penetrometer
GROUNDWATER	▽ Entry	
	▼ Standing Level	
Ease of Dig	E = Easy	M = Moderate
	H = Hard	VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP9
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.00	0.50	135	1.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.20			E	Firm dark brown slightly gravelly sandy CLAY. Gravel is fine to medium rounded quartzite. (REWORKED TOPSOIL / MADE GROUND)			
			0.10						1.00	
1.30	D					M	Stiff brown mottled light grey slightly sandy CLAY. (GLACIAL DEPOSITS)			
			0.00				End of Trial Pit at 1.50 m		1.50	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP9A
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
Backhoe excavator	26/02/2015	GM	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
1.80	0.50	0	2.10	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.20			E	Brown gravelly SAND with frequent timber fragments and rootlets. Sand is medium. Gravel is fine to coarse quartzite and rare mudstone. (MADE GROUND)			
			0.10							
			0.00			E	Firm brown slightly gravelly sandy CLAY. Sand is fine to medium. Gravel is fine to coarse rounded quartzite and sandstone. (GLACIAL DEPOSITS)		1.50	
			0.00				End of Trial Pit at 2.10 m		2.10	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Collpase in sand up to 1.50m bgl

GENERAL REMARKS:
Trial pit extended from TP9 through soil mound access ramp into site from main road. Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP101
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.40	0.65	-	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Grass over soft brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite. Frequent small roots. (TOPSOIL)			
						E	Soft brown mottled orange slightly sandy CLAY. Occasional small roots. (GLACIAL DEPOSITS)		0.30	
							Stiff closely fissured orange-brown mottled grey CLAY. Occasional small roots and occasional sand with fissures. (GLACIAL DEPOSITS)		0.50	
0.90	B, D			20/50	22.0					
1.00	V	220	0.00			M				
1.50	V	160				M-H				
							Stiff to hard thinly to thickly laminated light blue grey and brown CLAY with fine sand/silt between laminations. (GLACIAL DEPOSITS)		1.70	
2.00	V B, D	180	0.00			H				
2.80	B, D									
			0.00				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP102
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.30	0.65	-	3.10	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Grass over soft light brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to medium subrounded quartzite frequent small roots. (TOPSOIL)		0.30	
							Soft to firm light brown slighlty sandy slightly gravelly CLAY. Gravel is fine to coarse subrounded quartzite and mudstone. Frequent small roots. (GLACIAL DEPOSITS)		0.40	
0.80	B, D			23/56	26.0		Stiff closely fissured indistinctly thinly to thickly laminated orange-brown and light grey slightly gravelly CLAY. Occasional sand and silt between laminated and fissures. Gravel is fine to coarse subrounded to subangular mudstone rare quartzite. (GLACIAL DEPOSITS)			
1.00	V	140	0.00			E-M				
1.50	V D	210								
							Firm to stiff thinly to thickly laminated brown and blue-grey CLAY with fine to medium sand and silt between laminations. (GLACIAL DEPOSITS)		1.60	
1.90	B, D									
2.00	V	120	0.00							
						M				
2.90	D									
			0.00							
							End of Trial Pit at 3.10 m		3.10	

GROUNDWATER DETAILS:
Seepage at 1.00m bgl. Heavy seepage at 1.80m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES: B = Bulk; D = Tub; W = Water; ES = Amber Glass Jar; CBR = CBR Test; SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2): V=Hand Vane; P=Hand Penetrometer

GROUNDWATER: ▽ Entry; ▼ Standing Level

Ease of Dig: E = Easy; M = Moderate; H = Hard; VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP103
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.50	0.65	-	3.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Grass over soft light brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to medium occasionally coarse quartzite. Frequent small roots. (TOPSOIL)		0.25	
							Firm orange-brown mottled orange slightly sandy slightly gravelly CLAY. Gravel is fine to coarse subangular quartzite and mudstone. Frequent small roots. (GLACIAL DEPOSITS)		0.50	
1.00	V B, D	180	0.00	20/50	22.0		Stiff occasionally hard closely fissured light brown mottled blue-grey silty slightly gravelly silty CLAY. Gravel is fine to coarse subrounded to angular quartzite and mudstone. Occasional small roots. (GLACIAL DEPOSITS)			
1.50	V	160								
1.60	D								1.55	
1.80	B, D						Firm to stiff thinly to thickly laminated brown and light blue-grey silty CLAY with fine to medium sand and silt between laminations. (GLACIAL DEPOSITS)			
2.00	V	210	0.10							
2.50	V	210								
2.70	D									
			0.00				End of Trial Pit at 3.00 m		3.00	

GROUNDWATER DETAILS:
Slight seepage below 1.90m bgl and 3.00m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP104
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.20	0.65	-	2.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Soft brown sandy SILT with much organic material including wood, leaves, roots.		0.20	
							Soft dark brown slightly sandy fibrous PEAT. Organic material including wood, roots.			
0.60	D									
							Soft light grey-brown sandy SILT with occasional roots and soft wood fragments.		0.80	
			0.00			E				
							Light grey-brown very silty fine SAND with occasional pockets of soft brown fibrous peat.		1.20	
							Firm light-grey sandy SILT with occasional soft roots. (GLACIAL DEPOSITS)		1.90	
			0.10			E				
						M	Stiff thinly to thickly laminated brown and light-grey silty CLAY with silt and fine sand between laminations. (GLACIAL DEPOSITS)		2.30	
							End of Trial Pit at 2.50 m		2.50	

GROUNDWATER DETAILS:
Inflow at 0.80m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES	B = Bulk	ES = Amber Glass Jar
	D = Tub	CBR = CBR Test
	W = Water	SPT = Insitu Penetration Test
SHEAR STRENGTH (kN/m2)	V=Hand Vane	P=Hand Penetrometer
GROUNDWATER	▽ Entry	
	▼ Standing Level	
Ease of Dig	E = Easy	M = Moderate
	H = Hard	VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP105
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.10	0.65	-	1.90	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Soft brown sandy SILT with organic material including wood, leaves and roots.			
							Soft black-dark brown silty fibrous PEAT.		0.25	
							Orange-brown clayey gravelly fine to medium SAND with pockets of soft to firm sandy clay and frequent roots and wood fragments.		0.60	
			0.00							
1.70	V	120					Stiff closely fissured brown mottled grey silty CLAY. (GLACIAL DEPOSITS)		1.60	
1.90	V	200	0.00				End of Trial Pit at 1.90 m		1.90	

GROUNDWATER DETAILS:
Heavy inflow at 0.60m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP106
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.40	0.65	-	2.30	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Firm brown sandy slightly gravelly SILT. Gravel is fine to coarse subrounded to subangular quartzite. Occasional roots. (TOPSOIL)		0.30	
							Firm orange-brown mottled orange sandy slighlty gravelly CLAY. Gravel is fine to coarse subrounded quartzite. (GLACIAL DEPOSITS)			
0.90	D		0.00				Orange-brown occasionally red-brown very gravelly SAND with occasional pockets of sandy gravelly clay. (GLACIAL DEPOSITS)		0.80	
1.60	V	100					Firm to stiff closely fissured brown mottled grey silty CLAY with silt and fine sand between fissures. (GLACIAL DEPOSITS)		1.50	
1.70	D									
2.10	V	160	0.00				End of Trial Pit at 2.30 m		2.30	

GROUNDWATER DETAILS:
Inflow with running sand at 1.40m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES	B = Bulk	ES = Amber Glass Jar
	D = Tub	CBR = CBR Test
	W = Water	SPT = Insitu Penetration Test
SHEAR STRENGTH (kN/m2)	V=Hand Vane	P=Hand Penetrometer
GROUNDWATER	▽ Entry	
	▼ Standing Level	
Ease of Dig	E = Easy	M = Moderate
	H = Hard	VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP107
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.30	0.65	-	2.40	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Firm brown sandy slightly gravelly SILT. Gravel is fine to coarse subrounded quartzite. Occasional small to medium roots. (TOPSOIL)		0.30	
0.60	V	80				E	Firm closely fissured orange-brown mottled grey silty CLAY. Occasional small roots. (GLACIAL DEPOSITS)		0.75	
						E-M	Brown grey very gravelly fine to medium SAND with occasional pockets of sandy slighlty gravelly clay. Gravel is fine to coarse subrounded quartzite. (GLACIAL DEPOSITS)		1.30	
						M	Firm grey-brown sandy SILT with occasional soft wood fragments and medium roots. (GLACIAL DEPOSITS)		1.80	
2.00	V	120					Firm to stiff thinly to thickly laminated brown and grey silty CLAY with occasional soft wood and roots and fine sand and silt between laminations. (GLACIAL DEPOSITS)			
2.40	V	120					End of Trial Pit at 2.40 m		2.40	

GROUNDWATER DETAILS:
Seepage at 1.30m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
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Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP108
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	23/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
-	-	-	1.00	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	SOIL SAMPLES/TESTS Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Water over brown slightly gravelly sandy fiberous PEAT. Gravel is fine to medium subrounded quartzite.			
									0.30	
						E	Soft light grey-brown fibrous silty CLAY with frequent soft wood, roots and organic debris.			
							End of Trial Pit at 1.00 m		1.00	

GROUNDWATER DETAILS:
Flooded above ground level.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry ▼ Standing Level

Ease of Dig E = Easy M = Moderate H = Hard VH = Very Hard

APPLiED GEOLOGY
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Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP109
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	24/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.40	0.65	-	2.90	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
						E	Soft brown fiberous sandy SILT with frequent organic material.			
							Soft dark brown-black silty fiberous PEAT. Organic material includes wood, leaves, roots. Occasional bands of blue-grey sandy silt.		0.25	
			0.10			E				
							Very soft brown-grey slightly sandy SILT with occasional bands of brown silty fine sand and frequent soft wood, roots and organic material.		1.70	
						E	Below 2.20m bgl: Becoming firm.			
							Firm to stiff closely fissured brown occasional orange-brown mottled grey silty CLAY with occasional root traces and bands of silty fine to medium sand. (GLACIAL DEPOSITS)		2.50	
							End of Trial Pit at 2.90 m		2.90	

GROUNDWATER DETAILS:
Seepage at 1.40m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15	Site: Abenbury Way, Wrexham		Trial Pit Log
	Client: ERM		TP110
	Engineer:		Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	24/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
-	-	-	1.90	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
			0.00				Very soft dark-brown silty fibrous PEAT with soft wood, roots, leaves.			
							Very soft light grey-brown slightly sandy slightly gravelly SILT. Gravel is fine to coarse subrounded quartzite. Frequent soft wood, roots.		1.10	
							Firm to stiff closely fissured gravelly slightly sandy CLAY. Gravel is fine to coarse subrounded quartzite. Occasionally gravelly sand bands and occasional roots. (GLACIAL DEPOSITS)		1.70	
							End of Trial Pit at 1.90 m		1.90	

GROUNDWATER DETAILS:
Groundwater not encountered.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES	B = Bulk	ES = Amber Glass Jar
	D = Tub	CBR = CBR Test
	W = Water	SPT = Insitu Penetration Test
SHEAR STRENGTH (kN/m2)	V=Hand Vane	P=Hand Penetrometer
GROUNDWATER	▽ Entry	
	▼ Standing Level	
Ease of Dig	E = Easy	M = Moderate
	H = Hard	VH = Very Hard

APPLiED GEOLOGY
Tel: 02476511822
Fax: 02476697682

Job No. AG2200-15

Site: Abenbury Way, Wrexham
Client: ERM
Engineer:

Trial Pit Log
TP111
Sheet 1 of 1

Method	Date	Logged By	Checked By	Scale
5 Tonne mini excavator	24/03/2015	AS	AP	1:25

Length (m)	Breadth (m)	Orientation	Depth (m)	Ground Level	Co-ordinates	Ground Slope
2.30	0.65	-	1.50	-	-	

Depth (m)	SOIL SAMPLES/TESTS Type	Strength	PID (ppm)	PL/LL %	M/C %	Ease of Dig	Description of Strata	O.D Level	Depth (m)	Legend
							Very soft slightly sandy fiberous PEAT. Organic material includes soft wood, roots, leaves.			
			0.00				Soft light brown-grey slightly gravelly SILT. Gravel is fine to medium subrounded quartzite. Frequent roots, soft wood organic material and pockets of peat.		0.80	
							Firm closely fissured grey-brown mottled grey gravelly CLAY with bands of gravelly fine to medium sand. Gravel is fine to coarse subrounded quartzite. (GLACIAL DEPOSITS)		1.20	
							End of Trial Pit at 1.50 m		1.50	

GROUNDWATER DETAILS:
Heavy seepages at 0.80m bgl.

STABILITY OF PIT WALLS:
Stable.

GENERAL REMARKS:
Trial pit backfilled with arisings on completion.

KEY

SAMPLES B = Bulk, D = Tub, W = Water, ES = Amber Glass Jar, CBR = CBR Test, SPT = Insitu Penetration Test

SHEAR STRENGTH (kN/m2) V=Hand Vane P=Hand Penetrometer

GROUNDWATER ▽ Entry, ▼ Standing Level

Ease of Dig E = Easy, M = Moderate, H = Hard, VH = Very Hard

APPENDIX D

TERRA TEK SITE INVESTIGATION & LABORATORY SERVICES 20 YEARS

Applied Geology Ltd
Unit 23 Abbey Park
Stareton
Kenilworth
Warwickshire
CV8 2LY
For the attention of Gabby Manning

Report No: B19042
Issue No 01

LABORATORY TEST REPORT

Project Name	**ABENBURY WAY, WREXHAM**		
Project Number	**B19042**	Date samples received	17/03/2015
Your Ref	AG2200-15	Date written instructions received	17/03/2015
Purchase Order	7727	Date testing commenced	17/03/2015

Please find enclosed the results as summarised below

Figure / Table	Test Quantity	Description	ISO 17025 Accredited
1	~	Summary of Geotechnical Tests	See table
2	9	BRE Suite - Soil	Yes
3-17	15	Plastcity Index	Yes
18-22	5	Particle Size Distribution	Yes
23-35	13	Unconsolidated Undrained Single Stage Triaxial Compression	Yes
App X	~	Sample Descriptions - Soil	N/A
App Y	~	Summary of In-House Analytical Test Methods - Soil	N/A

Remarks :

Issued by : Stephen Langman Date of Issue : 08/04/2015

Approved Signatories : 08/04/2015

G Wilson (JMD/Laboratories Director), S Langman (Laboratory Coordinator)

Key to symbols used in this report
S/C : Testing was sub-contracted

Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
The results reported relate to samples received in the laboratory only.
All results contained in this report are provisional unless signed by an approved signatory
This report should not be reproduced except in full without the written approval of the laboratory.
Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory.
The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw
our report if we have not received cleared funds in accordance with our standard terms and conditions
Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation.
Feedback on the this report may be left via our website www.terratek.co.uk/contact-us

mCERTS UKAS TESTING 0126 25 YEARS 1990-2015

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Terra Tek Ltd is registered in Scotland No. 121594
Offices in Airdrie, Birmingham, Belfast and Chesham
Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH01	1.20-1.65		U	272134	Firm red/ brown CLAY.	23	48	19	29	0	CI		2.04	1.66	95			
BH01	1.70		T	271988	Brown CLAY with occasional gravel. Gravel is fine.	24												BRE SD1 Suite
BH01	2.00-2.45		T	271989	Brown slightly sandy CLAY.	21	47	19	28	0	CI							
BH01	2.80		T	271990	Brown slightly sandy CLAY.	22	40	18	22	0	CI							
BH01	3.50		T	271991	Brown slurry of SAND													BRE SD1 Suite
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH01	4.00-4.45		B	271982	Brown very sandy SILT.													PSD
BH01	5.00-5.45		U	272135	Stiff to firm brown CLAY.	26	49	20	29	0	CI		2.05	1.63	62			
BH01	5.50		T	271993	Brown CLAY													BRE SD1 Suite
BH01	8.00-8.45		U	272136	Firm brown slightly sandy CLAY.	20							2.08	1.73	61			
BH01	11.00-11.45		U	272137	Firm brown slightly sandy CLAY.	24	37	17	20	0	CI		2.05	1.65	74			
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH01	14.00-14.45		U	272138	Firm to stiff brown slightly sandy CLAY.	21							2.13	1.76	69			
BH01	16.00-16.45		B	271983	Brown silty SAND.													PSD
BH02	2.00-2.45		U	272139	Very stiff brown CLAY.	24							2.07	1.67	138			
BH02	4.50		T	271994	Brown CLAY													BRE SD1 Suite
BH02	5.00-5.45		B	271984	Brown very sandy SILT.													PSD
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	See individual report sheets

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress				
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH02	6.50-6.95		U	272140	Firm brown slightly sandy, silty laminated CLAY.	27							2.04	1.61	42			
BH02	9.00		T	271995	Brown CLAY													BRE SD1 Suite
BH02	9.50-9.95		U	272141	Firm red/ brown CLAY.	26	46	19	27	0	CI		2.00	1.59	78			
BH02	12.50-12.95		U	272142	Firm brown slightly sandy CLAY.	22							1.96	1.61	72			
BH04	1.20-1.65		U	272143	Stiff light brown CLAY.	18							2.07	1.75	166			
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet													See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y		

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH04	1.50		T	271996	Brown CLAY.	22	56	19	37	0	CH							
BH04	1.70		T	271997	Brown silty CLAY.	24												BRE SD1 Suite
BH04	2.00-2.45		T	271998	Brown CLAY.	23	53	20	33	0	CH							
BH04	2.80		T	271999	Brown CLAY.	26	54	22	32	0	CH							
BH04	3.80		T	272000	Brown CLAY													BRE SD1 Suite
Notes: Opinions and interpretations are outside the scope of UKAS accreditation					UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH04	4.00-4.45		B	271985	Brown very silty SAND.													PSD
BH04	5.00-5.45		U	272144	Firm brown CLAY.	28	49	20	29	0	CI		2.03	1.59	48			
BH04	8.00-8.45		U	272145	Firm to stiff brown CLAY with occasional gravel. Gravel is fine to medium.	27	49	20	29	4	CI		2.02	1.59	77			
BH04	11.00-11.45		U	272146	Soft brown very silty CLAY.	25							2.02	1.62	50			
BH04	11.50		T	272002	Brown CLAY													BRE SD1 Suite
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH06	1.50		T	272003	Brown slightly sandy CLAY.	29	50	21	29	0	CI							
BH06	2.00		T	272004	Brown CLAY.	24	49	18	31	0	CI							
BH06	2.80		T	272005	Brown slightly sandy CLAY.	25	43	19	24	0	CI							
BH06	4.00		T	272006	Brown silty, slightly sandy CLAY.	21	25	11	14	0	CL							
BH06	5.00		T	272007	Brown CLAY with occasional gravel. Gravel is fine.	21												BRE SD1 Suite
Notes: Opinions and interpretations are outside the scope of UKAS accreditation					UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet: Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	See individual report sheets

Originator: SPL

Approved: S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi	
						%	%	%		%		Mg/m³	Mg/m³	Mg/m³	kPa	kPa		
TP03	2.60-2.80		B	271986	Brown very silty SAND.													PSD
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 08/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No AG2200-15

Sample Identification				Lab Sample ID	Sulphate (water soluble in 2:1 extract) as SO4 g/l	pH
Hole	Depth m	Sample Ref	Sample Type			
BH01	1.70		T	271988	0.04	7.5
BH01	3.50		T	271991	0.08	7.7
BH01	5.50		T	271993	0.03	7.5
BH02	4.50		T	271994	0.08	7.7
BH02	9.00		T	271995	0.04	7.8
BH04	1.70		T	271997	0.02	7.9
BH04	3.80		T	272000	0.04	8.2
BH04	11.50		T	272002	0.06	7.9
BH06	5.00		T	272007	0.06	8.1
Limits of Detection					0.01	0.1
Terra Tek Analysis Method					TP043 M	TP019 M
Accreditation M=Mcerts U=UKAS N=No accreditation						

Originator	Checked & Approved
SPL	08/04/2015

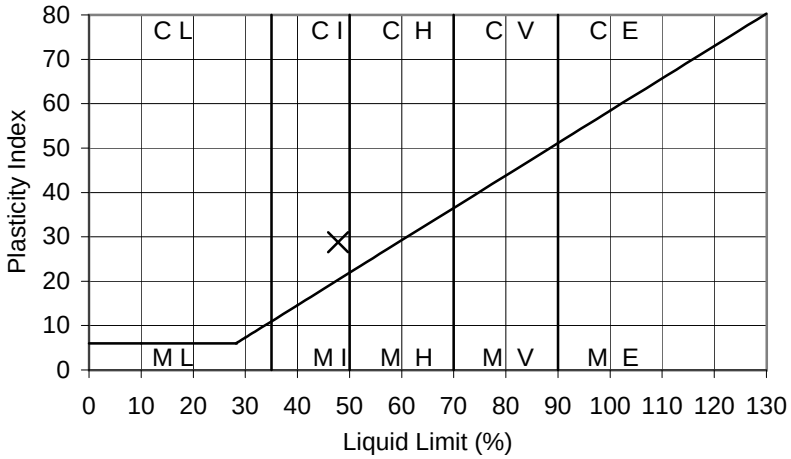
BRE SD1 SUITE - SOIL

Figure 2

Sheet 1 of 1

Non Engineering Description : Red/ brown CLAY

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	24	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	48	%
Plastic Limit :	19	%
Plasticity Index :	29	
Equivalent moisture content of material passing 425µm sieve :	24	%
Liquidity Index :	0.17	

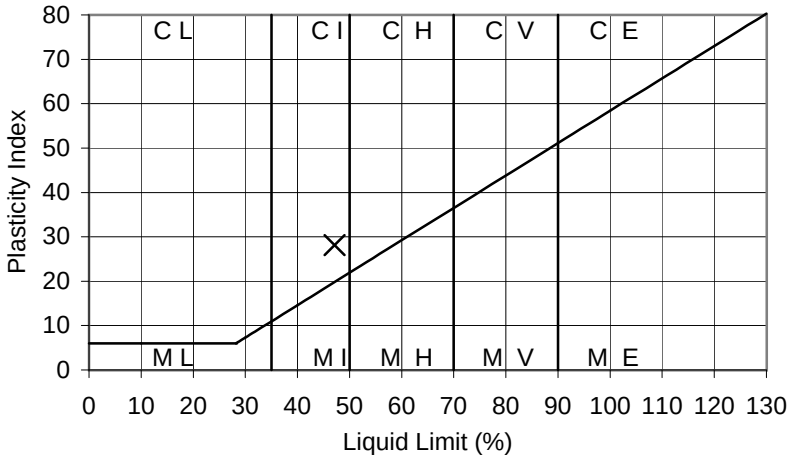
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**	**Figure 3**
CR	08/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	Sheet 1 of 1

Version 051 - 08/11/2013
1220 - LLPL BH01 01.20 U - B19042-272134.xls : Sample ID 272134
Moor Lane, Witton, Birmingham, B6 7HG
Lab Project No B19042 : 08/04/2015 15:29:32

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH01
	Engineer		Sample Ref	
			Depth (m)	2.00-2.45
			Sample Type	T

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



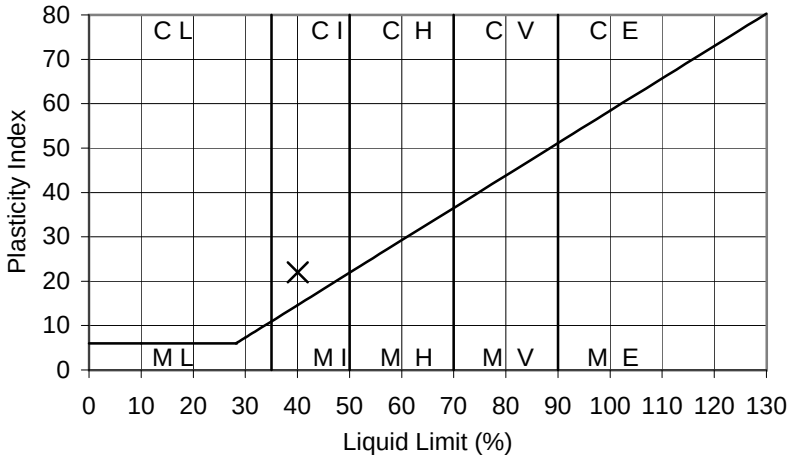
Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	21	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	47	%
Plastic Limit :	19	%
Plasticity Index :	28	
Equivalent moisture content of material passing 425µm sieve :	21	%
Liquidity Index :	0.07	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 4**
CR	S Langman 08/04/2015		Sheet 1 of 1

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



Results :

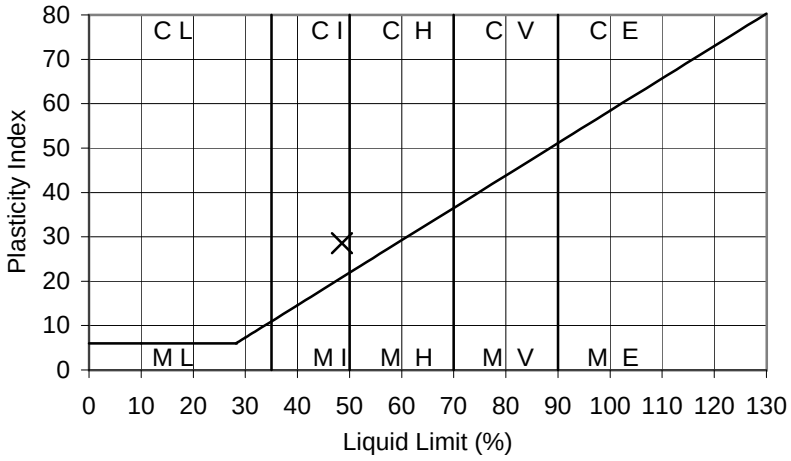
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	22	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	40	%
Plastic Limit :	18	%
Plasticity Index :	22	
Equivalent moisture content of material passing 425µm sieve :	22	%
Liquidity Index :	0.18	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**	**Figure 5**
CR	08/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	Sheet 1 of 1

Version 051 - 08/11/2013
1220 - LLPL BH01 02.80 T - B19042-271990.xls : Sample ID 271990
Moor Lane, Witton, Birmingham, B6 7HG
Lab Project No B19042 : 08/04/2015 15:29:45

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	26	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	49	%
Plastic Limit :	20	%
Plasticity Index :	29	
Equivalent moisture content of material passing 425µm sieve :	26	%
Liquidity Index :	0.21	

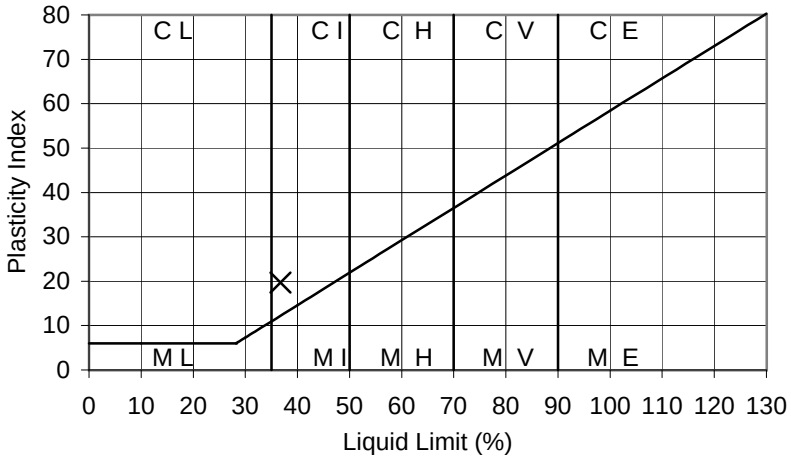
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 6**
CR	08/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

Version 051 - 08/11/2013
1220 - LLPL BH01 05.00 U - B19042-272135.xls : Sample ID 272135
Moor Lane, Witton, Birmingham, B6 7HG
Lab Project No B19042 : 08/04/2015 15:29:52

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH01
	Engineer		Sample Ref	
			Depth (m)	11.00-11.45
			Sample Type	U

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



Results :

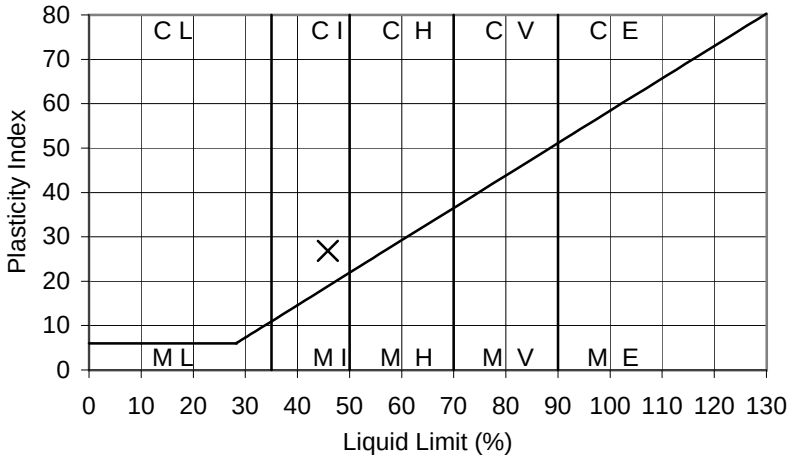
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	25	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	37	%
Plastic Limit :	17	%
Plasticity Index :	20	
Equivalent moisture content of material passing 425µm sieve :	25	%
Liquidity Index :	0.40	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 7**
CR	08/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH02
	Engineer		Sample Ref	
			Depth (m)	9.50-9.95
			Sample Type	U

Non Engineering Description : Red/ brown CLAY.

