Wykham Park Farm

Banbury

Site Investigation

Report for

Gallagher Estates

April 2017

Hydrock Project Ref: C-04841-C

Report Ref: WPF-HYD-XX-XX-RP-G-1001-P1-S2

DOCUMENT CONTROL SHEET

Issued by: Hydrock Consultants Limited
Over Court Barns
Over Lane
Almondsbury
Bristol
BS32 4DF

Tel: 01454 619533
Fax: 01454 614125
www.hydrock.com

Client: **Gallagher Estates**

Project: **Wykham Park Farm**

Title: **Desk Study and Ground Investigation Report**

Status: Final

Date: April 2017

Document Production Record

Issue Number:	P1 S1	Name	Signature
Prepared		Richard Coward BSc MSc CGeol FGS	[redacted]
Checked		Rob Hooker BSc MSc MCSMA FGS	[redacted]
Approved		Mark Briggs BSc CGeol FGS	[redacted]

Document Revision Record

Issue Number	Date	Revision Details
1	April 2017	Original issue.

Hydrock Consultants Limited has prepared this report in accordance with the instructions of the above named client for their sole and specific use. Any third parties who may use the information contained herein do so at their own risk

Contents

Appendices

Executive Summary and Conceptual Site Model

SITE INFORMATION AND SETTING	
Report Purpose	Phase 2 Interpretative Ground Investigation and Risk Assessment.
Client	Gallagher Estates.
Site Name and Location	Wykham Park Farm, Banbury.
Proposed Development	1000 residential properties, a local centre with commercial and community uses, a community primary school, associated landscape / infrastructure and employment space.
PHASE 1 (DESK STUDY + WALK-OVER)	
Current Land Use and Description	The site currently comprises five hedge lined arable agricultural fields.
Site History	Historical mapping shows the site to have been in agricultural use since the earliest Ordnance Survey mapping obtained. No significant alterations to the field boundaries are recorded.
Unexploded Ordnance	A non-specialist UXO assessment indicates low bomb risk. No further consideration of UXO is required.
Geology	Geological mapping records the site to be underlain at shallow depth by a succession comprising the Whitby Mudstone Formation, the Marlstone Rock Formation and the Dyrham Formation. The majority of the site is covered by strata of the Whitby Mudstone Formation with the Marlstone Rock Formation and Dyrham Formations shown outcropping in the west of the site where site gradients increase; the Marlstone Rock Formation also outcrops on the extreme east of the site. The Whitby Mudstone Formation is recorded as comprising a mudstone, siltstone and sandstone sequence. The Marlstone Rock Formation comprises a ferruginous limestone with interbeds of ferruginous mudstone and sandstone. The Dyrham Formation comprises primarily mudstone with interbeds siltstone and sandstone.
Hydrogeology	The Whitby Mudstone Formation and Marlstone Rock Formation are classed by the Environment Agency as a Secondary A Aquifers. Given the local setting it is anticipated that their prime function is to provide baseflow contribution to rivers. The Dyrham Formation is classified as a Secondary Aquifer with undifferentiated layers. The site does not lie within a source protection zone.
Hydrology	The nearest hydrological receptor identified is that of a field ditch on the southern site boundary.
Flood Risk	The site is in Flood Zone 1.
Previous Site Data	A Desk Study Report prepared for Gallagher Estates by Wardell Armstrong has been provided to Hydrock upon which to base the ground investigation for the site.
PHASE 2 – GROUND INVESTIGATION	
Hydrock Site Works	The Hydrock ground investigation comprised: • 132 trial pits to a maximum depth of 3.60m bgl; • 3 dynamic sampled and rotary cored boreholes with gas/groundwater monitoring standpipes; • 9 infiltration tests & 2 falling head permeability tests; • chemical testing of soils, waters and leachates; • geotechnical testing of soils and rock; and • 3 gas/groundwater monitoring visits.

<table>
<tr><td>Ground Conditions Encountered
(All Data)</td><td>Slightly clayey sandy topsoil persists across the site to between 0.15 and 0.40m depth below ground level. Beneath the topsoil the majority of the site is covered by residual soils of the Whitby Mudstone Formation extending up to 1.80m depth bgl. This strata comprised slightly sandy clay with some mudstone lithorelics. Beneath this and from below the topsoil in the west of the site, the Marlstone Rock Formation was encountered; this typically comprised strong yellow brown distinctly to partially weathered ferruginous limestone with interbeds of ferruginous clay. At the boundary with the overlying Whitby Mudstone Formation the Marlstone Rock Formation has often weathered to a residual clay containing limestone lithorelics. Thicknesses of > 5.7m of the Marlstone Rock Formation were encountered, from the outcrop in the west of the site, a total thickness of 5-10m is inferred. Beneath the Marlstone Rock Formation and from surface in the west of the site, the Dyrham Formation was encountered; this comprises residual clays grading to mudstone.</td></tr>
<tr><td>Groundwater Encountered
(All Data)</td><td>Groundwater has been monitored at between approximately 2.8m and 1.4m depth in BH’s 1 & 2 respectively in the east of the site and at 5.0m within BH3 in the west of the site.</td></tr>
<tr><td colspan="2">GEO-ENVIRONMENTAL ASSESSMENT AND CONCLUSIONS</td></tr>
<tr><td>Conclusions of Contamination
Generic Risk Assessment
(All Data)
(Including Guidance on Gas Protection Measures)</td><td>Human health:
• Significantly elevated concentrations of naturally occurring arsenic requiring mitigation (locally within the Marlstone Rock Formation).
Plant growth:
• No adverse impacts requiring mitigation.
Ground gases or vapours:
• No adverse impacts requiring mitigation.
Radon:
• Full Radon Protection Measures are required.
Water supply pipes:
• Greenfield site therefore standard pipework is envisaged.</td></tr>
<tr><td>Proposed Mitigation Measures</td><td>A Remedial Method Statement, including Materials Management Strategy, will need to be developed for the site detailing the required mitigation measures. Given the proposed use and site setting provision of a cover system comprising a capping in areas of residential gardens where the Marlstone Rock Formation is present at surface is recommended. The cover system will be required to be installed as follows:
• 600mm clean cover system within private gardens in areas where directly underlain by the Marlstone Rock Formation;
• Where less than 600mm of Whitby Mudstone Formation persists above the Marlstone Rock Formation; and
• Where development arising’s from the Marlstone Rock Formation have been deposited.
• Full radon protective measures are necessary according to current guidance.</td></tr>
<tr><td colspan="2">GEOTECHNICAL CONCLUSIONS</td></tr>
<tr><td>Groundworks and Earthworks</td><td>Excavations should be readily achievable with standard excavation plant where within the cohesive soils, however heavy duty excavation plant/breaking equipment is likely to be required where excavations are to extend into the ferruginous limestones. Instability of excavation faces was noted during excavation of trial pits TP06, 07, 08 and 09 within a sloping section in the western section of the site. Groundwater ingress should be anticipated where excavating below the water table, ingress rates are likely to be relatively low within the cohesive soils and more rapid within the limestone beds. Water seepages into excavations are likely to be adequately controlled by sump pumping. Arising’s are anticipated to be suitable for reuse subject to appropriate handling / management (notably control of moisture content) and following an appropriate Earthworks Specification. It is also important to note the likely restrictions on reuse of materials based upon their arsenic concentrations as detailed below.</td></tr>
<tr><td>Foundations</td><td>Subject to cut and fill proposals, strip/trench fill foundations from a minimum depth of 0.9mbgl with deepening due to existing vegetation and proposed planting in accordance with NHBC Standards.</td></tr>
</table>