Preparation : Sample as received



Results :

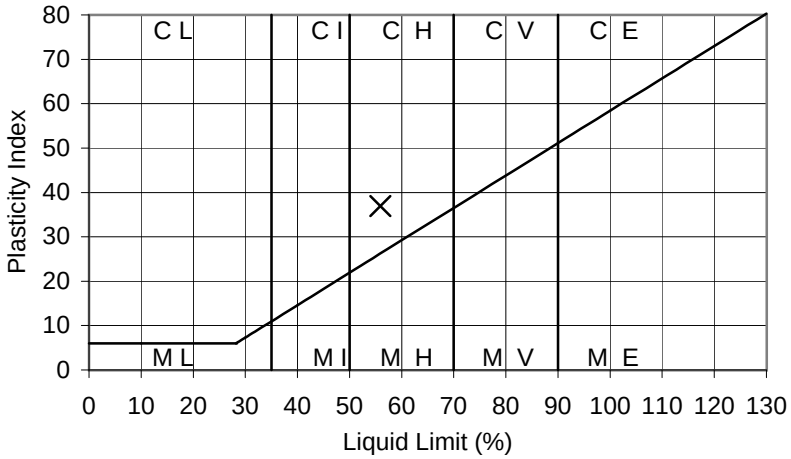
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	26	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	46	%
Plastic Limit :	19	%
Plasticity Index :	27	
Equivalent moisture content of material passing 425µm sieve :	26	%
Liquidity Index :	0.26	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 8**
CR	S Langman 08/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH04
	Engineer		Sample Ref	
			Depth (m)	1.50
			Sample Type	T

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	22	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	56	%
Plastic Limit :	19	%
Plasticity Index :	37	
Equivalent moisture content of material passing 425µm sieve :	22	%
Liquidity Index :	0.08	

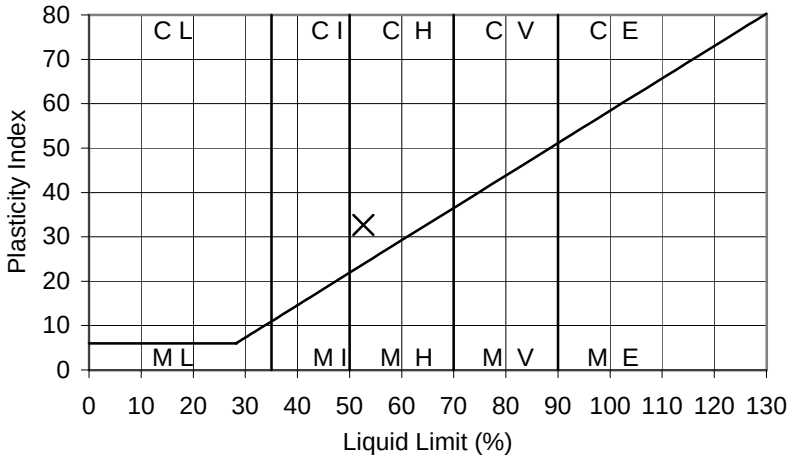
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 9**
CR	08/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
Client	Applied Geology Ltd	Hole ID	BH04
Engineer		Sample Ref	
		Depth (m)	2.00-2.45
		Sample Type	T

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



Results :

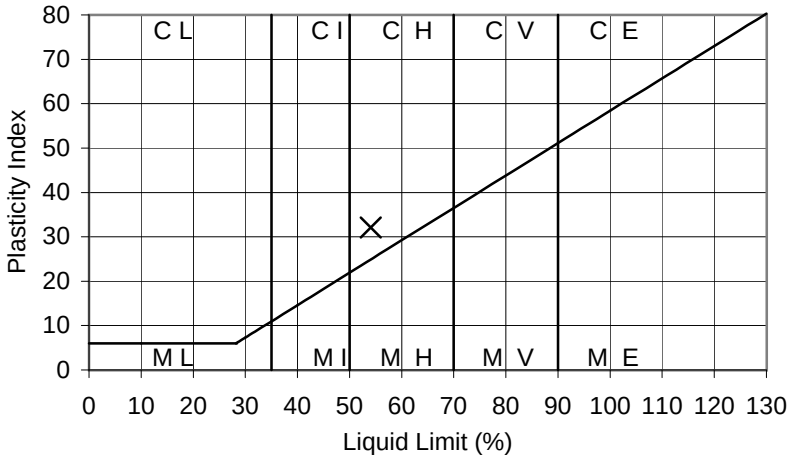
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	23	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	53	%
Plastic Limit :	20	%
Plasticity Index :	33	
Equivalent moisture content of material passing 425µm sieve :	23	%
Liquidity Index :	0.09	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 10**
CR	08/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH04
	Engineer		Sample Ref	
			Depth (m)	2.80
			Sample Type	T

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



Results :

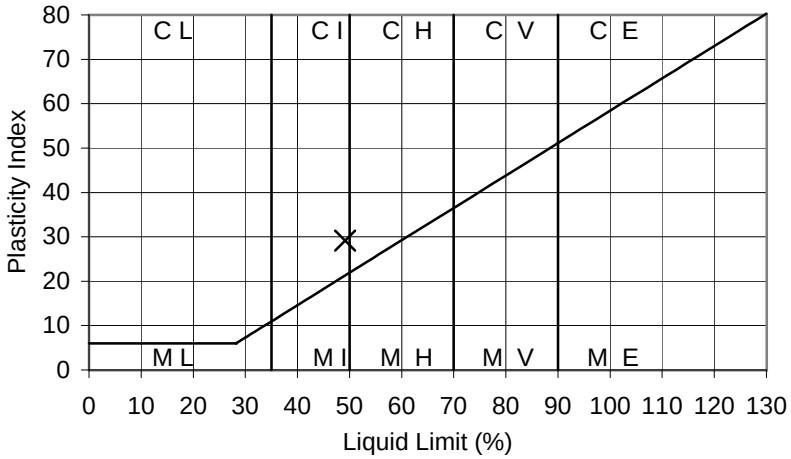
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	26	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	54	%
Plastic Limit :	22	%
Plasticity Index :	32	
Equivalent moisture content of material passing 425µm sieve :	26	%
Liquidity Index :	0.13	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 11**
CR	S Langman 08/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH04
	Engineer		Sample Ref	
			Depth (m)	5.00-5.45
			Sample Type	U

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



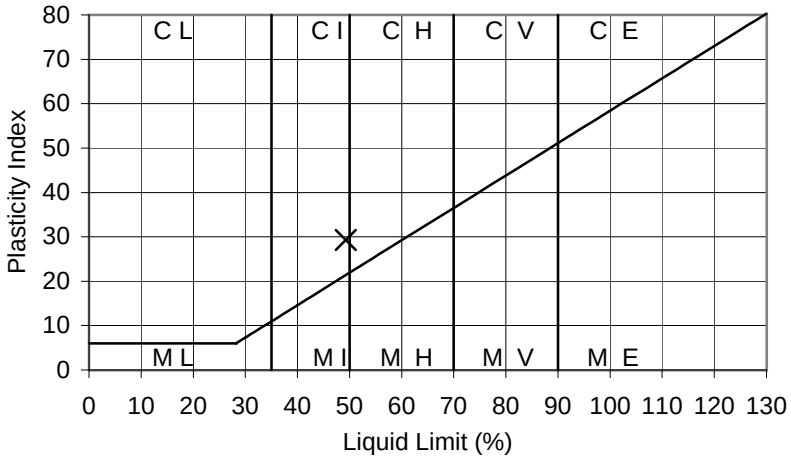
Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	27	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	49	%
Plastic Limit :	20	%
Plasticity Index :	29	
Equivalent moisture content of material passing 425µm sieve :	27	%
Liquidity Index :	0.24	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 12**
CR	08/04/2015		Sheet 1 of 1

Non Engineering Description : Brown CLAY with occasional gravel. Gravel is fine to medium.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	27	%
Percentage retained on 425µm sieve :	4	%
Liquid Limit :	49	%
Plastic Limit :	20	%
Plasticity Index :	29	
Equivalent moisture content of material passing 425µm sieve :	28	%
Liquidity Index :	0.28	

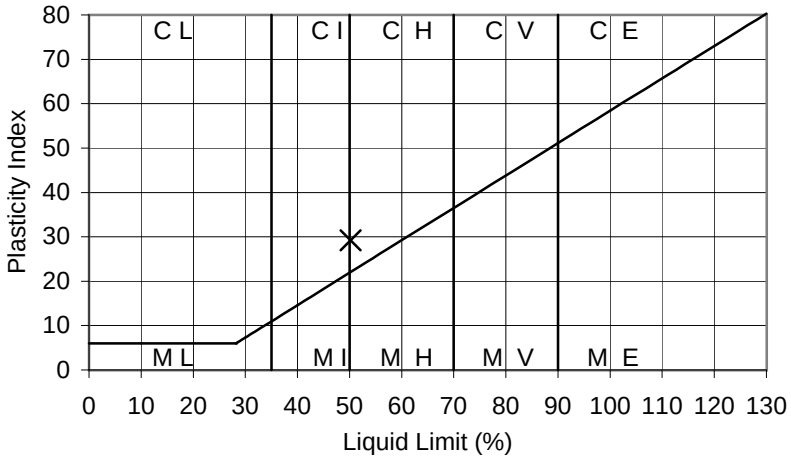
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 13**
CR	08/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

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1220 - LLPL BH04 08.00 U - B19042-272145.xls : Sample ID 272145
Moor Lane, Witton, Birmingham, B6 7HG
Lab Project No B19042 : 08/04/2015 15:30:40

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH06
	Engineer		Sample Ref	
			Depth (m)	1.50
			Sample Type	T

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



Results :

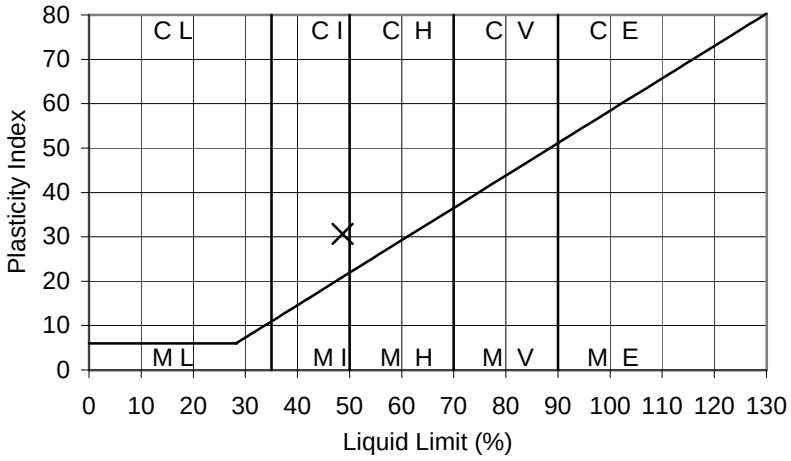
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	29	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	50	%
Plastic Limit :	21	%
Plasticity Index :	29	
Equivalent moisture content of material passing 425µm sieve :	29	%
Liquidity Index :	0.28	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 14**
CR	S. Langman 08/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH06
	Engineer		Sample Ref	
			Depth (m)	2.00
			Sample Type	T

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



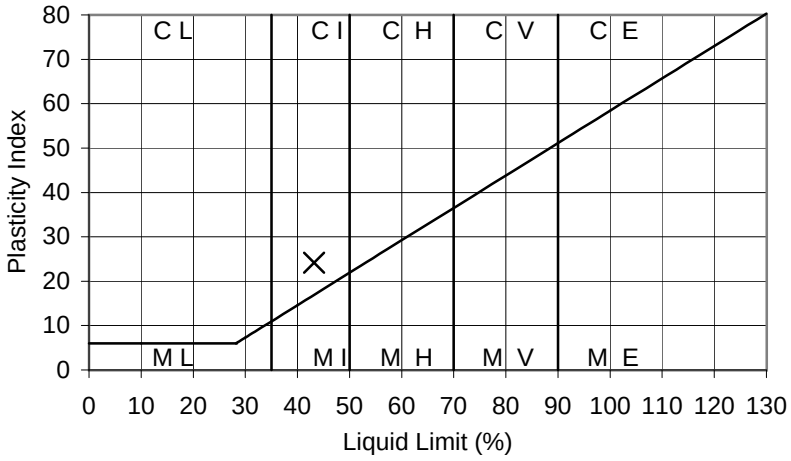
Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	24	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	49	%
Plastic Limit :	18	%
Plasticity Index :	31	
Equivalent moisture content of material passing 425µm sieve :	24	%
Liquidity Index :	0.19	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 15**
CR	08/04/2015		Sheet 1 of 1

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	25	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	43	%
Plastic Limit :	19	%
Plasticity Index :	24	
Equivalent moisture content of material passing 425µm sieve :	25	%
Liquidity Index :	0.25	

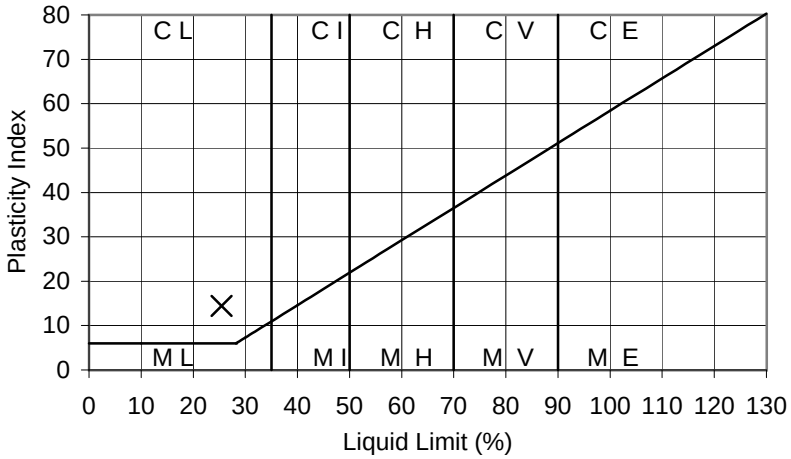
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**	**Figure 16**
CR	08/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	Sheet 1 of 1

Version 051 - 08/11/2013
1220 - LLPL BH06 02.80 T - B19042-272005.xls : Sample ID 272005
Moor Lane, Witton, Birmingham, B6 7HG
Lab Project No B19042 : 08/04/2015 15:30:58

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
	Client	Applied Geology Ltd	Hole ID	BH06
	Engineer		Sample Ref	
			Depth (m)	4.00
			Sample Type	T

Non Engineering Description : Brown silty, slightly sandy CLAY.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	21	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	25	%
Plastic Limit :	11	%
Plasticity Index :	14	
Equivalent moisture content of material passing 425µm sieve :	21	%
Liquidity Index :	0.71	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 17**
CR	S Langman 08/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH01
Engineer		Sample Ref	
		Depth (m)	4.00-4.45
		Sample Type	B

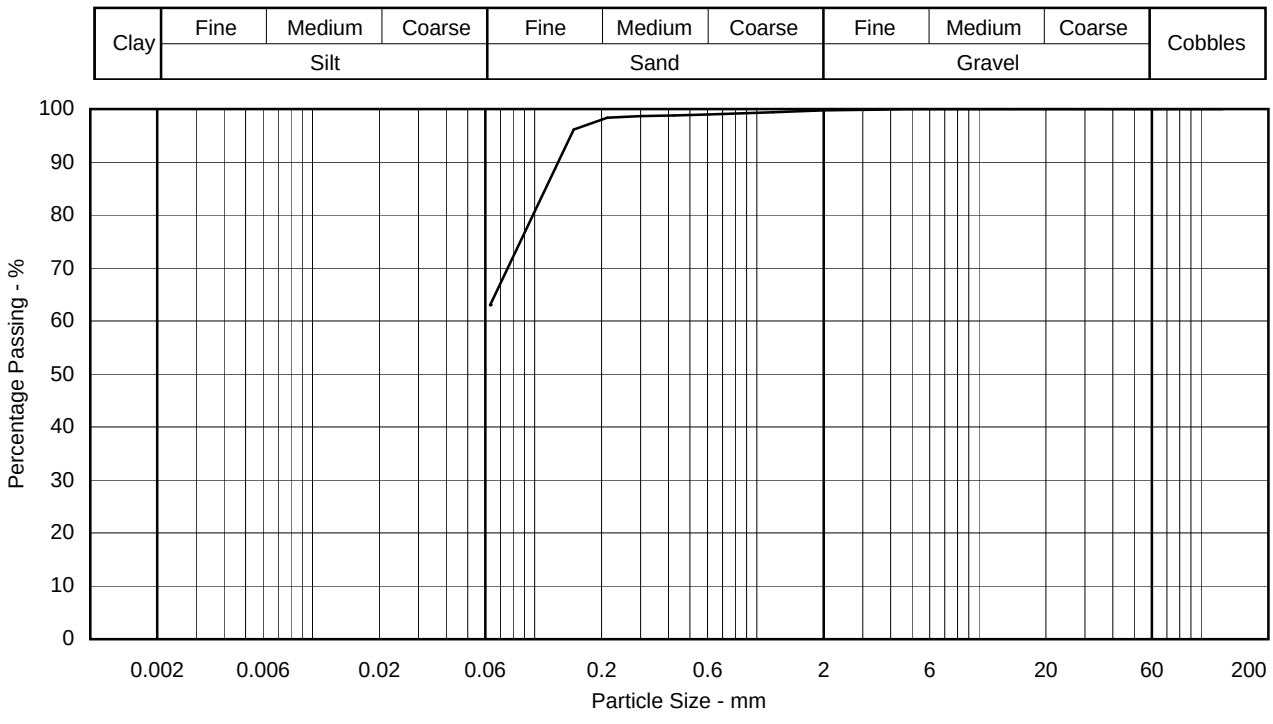
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	99
600 µm	99
425 µm	99
300 µm	99
212 µm	98
150 µm	96
63 µm	63

Non Engineering Description
Brown very sandy SILT.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.3
Sand	36.7
Silt & Clay	63.0

Particle Diameter - mm	
D100	5.0
D60	
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	08/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 18

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH01
Engineer		Sample Ref	
		Depth (m)	16.00-16.45
		Sample Type	B

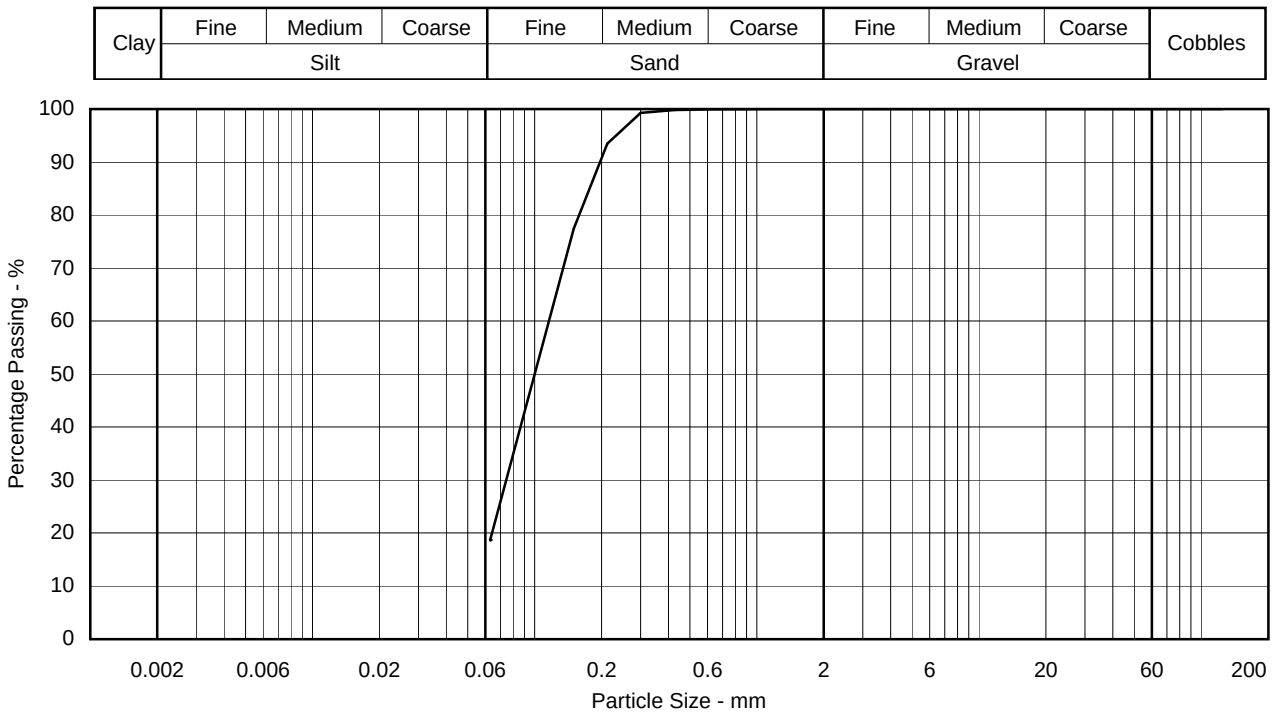
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	99
212 µm	93
150 µm	77
63 µm	19

Non Engineering Description
Brown silty SAND.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.0
Sand	81.3
Silt & Clay	18.7

Particle Diameter - mm	
D100	1.2
D60	0.12
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	08/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 19

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH02
Engineer		Sample Ref	
		Depth (m)	5.00-5.45
		Sample Type	B

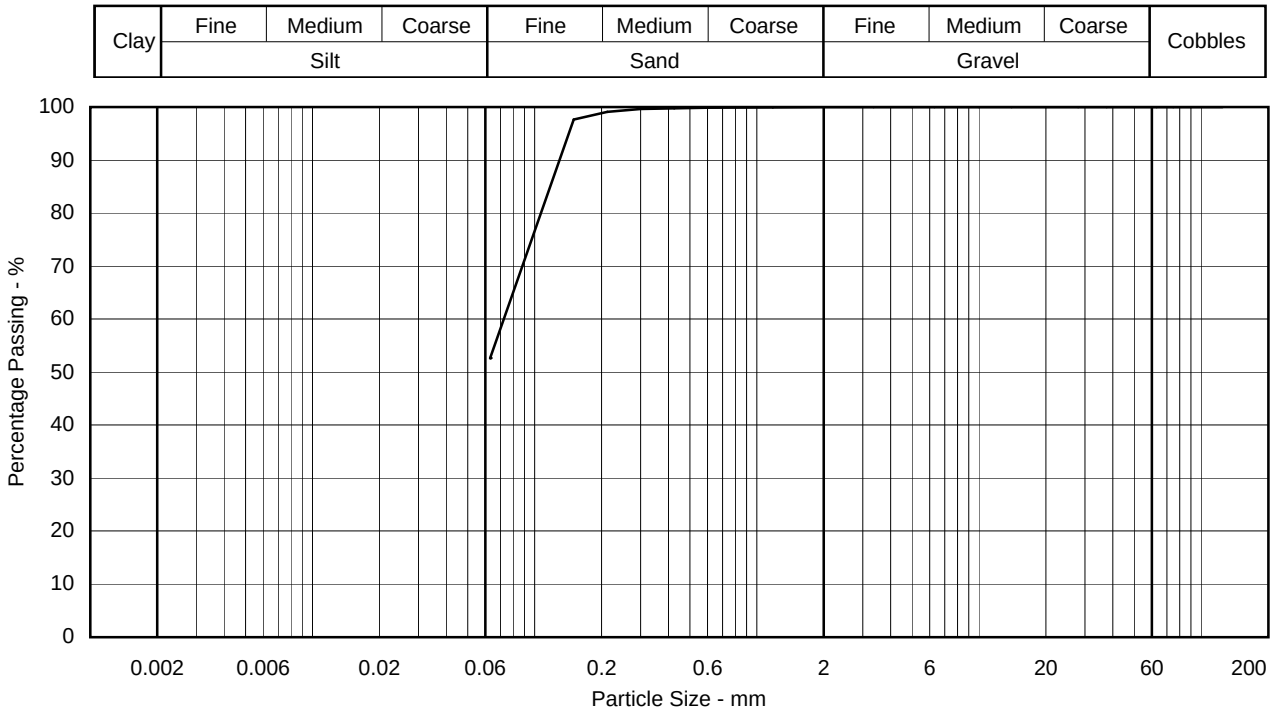
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	100
212 µm	99
150 µm	98
63 µm	53

Non Engineering Description
Brown very sandy SILT.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.0
Sand	47.3
Silt & Clay	52.7

Particle Diameter - mm	
D100	2.0
D60	0.073
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	08/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 20

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH04
Engineer		Sample Ref	
		Depth (m)	4.00-4.45
		Sample Type	B

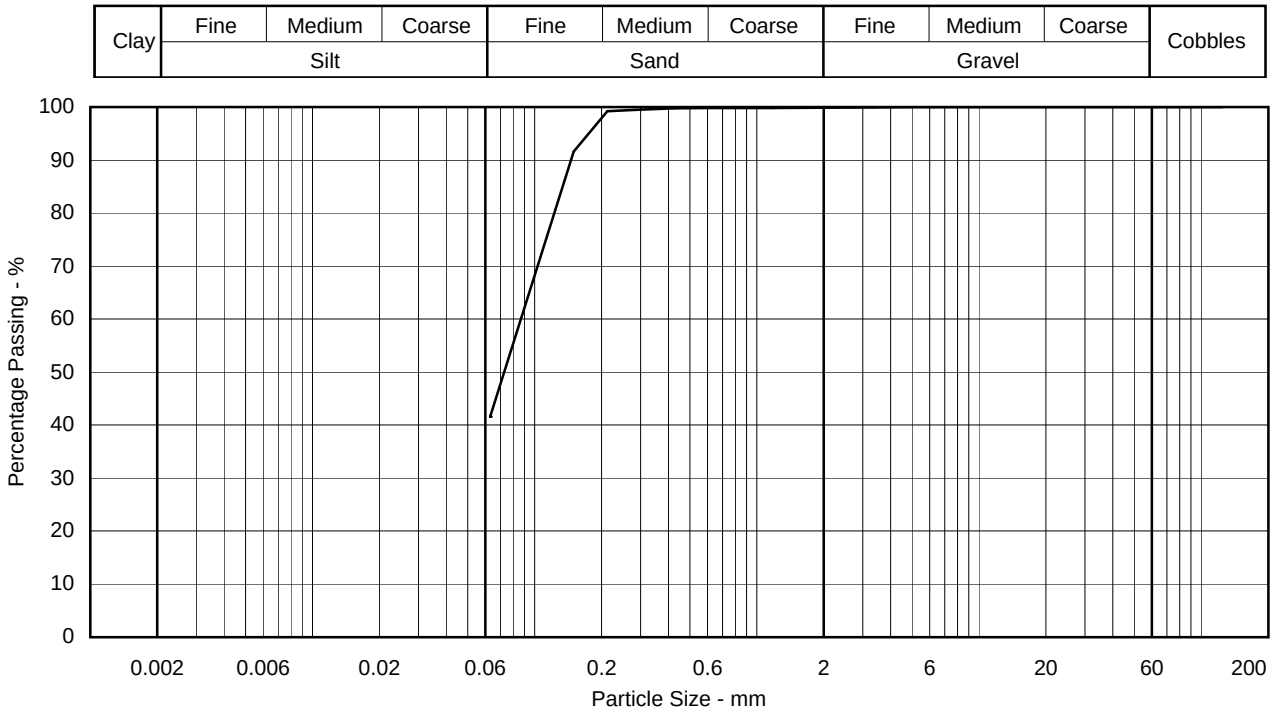
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	100
300 µm	100
212 µm	99
150 µm	92
63 µm	42

Non Engineering Description
Brown very silty SAND.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.1
Sand	58.3
Silt & Clay	41.6

Particle Diameter - mm	
D100	5.0
D60	0.087
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	08/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 21

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	TP03
Engineer		Sample Ref	
		Depth (m)	2.60-2.80
		Sample Type	B

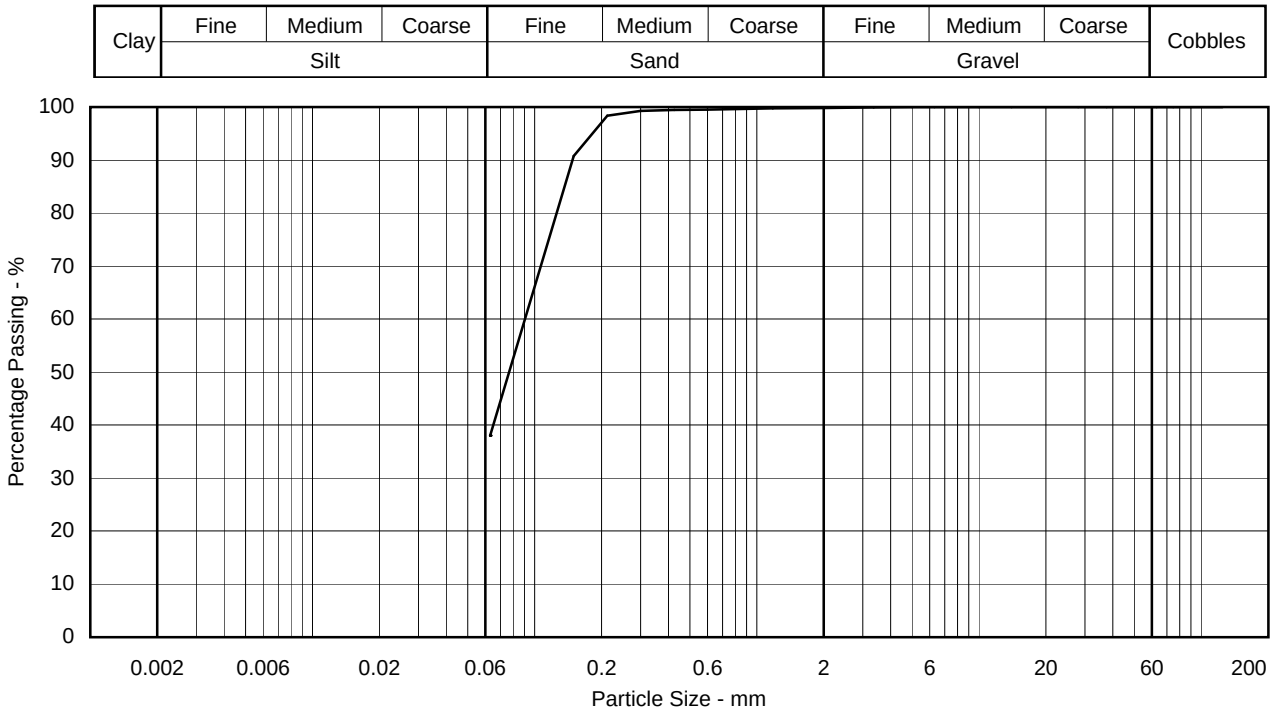
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	99
212 µm	98
150 µm	91
63 µm	38

Non Engineering Description
Brown very silty SAND.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.2
Sand	61.8
Silt & Clay	38.0

Particle Diameter - mm	
D100	5.0
D60	0.090
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	08/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 22

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

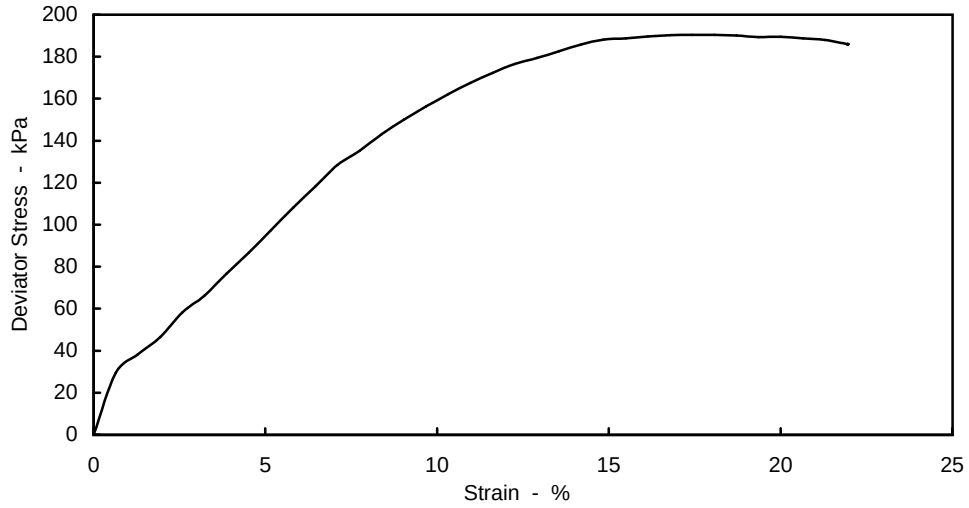
Contract No. AG2200-15

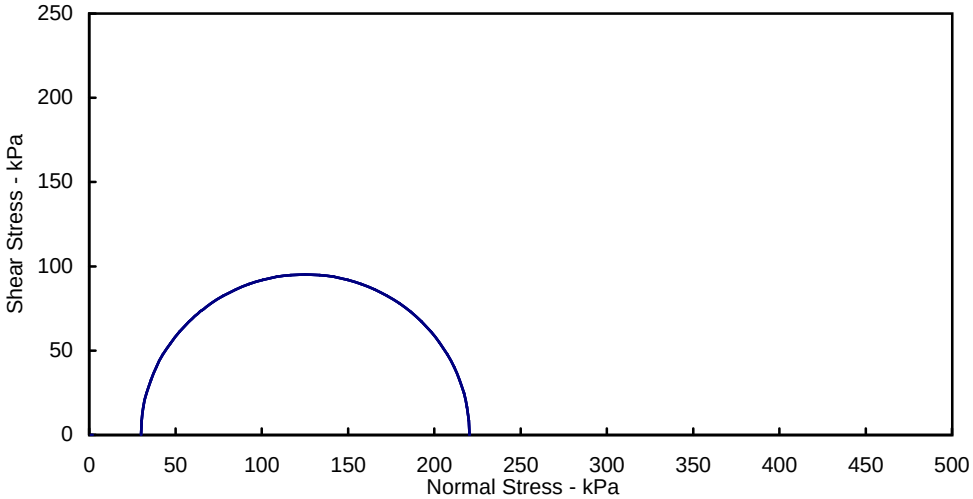
Hole BH01
Sample Ref
Depth (m) 1.20-1.65
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	155.0		
Diameter	mm	104.0		
Moisture Content	%	23		
Bulk Density	Mg/m³	2.04		
Dry Density	Mg/m³	1.66		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.68		
Rate of Axial Displacement	%/min	2.58		
Cell Pressure	kPa	30		
Strain at Failure	%	18.1		
Maximum Deviator Stress	kPa	190		
Shear Strength	kPa	95		
Mode of Failure		Compound		
Non Engineering Description		Firm red/ brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

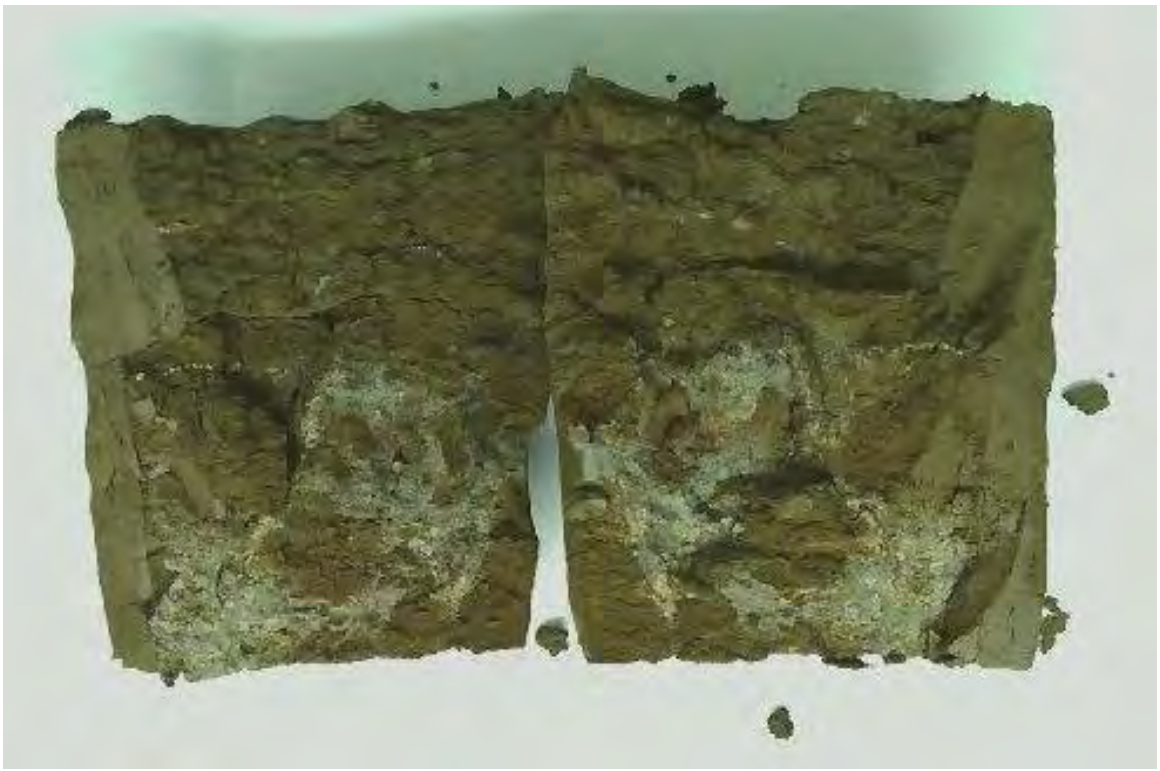
UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

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Figure 23

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH01
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	1.20-1.65
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 23
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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

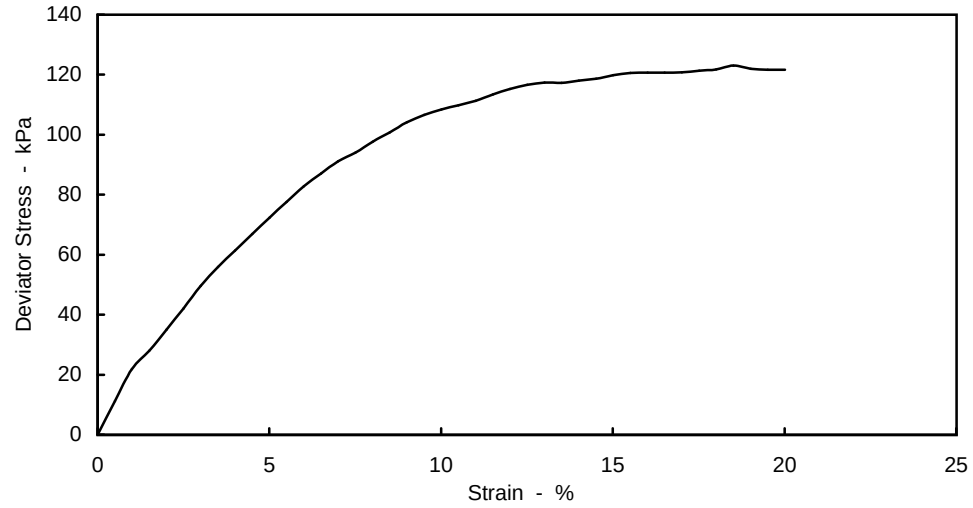
Contract No. AG2200-15

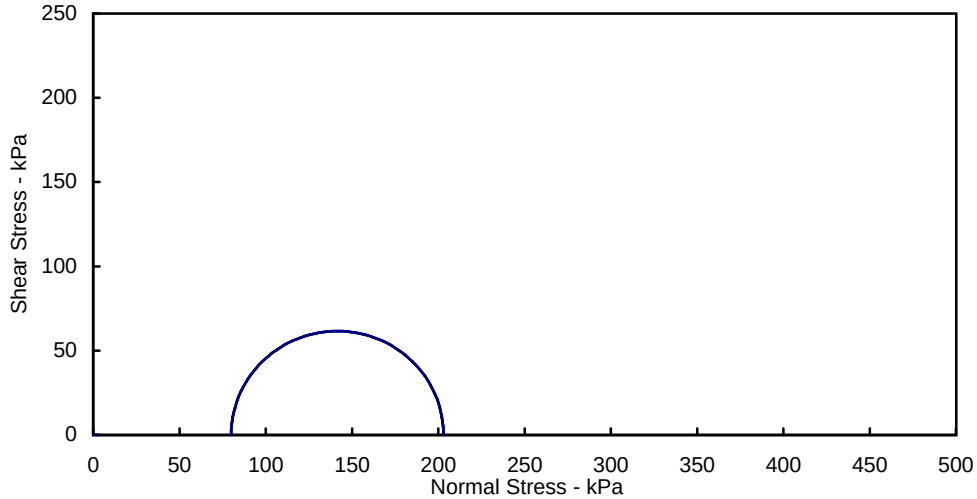
Hole BH01
Sample Ref
Depth (m) 5.00-5.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.9		
Diameter	mm	103.3		
Moisture Content	%	26		
Bulk Density	Mg/m³	2.05		
Dry Density	Mg/m³	1.63		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.70		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	80		
Strain at Failure	%	18.5		
Maximum Deviator Stress	kPa	123		
Shear Strength	kPa	62		
Mode of Failure		Brittle		
Non Engineering Description		Stiff to firm brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

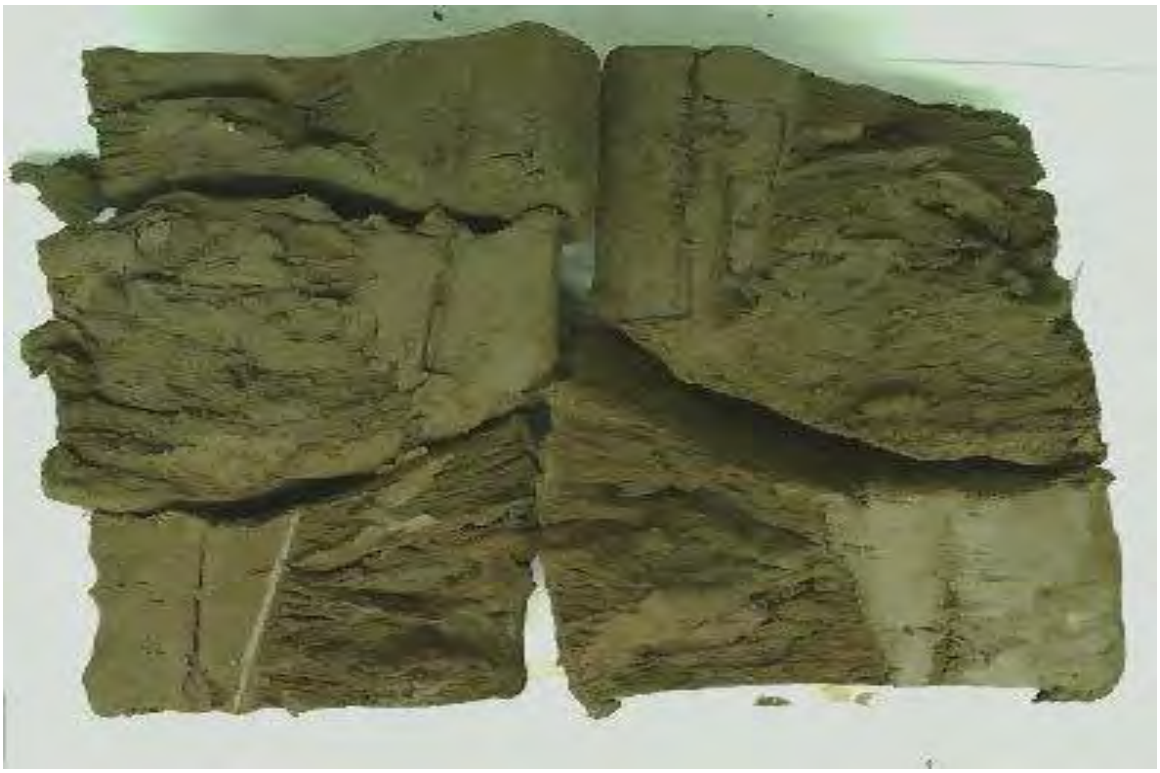
UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

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Figure 24

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site ABENBURY WAY, WREXHAM	**Contract No** **AG2200-15**
	Client Applied Geology Ltd	Hole BH01
	Engineer	Sample Ref Depth (m) 5.00-5.45 Sample Type U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	**Figure 24**
ME	08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

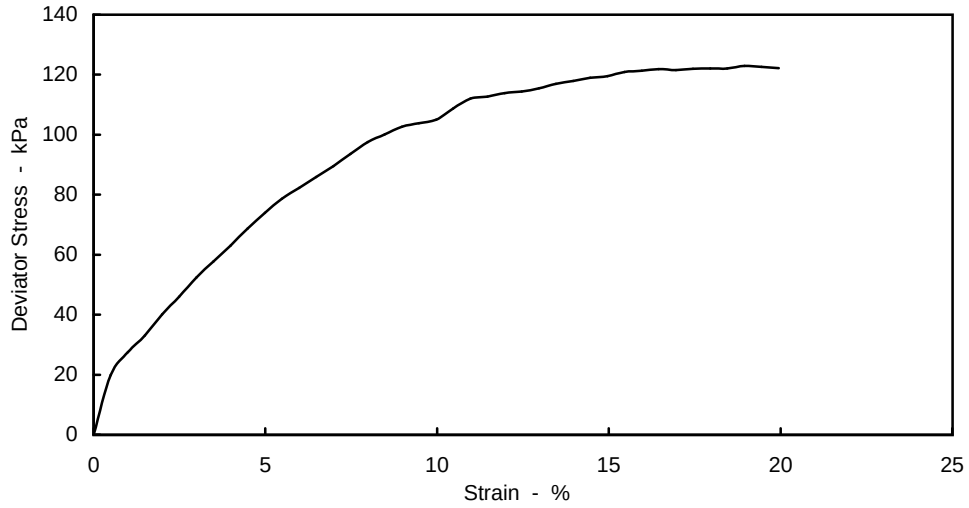
Contract No. AG2200-15

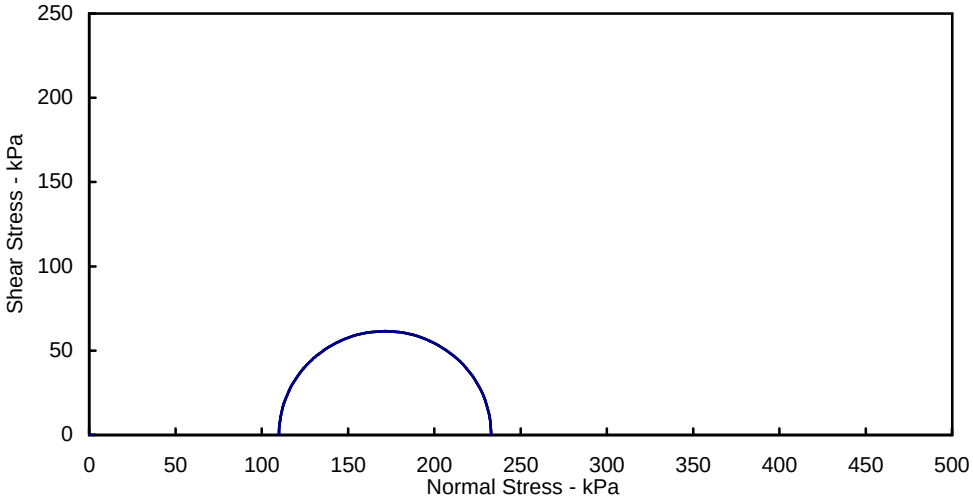
Hole BH01
Sample Ref
Depth (m) 8.00-8.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	200.6		
Diameter	mm	103.0		
Moisture Content	%	20		
Bulk Density	Mg/m³	2.08		
Dry Density	Mg/m³	1.73		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.71		
Rate of Axial Displacement	%/min	1.99		
Cell Pressure	kPa	110		
Strain at Failure	%	18.9		
Maximum Deviator Stress	kPa	123		
Shear Strength	kPa	61		
Mode of Failure		Plastic		
Non Engineering Description		Firm brown slightly sandy CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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ME	08/04/2015

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Figure 25

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH01
Engineer		Sample Ref	
		Depth (m)	8.00-8.45
		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	**Figure 25**
ME	08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

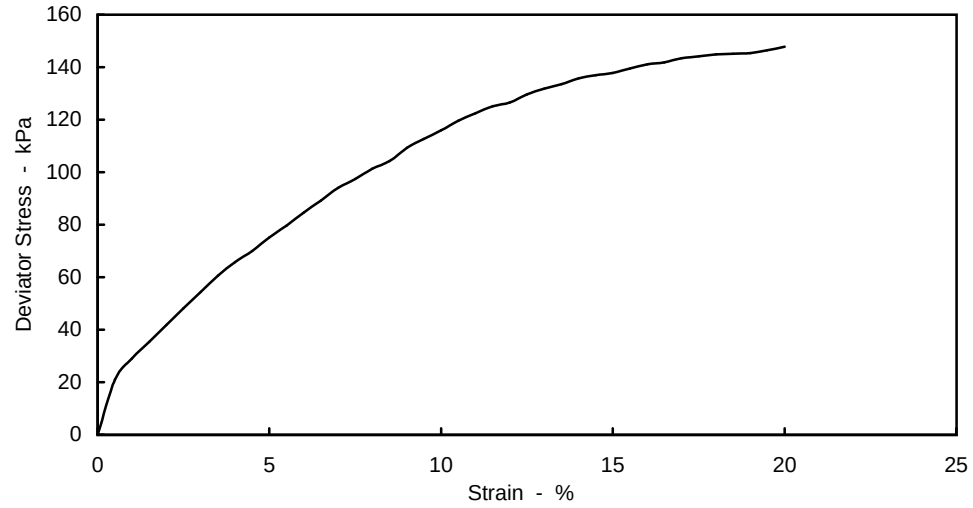
Contract No. AG2200-15

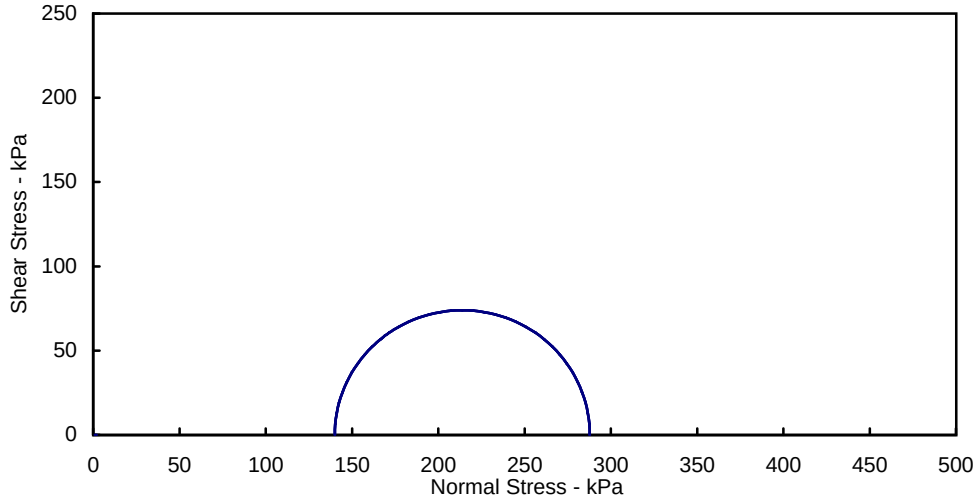
Hole BH01
Sample Ref
Depth (m) 11.00-11.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	200.0		
Diameter	mm	103.8		
Moisture Content	%	24		
Bulk Density	Mg/m³	2.05		
Dry Density	Mg/m³	1.65		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.73		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	140		
Strain at Failure	%	20.0		
Maximum Deviator Stress	kPa	148		
Shear Strength	kPa	74		
Mode of Failure		Compound		
Non Engineering Description		Firm brown slightly sandy CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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Figure 26

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH01
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	11.00-11.45
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 26
ME	S. Langman 08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

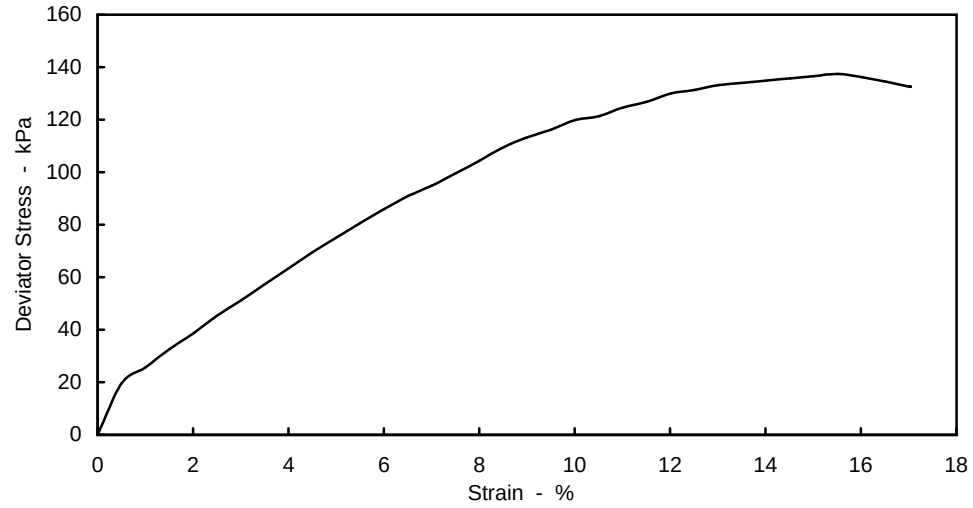
Contract No. AG2200-15

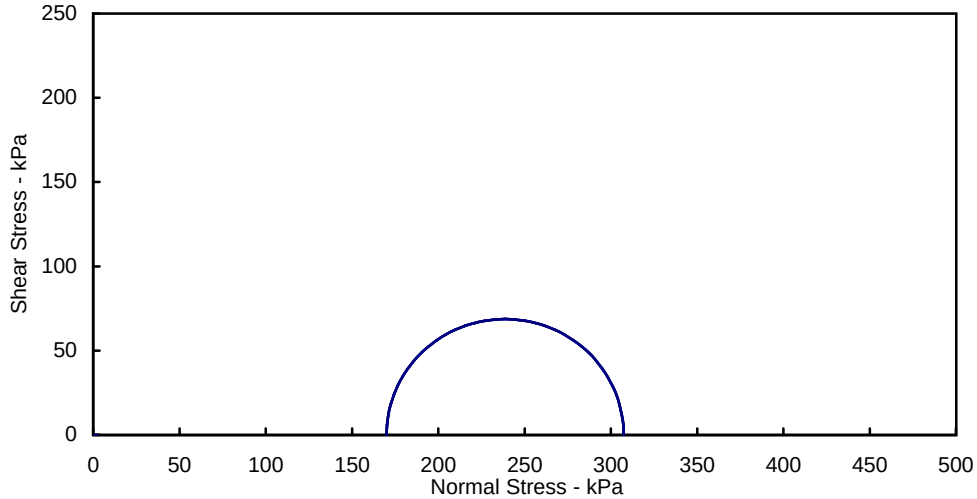
Hole BH01
Sample Ref
Depth (m) 14.00-14.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.8		
Diameter	mm	103.8		
Moisture Content	%	21		
Bulk Density	Mg/m³	2.13		
Dry Density	Mg/m³	1.76		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.61		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	170		
Strain at Failure	%	15.5		
Maximum Deviator Stress	kPa	137		
Shear Strength	kPa	69		
Mode of Failure		Brittle		
Non Engineering Description		Firm to stiff brown slightly sandy CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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Figure 27