Ground Floor Slabs	Floor slabs should be fully suspended.
Road Pavement Design (CBR)	A CBR value of 2.5% can be assumed for the natural soils at the site from 0.4m depth for design purposes (subject to confirmation during construction).
Soakaways	Soakaway drainage is not considered viable within the shallow cohesive soils that the site. The deeper underlying limestones are likely to exhibit sufficient infiltration characteristics to support soakaway drainage in places. However, both the persistence of these limestone beds beneath the site and their infiltration capacity would require further targeted testing to confirm viability.
Buried Concrete	Design Sulfate Class - DS-1 and ACEC Class AC-1.
Waste Management	Should significant cut/fill be proposed, a Materials Management Plan (MMP) will need to be produced where arising's are to be re-used off site. Natural arising's which are impacted with elevated concentrations of arsenic can be managed through this process provided they are to be re-used at a site already impacted by elevated concentrations of naturally occurring arsenic. Should it be proposed to take these arising's to a site which is not impacted by elevated concentrations of naturally occurring arsenic, further tiers of risk assessment and liaison with the Environment Agency are likely to be necessary in support of this operation. Where these arising's require off-site disposal to landfill, it is considered these are likely to be classified as either Non-hazardous or Hazardous based upon the total arsenic concentrations.
FUTURE CONSIDERATIONS	
Uncertainties and Limitations	The Masterplan is currently in development, as such uncertainty exists with regard to end uses within parts of the site, furthermore, proposed site levels are yet to be established. The extent of shallow arsenic impacted soils at the site requires further delineation, both in terms of its lateral and vertical extents. This is required in-order that the most cost effective remedial solution can be developed. It is considered that the proposed site development will result in a significant volume of impacted arising's realized throughout the construction program. The management of these arising's requires careful consideration at the earliest opportunity to ensure appropriate management of this material.
Further Work	The following further works will be required: • discussions with regulatory bodies regarding the conclusions of this report; • further delineation of arsenic concentrations at the site; • estimation of the potential volume of arsenic impacted arising's; • develop Remedial Strategy / Materials Management Strategy and seek approval of documents; • discussions with service providers regarding the materials suitable for pipework etc.; • foundation depth assessment in relation to trees, following a tree survey to BS 5837:2012; • preparation of an Earthworks Specification; • remediation of the site; and • verification of the remedial works.

This Executive Summary forms part of Hydrock Consultants Limited report number WPF-HYD-PH1-XX-G-1001-P1-S2 and should not be used as a separate document.

1.0 INTRODUCTION

1.1 Terms of Reference

In June 2016, Hydrock Consultants Limited (Hydrock) was commissioned by Gallagher UK to undertake an initial site investigation at Wykham Park Farm near Banbury in Oxfordshire.

The site covers approximately 50 hectares (ha) and currently comprises five fields and a section of another field, which are currently in use for arable farming. The field boundaries are lined with mature hedgerows. There is a small wooded area located in the north western corner of the site and trees are also present along the majority of the site boundary.

The proposed development is to comprise up to 1000 residential properties, up to two hectares (ha) of employment space, a local centre with commercial and community uses, a community primary school and associated landscape and infrastructure including car parking, roads, pedestrian and cycle routes and drainage measures.

A site location plan (Drawing 04841-G001), a site survey plan and a proposed development layout are presented in Appendix A.

1.2 Objectives

The objectives of this investigation are to assess the ground and groundwater conditions to provide initial geotechnical design recommendations, to carry out a risk assessment of potential chemical contaminants and to establish ‘suitability for use’ under the current planning regime.

1.3 Scope

The scope of work for this commission comprises:

- an initial ground investigation including trial pitting, rotary drilling, gas and groundwater monitoring, laboratory chemical and geotechnical testing; and
- reporting on findings of the ground investigation, geo-environmental assessment of the site conditions and geotechnical interpretation of the ground and groundwater conditions.

See Appendix G for detailed reporting methodology.

1.4 Provided Information

The following has been provided to Hydrock by Gallagher Estates for use in the preparation of this report:

- Jubb. 29th June 2016. Development Site Boundary Line, reference B14129_A_003_Rev_A
- Geomatic Surveys Limited. 16th February 2011. Topographical Survey - Proposed Development Whittingham Road, Longridge, reference 0908/Topo; and
- Wardell Armstrong. August 2014. Wykham Park Farm, Banbury – Desk Study Report ref: CA10769.

The provided desk study is included in Appendix C and has been used as the basis for the preliminary conceptual site model presented in Section 2.0.

1.5 Approach

The work has been carried out in general accordance with recognised best practice as detailed in guidance documents such as the CLR 11 M*odel Procedures* (Environment Agency 2004), the AGS (2006) *Good Practice Guidelines for Site Investigations*, BS 5930:2015 and BS 10175:2011+A1:2013. The technical details of the approach and the methodologies adopted are given in Appendix G.

A recognised phased approach has been followed, starting with a desk study and walk-over to produce a preliminary assessment of the site conditions and the important factors that require further investigation to reduce uncertainty.

Phase 2 comprises intrusive investigation work and testing. The factual data from Phases 1 and 2 are used to develop a conceptual site model (CSM). This comprises a ground model (of the physical conditions) and an exposure model (of the possible contaminant linkages). The CSM forms the basis for a number of risk assessments in accordance with current guidelines. Professional judgement is then used to evaluate the findings of the risk assessments and to provide recommendations for the project.

By convention, the geo-environmental and the geotechnical aspects are discussed in separate sections, but in instances where interaction is required to produce a holistic design, this is discussed at the end of the geotechnical recommendations section.

Remaining uncertainties and recommendations for further work are listed at the end of the report.

2.0 PRELIMINARY CONCEPTUAL SITE MODEL

2.1 Physical Setting

The preliminary ground model of the site is the basis of the understanding of the ground conditions that will inform the geo-environmental exposure model and the geotechnical hazard assessment.

2.1.1 Location and Site History

The site is 50ha in size and is located approximately 1.5km to the south of Banbury town centre to the east of the A361 (grid ref: 44851, 38674). The site boundary is shown on Hydrock drawing 04841-G002. The site currently comprises several fields which are in use as arable farm land. The field boundaries are delineated by mature hedgerows and there is a small wooded area located in the north western corner of the site. Trees are also present along the majority of the site boundary. There is a single track which runs through the western section of the site from Broxham Road in the north down to Wykham Lane in the south.

The site is bound to the north in part by open fields and by a track known as ‘Salt Way’, beyond which is a residential development and school playing fields. The eastern and southern area is bound by fields with hedge lined boundaries. To the west the site is bound by the A361 with open fields beyond.

2.1.2 Landscape and Topography

The topography in the majority of the site is gently sloping to the south with a steeper slope in the western corner which falls by approximately 5m to the west. The elevation ranges from 123mAOD to 130mAOD. The desk based information shows no evidence of any previous site use other than for farming and there is no evidence of deposited waste material on site.

2.1.3 Geology

The ground model is one of a thin layer of topsoil, over cohesive weathered horizon of the Whitby Mudstone Formation, over the Marlstone Rock Formation in the majority of the site.

The published geological mapping for the area (sheet 43) indicates that the site is mostly underlain by the Whitby Mudstone Formation of the Lias Group (Jurassic). The Whitby Mudstone Formation is recorded as comprising fossiliferous mudstone, siltstone, sandstone and occasional limestone bands. The eastern section of the site and the south western corner of the site is recorded to be underlain by the Marlstone Rock Formation, also of the Lias Group. The Marlstone Rock Formation generally comprises ferruginous limestone, interbedded ferruginous sandstone and subordinate ferruginous mudstone. Elevated concentrations of some metals and metalloids (including arsenic) are known to be associated with soils derived from the Marlstone Rock Formation in the area of the site. The-western edge of the site is shown to be underlain by the Dyrham Formation of the Lias Group of Jurassic age. The Dyrham Formation generally comprises pale to dark grey and greenish grey, silty and sandy mudstone, with interbedded silt or very fine grained sand (locally muddy or silty), with yellow weathering.

The stratigraphy of the geology in the area is the Whitby Mudstone Formation underlain by the Marlstone Rock Formation underlain by the Dyrham Formation.

2.1.4 Hydrology and Drainage

The nearest hydrological receptor identified is a spring located on site, approximately 10m from the southern boundary which flows westward into a ditch which feeds into another ditch located to the south of Wykham Farm Cottage (located to the south east of the site).

This ditch flows southwards into the Sor Brook located approximately 1km to the south of the site. Approximately 600m to the south of the site there is a small reservoir. The closest ponds are located 250m to the north west of the site, and 500m to the south of the site.

2.1.5 Hydrogeology

The underlying Whitby Mudstone Formation and Marlstone Rock Formation are classed by the Environment Agency as a Secondary A Aquifers. Given the local setting it is anticipated that their prime function is to provide baseflow contribution to rivers. The Dyrham Formation is classified as a Secondary Aquifer with undifferentiated layers.

The site it is not within a source protection zone.

Flow from surface to the underlying bedrock may be limited by the low permeability destructured clay soils below topsoil and sub-soil likely to be on site. Water flow within the bedrock is anticipated to be via pore space and fracture flow.

2.2 Geo-environmental Exposure Model

The preliminary exposure model is used for geo-environmental hazard identification and establishing potential contaminant linkages based on the contaminant-pathway-receptor approach.

2.2.1 Potential Contaminants

For the purpose of this assessment the potential contaminants have been separated according to whether they are likely to have originated from on-site or off-site sources.

Potential On-Site Sources of Contamination

- Made Ground possibly including metals, metalloids, asbestos, PAH and petroleum hydrocarbons.
- Elevated metals within natural soils.

Potential Off-Site Sources of Contamination

The desk study undertaken by Wardell Armstrong describes *Generic Tanks (unknown contents)* 26m to the north-east. Hydrock have had no further information made available regarding these.

It should be noted that ground gases from off-site sources (such as other landfills) have been excluded as there are no significant landfills within 500m of the site.

2.2.2 Potential Receptors

The following potential receptors have been identified.

- Humans (neighbours, site end users).
- Development end use (buildings, utilities and landscaping).

It should be noted that health and safety risks to site contractors and maintenance workers have not been assessed during these works and will need to be considered separately.

2.2.3 Potential Pathways

The following potential pathways have been identified.

- Humans: ingestion, skin contact, inhalation of dust and outdoor air.
- Buildings: Radon ingress via permeable soils and/or construction gaps.
- Plant life: root uptake.

2.3 Geotechnical Hazard Identification

Potential geotechnical hazards based on the expected ground conditions are listed below.

- Attack of buried concrete by aggressive ground conditions – the development site may contain potentially sulfate bearing soils.
- Shrinkage/swelling of clay – settlement/heave of foundations when located within the influence of trees and vegetation.

2.4 Radon

The radon risk has been assessed by reference to the Indicative Atlas of Radon in England and Wales (Miles et al 2007) and Annex A maps in BR 211 (Scivyer 2015).

This indicates that the site is in a Radon Affected Area where recorded radon levels in more than 10% of homes are above the action level and full radon protection measures are required for new buildings at this location in line with current guidance

2.5 Unresolved Issues and Uncertainties

The Phase 1 investigation has highlighted a number of issues that require intrusive investigation and assessment to inform the design of the proposed development.

3.0 GROUND INVESTIGATION

3.1 Investigation Rationale

The ground investigation rationale based on the findings of the preliminary risk assessment is summarised in Table 3.1.

Table 3.1: Investigation Rationale

Exploratory Holes	Purpose
BH01 and BH02	To assess deeper ground and groundwater conditions and enable geotechnical characterisation. Installation of gas and groundwater wells and to enable collection of water samples. Installation of well to conduct falling head tests.
BH03	To assess deeper ground conditions and for geotechnical characterisation. Installation of gas and groundwater wells and to enable collection of water samples.
TP 01-132	To assess shallow ground conditions. To allow collection of samples for contamination testing. Square grid with approximate 100m spacing.
CBR01-15	To assess CBR values in areas of proposed highways

3.2 Ground Gas Regime

It is judged from the available evidence that the gas generation potential at the site is negligible and as such the monitoring regime suggested by CIRIA is not proportionate to the risk. This is on account of the fact the site is likely to be underlain by a weathered zone of clay and there are no landfills recorded within 500m of the site. There is also no evidence of biodegradable material on the site. Notwithstanding this gas and groundwater monitoring standpipes were installed in all the boreholes and a limited monitoring regime proposed to provide data to support the above conclusion.