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
		Hole	BH01
Client	Applied Geology Ltd	Sample Ref	
		Depth (m)	14.00-14.45
Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	**Figure 27**
ME	08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

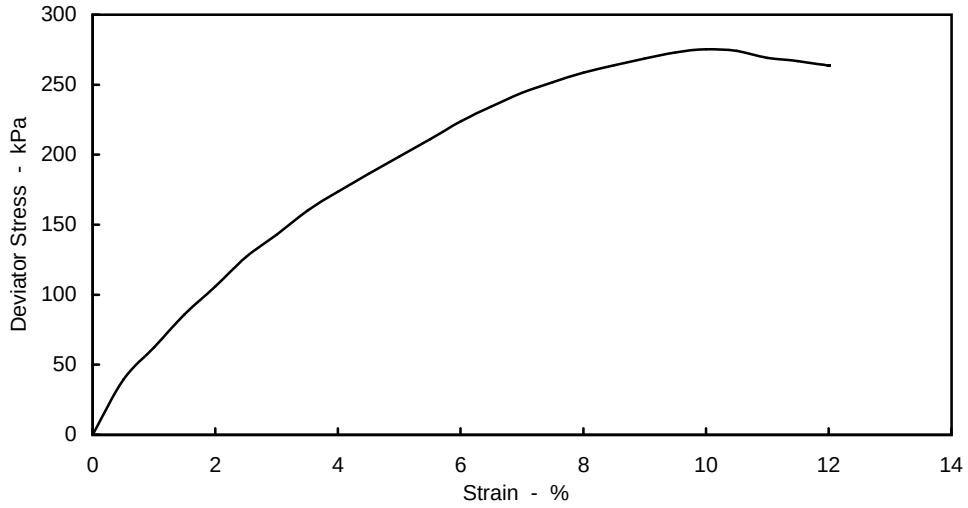
Contract No. AG2200-15

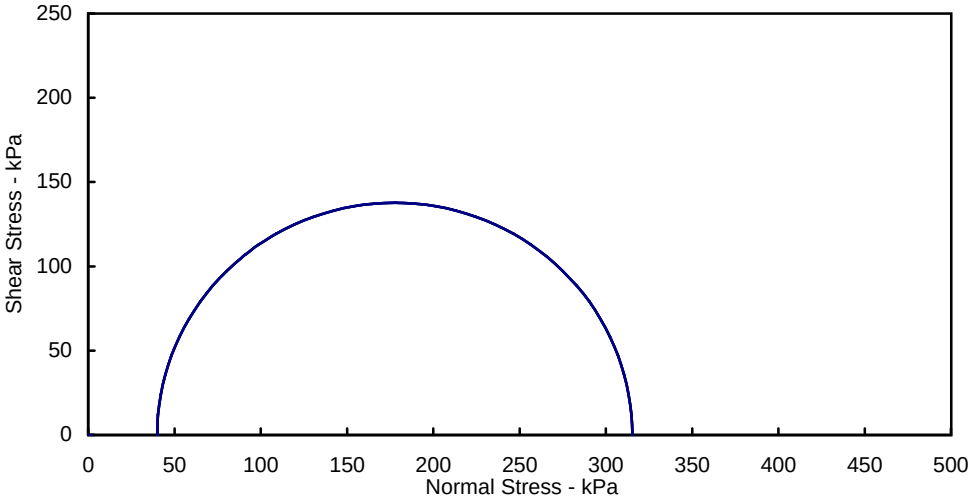
Hole BH02
Sample Ref
Depth (m) 2.00-2.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	200.0		
Diameter	mm	103.6		
Moisture Content	%	24		
Bulk Density	Mg/m³	2.07		
Dry Density	Mg/m³	1.67		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.44		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	40		
Strain at Failure	%	10.0		
Maximum Deviator Stress	kPa	275		
Shear Strength	kPa	138		
Mode of Failure		Compound		
Non Engineering Description		Very stiff brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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Figure 28

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site ABENBURY WAY, WREXHAM	**Contract No** **AG2200-15**
	Client Applied Geology Ltd	Hole BH02
	Engineer	Sample Ref Depth (m) 2.00-2.45 Sample Type U





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ME	08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

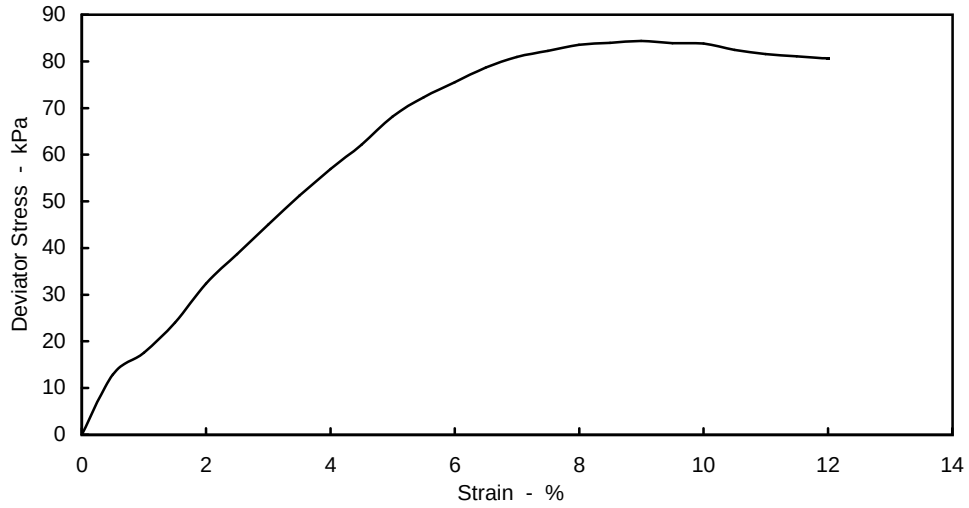
Contract No. AG2200-15

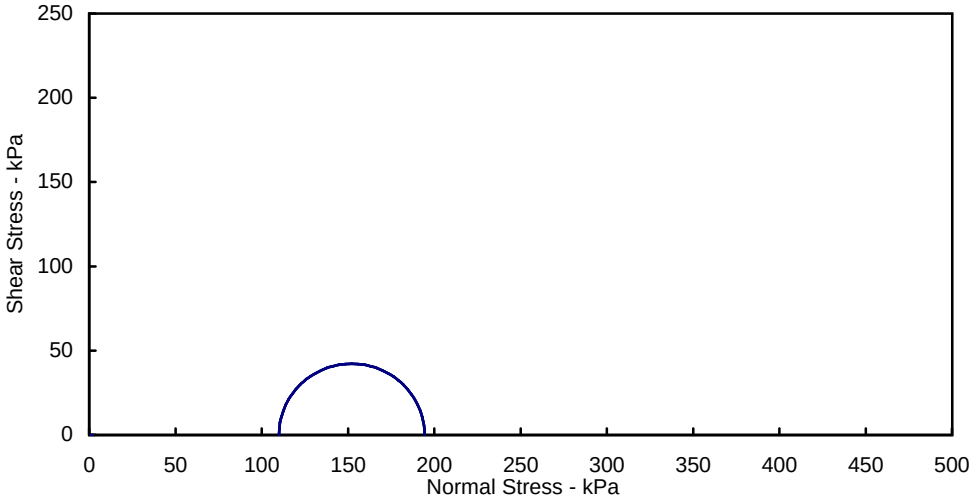
Hole BH02
Sample Ref
Depth (m) 6.50-6.95
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	200.1		
Diameter	mm	103.9		
Moisture Content	%	27		
Bulk Density	Mg/m³	2.04		
Dry Density	Mg/m³	1.61		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.40		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	110		
Strain at Failure	%	9.0		
Maximum Deviator Stress	kPa	84		
Shear Strength	kPa	42		
Mode of Failure		Compound		
Non Engineering Description		Firm brown slightly sandy, silty laminated CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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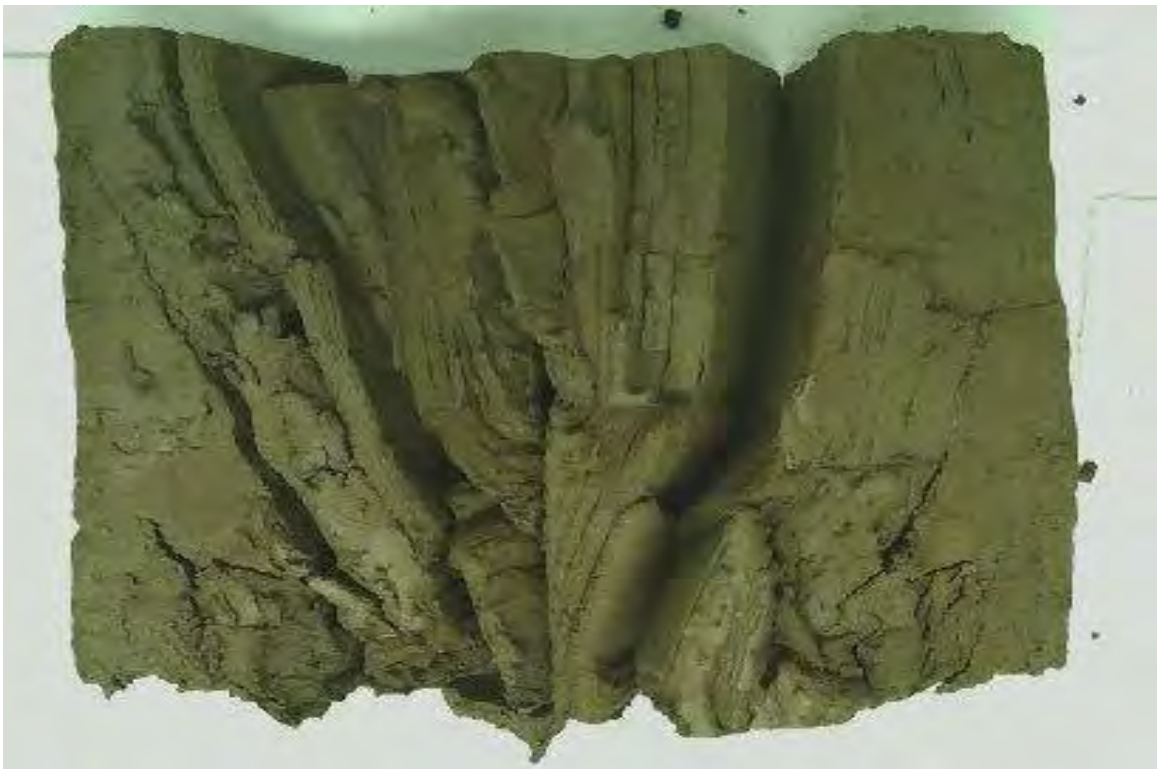
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Figure 29

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH02
Engineer		Sample Ref	
		Depth (m)	6.50-6.95
		Sample Type	U





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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

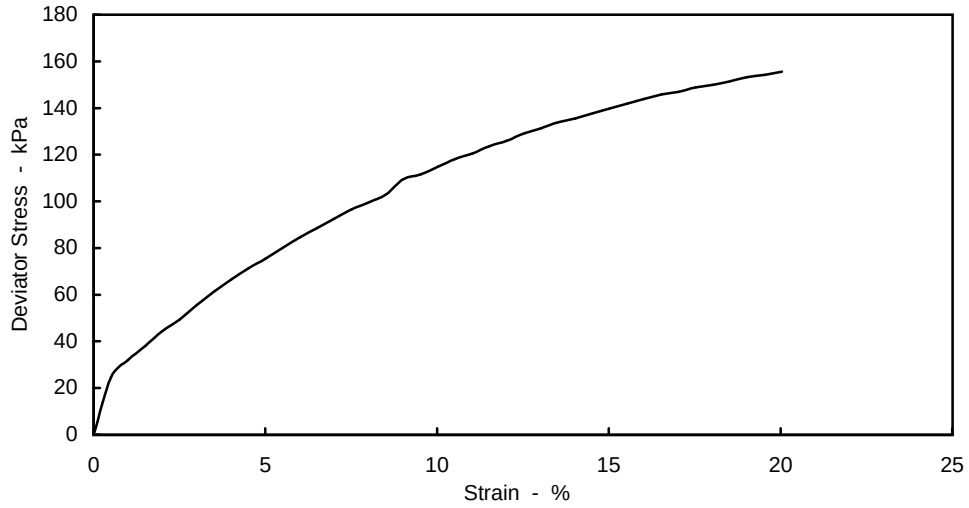
Contract No. AG2200-15

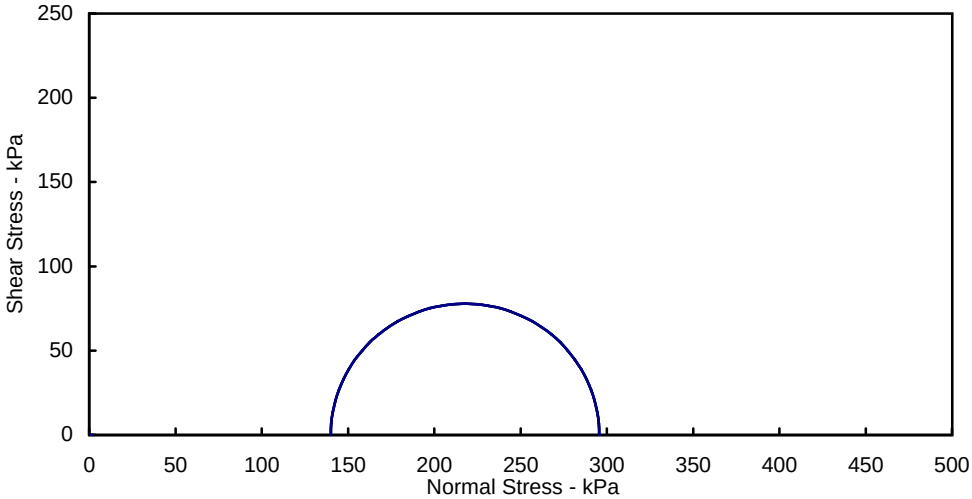
Hole BH02
Sample Ref
Depth (m) 9.50-9.95
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.6		
Diameter	mm	103.6		
Moisture Content	%	26		
Bulk Density	Mg/m³	2.00		
Dry Density	Mg/m³	1.58		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.73		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	140		
Strain at Failure	%	20.0		
Maximum Deviator Stress	kPa	156		
Shear Strength	kPa	78		
Mode of Failure		Plastic		
Non Engineering Description		Firm red/brown laminated brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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ME	08/04/2015

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Figure 30

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH02
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	9.50-9.95
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 30
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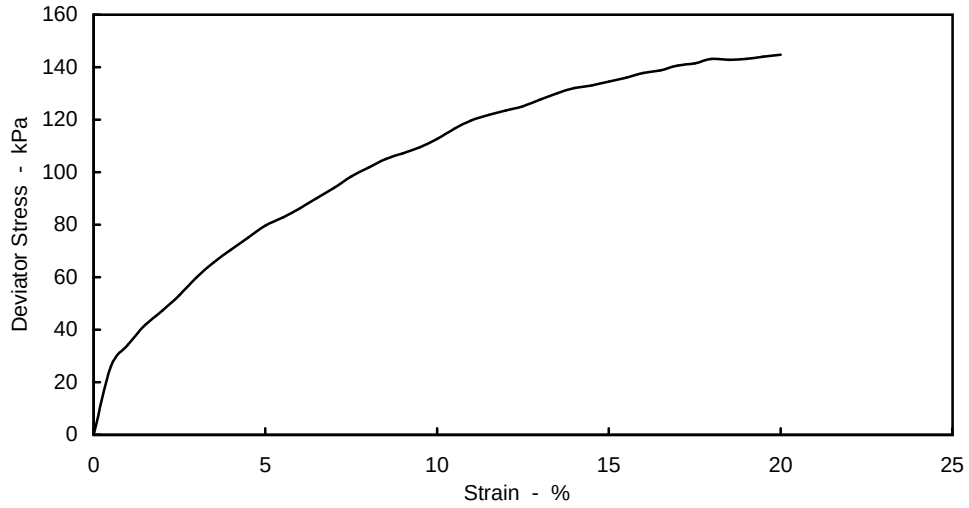
TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

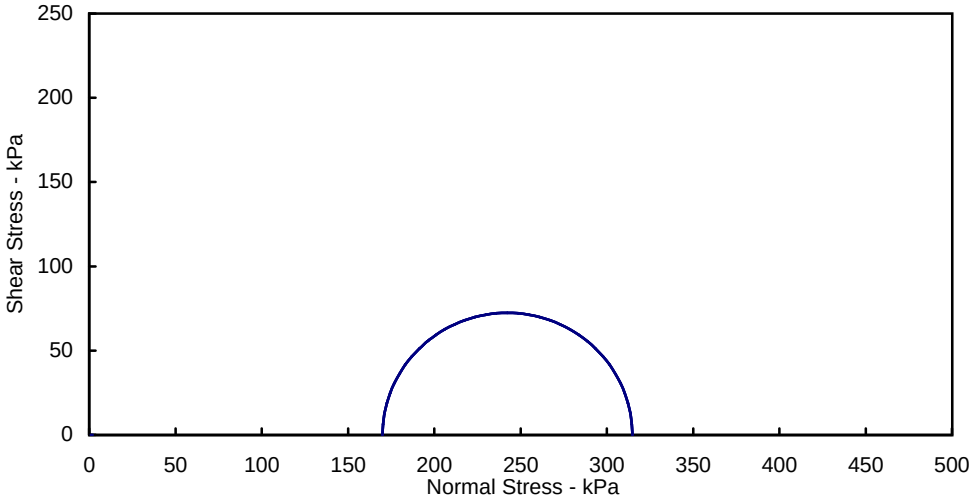
Site	ABENBURY WAY, WREXHAM	**Contract No.**	**AG2200-15**
Client	Applied Geology Ltd	Hole	BH02
Engineer		Sample Ref	
		Depth (m)	12.50-12.95
		Sample Type	U

Sample Details		
Sample Condition		Undisturbed
Height	mm	200.0
Diameter	mm	99.3
Moisture Content	%	22
Bulk Density	Mg/m³	1.96
Dry Density	Mg/m³	1.61
Test Details		
Membrane Thickness	mm	0.20
Membrane Correction	kPa	0.77
Rate of Axial Displacement	%/min	2.00
Cell Pressure	kPa	170
Strain at Failure	%	20.0
Maximum Deviator Stress	kPa	145
Shear Strength	kPa	72
Mode of Failure		Plastic
Non Engineering Description		Firm brown slightly sandy CLAY.

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

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Figure 31

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No** **AG2200-15**
	Client	Applied Geology Ltd	Hole BH02
	Engineer		Sample Ref
			Depth (m) 12.50-12.95
			Sample Type U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	**Figure 31**
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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

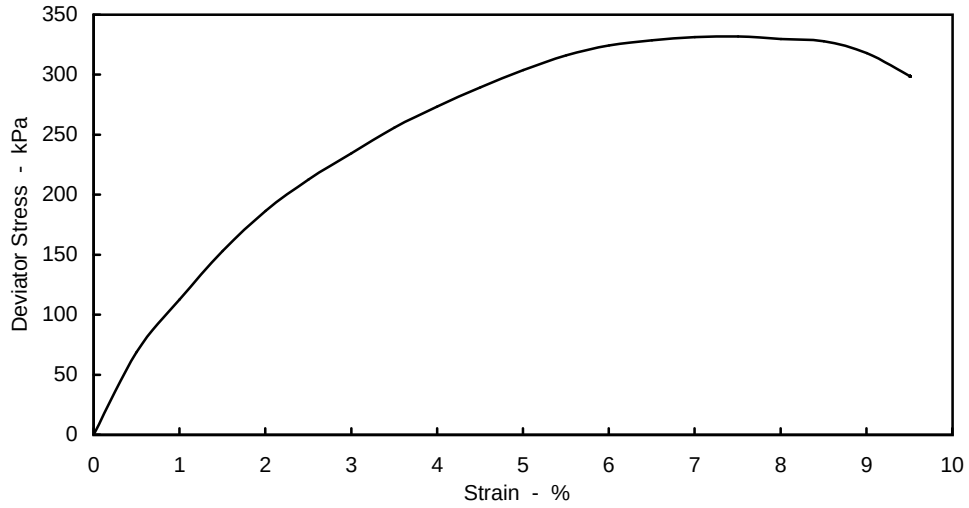
Contract No. AG2200-15

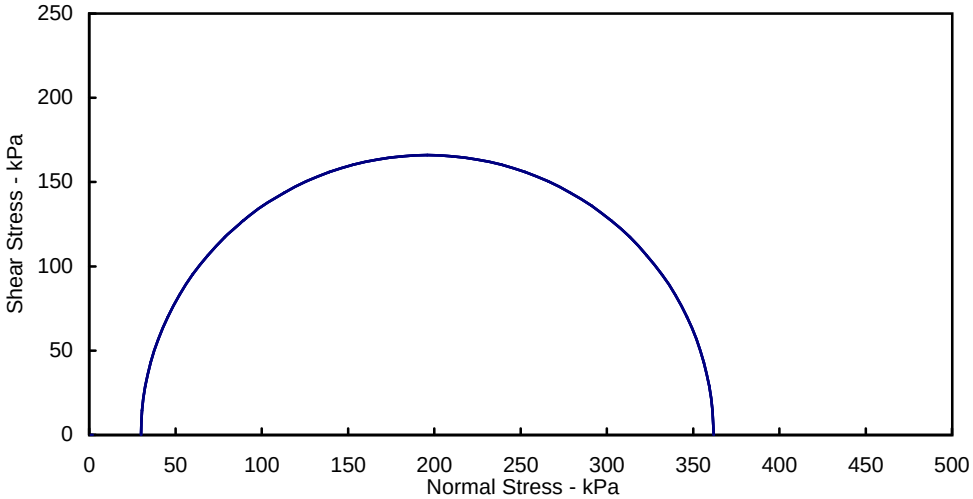
Hole BH04
Sample Ref
Depth (m) 1.20-1.65
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.9		
Diameter	mm	103.1		
Moisture Content	%	18		
Bulk Density	Mg/m³	2.07		
Dry Density	Mg/m³	1.76		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.35		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	30		
Strain at Failure	%	7.5		
Maximum Deviator Stress	kPa	332		
Shear Strength	kPa	166		
Mode of Failure		Brittle		
Non Engineering Description		Stiff light brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

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Figure 32

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH04
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	1.20-1.65
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 32
ME	S. Langman 08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

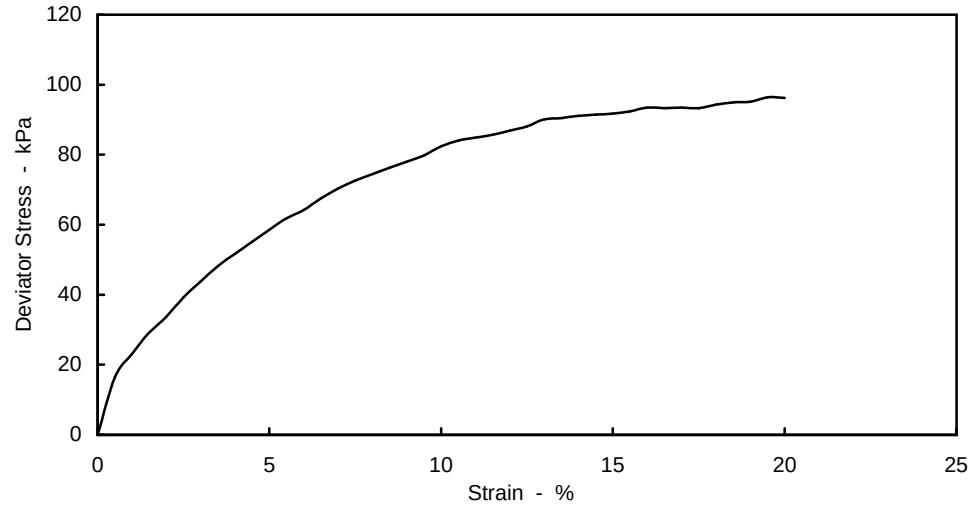
Contract No. AG2200-15

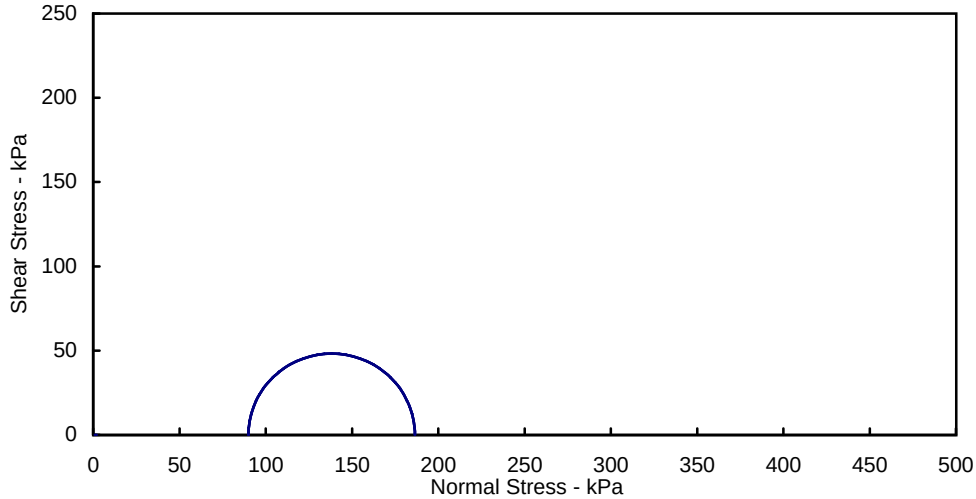
Hole BH04
Sample Ref
Depth (m) 5.00-5.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	200.0		
Diameter	mm	103.2		
Moisture Content	%	28		
Bulk Density	Mg/m³	2.03		
Dry Density	Mg/m³	1.59		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.72		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	90		
Strain at Failure	%	19.5		
Maximum Deviator Stress	kPa	96		
Shear Strength	kPa	48		
Mode of Failure		Compound		
Non Engineering Description		Firm brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

BS 1377 : Part 7 : 1990 Clause 8

Figure 33

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH04
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	5.00-5.45
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 33
ME	08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