3.3 Site Works

The fieldwork took place between 12 December 2016 and the 19 January 2017 is summarised in Table 3.2, the approximate position of site investigation locations (positioned using a GPS) are shown on the Ground Investigation Plan in Appendix D.

The logs, including details of ground conditions, soil sampling, *in situ* testing and any installations, are presented in Appendix D.

The weather conditions during the fieldwork and for the previous week were changeable.

Table 3.2: Summary of Site Works

Activity	Method	No.	Max. or Range Depth	*In Situ* Tests	Notes (e.g. Installations)
Drilling, Pitting and Probing					
Boreholes	Dynamic Sampled with Rotary Follow-on	3	5.70m	SPT Variable head infiltration tests	63mm HDPE wells with gas taps in all holes
Trial pits	Machine (JCB 3CX)	132	3.60m	HSV Infiltration tests	
Other *In Situ* Testing or Monitoring					
CBR	Landrover	17	0.60m		
Gas/Groundwater monitoring		3	5.70		

3.4 Geo-Environmental Testing

3.4.1 Sampling Strategy and Protocols

Investigatory hole locations were determined using a spacing grid of 50m and were not targeted at specific features as these were either not known geographically or site wide. No specific sampling statistics or grid were utilised in this instance.

Samples were taken stored and transported in general accordance with BS 10175:2011+A1:2013.

3.4.2 Geo-environmental Monitoring

Gas monitoring boreholes have been monitored on three occasions. The results are presented in Appendix F.

3.4.3 Geo-environmental Laboratory Analyses

Wherever possible, UKAS accredited procedures have been used and the chemical test certificates are provided in Appendix H. The geo-environmental analyses undertaken on soils are summarised in Table 3.3.

Table 3.3: Summary of Sample Numbers for Geo-environmental Analyses of Soils or Other Solids

Determinand Suite	Topsoil	Whitby Mudstone Formation	Marlstone Rock Formation	Dyrham Formation
Hydrock default suite of determinands for solids	6	27	7	7
Pesticide and herbicide screening	4			
Bio-accessibility of As (PBET extraction)		5	3	6

The geo-environmental analyses undertaken on waters, leachates (eluates) or other liquids are summarised in Table 3.4.

Table 3.4: Summary of Sample Numbers for Geo-environmental Analyses of Waters, Soil Leachates or Other Liquids

Determinand Suite	Soil Leachates - Natural Ground
Hydrock default suite of determinands for waters	3

3.5 Geotechnical Testing

Wherever possible, UKAS accredited procedures have been used and the geotechnical test certificates are provided in Appendix E. The tests undertaken are summarised in Table 3.3.

Table 3.5: Summary of Sample Numbers for Geotechnical Tests

Test	Whitby Mudstone Formation	Marlstone Rock Formation	Dyrham Formation
Natural moisture content	8	1	10
Atterberg limit determination	8	1	10
One dimensional oedometer consolidation	4	1	3
Particle size distribution (sieve)	4	3	4
Particle size distribution (sedimentation)	3		1
Sulfate and aggressive chemical environment classification for buried concrete classification (full BRE SD1 suite)	6	5	3

4.0 GROUND INVESTIGATION RECORDS AND DATA

4.1 Physical Ground Conditions

4.1.1 Summary of Strata Encountered

The following presents a summary of the properties of the ground and groundwater conditions encountered, based on field observations, interpretation of the field data and laboratory test results, taking into account drilling, excavation and sampling methods, transport, handling and specimen preparation.

All relevant data from the Hydrock investigation detailed in Section 3.0 as well as any suitable previous investigations mentioned in Section 1.0 are used from this point forward. Derived[1] geotechnical parameters are presented also.

For the purposes of property designation, soils are divided into fine soils (clays and silts) and coarse soils (sands, gravels, cobbles and boulders) in accordance with BS 5930.

Soil plasticity class for fine soils is based on the classification system of BS 5930, adopting modified plasticity index values (based on percentage passing 425 µm sieve). Volume change potential of fine soils on change of moisture content has been assessed using guidance provided in NHBC Standards.

The angle of shearing resistance (ϕ') of the coarse soils has been derived from the uncorrected standard penetration resistance N-value using the relationship published by Hatanaka and Uchida (1996).

Details are provided in the logs in Appendix D, a summary is presented in Table 4.1 and the individual strata are described in the sections below.

Table 4.1: Strata Encountered

Stratum	Brief Description	Depth to Top (m bgl)	Depth to Base (m bgl)	Thickness (m)
Topsoil	Slightly sandy clayey topsoil	GL	0.15 – 0.40	0.15 – 0.40
Whitby Mudstone Formation	Slightly sandy slightly gravelly residual clay with limestone bands in places	0.15 -0.70	0.60 – 1.80	0.30 – 1.50
Marlstone Rock Formation	Strong yellow brown distinctly weathered limestone	0.20 – 2.90	1.10 - >5.70	>5.45
Dyrham Formation	Slightly sandy slightly gravelly residual clays and silts with rare pockets of clayey sand.	0.20 – 1.45	1.70 - >5.1	>4.8

---

[1] **Derived values** of geotechnical parameters and/or coefficients are obtained from test results, by theory, correlation or empiricism in line with BS EN 1997-2:2007, Section 1.6.

4.1.2 Topsoil

For the purposes of this report, topsoil is defined as the upper layer of an *in situ* soil profile, usually darker in colour and more fertile than the layer below (subsoil), and which is a product of natural chemical, physical, biological and environmental processes, but does not imply compliance with BS 3882:2015.

4.1.3 Whitby Mudstone Formation

The Whitby Mudstone Formation was encountered underlying the topsoil in the majority of the site, except in the western and south-eastern area of the site. This generally consisted of a firm to stiff slightly sandy, slightly gravelly, residual clay.

Natural moisture contents in the fine units of these materials range from 26% to 46%, and modified plasticity indices range from 13% to 36.5%. On this basis these soils are classified as of high to very high plasticity (CH/CV soils) and of medium volume change potential.

Undrained shear strength parameters of the cohesive units of these materials based on *in situ* testing are presented in Table 4.2.

Table 4.2: Soil Strength Results and Derived Values

Shear Strength (Range)	Method	No. of Results
c_u (kPa)		
50 - 240	Hand shear vane	106

4.1.4 Marlstone Rock Formation

The Marlstone Rock Formation was encountered underlying the topsoil in the south west and south east of the site and the Whitby Mudstone Formation in remaining areas of the site. This generally consisted of a weathered zone of slightly sandy gravelly residual/destructured clay grading to strong distinctly weathered/partially weathered limestone.