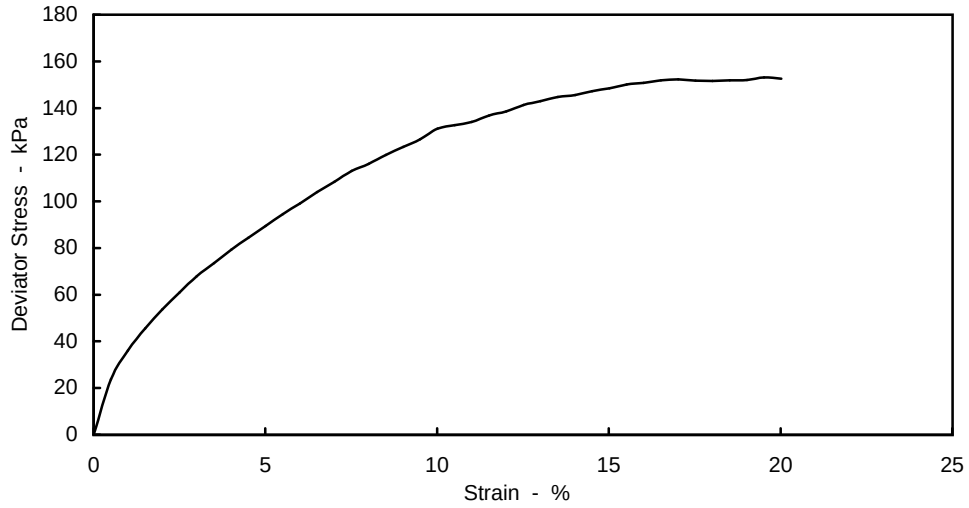
Contract No. AG2200-15

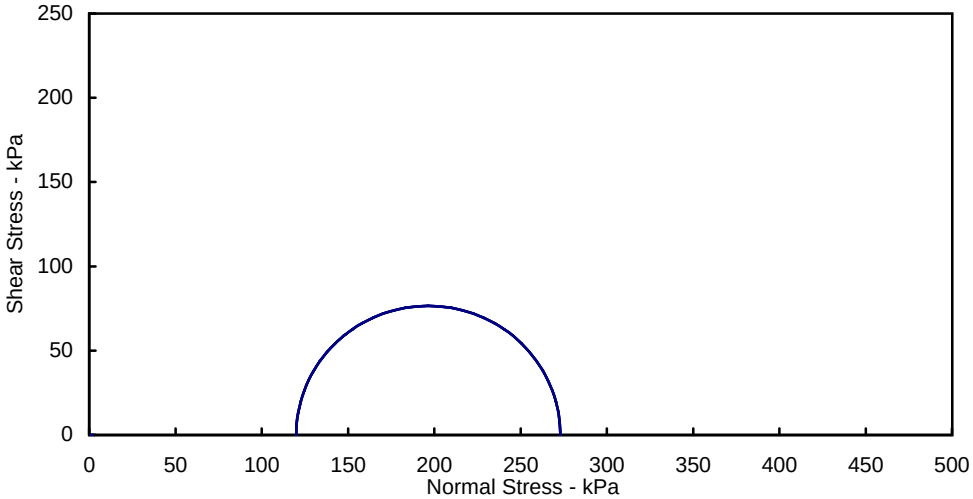
Hole BH04
Sample Ref
Depth (m) 8.00-8.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.8		
Diameter	mm	103.2		
Moisture Content	%	27		
Bulk Density	Mg/m³	2.02		
Dry Density	Mg/m³	1.59		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.73		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	120		
Strain at Failure	%	19.5		
Maximum Deviator Stress	kPa	153		
Shear Strength	kPa	77		
Mode of Failure		Plastic		
Non Engineering Description		Firm to stiff brown CLAY with occasional gravel. Gravel is fine to medium.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

BS 1377 : Part 7 : 1990 Clause 8

Figure 34

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH04
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	8.00-8.45
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 34
ME	S. Langman 08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

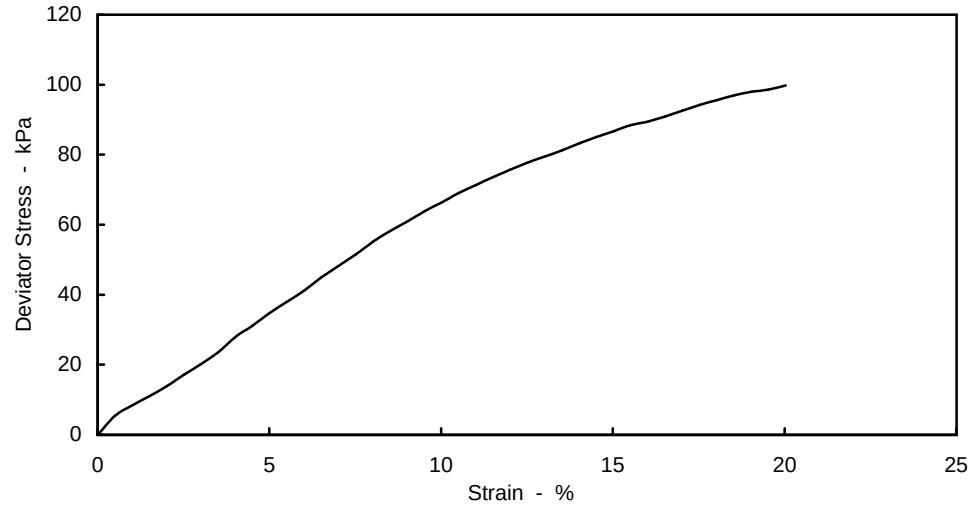
Contract No. AG2200-15

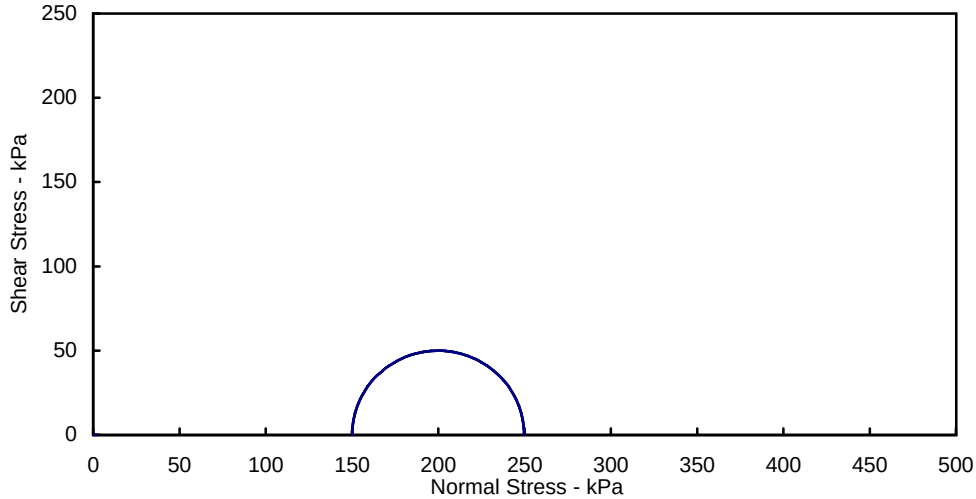
Hole BH04
Sample Ref
Depth (m) 11.00-11.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.7		
Diameter	mm	104.2		
Moisture Content	%	25		
Bulk Density	Mg/m³	2.02		
Dry Density	Mg/m³	1.61		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.73		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	150		
Strain at Failure	%	20.0		
Maximum Deviator Stress	kPa	100		
Shear Strength	kPa	50		
Mode of Failure		Plastic		
Non Engineering Description		Soft brown very silty CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
ME	08/04/2015

UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

BS 1377 : Part 7 : 1990 Clause 8

Figure 35

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	AG2200-15
			Hole	BH04
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	11.00-11.45
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 35
ME	S. Langman 08/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

Contract No **AG2200-15**

Sample Identification				Lab Sample ID	Date Sampled	Temperature of cool box on receipt °C	Description
Exploratory Hole	Depth m	Sample Ref	Sample Type				
BH01	1.70		T	271988	Deviating	6.8	Brown CLAY with occasional gravel. Gravel is fine.
BH01	3.50		T	271991	Deviating	6.8	Brown slurry of SAND
BH01	5.50		T	271993	Deviating	6.8	Brown CLAY
BH02	4.50		T	271994	Deviating	6.8	Brown CLAY
BH02	9.00		T	271995	Deviating	6.8	Brown CLAY
BH04	1.70		T	271997	Deviating	6.8	Brown silty CLAY.
BH04	3.80		T	272000	Deviating	6.8	Brown CLAY
BH04	11.50		T	272002	Deviating	6.8	Brown CLAY
BH06	5.00		T	272007	Deviating	6.8	Brown CLAY with occasional gravel. Gravel is fine.

Notes

1. Where a date of sampling is not provided, the sample is classified as deviating.
2. Temperatures exceeding 6°C on receipt may be deviating, but will be dependent upon the suite of tests carried out.
3. Samples are considered deviating if the incorrect sample container type has been used. This is indicated within the report tables.
4. Results reported for samples classified as deviating may be compromised.

Originator	Checked & Approved
SPL	S. Langman 08/04/2015

LABORATORY DESCRIPTIONS

Appendix X

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

Contract No AG2200-15

Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
GP001	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Preparation of soil samples for chemical analysis	Yes	Yes	N/A
TP019	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of pH in 2.5:1 water/soil extract using pH meter.	Yes	Yes	Dry
TP029	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of acid soluble sulfate by gravimetry.	Yes	Yes	Dry
TP032	MAFF Book 427: The Analysis of Agricultural Materials: Method 8	Determination of water soluble boron by colorimetry	Yes		Dry
TP033	APHA/AWWA, 19th edition: Method 5520E	Determination of Toluene Extractable Matter by soxhlet extraction.	Yes		Dry
TP037	ISO 11466, 1995 : Soil Quality: Extraction of Trace Elements Soluble in Aqua Regia	Determination of aqua regia extractable metals by ICP-OES.	Yes	Selected (see report table)	Dry
TP038	ISO 11466, 1995 : Soil Quality: Extraction of Trace Elements Soluble in Aqua Regia	Determination of aqua regia extractable arsenic, selenium & antimony by ICP-OES/hydride generation	Yes	Yes	Dry
TP040	APHA/AWWA, 19th edition: Method 3500Cr-D	Determination of hexavalent chromium by colorimetry.	Yes		Dry
TP041	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of organic matter by titrimetry.	Yes		Dry
TP042	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of loss on ignition at 50-440°C by gravimetry	Yes	Yes	Dry
TP043	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of water soluble sulfate in 2:1 water/soil extract	Yes	Yes	Dry
TP045	GACHAMJA A.M. Chromatography and Analysis: 1992 9-11 (modified)	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS	Yes	Yes	Dry
TP046	MEWAM method: Phenols in water and Effluents: 4-aminoantipyrine method	Determination of monohydric phenols by steam distillation/colorimetry	Yes	Yes	Dry
TP047	MEWAM method: Cyanide in Waters etc	Determination of Free Cyanide by steam distillation/colorimetry	Yes		Dry
TP048	MEWAM method: Cyanide in Waters etc	Determination of total cyanide by steam distillation/colorimetry.	Yes	Yes	Dry
TP049	MEWAM method: Cyanide in Waters etc	Determination of complex cyanide by calculation	Yes		Dry
TP050	MEWAM method: Determination of Thiocyanate ,1985	Determination of thiocyanate by colorimetry	Yes	Yes	Dry
TP051	USEPA Method 9030B	Determination of acid soluble sulfides by steam distillation/colorimetry.	Yes	Yes	Dry
TP052	BS1881: Part 324, 1988: Testing Concrete	Determination of elemental sulfur by soxhlet extraction and titrimetry.	Yes		Dry
TP067	TNRCC Method 1005: 2001 (modified)	Determination of pentane/acetone extractable petroleum hydrocarbons (C8 - C40) by GC/FID	Yes	Yes	Wet

Notes

1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample.
2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated.
3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request.
4. The laboratory records the date of analysis of each parameter. This information is available on request.
5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.

Originator	Checked & Approved	**SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)**	**Appendix Y**
N/A	N/A		Sheet 1 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

Contract No AG2200-15

Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
TP070	MAFF Book 427, Method 11	Determination of available metals by ICP-OES.			Dry
TP072	In-house documented method	Determination of ammoniacal nitrogen by colorimetry.			Dry
TP073	In-house documented method	Determination of anionic detergent (MBAS) by colorimetry			Dry
TP074	In-house documented method	Determination of water soluble fluoride by ion selective electrode			Dry
TP098	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of acid soluble chloride by titrimetry			Dry
TP099	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
TP100	Wisconsin DNR Modified GRO method, Method for Determining Gasoline Range Organics	Determination of Volatile Petroleum Hydrocarbons/GRO.	Yes	Yes	Wet
TP110	USEPA Methods 8082A & 3665A	Determination of Total & Speciated 7 PCB Congeners by GC/MS SIM	Yes	Yes	Wet
TP114	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of carbonate in soil (rapid titration method)			Dry
TP115	MAFF Book 427: The Analysis of Agricultural Materials: Method 8	Determination of water soluble boron by ICP-OES	Yes	Yes	Dry
TP125	BS EN 12457-3: Characterisation of Waste - Compliance test for leaching of granular waste materials and sludges (two-stage batch test)	Preparation of soil samples for two-stage leachate test			Dry
TP126	TNRCC Method 1006 (modified)	Extracted petroleum hydrocarbons from TP067 split into aromatic and aliphatic fractions. Analysed by GC/FID.	Yes		Wet
TP134	In-house documented method	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
TP135	USEPA Methods 8100 & 8270D. In-house method TP045	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS (with concentration stage)			Dry
TP136	In-house documented method	Determination of water soluble magnesium in soil			Dry
TP145	USEPA Methods 3550C & 8270D	Determination of Semi-Volatile Organic Compounds by GC/MS	Yes	Yes	Wet
TP147	USEPA Methods 8082A & 3665A	Determination of total & speciated WHO 12 PCB Congeners by GC/MS SIM.			Wet
TP150	USEPA Methods 8081B & 8141B	Determination of pesticides and herbicides in soil by GC/MS SIM			Dry
TP152	USEPA Method 556	Determination of carbonyls in soil by GC/MS.			Wet
TP154	USEPA Method 5021. Wisconsin DNR modified GRO method	Determination of volatiles in soil by GC/MS headspace			Wet

Notes

1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample.
2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated.
3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request.
4. The laboratory records the date of analysis of each parameter. This information is available on request.
5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.

Originator	Checked & Approved	SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)	Appendix Y
N/A	N/A		Sheet 2 of 2

TERRA TEK
SITE INVESTIGATION & LABORATORY SERVICES

Applied Geology Ltd
Unit 23 Abbey Park
Stareton
Kenilworth
Warwickshire
CV8 2LY
For the attention of Adam Perks

Report No: B19089
Issue No 01

LABORATORY TEST REPORT

Project Name	**ABENBURY WAY, WREXHAM**		
Project Number	**B19089**	Date samples received	31/03/2015
Your Ref		Date written instructions received	31/03/2015
Purchase Order	7819	Date testing commenced	31/03/2015

Please find enclosed the results as summarised below

Figure / Table	Test Quantity	Description	ISO 17025 Accredited
1	~	Summary of Geotechncial Tests	See table
2	4	BRE Suite - Soil	Yes
3-10	8	Liquid & Plastic Limit	Yes
11-14	4	Particle Size Distribution	Yes
15-18	4	Moisture Content/Dry Density Relationship	Yes
19	1	One Dimensional Consolidation	Yes
20-24	5	Unconsolidated Undrained Single Stage Triaxial Compression	Yes
App X	~	Sample Descriptions - Soil	N/A
App Y	~	Summary of In-House Analytical Test Methods - Soil	N/A

Remarks :

Issued by : Stephen Langman Date of Issue : 21/04/2015

Approved Signatories : 21/04/2015
G Wilson (JMD/Laboratories Director), S Langman (Laboratory Coordinator)

Key to symbols used in this report
S/C : Testing was sub-contracted

Unless we are notified to the contrary, samples will be disposed after a period of one month from this date.
The results reported relate to samples received in the laboratory only.
All results contained in this report are provisional unless signed by an approved signatory
This report should not be reproduced except in full without the written approval of the laboratory.
Under multisite accreditation the testing contained in this report may have been performed at another Terra Tek laboratory.
The enclosed results remain the property of Terra Tek Limited and we reserve the right to withdraw
our report if we have not received cleared funds in accordance with our standard terms and conditions
Only those results indicated in this report are UKAS accredited and any opinions or interpretations expressed are outside the scope of UKAS accreditation.
Feedback on the this report may be left via our website www.terratek.co.uk/contact-us

mCERTS UKAS TESTING 0126 25 YEARS 1990-2015

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Head Office : 62 Rochsolloch Road, Airdrie, ML6 9BG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No B19089

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
BH3	1.50-1.95		U	273257	Soft to firm brown sandy CLAY.	21	46	21	25	0	CI		2.11	1.74	109			
BH3	3.00-3.45		U	273258	Soft brown SILT.	23							1.96	1.59	26			
BH3	6.00-6.45		U	273259	Firm brown CLAY.	28	59	21	38	0	CH		2.00	1.56	43			Oed
BH3	9.00-9.45		U	273260	Firm brown CLAY.	25	41	18	23	0	CI		2.02	1.62	52			BRE SD1 Suite
BH3	27.00-27.45		U	273261	Soft brown sandy CLAY.	18	30	15	15	0	CL		2.14	1.81	54			BRE SD1 Suite
Notes	Opinions and interpretations are outside the scope of UKAS accreditation				UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 21/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No B19089

Sample Identification							Atterberg limits						Density		Total Stress			
Exploratory Hole	Depth m	Sample Ref	Sample Type	Lab Sample ID	Non Engineering Sample Description	Moisture Content %	Liquid Limit %	Plastic Limit %	Plasticity Index	Percentage retained 425µm %	Atterberg Classification	Particle Density Mg/m³	Bulk Mg/m³	Dry Mg/m³	Shear Strength kPa	Apparent Cohesion C kPa	Angle of Shearing Resistance Phi	Other Tests
TP101	0.90		B	273262	Brown sandy CLAY.													PSD,2.5kg Compaction
TP101	0.90		T	273246	Brown CLAY.	22	50	20	30	0	CI							
TP101	2.00		B	273263	Brown slightly sandy CLAY.							2.67						PSD,2.5kg Compaction
TP101	2.00		T	273247	Grey/ brown slightly sandy CLAY.	21	47	19	28	0	CI							BRE SD1 Suite
TP102	0.80		B	273265	Brown/ grey slightly sandy CLAY.							2.68						PSD,2.5kg Compaction

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

Test details are given on the 'Notes on Laboratory Procedures' sheet

See individual report sheets

UKAS Accredited Test Y/N	Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y

Originator	Approved
SPL	S. Langman 21/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No B19089

Sample Identification				Lab Sample ID	Non Engineering Sample Description	Moisture Content	Atterberg limits					Particle Density	Density		Total Stress			Other Tests
Exploratory Hole	Depth m	Sample Ref	Sample Type				Liquid Limit	Plastic Limit	Plasticity Index	Percentage retained 425µm	Atterberg Classification		Bulk	Dry	Shear Strength	Apparent Cohesion C	Angle of Shearing Resistance Phi	
						%	%	%		%		Mg/m³	Mg/m³	Mg/m³	kPa	kPa		
TP102	0.80		T	273249	Grey/ brown CLAY.	26	56	23	33	0	CH							BRE SD1 Suite
TP103	1.00		B	273267	Brown/ grey sandy CLAY.													PSD,2.5kg Compaction
TP103	1.00		T	273253	Brown CLAY.	22	50	20	30	0	CI							
Notes: Opinions and interpretations are outside the scope of UKAS accreditation					UKAS Accredited Test Y/N	Test details are given on the 'Notes on Laboratory Procedures' sheet												See individual report sheets
						Y	Y	Y	Y	Y	-	Y	Y	Y	Y	Y	Y	

Originator	Approved
SPL	S. Langman 21/04/2015

SUMMARY OF GEOTECHNICAL TESTS

Figure 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site: ABENBURY WAY, WREXHAM

Client: Applied Geology Ltd

Engineer:

Contract No B19089

Sample Identification				Lab Sample ID	Sulphate (water soluble in 2:1 extract) as SO4	pH
Hole	Depth m	Sample Ref	Sample Type		g/l	
BH3	9.00-9.45		U	273260	0.02	8.2
BH3	27.00-27.45		U	273261	0.02	8.3
TP101	2.00		T	273247	<0.01	8.3
TP102	0.80		T	273249	0.01	7.4
				Limits of Detection	0.01	0.1
				Terra Tek Analysis Method	TP043 M	TP019 M
				Accreditation M=Mcerts U=UKAS N=No accreditation		

Originator	Checked & Approved
SPL	S. Langman 21/04/2015

BRE SD1 SUITE - SOIL

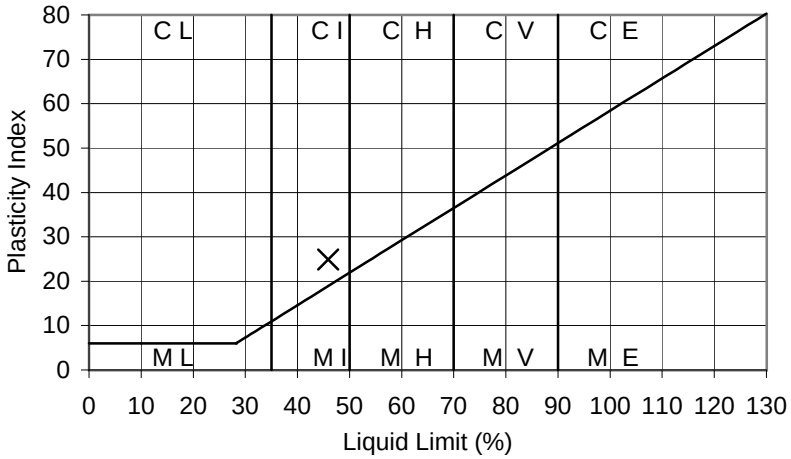
Figure 2

Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
	Client	Applied Geology Ltd	Hole ID	BH3
	Engineer		Sample Ref	
			Depth (m)	1.50-1.95
			Sample Type	U

Non Engineering Description : Brown sandy CLAY.

Preparation : Sample as received



Results :

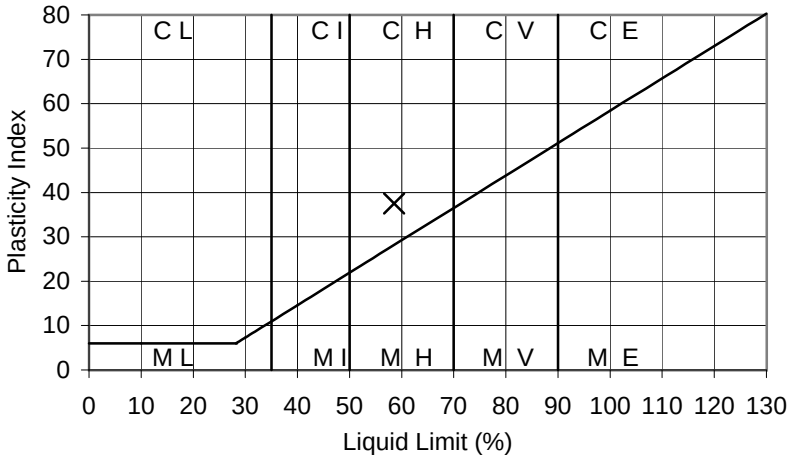
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	23	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	46	%
Plastic Limit :	21	%
Plasticity Index :	25	
Equivalent moisture content of material passing 425µm sieve :	23	%
Liquidity Index :	0.08	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 3**
CR	21/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
	Client	Applied Geology Ltd	Hole ID	BH3
	Engineer		Sample Ref	
			Depth (m)	6.00-6.45
			Sample Type	U

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



Results :

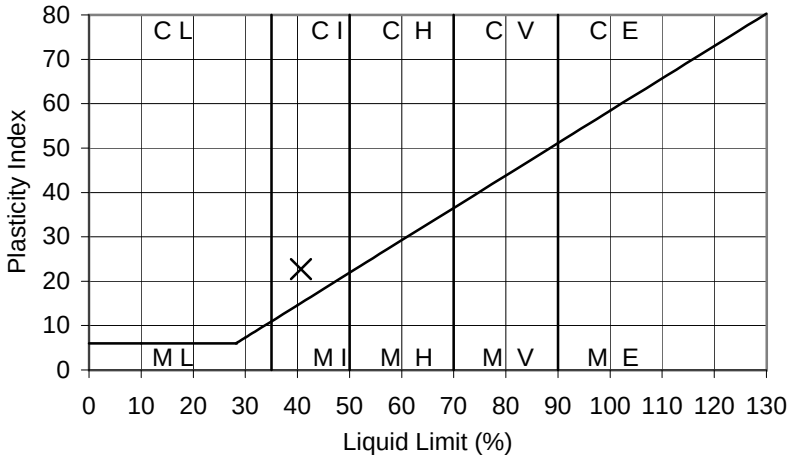
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	27	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	59	%
Plastic Limit :	21	%
Plasticity Index :	38	
Equivalent moisture content of material passing 425µm sieve :	27	%
Liquidity Index :	0.16	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 4**
CR	S Langman 21/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
	Client	Applied Geology Ltd	Hole ID	BH3
	Engineer		Sample Ref	
			Depth (m)	9.00-9.45
			Sample Type	U

Non Engineering Description : Brown slightly sandy CLAY.

Preparation : Sample as received



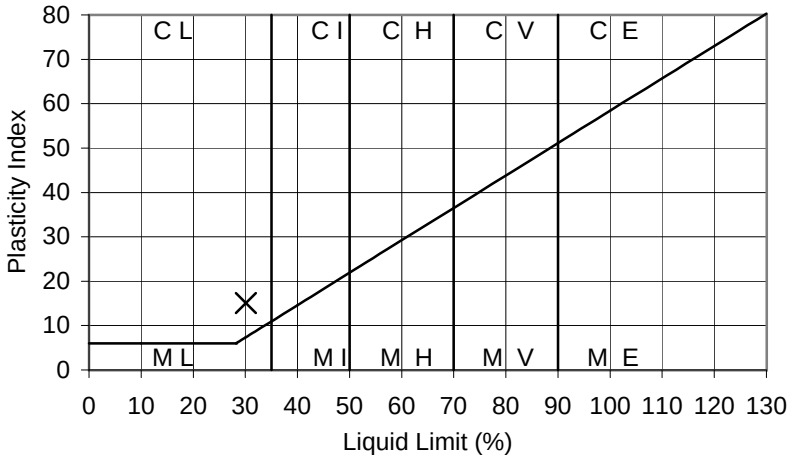
Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	26	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	41	%
Plastic Limit :	18	%
Plasticity Index :	23	
Equivalent moisture content of material passing 425µm sieve :	26	%
Liquidity Index :	0.35	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 5**
CR	21/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

Non Engineering Description : Brown sandy CLAY.

Preparation : Sample as received



Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	18	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	30	%
Plastic Limit :	15	%
Plasticity Index :	15	
Equivalent moisture content of material passing 425µm sieve :	18	%
Liquidity Index :	0.20	

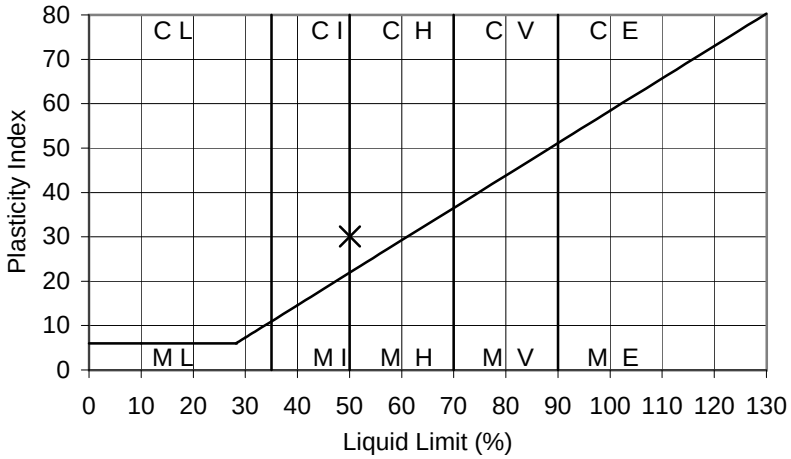
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 6**
CR	21/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

Version 051 - 08/11/2013
1220 - LLPL BH3 27.00 U - B19089-273261.xls : Sample ID 273261
Moor Lane, Witton, Birmingham, B6 7HG
Lab Project No B19089 : 21/04/2015 16:59:16

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
			Hole ID	TP101
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	0.90
	Engineer		Sample Type	T

Non Engineering Description : Brown CLAY.

Preparation : Sample as received



Results :

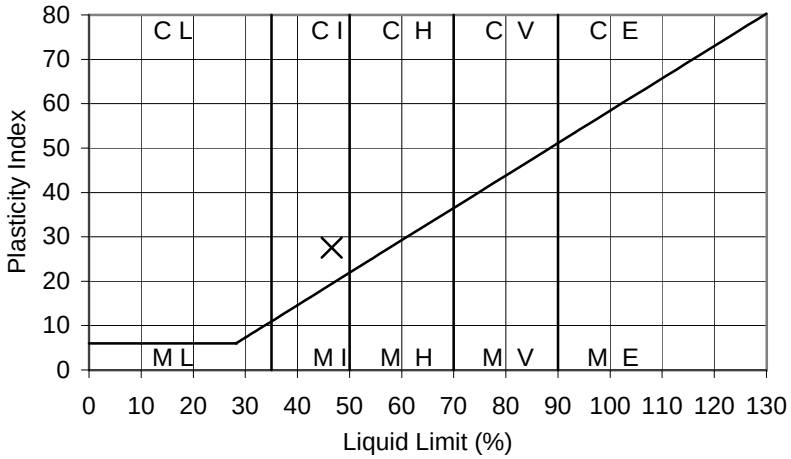
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	22	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	50	%
Plastic Limit :	20	%
Plasticity Index :	30	
Equivalent moisture content of material passing 425µm sieve :	22	%
Liquidity Index :	0.07	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 7**
CR	S Langman 21/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
			Hole ID	TP101
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	2.00
	Engineer		Sample Type	T

Non Engineering Description : Grey/ brown slightly sandy CLAY.

Preparation : Sample as received



Results :

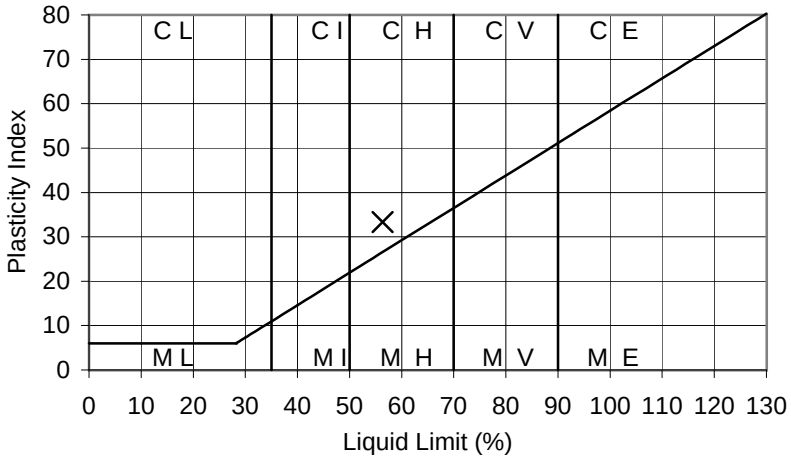
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	21	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	47	%
Plastic Limit :	19	%
Plasticity Index :	28	
Equivalent moisture content of material passing 425µm sieve :	21	%
Liquidity Index :	0.07	

Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990	**Figure 8**
CR	S Langman 21/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
	Client	Applied Geology Ltd	Hole ID	TP102
	Engineer		Sample Ref	
			Depth (m)	0.80
			Sample Type	T

Non Engineering Description : Grey/ brown CLAY.

Preparation : Sample as received



Results :

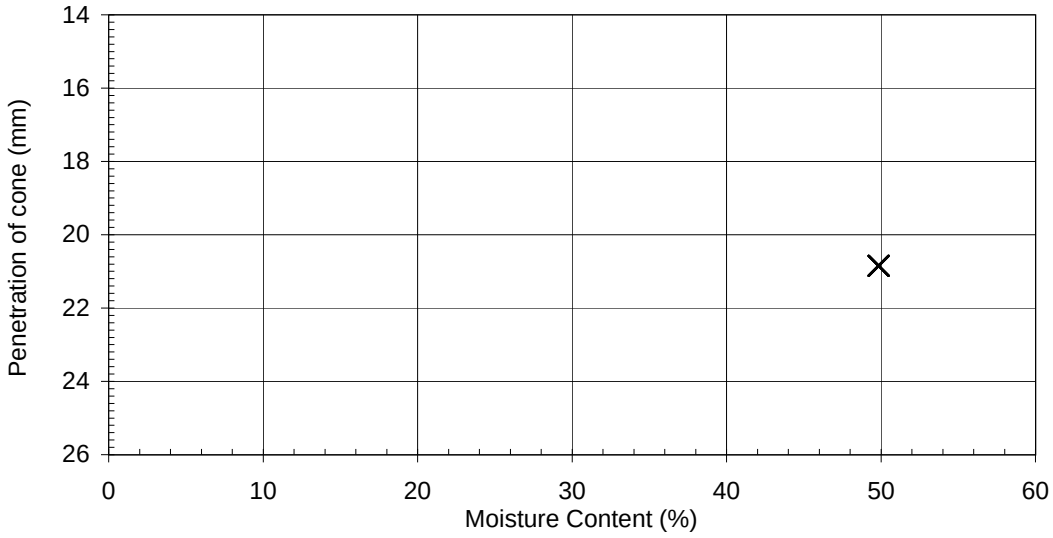
As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	26	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	56	%
Plastic Limit :	23	%
Plasticity Index :	33	
Equivalent moisture content of material passing 425µm sieve :	26	%
Liquidity Index :	0.09	

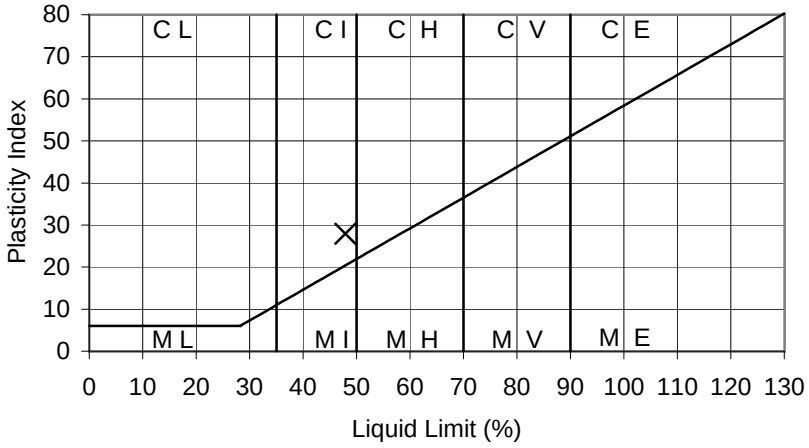
Originator	Checked & Approved	**Liquid Limit (One Point Cone Penetrometer Method) Plastic Limit, Plasticity Index & Liquidity Index**		**Figure 9**
CR	21/04/2015	BS 1377:Part 2:Clause 4.4:1990 BS 1377:Part 2:Clause 5:1990		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	**Contract No.**	**B19089**
	Client	Applied Geology Ltd	Hole ID	TP103
	Engineer		Sample Ref	
			Depth (m)	1.00
			Sample Type	T

Non Engineering Description : Brown CLAY.

Preparation : Sample as received





Results :

As Received Moisture Content : (BS1377:Part 2:Clause 3:1990)	22	%
Percentage retained on 425µm sieve :	0	%
Liquid Limit :	48	%
Plastic Limit :	20	%
Plasticity Index :	30	
Equivalent moisture content of material passing 425µm sieve :	22	%
Liquidity Index :	0.07	

Originator	Checked & Approved	**Liquid Limit (Four Point Cone Penetrometer Method)** **Plastic Limit, Plasticity Index & Liquidity Index** BS 1377:Part 2:Clause 4.3:1990 BS 1377:Part 2:Clause 5:1990	**Figure 10**
CR	S. Langman 21/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP101
Engineer		Sample Ref	
		Depth (m)	0.90
		Sample Type	B

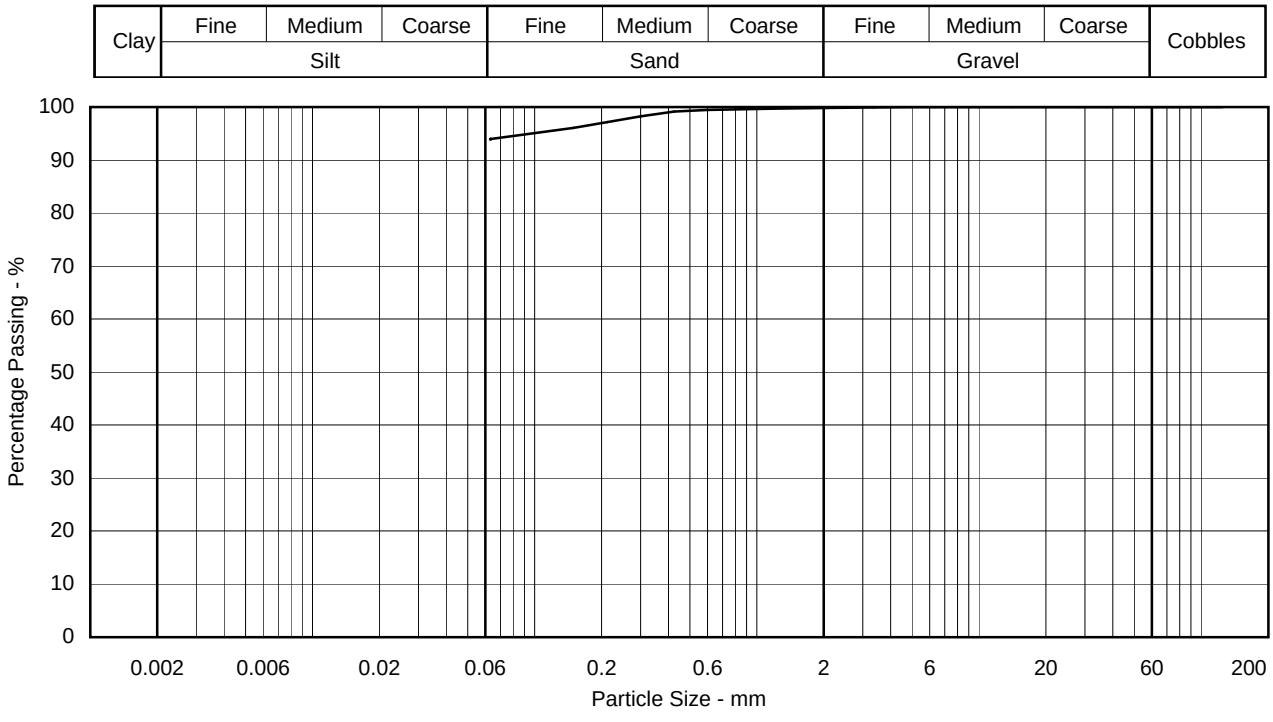
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	99
425 µm	99
300 µm	98
212 µm	97
150 µm	96
63 µm	94

Non Engineering Description
Brown sandy CLAY.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.2
Sand	5.8
Silt & Clay	94.0

Particle Diameter - mm	
D100	5.0
D60	
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	21/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 11

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP101
Engineer		Sample Ref	
		Depth (m)	2.00
		Sample Type	B

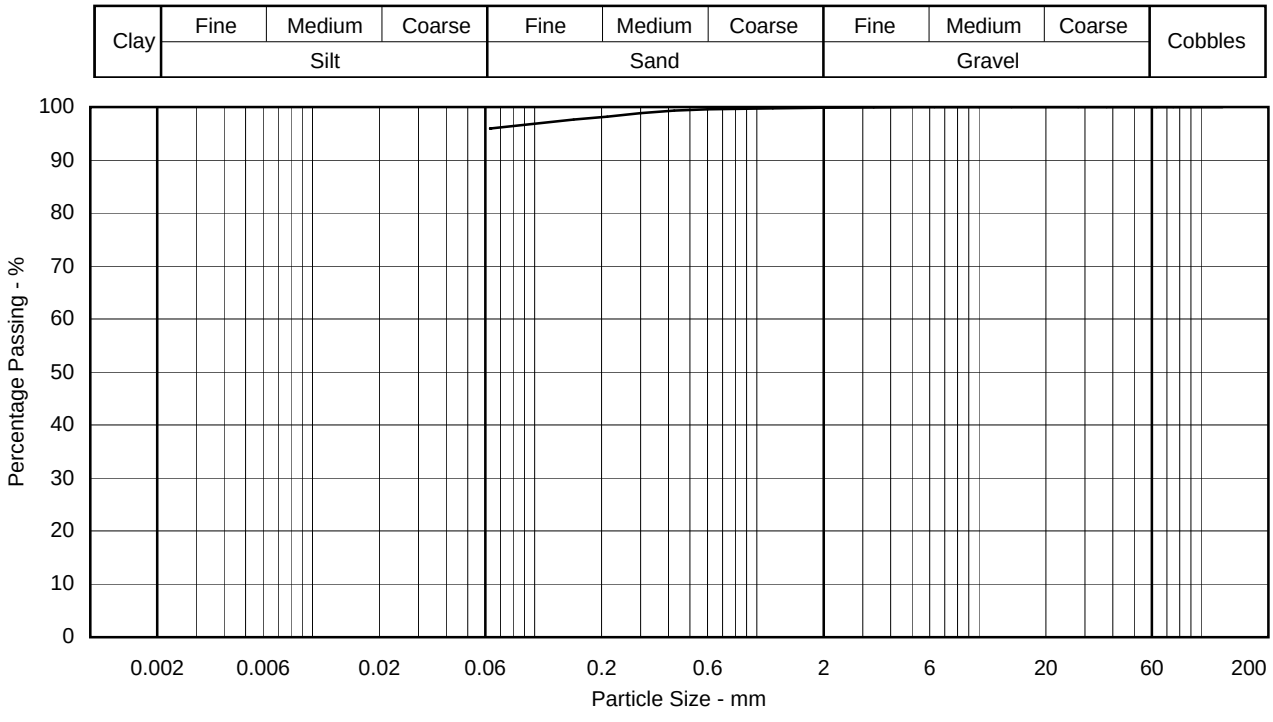
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	99
212 µm	98
150 µm	98
63 µm	96

Non Engineering Description
Brown slightly sandy CLAY.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.1
Sand	3.9
Silt & Clay	96.0

Particle Diameter - mm	
D100	5.0
D60	
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	21/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 12

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP102
Engineer		Sample Ref	
		Depth (m)	0.80
		Sample Type	B

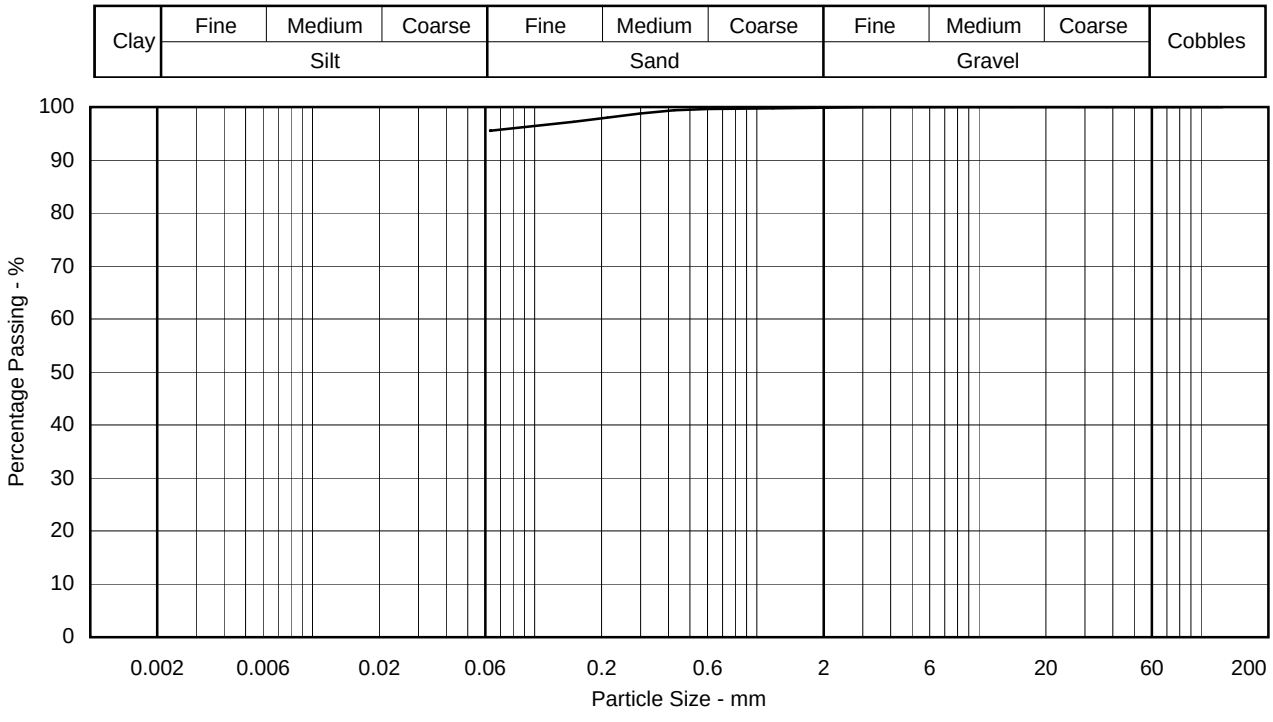
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	100
425 µm	99
300 µm	99
212 µm	98
150 µm	97
63 µm	96

Non Engineering Description
Brown/ grey slightly sandy CLAY.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.1
Sand	4.3
Silt & Clay	95.5

Particle Diameter - mm	
D100	3.4
D60	
D10	
Uniformity Coefficient	N/A

Notes



Originator	Checked & Approved
CR	21/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 13

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP103
Engineer		Sample Ref	
		Depth (m)	1.00
		Sample Type	B

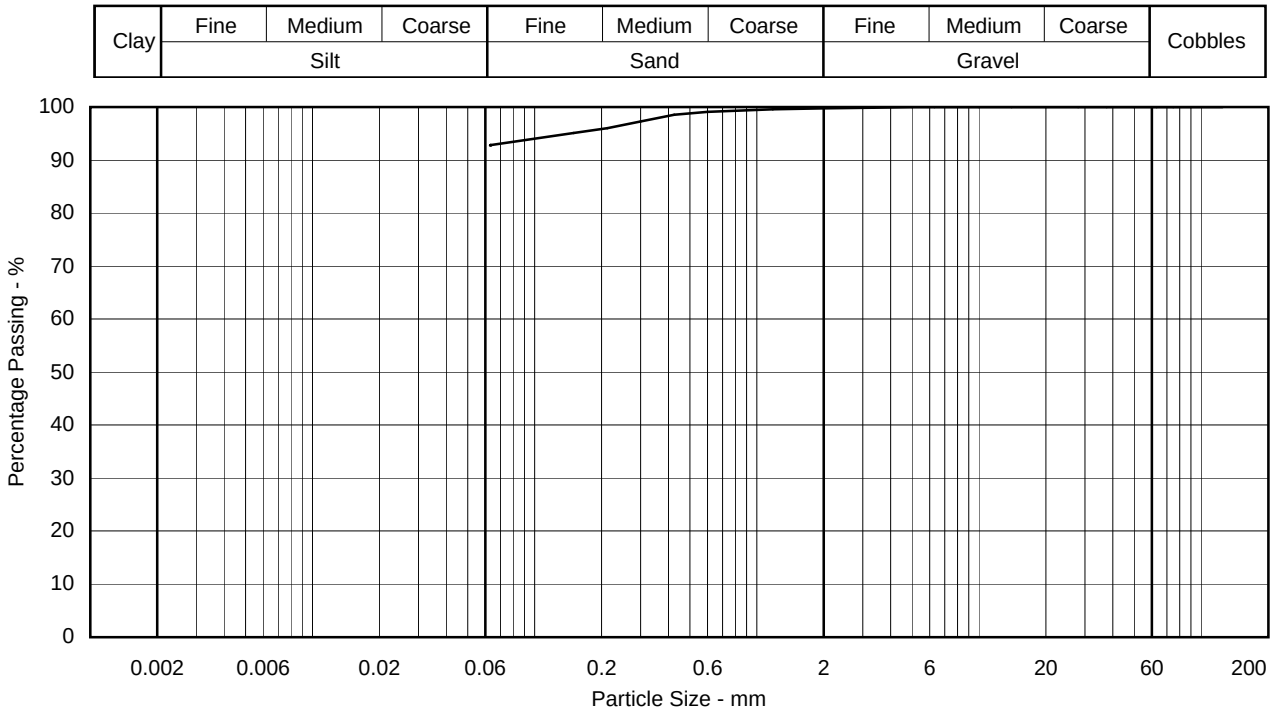
Particle Size	% Passing
125.0 mm	100
90.0 mm	100
75.0 mm	100
63.0 mm	100
50.0 mm	100
37.5 mm	100
28.0 mm	100
20.0 mm	100
14.0 mm	100
10.0 mm	100
6.30 mm	100
5.00 mm	100
3.35 mm	100
2.00 mm	100
1.18 mm	100
600 µm	99
425 µm	99
300 µm	97
212 µm	96
150 µm	95
63 µm	93

Non Engineering Description
Brown/ grey sandy CLAY.

Sample Proportions - %	
Cobbles	0.0
Gravel	0.3
Sand	6.9
Silt & Clay	92.8

Particle Diameter - mm	
D100	5.0
D60	
D10	
Uniformity Coefficient	N/A

Notes



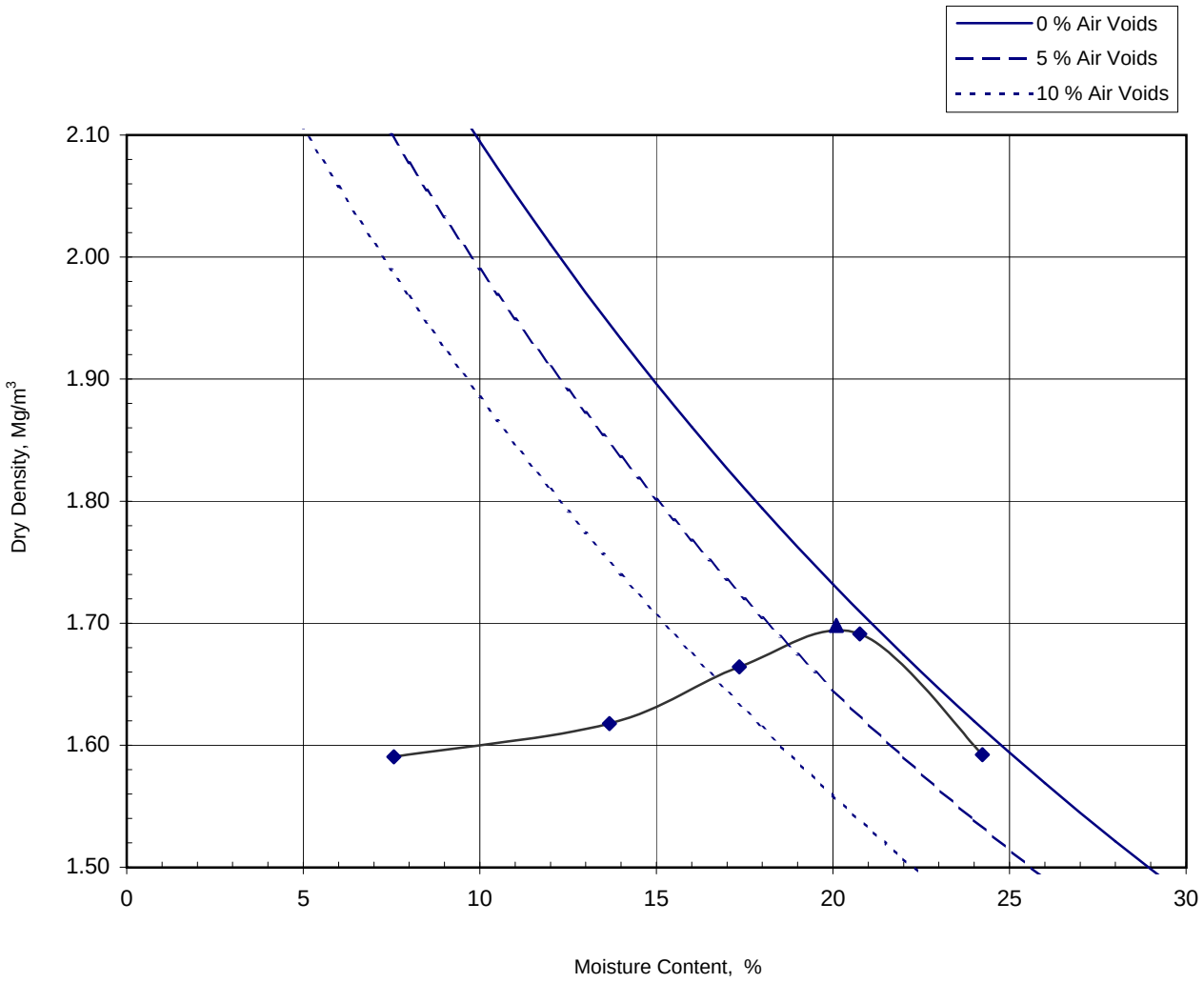
Originator	Checked & Approved
CR	21/04/2015

PARTICLE SIZE DISTRIBUTION
BS1377:Part 2:1990 Clause 9.2 - Wet Sieving

Figure 14

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP101
Engineer		Sample Ref	
		Depth (m)	0.90
		Sample Type	B



Non Engineering Description		Brown sandy CLAY.
Preparation		Air dried
Test Method		2.5kg Rammer for soils with particles up to medium-gravel size
Samples Used		Single
Mass Retained on 37.5 mm Sieve	%	0
Mass Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m³	2.65
Natural Moisture Content	%	-
Maximum Dry Density	Mg/m³	1.70
Optimum Moisture Content	%	20.1