Undrained shear strength parameters of the cohesive units of these materials based on *in situ* testing are presented in Table 4.3.

Table 4.3: Soil Strength Results and Derived Values

Shear Strength (Range)	Method	No. of Results
c_u (kPa)		
30-80	Hand shear vane	5

4.1.5 Dyrham Formation

The Dyrham Formation was encountered underlying the topsoil in the western area of the site. This generally consisted of a slightly sandy slightly gravelly residual clay with rare pockets of clayey sand.

Natural moisture contents in the fine units of these materials range from 13% to 40%, and modified plasticity indices range from 7.5% to 22%. On this basis these soils are classified as of low to very high plasticity (CL to CV soils) and of low to medium volume change potential.

Undrained shear strength parameters of the cohesive units of these materials based on *in situ* and laboratory testing are presented in Table 4.4

Table 4.4: Soil Strength Results and Derived Values

Shear Strength (Range)	Method	No. of Results
c_u (kPa)		
80 - 160	Hand shear vane	8

4.2 Other Geotechnical Parameters

4.2.1 California Bearing Ratio (CBR)

The CBR results are summarised in Table 4.5 including recommended values that can be assumed for preliminary design purposes within the scope of this report.

Table 4.5: CBR Results and Derived Values

Depth	Method	No. Tests	CBR (%) (Range)
Ground level – 0.40m	*In situ* CBR rig	17	1.8 - 13
0.40 – 0.75	*In situ* CBR rig	19	2.2 - 39

4.2.2 Sulfate Content

In accordance with BRE (Special Digest 1), the Design Sulfate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification are presented in Table 4.6. The assessment summary sheet is presented in Appendix E.

Table 4.6: Aggressive Chemical Environment Concrete Classification

Stratum	No. Tests	DS	ACEC
All soil types	14	DS-1	AC-1

4.2.3 Rock Characterisation

Marlstone Rock Formation

BH01, BH02 and BH03 encountered rock within the Marlstone Rock Formation between 1.00m and 2.50m. This was overlain by a destructured slightly sandy gravelly clay. BH01 encountered interbedded limestone and clays with bed thicknesses of between 0.10m to 0.80m. Fractures within BH02 were found to be medium spaced with slightly sandy clay infill and the Rock Quality Designation (RQD) ranged from 0 to 30% within the limestone bands.

4.3 Groundwater

4.3.1 Groundwater Levels

Groundwater strikes encountered during the investigation and subsequent monitoring are summarised in Table 4.7.

Table 4.7: Groundwater Data

Stratum	Date Range	Exploratory Hole	Post-Fieldwork Monitoring	
			Depth to Groundwater (Range) (m bgl)	Approximate Groundwater Elevation (Reduced Level) (Range) (mAOD)
Marlstone Rock Formation	23/01/17 – 21/02/17	BH01	2.54-2.80	122.46-122.2
		BH02	1.37-2.05	126.13-125.45
		BH03	5.05	124.15

4.3.2 Infiltration Tests

The results of the infiltration testing undertaken are summarised in Table 4.8. The results sheets are presented in Appendix E. All testing was carried out in accordance with Hydrock's 1-day assessment methodology. This is in general accordance with BRE Digest 365 (BRE 2007) where infiltration rates allow three test runs during a working day (or where there is no infiltration), but where low infiltration rates were encountered the available time may not have been sufficient to fully comply with the BRE test method.

Where less than three tests were possible in a particular location the results provided should be considered indicative only and should not be used for design purposes. Further discussion concerning the suitability of infiltration testing at the site is provided in Section 0.

Table 4.8: Infiltration Test Results

Stratum	Trial Pit no.	Depth	Infiltration Rate (m/s)		
			Test 1	Test 2	Test 3
Whitby Mudstone Formation	SA1/TP106	1.70m	Fail	N/A	N/A
	SA2/TP102	1.50m	Fail	N/A	N/A
	SA3/TP93	1.10m	Fail	N/A	N/A
	SA4/TP50	1.60m	Fail	N/A	N/A
	SA5/TP90	1.80m	Fail	N/A	N/A
	SA6/TP82	1.25m	Fail	N/A	N/A
Marlstone Rock Formation	SA7/TP18	0.90m	2.43×10^{-04}	1.53×10^{-04}	1.58×10^{-04}

Stratum	Trial Pit no.	Depth	Infiltration Rate (m/s)		
			Test 1	Test 2	Test 3
Whitby Mudstone Formation	SA8/TP119	2.25m	Fail	N/A	N/A
Dyrham Formation	SA9/TP11	1.70m	8.58 x 10^{-04}	9.75 x 10^{-04}	8.28 x 10^{-04}

4.3.3 Permeability Tests

The results of permeability testing using falling head analysis are summarised in Table 4.9. The results sheets are given in Appendix E.

Table 4.9: Permeability Test Results

Stratum	Borehole No.	Depth	Test	Hydraulic Conductivity (m/s)
Marlstone Rock Formation	BH01	2.20 – 5.70m	Run 1	5.52 x 10^{-5}
			Run 2	5.52 x 10^{-5}
			Run 3	3.26 x 10^{-5}
	BH02	1.00 – 5.10m	Run 1	9.12 x 10^{-6}
			Run 2	1.16 x 10^{-5}
			Run 3	1.13 x 10^{-5}

4.4 Geo-Environmental Results

The chemical test results for soil, leachate and groundwater are given in Appendix H, which also includes summary tables of the data.

Elevated concentrations of Arsenic and Vanadium were encountered across site originating from the naturally occurring concentrations within the Marlstone Rock Formation.

Concentrations of the following determinands were not reported above the laboratory limit of detection.

- Soils – Cadmium, Chromium (VI), Mercury, Selenium, Cyanide, Phenol (total), Acenaphthylene, Anthracene, Benz(a)anthracene, Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(ghi)perylene, Benzo(k)fluoranthene, Chrysene, Dibenz(a,h)anthracene, Fluoranthene, Fluorene, Indeno(1,2,3,cd)pyrene, Naphthalene, Phenanthrene and Pyrene.
- Leachates – Silver, Aluminium, Arsenic, Boron, Cadmium, Chromium, Mercury, Lead, Antimony, Tin, Cyanide, Anthracene, Benzo(a)pyrene, Fluroanthene and Napthalene.

4.5 Ground Gases (Carbon Dioxide and Methane)

Records from the gas monitoring boreholes are presented in Appendix F and summarised in Table 4.10.

Table 4.10: Range of Ground Gas Data

Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Flow Rate (l/hr)
0.1-0.2	0.4 – 1.7	13.8 – 20.9	0.3

4.6 Updated Ground Model

The preliminary conceptual site model initially developed from the desk study and walk-over survey (Section 2.0) has been updated using the findings of the ground investigation. The main features of the site are summarised on the Site Zonation Plan (Appendix A).