Originator	Checked & Approved
PM	21/04/2015

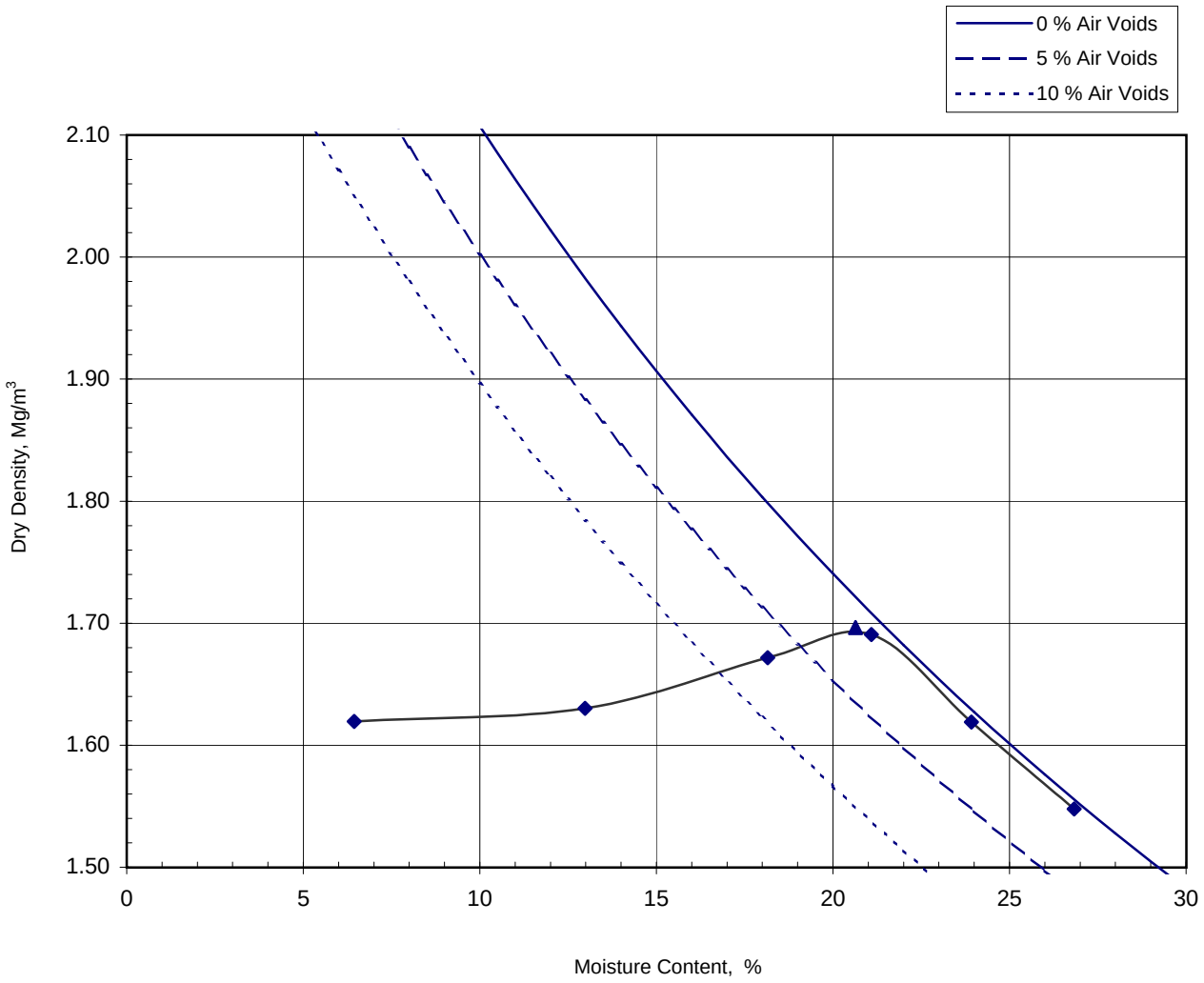
Moisture Content / Dry Density Relationship
BS1377:Part 4:1990 Clause 3.3

Figure 15

Moor Lane, Witton, Birmingham, B6 7HG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP101
Engineer		Sample Ref	
		Depth (m)	2.00
		Sample Type	B



Non Engineering Description		Brown slightly sandy CLAY.
Preparation		Air dried
Test Method		2.5kg Rammer for soils with particles up to medium-gravel size
Samples Used		Single
Mass Retained on 37.5 mm Sieve	%	0
Mass Retained on 20.0 mm Sieve	%	0
Particle Density - Measured	Mg/m³	2.67
Natural Moisture Content	%	-
Maximum Dry Density	Mg/m³	1.70
Optimum Moisture Content	%	20.6

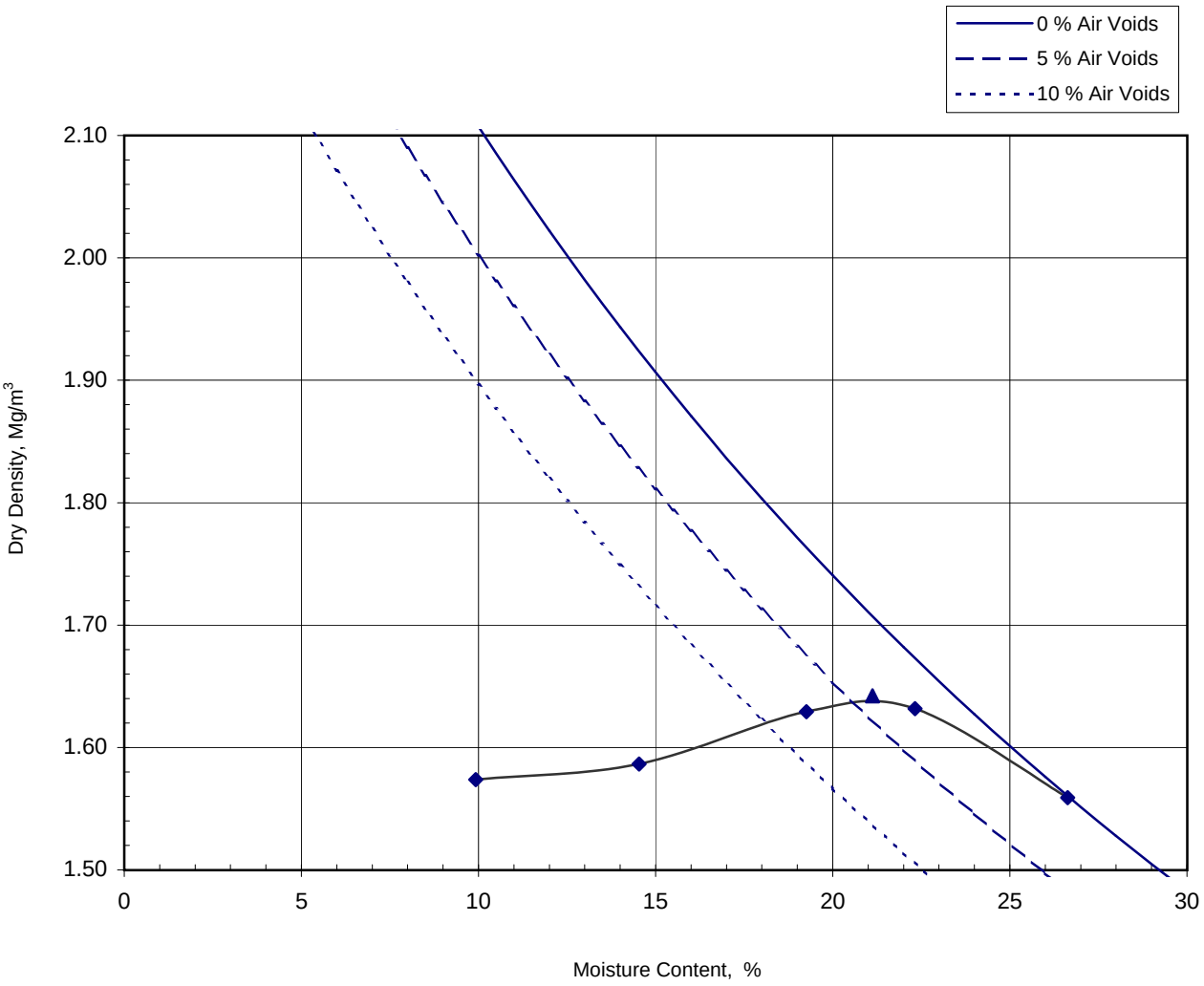
Originator	Checked & Approved
PM	21/04/2015

Moisture Content / Dry Density Relationship
BS1377:Part 4:1990 Clause 3.3

Figure 16

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP102
Engineer		Sample Ref	
		Depth (m)	0.80
		Sample Type	B



Non Engineering Description		Brown/ grey slightly sandy CLAY.
Preparation		Air dried
Test Method		2.5kg Rammer for soils with particles up to medium-gravel size
Samples Used		Single
Mass Retained on 37.5 mm Sieve	%	0
Mass Retained on 20.0 mm Sieve	%	0
Particle Density - Measured	Mg/m³	2.67
Natural Moisture Content	%	-
Maximum Dry Density	Mg/m³	1.64
Optimum Moisture Content	%	21.1

Originator	Checked & Approved
PM	21/04/2015

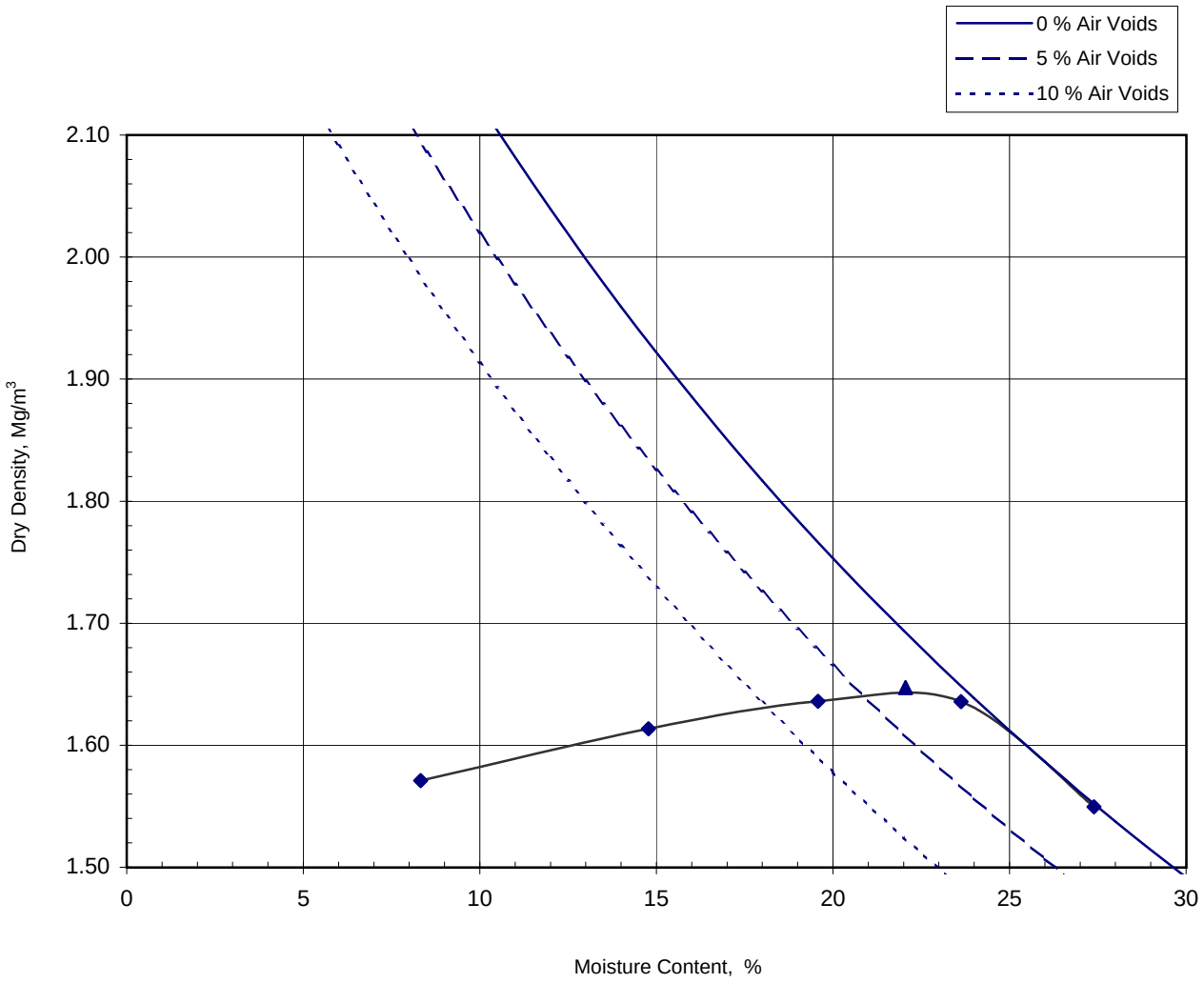
Moisture Content / Dry Density Relationship
BS1377:Part 4:1990 Clause 3.3

Figure 17

Moor Lane, Witton, Birmingham, B6 7HG

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	TP103
Engineer		Sample Ref	
		Depth (m)	1.00
		Sample Type	B



Non Engineering Description		Brown/ grey sandy CLAY.
Preparation		Air dried
Test Method		2.5kg Rammer for soils with particles up to medium-gravel size
Samples Used		Single
Mass Retained on 37.5 mm Sieve	%	0
Mass Retained on 20.0 mm Sieve	%	0
Particle Density - Assumed	Mg/m³	2.70
Natural Moisture Content	%	-
Maximum Dry Density	Mg/m³	1.65
Optimum Moisture Content	%	22.1

Originator	Checked & Approved
PM	S. Langman 21/04/2015

Moisture Content / Dry Density Relationship

BS1377:Part 4:1990 Clause 3.3

Figure 18

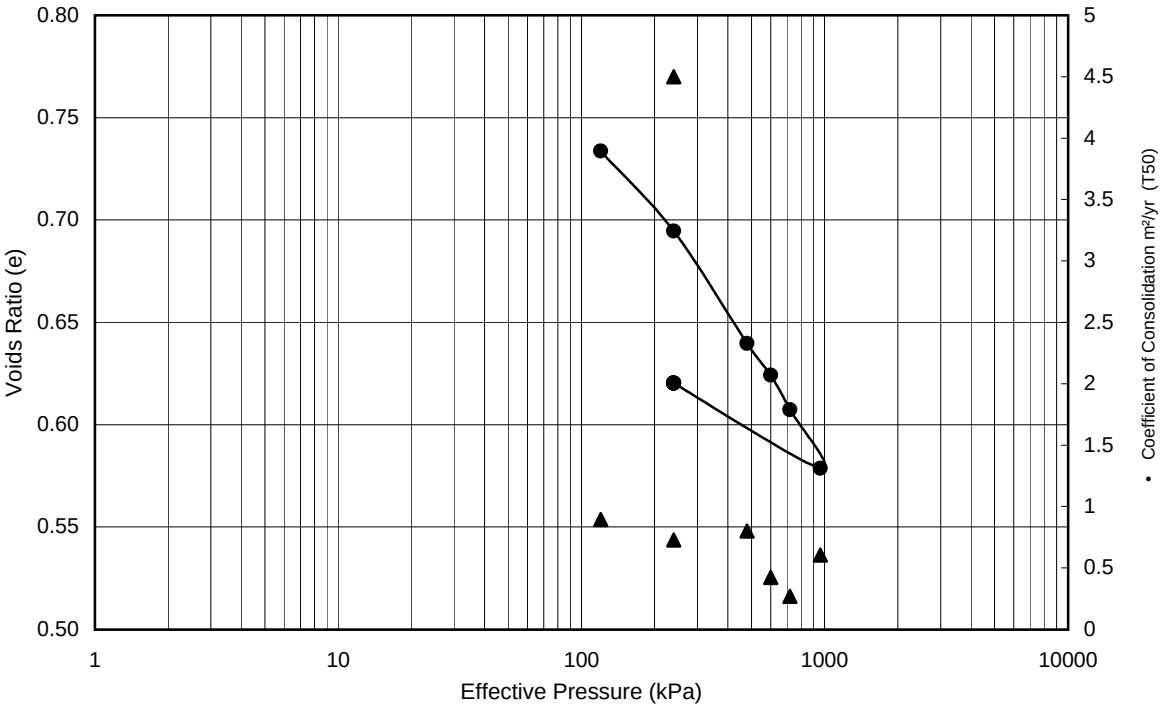
TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site ABENBURY WAY, WREXHAM	Contract No **B19089**
	Client Applied Geology Ltd	Hole ID BH3
	Engineer	Sample Ref
		Depth (m) 6.00-6.45
		Sample Type U

Non Engineering Description: Brown CLAY.

Initial Moisture Content	32 %	Final Moisture Content	27 %	
Initial Voids Ratio	0.810	Final Voids Ratio	0.620	
Initial Bulk Density	1.95 Mg/m³	Particle Density	2.68 Mg/m³	Assumed
Initial Dry Density	1.48 Mg/m³	Degree of saturation	105 %	
Specimen Dimensions	19.97mm x 75.01mm dia			
Laboratory temperature	20±2°C			

Specimen taken 50mm below top of (U100) tube by vertical extrusion with horizontal orientation

Pressure Range kPa	M_v m²/MN	C_v (root time) m²/year	C_v (log time) m²/year	Voids ratio (e)	C_{sec}	Duration days
2 - 120	0.357	1.45	0.90	0.734		1
120 - 240	0.188	1.01	0.73	0.695		1
240 - 480	0.135	1.20	0.80	0.640		1
480 - 600	0.079	3.46	0.42	0.624		1
600 - 720	0.087	3.60	0.27	0.607		1
720 - 960	0.074	2.41	0.60	0.579		1
960 - 240	0.037	6.91	4.50	0.620		1



Originator	Checked & Approved	**ONE DIMENSIONAL CONSOLIDATION** BS1377:PART 5:1990	**Figure 19**
MUF	21/04/2015		Sheet 1 of 1

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

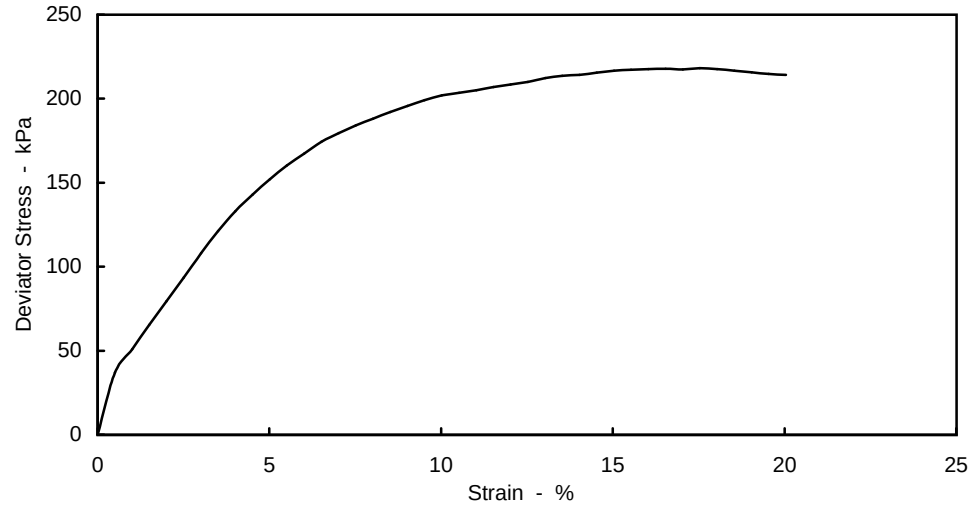
Contract No. B19089

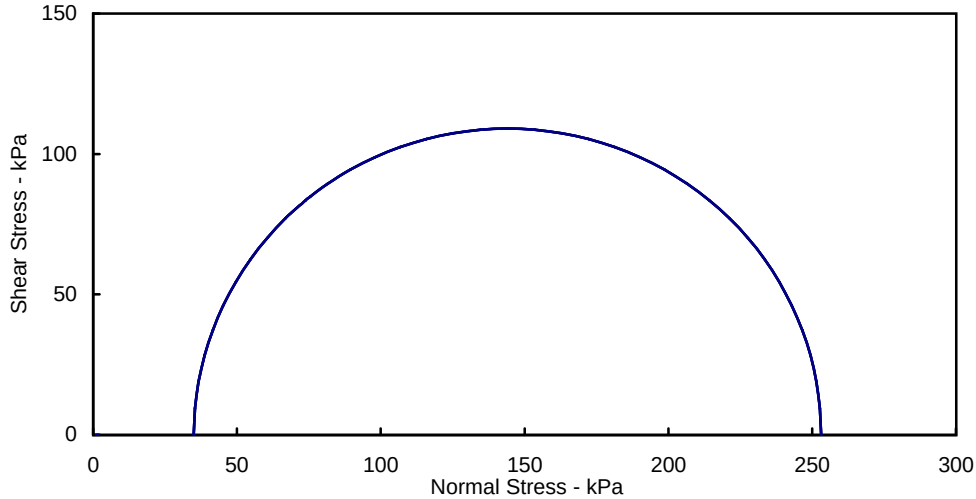
Hole BH3
Sample Ref
Depth (m) 1.50-1.95
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.6		
Diameter	mm	102.3		
Moisture Content	%	21		
Bulk Density	Mg/m³	2.11		
Dry Density	Mg/m³	1.74		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.68		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	35		
Strain at Failure	%	17.5		
Maximum Deviator Stress	kPa	218		
Shear Strength	kPa	109		
Mode of Failure		Plastic		
Non Engineering Description		Soft to firm brown sandy CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





Originator	Checked & Approved
PM	21/04/2015

UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

BS 1377 : Part 7 : 1990 Clause 8

Figure 20

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	B19089
			Hole	BH3
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	1.50-1.95
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 20
PM	S. Langman 21/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

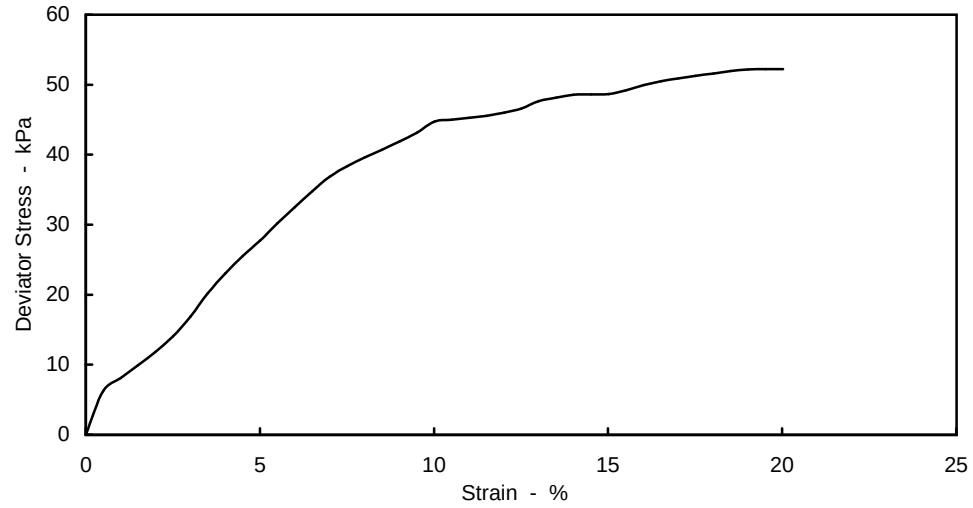
Contract No. B19089

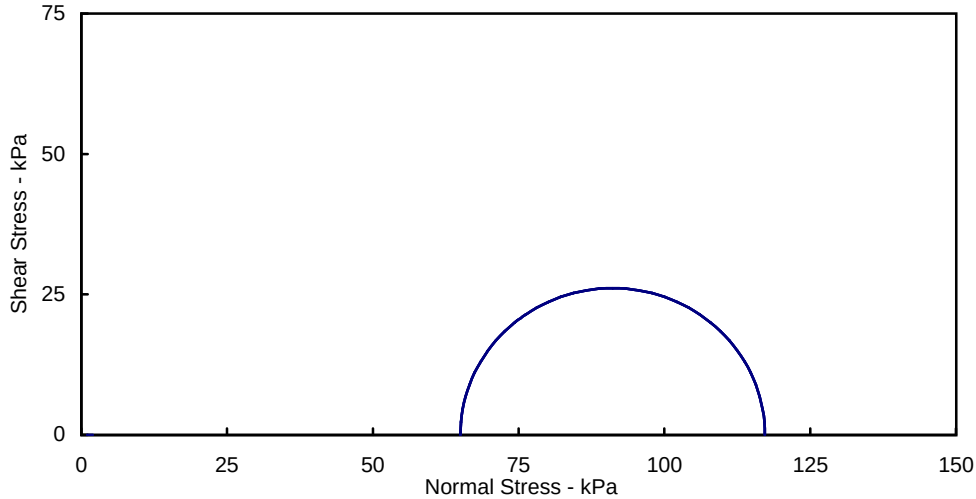
Hole BH3
Sample Ref
Depth (m) 3.00-3.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.8		
Diameter	mm	103.9		
Moisture Content	%	23		
Bulk Density	Mg/m³	1.96		
Dry Density	Mg/m³	1.59		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.72		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	65		
Strain at Failure	%	19.5		
Maximum Deviator Stress	kPa	52		
Shear Strength	kPa	26		
Mode of Failure		Plastic		
Non Engineering Description		Soft brown SILT.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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PM	21/04/2015

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BS 1377 : Part 7 : 1990 Clause 8

Figure 21

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	B19089
			Hole	BH3
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	3.00-3.45
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 21
PM	S. Langman 21/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

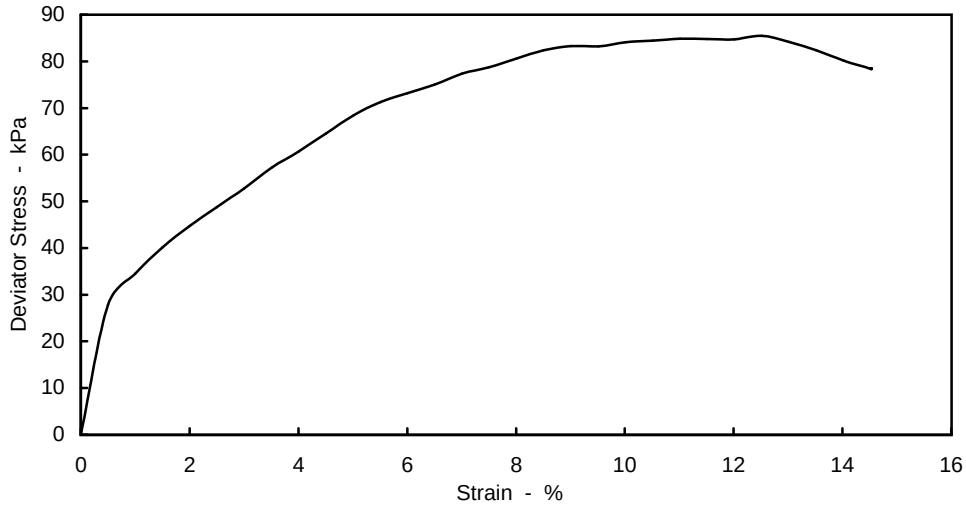
Contract No. B19089

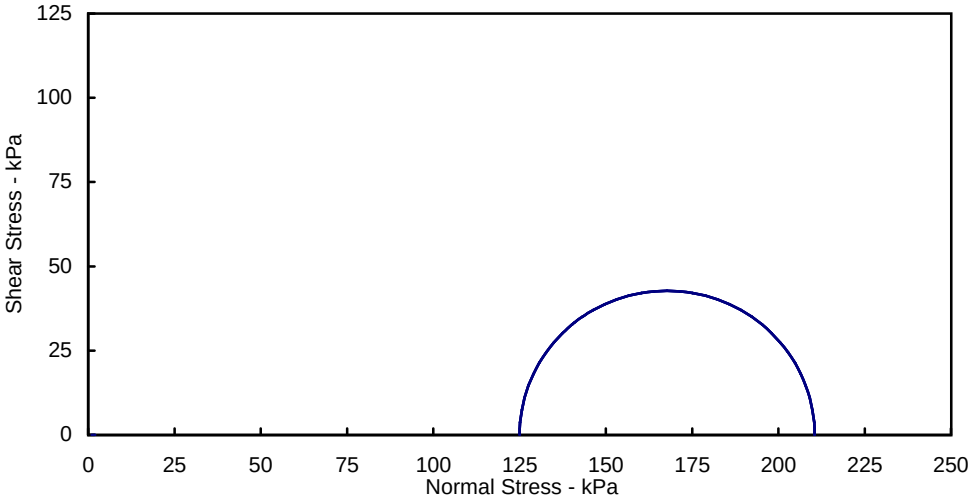
Hole BH3
Sample Ref
Depth (m) 6.00-6.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.7		
Diameter	mm	102.7		
Moisture Content	%	28		
Bulk Density	Mg/m³	2.00		
Dry Density	Mg/m³	1.55		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.52		
Rate of Axial Displacement	%/min	2.00		
Cell Pressure	kPa	125		
Strain at Failure	%	12.5		
Maximum Deviator Stress	kPa	86		
Shear Strength	kPa	43		
Mode of Failure		Brittle		
Non Engineering Description		Firm brown CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

BS 1377 : Part 7 : 1990 Clause 8

Figure 22

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	BH3
Engineer		Sample Ref	
		Depth (m)	6.00-6.45
		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	**Figure 22**
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TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

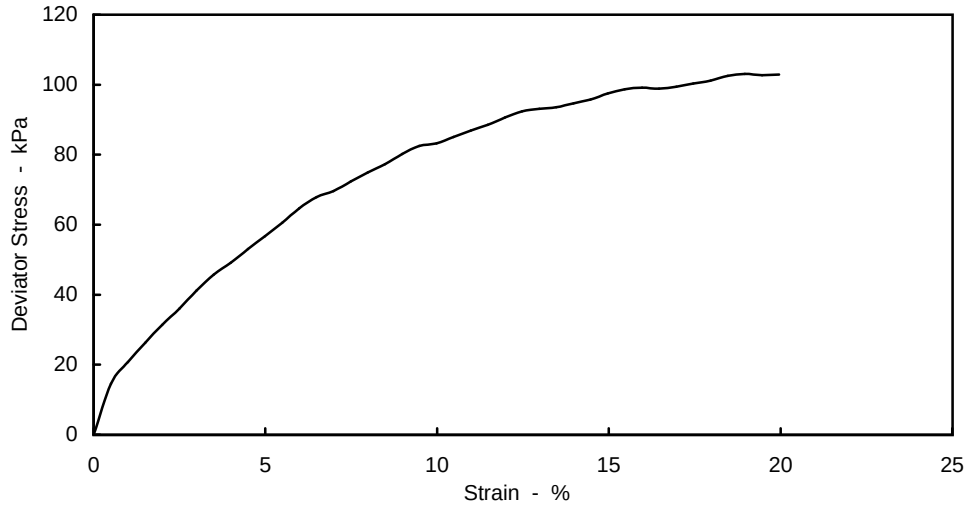
Contract No. B19089

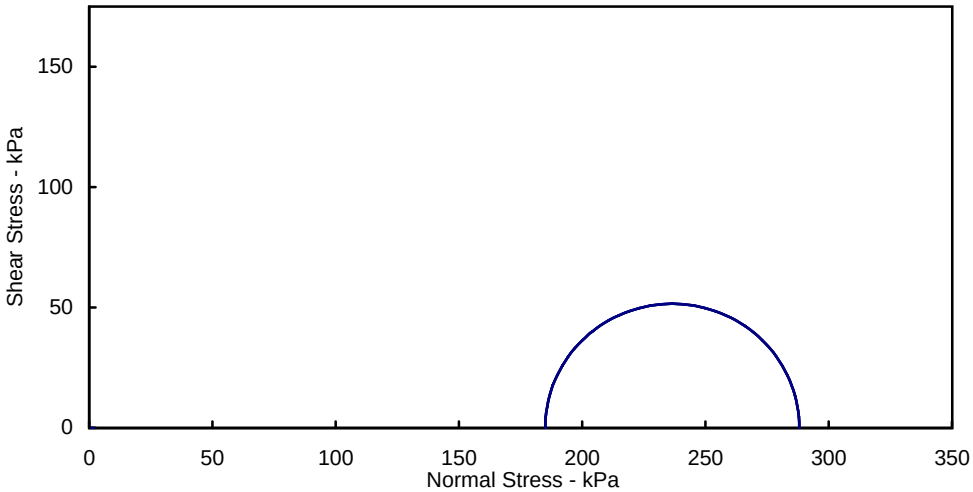
Hole BH3
Sample Ref
Depth (m) 9.00-9.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	200.4		
Diameter	mm	103.3		
Moisture Content	%	25		
Bulk Density	Mg/m³	2.02		
Dry Density	Mg/m³	1.61		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.71		
Rate of Axial Displacement	%/min	1.00		
Cell Pressure	kPa	185		
Strain at Failure	%	19.0		
Maximum Deviator Stress	kPa	103		
Shear Strength	kPa	52		
Mode of Failure		Plastic		
Non Engineering Description		Firm brown slightly sandy CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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UNCONSOLIDATED UNDRAINED SINGLE STAGE TRIAXIAL COMPRESSION

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Figure 23

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES	Site	ABENBURY WAY, WREXHAM	Contract No	B19089
			Hole	BH3
	Client	Applied Geology Ltd	Sample Ref	
			Depth (m)	9.00-9.45
	Engineer		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Figure 23
PM	S. Langman 21/04/2015		Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

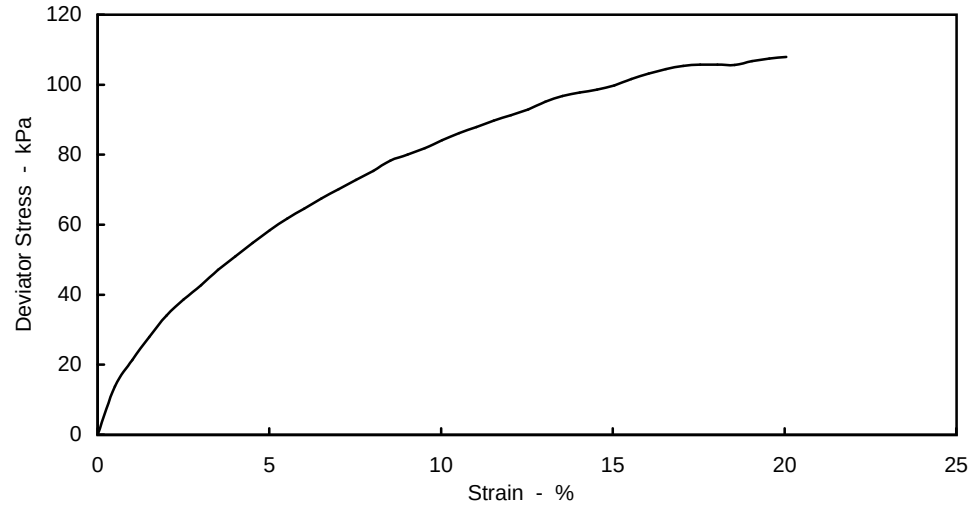
Contract No. B19089

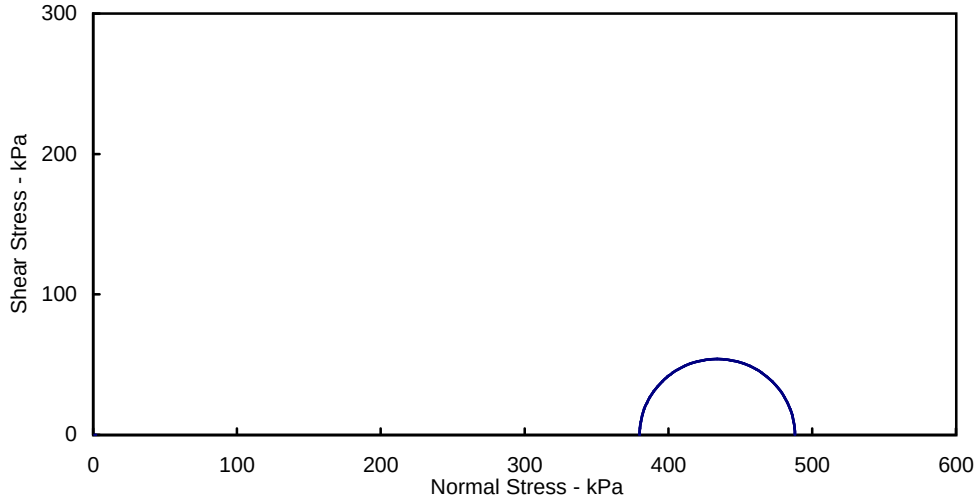
Hole BH3
Sample Ref
Depth (m) 27.00-27.45
Sample Type U

Sample Details				
Sample Condition		Undisturbed		
Height	mm	199.5		
Diameter	mm	102.4		
Moisture Content	%	18		
Bulk Density	Mg/m³	2.14		
Dry Density	Mg/m³	1.82		
Test Details				
Membrane Thickness	mm	0.20		
Membrane Correction	kPa	0.74		
Rate of Axial Displacement	%/min	2.01		
Cell Pressure	kPa	380		
Strain at Failure	%	20.1		
Maximum Deviator Stress	kPa	108		
Shear Strength	kPa	54		
Mode of Failure		Plastic		
Non Engineering Description		Soft brown sandy CLAY.		

Comments
Undisturbed specimen taken 100mm below top of tube

Shear Strength Parameters		
C	n/a	kPa
Phi	n/a	°





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PM	21/04/2015

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BS 1377 : Part 7 : 1990 Clause 8

Figure 24

TERRA TEK
SITE INVESTIGATION AND LABORATORY SERVICES

Site	ABENBURY WAY, WREXHAM	**Contract No**	**B19089**
Client	Applied Geology Ltd	Hole	BH3
Engineer		Sample Ref	
		Depth (m)	27.00-27.45
		Sample Type	U





Originator	Checked & Approved	Please note that these photographs are intended to show the failure mode, and do not necessarily show accurately the colouration of the soil.	Tk	**Figure 24**
PM	S. Langman 21/04/2015			Sheet 2 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

Contract No B19089

Sample Identification				Lab Sample ID	Date Sampled	Temperature of cool box on receipt °C	Description
Exploratory Hole	Depth m	Sample Ref	Sample Type				
BH3	9.00-9.45		U	273260	Deviating	13.6	Brown CLAY
BH3	27.00-27.45		U	273261	Deviating	13.6	Brown CLAY
TP101	2.00		T	273247	Deviating	13.6	Brown CLAY
TP102	0.80		T	273249	Deviating	13.6	Brown CLAY

Notes

1. Where a date of sampling is not provided, the sample is classified as deviating.
2. Temperatures exceeding 6°C on receipt may be deviating, but will be dependent upon the suite of tests carried out.
3. Samples are considered deviating if the incorrect sample container type has been used. This is indicated within the report tables.
4. Results reported for samples classified as deviating may be compromised.

Originator	Checked & Approved
SPL	S Langman 21/04/2015

LABORATORY DESCRIPTIONS

Appendix X

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

Contract No B19089

Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
GP001	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Preparation of soil samples for chemical analysis	Yes	Yes	N/A
TP019	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of pH in 2.5:1 water/soil extract using pH meter.	Yes	Yes	Dry
TP029	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of acid soluble sulfate by gravimetry.	Yes	Yes	Dry
TP032	MAFF Book 427: The Analysis of Agricultural Materials: Method 8	Determination of water soluble boron by colorimetry	Yes		Dry
TP033	APHA/AWWA, 19th edition: Method 5520E	Determination of Toluene Extractable Matter by soxhlet extraction.	Yes		Dry
TP037	ISO 11466, 1995 : Soil Quality: Extraction of Trace Elements Soluble in Aqua Regia	Determination of aqua regia extractable metals by ICP-OES.	Yes	Selected (see report table)	Dry
TP038	ISO 11466, 1995 : Soil Quality: Extraction of Trace Elements Soluble in Aqua Regia	Determination of aqua regia extractable arsenic, selenium & antimony by ICP-OES/hydride generation	Yes	Yes	Dry
TP040	APHA/AWWA, 19th edition: Method 3500Cr-D	Determination of hexavalent chromium by colorimetry.	Yes		Dry
TP041	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of organic matter by titrimetry.	Yes		Dry
TP042	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of loss on ignition at 50-440°C by gravimetry	Yes	Yes	Dry
TP043	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of water soluble sulfate in 2:1 water/soil extract	Yes	Yes	Dry
TP045	GACHAMJA A.M. Chromatography and Analysis: 1992 9-11 (modified)	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS	Yes	Yes	Dry
TP046	MEWAM method: Phenols in water and Effluents: 4-aminoantipyrine method	Determination of monohydric phenols by steam distillation/colorimetry	Yes	Yes	Dry
TP047	MEWAM method: Cyanide in Waters etc	Determination of Free Cyanide by steam distillation/colorimetry	Yes		Dry
TP048	MEWAM method: Cyanide in Waters etc	Determination of total cyanide by steam distillation/colorimetry.	Yes	Yes	Dry
TP049	MEWAM method: Cyanide in Waters etc	Determination of complex cyanide by calculation	Yes		Dry
TP050	MEWAM method: Determination of Thiocyanate ,1985	Determination of thiocyanate by colorimetry	Yes	Yes	Dry
TP051	USEPA Method 9030B	Determination of acid soluble sulfides by steam distillation/colorimetry.	Yes	Yes	Dry
TP052	BS1881: Part 324, 1988: Testing Concrete	Determination of elemental sulfur by soxhlet extraction and titrimetry.	Yes		Dry
TP067	TNRCC Method 1005: 2001 (modified)	Determination of pentane/acetone extractable petroleum hydrocarbons (C8 - C40) by GC/FID	Yes	Yes	Wet

Notes

1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample.
2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated.
3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request.
4. The laboratory records the date of analysis of each parameter. This information is available on request.
5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.

Originator	Checked & Approved	**SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)**	**Appendix Y**
N/A	N/A		Sheet 1 of 2

TERRA TEK SITE INVESTIGATION AND LABORATORY SERVICES

Site ABENBURY WAY, WREXHAM

Client Applied Geology Ltd

Engineer

Contract No B19089

Method Code	Reference	Description of Method	ISO17025 Accredited	MCERTS Accredited	Wet/Dry Sample Tested
TP070	MAFF Book 427, Method 11	Determination of available metals by ICP-OES.			Dry
TP072	In-house documented method	Determination of ammoniacal nitrogen by colorimetry.			Dry
TP073	In-house documented method	Determination of anionic detergent (MBAS) by colorimetry			Dry
TP074	In-house documented method	Determination of water soluble fluoride by ion selective electrode			Dry
TP098	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of acid soluble chloride by titrimetry			Dry
TP099	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
TP100	Wisconsin DNR Modified GRO method, Method for Determining Gasoline Range Organics	Determination of Volatile Petroleum Hydrocarbons/GRO.	Yes	Yes	Wet
TP110	USEPA Methods 8082A & 3665A	Determination of Total & Speciated 7 PCB Congeners by GC/MS SIM	Yes	Yes	Wet
TP114	BS1377, Part 3, 1990: Soils for Civil Engineering Purposes.	Determination of carbonate in soil (rapid titration method)			Dry
TP115	MAFF Book 427: The Analysis of Agricultural Materials: Method 8	Determination of water soluble boron by ICP-OES	Yes	Yes	Dry
TP125	BS EN 12457-3: Characterisation of Waste - Compliance test for leaching of granular waste materials and sludges (two-stage batch test)	Preparation of soil samples for two-stage leachate test			Dry
TP126	TNRCC Method 1006 (modified)	Extracted petroleum hydrocarbons from TP067 split into aromatic and aliphatic fractions. Analysed by GC/FID.	Yes		Wet
TP134	In-house documented method	Determination of water soluble chloride by titrimetry	Yes	Yes	Dry
TP135	USEPA Methods 8100 & 8270D. In-house method TP045	Determination of polyaromatic hydrocarbons extractable in dichloromethane, by GC/MS (with concentration stage)			Dry
TP136	In-house documented method	Determination of water soluble magnesium in soil			Dry
TP145	USEPA Methods 3550C & 8270D	Determination of Semi-Volatile Organic Compounds by GC/MS	Yes	Yes	Wet
TP147	USEPA Methods 8082A & 3665A	Determination of total & speciated WHO 12 PCB Congeners by GC/MS SIM.			Wet
TP150	USEPA Methods 8081B & 8141B	Determination of pesticides and herbicides in soil by GC/MS SIM			Dry
TP152	USEPA Method 556	Determination of carbonyls in soil by GC/MS.			Wet
TP154	USEPA Method 5021. Wisconsin DNR modified GRO method	Determination of volatiles in soil by GC/MS headspace			Wet

Notes

1. Terra Tek (Birmingham) are MCERTS accredited for clay, sand & loam matrix types only, where they constitute the major component of the sample. Other coarse granular materials, ie gravel, are not accredited where they comprise the major component of the sample.
2. Results are expressed on a dry-weight basis (samples dried at 30°C ± 5°C) except where stated.
3. The laboratory removes any material >2mm prior to analysis. The quantity and nature of any material removed from samples is recorded and the information is available on request.
4. The laboratory records the date of analysis of each parameter. This information is available on request.
5. Where a parameter cannot be determined in house it is our policy to use a UKAS/MCERTS accredited laboratory wherever possible. Terra Tek will assume responsibility for the quality of subcontracted tests and the performance of the subcontractor chosen. Where there is no known UKAS/MCERTS laboratory for a particular parameter, a laboratory listed within the Terra Tek Approved Subcontractors list, which is subject to performance assessment, will be selected.

Originator	Checked & Approved	SUMMARY OF IN-HOUSE ANALYTICAL TEST METHODS (SOIL)	Appendix Y
N/A	N/A		Sheet 2 of 2

APPENDIX E

APPENDIX E

STANDARD FIELDWORK AND ASSESSMENT PROCEDURES

Scope of Work

The scope of work undertaken is defined in Section 1.1 of the Report. It should be noted that Applied Geology Limited does not provide arboricultural surveys or specialist surveys for the detection of invasive plant species (such as Japanese Knotweed) or protected species of wildlife. Information from environmental and ecological datasets is included from a review of the MAGIC (Multi-Agency Geographic Information for the Countryside) website, however, if a full assessment of Environmental or Ecological aspects is required, it is recommended that other specialists are consulted. Similarly, information on flood risk is included obtained from the Environment Agency Web site and the GroundSure report but this is not intended to be a full hydrological study and if a flood risk assessment is needed, additional analysis by others is recommended to confirm this aspect of the development.

Fieldwork

Fieldwork is generally carried out, in accordance with BS5930 (1999) "Code of Practice for Site Investigations", BS10175 Investigation of Potentially Contaminated Sites, and the Association of Geotechnical and Geo-environmental Specialist Guidelines for Good Practice in Site Investigations (August 1998)

Prior to commencement on site, statutory services plans are generally obtained and verbal enquiries are also made regarding the positions of private or statutory services on site. Prior to excavation or drilling, locations are scanned with a cable avoidance tool (CAT) and service pits are generally excavated at borehole positions, where possible.

Descriptions and depths of the various strata recovered are presented on the exploratory hole records, reproduced in the report appendices, together with sample depths, the results of in-situ testing, comments on groundwater inflows, and any other pertinent information. The strata descriptions are in accordance with BS5930:1999 incorporating Amendment No 2 (2010). Disturbed plastic pot and glass amber jar samples are recovered from the various strata and stored and transported in cool boxes, where relevant, for possible future laboratory testing.

Light cable percussion boreholes are generally drilled using a Pilcon Wayfarer or Dando rig and are advanced using equipment to bore 200/150mm diameter boreholes. Disturbed plastic pot samples are recovered from all deposits encountered to allow examination and laboratory testing. Certain strata are cased off due to their tendency to collapse, particularly in the presence of groundwater inflows and/or to reduce the risk of cross contamination. In situ Standard Penetration Tests, using Split Spoon (SPT) and Cone (CPT) are undertaken in the boreholes to provide a measure of the relative density of the granular (coarse grained) deposits or shear strength of the clay/chalk/ weathered rock deposits using industry recognised correlation guidelines of shear strength against SPT "N" value results. Within the fine grained (cohesive) deposits, "undisturbed" 100mm driven open tube samples were recovered from the various deposits to provide samples for examination and laboratory testing. On encountering groundwater, boring is usually suspended for 20 minutes while any rise in water level is recorded. Full details of the groundwater observations and monitoring results during boring operations are included on the borehole records. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion, unless otherwise stated on the individual logs.

Unless otherwise stated on the relevant logs, trial pits are excavated using a wheeled backhoe excavator, usually with a 0.6m wide bucket. The excavations are logged from the ground surface by an Engineering Geologist / Geo-environmental Engineer and relevant field testing, appropriate to the soils encountered, is carried out on samples brought to the surface. Disturbed soil samples are collected from selected horizons for subsequent laboratory testing. The trial pits are usually unshored and where reasonable, left open for a period of time to allow observations of pit stability

and depth and inflow rate of any groundwater ingress. The excavations are backfilled with arisings prior to moving on to the next position. Any trial pits carried out as part of this or previous investigations may represent soft spots and conduits/sumps for groundwater or surface water. In excavations, such materials may also be loose and unstable.

Driven Continuous Sampling (DCS) boreholes are drilled using a track mounted Global mini-rig or similar using sampling tubes of varying diameter (decreasing with depth). Samples of the deposits encountered are recovered in 1m long clear plastic liners, which are logged and sub-sampled on site by an Engineering Geologist. Generally for geotechnical investigations, during the drilling process in-situ Standard Penetration Tests (SPTs) are undertaken at selected depths to determine the relative density of coarse grained deposits encountered or the in-situ strength of fine grained deposits by comparing the SPT "N" value results with published empirical data. Groundwater seepages are noted during drilling if encountered. All boreholes without monitoring wells installed are usually backfilled with arisings upon completion.

Unless specifically stated in the report, exploratory hole locations should be regarded as approximate. Consideration should be given to accurate location of the exploratory holes where it is considered they may impact on proposed development.

Laboratory Testing

The geotechnical testing was carried out in accordance with BS 1377:1990 Method of Tests for Soils for Civil Engineering Purposes and was undertaken by a UKAS accredited specialist laboratory. Chemical testing was undertaken by a UKAS accredited specialist chemical testing laboratory and MCERTS accredited methods, in accordance with Environment Agency recommendations, were specified where available.

Contamination Assessment – Human Health

Applied Geology Limited has followed the guidance given in the CLR 11 publication and other available guidance to assess the contaminant concentrations. Details of the methodology followed are briefly outlined below.

The available chemical data is sorted into appropriate datasets depending on sampling regime and ground conditions. An initial generic quantitative risk assessment is undertaken on this data using statistical tests, where appropriate, and appropriate screening values.

Risk to human health has been initially assessed by comparing soil results against various published statutory and non-statutory screening criteria. These have been sourced from the following, in order of preference:

- Environment Agency/DEFRA, Soil Guideline Values (SGV) published in 2009 and 2014 using the new CLEA model and DEFRA Category 4 Screening Levels (C4SL);
- LQM/CIEH Generic Assessment Criteria (LQM GAC V2) Version 2, 2009;
- EIC/AGS/CL:AIRE Soil Generic Assessment Criteria, 2010.

Reference has also been made to the Soil Screening Values (SSV) derived by Atkins (ATRISKsoil) and updated and published on their website in March 2011.

However, due to the difference in soil type used by Atkins to derive their screening values, Applied Geology has also generated their own screening criteria for various end-uses/SOM combinations but only using published toxicological data (from the above sources) to generate GAC using CLEA v1.06. Applied Geology GAC has therefore generally been used in preference to Atkins SSV as they are more comparable with the EA, LQM/CIEH and EIC/AGS screening values.

In March 2014, DEFRA published a new series of soil screening values, termed Category 4 Screening Levels (C4SL), which are intended to allow identification of those sites that fall within Category 4 (not contaminated) and are therefore able to be developed with no further remedial

action. The C4SL are considered to represent a contamination level that is 'low' from a toxicological view point, and is therefore considered to be 'acceptable'.

Historically, the level of contamination has been assessed with reference to SGV/GAC values which were derived to represent a 'minimal' level of contamination. The SGV/GAC values are still valid and can be used alongside C4SL, however both screening values are only intended to provide guidance as to the level of contamination, and where concentrations fall below these screening values, the site is not contaminated (and is within Category 4). Exceedance of a SGV/GAC/C4SL does not automatically indicate that an 'unacceptable' risk exists at a site; simply that further consideration of that particular contaminant is required.

The latest guidance from the HPA advises that for the assessment of speciated Polyaromatic Hydrocarbons (PAH) contamination benzo(a)pyrene (b(a)p) can be used as a surrogate marker for 'genotoxic' (gene damaging) PAHs. The surrogate marker approach estimates the toxicity of a mixture of PAHs in an environmental matrix by using data from toxicity studies in which a PAH mixture of known composition was tested. Exposure to the surrogate marker (b(a)p for C4SL) is assumed to represent exposure to all the PAHs in the environmental matrix. Thus, the level of toxicity ascribed to the surrogate represents the toxicity of the PAH mixture. This allows an assessment of the combined carcinogenic risk associated with genotoxic PAHs using only b(a)p.

Contamination Assessment – Controlled Waters

Risks to Controlled Waters have been assessed by following the guidance given in the CLR11 Model Procedures Report (EA 2004) and EA publication "Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination (EA 2006)".

This guidance presents a recommended methodology comprising several levels of assessment for deriving site-specific remedial objectives (Target Values) for contaminated soils and/ or groundwater in order to protect the aquatic environment. The different levels of assessment are summarised below.

Level	Soil Source	Groundwater Source
1	Partition into leachate	Not applicable
2	As above, plus attenuation in the unsaturated zone and dilution in the aquifer	Direct comparison to appropriate quality standards
3	As above, plus lateral attenuation in the saturated zone to off-site compliance point	Lateral attenuation in the saturated zone to off-site compliance point

*soil leachate extraction test results used if available and appropriate.

Effectively the Level 1 soil and Level 2 groundwater assessments are preliminary. The other level is a detailed assessment requiring the use of suitable software, which is outside the scope of this investigation.

From the available soil, leachate and groundwater results, chemicals of concern are selected which are then directly compared to appropriate published standards. The principal standards used to assess the potential risks to controlled waters are the UK drinking water standards (UK DWS) and the Environment Agency's Environmental Quality Standards (EQS), which are derived for the protection of aquatic life.

Waste Soil Disposal

A specific categorisation and assessment of potential waste soils arising from the proposed development has not been undertaken as part of the investigation, unless otherwise detailed in the report text. However, generic comments and advice are made below for the reader.

Any excavated soil material and excess spoil disposed of off-site should be treated as Waste and classified as Inert, Non-hazardous or Hazardous for off-site disposal prior to removal from site as required by the “Duty of Care” (Environmental Protection Act, 1990) legislation together with Annex II of Directive 1999/31/EC (“Landfill Directive”).

All waste soils should be sorted to prevent mixtures of waste types. Where possible, any waste soil should be recycled and the volume of soil to be disposed of should be minimised. Initially, Basic Characterisation of the waste is required whereby the material should be described and its source of origin recorded (a site plan, exploratory hole records and the certificates of chemical analysis in this report should be included).

This should also include data on its composition and leaching behaviour, its European Waste Catalogue (EWC) code, and where relevant any hazardous properties according to Annex III of Directive 91/689/EEC. This information should be provided to the licensed waste contractor.

Soils excavated on many sites would generally fall under the EWC description “Soil and Stones”, EWC code 17 05 04 with restrictions excluding topsoil and peat. Waste Acceptance Criteria (WAC) testing is required for all other Inert wastes and Hazardous Waste where relevant but not for non-hazardous waste.

Any asbestos must be disposed of by suitably licensed contractors to a suitably licensed facility.

Health & Safety Aspects

As outlined within the HSE publication ‘Successful Health and Safety Management - HSG65’, this report should inform your development of safe systems of work and information as an input into the safety management system.

When developing risk control systems we suggest making reference to the CIRIA report 132 "A guide for safe working on contaminated sites" and the HSE document "Protection of workers and the general public during the development of contaminated land – HSG66". All risk control measures should be in accordance with the guidelines laid down within the Management of Health and Safety at Work Regulations 1999.

The contents of this report may be used to supplement the contents of the Health and Safety File as required under the Construction Design and Management (CDM) Regulations.

Trench support or the angle of batter should be designed by an appropriately qualified engineer or competent person to suit the required depth and the ground and groundwater conditions.

Care should be taken when digging excavations to prevent undermining or causing loss of support to the foundations of the nearby adjoining structures. Surcharging such as from spoil or vehicle movements close to excavation sides should be avoided

Practical guidance on trench excavation is given in CIRIA Report 97 Trenching Practice. Guidance on groundwater control is given in CIRIA Report 113 Control of groundwater for temporary works. Temporary works should be designed by a suitably qualified engineer or a competent person particularly where personnel access is necessary, in accordance with the requirements of the Construction (Design and Management) (CDM) Regulations.

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