Subsequent to the ground model described in Section 2.0, the ground investigation has confirmed ground conditions below the site which are detailed below.

A thin layer of residual clay soils of the Whitby Mudstone Formation to a maximum depth of 1.80m throughout the majority of the site. The Whitby is underlain by the Marlstone Rock Formation (comprising ferruginous limestone and weathered clay bands) which was encountered at between 0.60 and 1.80m below existing ground level, with an average of 1.10m below ground level. Generally the Marlstone Rock Formation was found to be shallower within the west of the site compared to the east and is inferred to outcrop along the top of the sloping area in the west of the site as shown on Hydrock drawing WPF-HYD-XX-GI-DR-G-1003. The outcrop in the western area is considered at surface to be a thickness of between approximately 30 and 60m. The Marlstone Rock Formation was also found to outcrop in the south west of the site. The Dyrham Formation (comprising residual clays and mudstone) was encountered beneath the Marlstone Rock Formation and found to outcrop within the western area of the site.

An area of weaker ground was encountered within the sloped area in the west of the site, and also within the south eastern area.

Groundwater was encountered during the monitoring visits at between 1.37 and 5.05m bgl.

5.0 GEO-ENVIRONMENTAL ASSESSMENT

5.1 Approach

A number of generic risk assessments are undertaken in accordance with the principles of CLR 11 (Environment Agency 2004) using the CSM that has been updated following the ground investigation. Firstly, the risks associated with the identified potential contaminant linkages are estimated using standardised methods (typically involving comparison of site data with published 'screening values'. Secondly, where screening values are exceeded, the risks are evaluated in an authoritative review of the findings with other pertinent information to determine if exceedance may be acceptable in the particular circumstances. For details please refer to Appendix G.

The data sets used comprise the appropriate analytical results obtained by Hydrock and listed in Section 3.4.

In cases where unacceptable risks are indicated, mitigation measures such as more advanced stages of risk assessment or remediation will be proposed in Section 6.0.

5.2 Updated Exposure Model

Following the site investigation, the plausible contaminant sources, receptors and pathways identified in Section 2.0 have been updated or confirmed as follows.

5.2.1 Sources

The following potential source has been removed from the exposure model.

- Made Ground possibly including metals, metalloids, asbestos, PAH and petroleum hydrocarbons as no significant Made Ground was encountered.

5.2.2 Receptors

No potential receptors have been removed from, or added to, the exposure model.

5.2.3 Pathways

No pathways have been removed from, or added to, the exposure model.

5.3 Human Health Risk Assessment

This is a Tier 2 assessment using soil screening values for the CLEA land use scenarios residential with plant uptake.

The soil screening values used are generic assessment criteria (GAC) and results are given in Appendix H. Note that the Category 4 Screening Levels (C4SL) for lead have been used as there are no recognised GACs and the use of the term 'GAC' in this report includes these.

Statistical testing is used where data sets are suitable. For data sets with low sample numbers and/or a non-random spatial distribution (e.g. where sampling is targeted at specific areas) individual sample test results are compared directly with the screening values.

It should be noted that the phrase ‘further assessment required’ is used to denote soil concentrations that are equal to, or exceed, a GAC. This does not necessarily mean that the soil is ‘contaminated’ or not fit for use.

5.3.1 Risk Estimation (Including Statistical Testing)

The ‘averaging areas’ used in this report are based on the interpreted underlying geology encountered on site due the high concentrations of metals known within the Marlstone Rock Formation. These are summarised as:

- Whitby Mudstone Formation;
- Marlstone Rock Formation; and
- Dyrham Formation.

The data set for each chemical determinand has been assessed for the presence of potential outliers (based on the conceptual model). No outliers have been removed.

In line with the guidance provided by the CIEH (May 2008) the 95th upper confidence level on the true mean (US_{95}) has been calculated from the sample data. Data have been assessed using the one-sample t-test or the one-sided Chebychev Theorem, as appropriate to the distribution and number of samples.

Based on a US_{95} exceedance of the GAC, the pervasive chemicals of potential concern which require further assessment are summarised in Table 5.1.

Table 5.1: Pervasive Chemicals of Potential Concern for Which Further Assessment is Required (Human Health)

Geological Unit	Chemical of Potential Concern	Generic Criterion (mg/kg)	Basis for Generic Criterion	No. Samples	Min. (mg/kg)	Max. (mg/kg)	US_{95} (mg/kg)	No. Samples Exceeding Generic Criterion
Whitby Mudstone Formation	Arsenic	37	SGV report + CLEA 1.07	38	47	270	144.72	38
Marlstone Rock Formation	Arsenic	37	SGV report + CLEA 1.07	10	72	920	821.25	10
	Nickel	130	Hydrock + CLEA 1.07	7	67	130	145.96	1
	Vanadium	410	LQM/CIEH + CLEA 1.07	7	50	550	622.78	3
Dyrham Formation	Arsenic	37	SGV report + CLEA 1.07	10	130	270	247.79	10

Geological Unit	Chemical of Potential Concern	Generic Criterion (mg/kg)	Basis for Generic Criterion	No. Samples	Min. (mg/kg)	Max. (mg/kg)	US_{95} (mg/kg)	No. Samples Exceeding Generic Criterion
Dyrham Formation	Vanadium	410	LQM/CIEH + CLEA 1.07	7	360	540	506.34	1

5.3.2 Risk Evaluation

5.3.2.1 Generic Quantitative Risk Assessment

The screening exercise identified the following substances at concentrations above the GAC. These are considered further here to assess if the exceedance may be acceptable with respect to the proposed development.

Vanadium is recorded in the Marlstone Rock Formation and Dyrham Formation at a US_{95} of 623 mg/kg and 506 mg/kg respectively, which is 1.5 and 1.2 times the GAC of 410 mg/kg. There is no evidence of a man-made source of vanadium on the site. However, the Marlstone Rock Bed is known to have naturally high levels of vanadium which in this area range between 127 and 646 mg/kg according to the *Advanced Geochemical Atlas of England and Wales* (Rawlins *et al* 2012). The vanadium concentrations at this site are not greater than the normal background levels, or significantly greater than that of the Generic Criterion. Consequently, this exceedance is not considered a significant risk to human health and in line with the current Contaminated Land Statutory Guidance, which accepts that there may be natural background levels of substances as a result of the geology, no further consideration is required. However, it is recommended that the opinion of the regulatory authorities be sought in this regard.

Nickel is recorded in the Marlstone Rock Formation at a US_{95} of 146 mg/kg, which is 1.12 times the GAC of 130 mg/kg. There is no evidence of a man-made source of nickel on the site. The nickel concentrations at this site do not exceed the Generic Criterion. Consequently, the US_{95} exceedance is not considered a significant risk to human health. No further consideration is required. However, it is recommended that the opinion of the regulatory authorities be sought in this regard.

Arsenic is recorded in the Whitby Mudstone Formation, Marlstone Rock Formation and Dyrham Formation at a US_{95} values of 145 mg/kg, 821 mg/kg and 506 mg/kg respectively, which are between 3.9 and 22 times the GAC of 37 mg/kg. There is no evidence of a man-made source of arsenic on the site. However, the Marlstone Rock Bed is known to have naturally high levels of arsenic in this area. Due to the high exceedances bioaccessability testing has been undertaken and is detailed in Section 5.3.2.2.

5.3.2.2 Detailed Quantitative Risk Assessment

As arsenic was recorded at the values above, a more detailed quantitative risk assessment was required to determine the bioaccessibility within each of the formations encountered.

Please refer to drawing WPF-HYD-XX-GI-DR-G-1002 which shows the geological formations at surface across the site and how this relates to the proposed development layout.

The derivation of the SGV makes the cautious assumptions that all the arsenic in soil is inorganic arsenic (the most toxic form) and that 100% of it is bioavailable, i.e. can be absorbed by the human body (Environment Agency, 2009).

It is a common finding that only a small proportion of arsenic in soil is bioavailable (see for example Nathanail et al, 2004). Consequently, it is possible to calculate a Site-Specific Acceptance Criterion (SSAC) for a particular site in which takes into consideration the bioavailable proportion of the total arsenic concentration. The site data can then be compared with the SSAC instead of the generic SGV, to better reflect site circumstances.

It should be understood that there are some uncertainties in the use of bioaccessibility results to derive SSACs. Advice from the Environment Agency (February 2005, 2009) is that bioavailability testing should be used with caution because of potential variability of test data and uncertainties in applying them to humans.

Methodology

True bioavailability can only be obtained by in vivo animal dosing studies but an estimate can be obtained from bioaccessibility testing. Bioaccessibility tests are in vitro extraction methods designed to mimic the human digestive tract in its removal of arsenic from ingested soil. This (bioaccessible) proportion of the total arsenic is deemed to be in solution in the gastro-intestinal system and could, therefore, enter the systemic circulatory system (and be bioavailable to cause harm). Not all bioaccessible arsenic is bioavailable, some will be excreted harmlessly. Consequently, bioaccessibility testing is a conservative estimate of bioavailability.

The CLEA 1.07 model used to derive the SGV allows the variation of the relative bioavailability (RBAsoil, tox) for soil and airborne dust. This model has been used in the assessment, applying the appropriate bioavailability fraction to the soil ingestion pathway.

Sampling and Results

Three distinct geology formations have been noted on site, Whitby, Marlstone and Dyrham. The testing has therefore been split into these formations and sent to the laboratory for PBET analysis. Variability in the soils is evidenced by a result of 920mg/kg which when re-tested gave a result of 490mg/kg. The results are appended to this report and are summarised in the following tables.

Table 5.2: Whitby Mudstone Formation

Sample	TP22 0.30m	TP78 0.40m	TP105 0.30m	TP111 0.50m	TP118 0.30m
Total arsenic (mg/kg)	170	170	86	270	150
Stomach bioaccessibility fraction %	6.3	2.2	8.1	1.4	4.5
Intestine 1 bioaccessibility fraction %	3.1	5.1	9.3	2.4	5.1
Intestine 2 bioaccessibility fraction %	4.0	6.0	7.3	2.5	4.1
Maximum bioaccessible fraction %	**6.3**	**6.0**	**9.3**	**2.5**	**5.1**

Table 5.3: Marlstone Rock Formation

Sample	TP18 1.00m	TP25 0.50m	TP124 0.50m
Total arsenic (mg/kg)	490	480	290
Stomach bioaccessibility fraction %	0.7	1.0	1.3
Intestine 1 bioaccessibility fraction %	1.4	2.3	2.3
Intestine 2 bioaccessibility fraction %	1.9	1.4	3.1
Maximum bioaccessible fraction %	**1.9**	**2.3**	**3.1**

Table 5.4: Dyrham Formation

Sample	TP02 0.20m	TP03 0.20m	TP05 0.70m	TP07 0.50m	TP10 0.50
Total arsenic (mg/kg)	150	160	230	81	260
Stomach bioaccessibility fraction %	2.7	1.5	1.2	3.3	0.9
Intestine 1 bioaccessibility fraction %	3.9	3.5	4.4	9.4	3.7
Intestine 2 bioaccessibility fraction %	2.9	3.4	3.7	10.8	3.2
Maximum bioaccessible fraction %	**3.9**	**3.5**	**4.4**	**10.8**	**3.7**

The most conservative value of the bioaccessible fraction from each test sequence is listed in the bottom line of the table.

Risk Assessment

The logic in the arsenic SGV report (Environment Agency 2009) is that only the oral exposure is used to derive the SGV (see Table 2, Note 3 and the text following the table in that report). Consequently, the logic for deriving the SSAC using the bioaccessible fraction should be the same. Only the oral pathway is considered and so the SSAC is based on the oral SAC in CLEA 1.071 in the same way as the SGV.

Whitby Mudstone Formation

The site specific bioaccessibility fraction has been taken as 9.3 % based on the most conservative value obtained from the above test locations.

The CLEA model has been used to calculate an SSAC of 234 mg/kg for the ‘residential with plant uptake’ exposure scenario. The CLEA results sheets are appended to this report.

The US_{95} for the Whitby Mudstone Formation is 144 mg/kg with a worst case single value of 270 mg/kg recorded. Therefore, against the calculated SSAC of 234 mg/kg it is concluded that there is no significant risk to human health from arsenic under the exposure conditions modelled.

However, the Marlstone Rock Formation is present below the Whitby Mudstone Formation at its shallowest from 0.7m bgl but is typically 1.0m bgl. The assessment for this formation is below and therefore if excavations are made or levels cut to expose the underlying Marlstone Rock Formation the assessment below would apply and mitigation measures will be required.

Should significant cut/fill be proposed within the area of the Whitby Mudstone Formation, a materials management plan (MMP) will need to be produced where arising’s are to be re-used off site. The extent of arsenic contamination within the Whitby Mudstone Formation where it nears the boundary with the Marlstone Rock Formation requires further delineation such that a more accurate model of impacted soil can be produced.

Marlstone Rock Formation

The site specific bioaccessibility fraction has been taken as 3.1 % based on the most conservative value obtained from the above test locations.

Residential land use

The CLEA model has been used to calculate an SSAC of 359 mg/kg for the ‘residential with plant uptake’ exposure scenario. The CLEA results sheets are appended to this report.

The US95 for the Marlstone Rock Formation is 821 mg/kg with a worst case single value of 920 mg/kg recorded. Therefore, against the calculated SSAC of 359 mg/kg it is concluded that there is a potential significant risk to human health from arsenic under the exposure conditions modelled and mitigation measures will be required in areas where the Marlstone Rock Formation is exposed. A cover system of 600mm will be required in any area of residential soft landscaping. The thickness of cover has been calculated using a maximum value of 80% of the SSAC for arsenic for the materials used.

POS Residential land use

The CLEA model has been used to calculate an SSAC of 1620 mg/kg for the ‘public open space, residential’ exposure scenario. The CLEA results sheets are appended to this report.

The US95 for the Marlstone Rock Formation is 821 mg/kg with a worst case single value of 920 mg/kg recorded. Therefore, against the calculated SSAC of 1620 mg/kg it is concluded that in the public open space area in the east of the site where the Marlstone Rock Formation is likely to be exposed there is considered to be no significant risk to human health from arsenic under the exposure conditions modelled.

Dyrham Formation

The site specific bioaccessibility fraction has been taken as 10.8 % based on the most conservative value obtained from the above test locations.

The western section of the site where the Dyrham Formation is exposed at surface is proposed to be public open space and therefore the CLEA model has been used to calculate an SSAC of 622 mg/kg for the ‘POS RESI’ exposure scenario. The CLEA results sheets are appended to this report.

The US95 for the Dyrham Formation is 248 mg/kg with a worst case single value of 270 mg/kg recorded. Therefore, against the calculated SSAC of 622 mg/kg it is concluded that there is no significant risk to human health from arsenic under the exposure conditions modelled.

Please note the above assessments and remedial requirements will require discussion and approval by the local authority contaminated land officer.

5.4 Plant Life Risk Assessment

5.4.1 Risk Estimation

Priority phytotoxic chemical concentrations have screened against published values to determine the likely risk to plant growth and the findings presented in Appendix H. As with human health, statistical testing is used where data sets are suitable, otherwise individual sample test results are compared directly with the screening values.

Based on a US_{95} exceedance of the GAC, the pervasive chemicals of potential concern which require further assessment are summarised in Table 5.5.

Table 5.5: Pervasive Chemicals of Potential Concern for Which Further Assessment is Required (Risk to Plants)

Chemical of Potential Concern	Generic Criterion (mg/kg)	Basis for Generic Criterion	No. Samples	Min. (mg/kg)	Max. (mg/kg)	US_{95} (mg/kg)	No. Samples Exceeding Generic Criterion
Arsenic	250	MAFF 1998	10	72	920	821.24	6
Nickel	75	BS3882 2015	7	67	130	145.96	6
Zinc	300	BS3882 2015	7	98	380	377.15	1

5.4.2 Risk Evaluation

Within the natural soils, arsenic, nickel and zinc are elevated when compared to the GAC. Detriment to plant life is hard to quantify and many of the GACs are based on agricultural crop yields rather than serious harm of death of a species. As the exceedance of nickel and zinc are slight, the background geology is naturally high in arsenic and the vegetation on site did not show any signs of physical distress, Hydrock does not believe any additional consideration is required with regards to risks to plant life. Furthermore the site is currently used for agriculture and no detrimental effect has been recorded.

5.5 Ground Gases Risk Assessment

It is judged from the available evidence that the gas generation potential at the site is negligible and as such the monitoring regime suggested by CIRIA is not proportionate to the risk. This is on account of the fact that it is likely to be underlain by a weathered zone of clay and there are no recorded sources on or within close proximity to the site.

5.6 Construction Materials Risk Assessment

5.6.1 Water Pipelines

The current guidance on selection of materials for potable water supply pipes to be laid in contaminated land is contained in a document published jointly by Water UK and the Home Builders Federation (Water UK HBF (2014)). The protocols in that document are for guidance and are not subject to enforcement by Water UK or any agency, but have been adopted by

Water UK and by HBF as best practice for their members. Accordingly this guidance is used in the following assessment. For further details see Appendix G.

A formal water pipe risk assessment is beyond the scope of this report, however, the findings of this investigation have been compared to the threshold values in Water UK Table 1 as far as is practicable to give an indication of the possible restrictions to the use of plastic pipes for water supply to the site.

The site is greenfield and it is envisaged that standard pipework will be suitable for the site. However, this investigation was not designed specifically for water pipe runs and confirmation should be sought from the water supply company at the earliest opportunity.

5.7 Findings of the Generic and Detailed Risk Assessments

Particular areas of the site which are of potential concern are indicated on the Geological Zonation Plan in Appendix A. The source-pathway-receptor contaminant linkages given in Table 5.6 are those which, following the risk evaluation process, require further consideration and are discussed further in Section 6.0.

Table 5.6: Final Conceptual Model and Residual Risks Following Risk Evaluation

Contaminant Linkage			Comments	
Sources	**Pathways**	**Receptors**	**General**	**Mitigation**
Arsenic in the Marlstone Rock Formation.	Ingestion, inhalation or direct contact.	Human health.	Bioavailability testing has been undertaken to produce an SSAC for the arsenic found within the soil samples.	Develop Remedial Method Statement and Materials Management Strategy. Arsenic within the Dyrham may require mitigation depending on the final masterplan.

6.0 GEO-ENVIRONMENTAL CONCLUSIONS AND RECOMMENDATIONS

6.1 Key Risk Drivers

6.1.1 Human Health

Elevated levels of arsenic, vanadium and zinc were reported within the natural soils on site. Arsenic levels were such that bioavailability testing was undertaken to produce a SSAC for each geological strata. Detailed site specific risk assessment has shown a potential risk associated with the Marlstone Rock Formation soils in a residential setting. Remedial actions are therefore required.

The natural soils contain elevated naturally occurring sources of arsenic, vanadium and zinc.

6.1.2 Plant Life and Controlled Waters

No further consideration is required with regards to plant life and controlled waters.

6.2 Mitigation Measures

To manage the different site soils appropriately a detailed Remedial Method Statement will be required, which should detail the Materials Management Strategy for soils.

The proposed mitigation measure is to install a cover system in any residential areas of soft landscaping (i.e within garden areas) either within the areas directly underlain by the Marlstone Rock Formation, within areas where <600mm of Whitby Mudstone Formation persists above the Marlstone Rock Formation and where development arising's from the Marlstone Rock Formation have been deposited. A cover system thickness of 600mm thick is recommended. This will sever the contaminant linkages at risk to human health. The cover should also be suitable to provide a growing medium for new planting and to this end a minimum of 150 mm of topsoil is recommended, over a sub-soil layer. The clean cover chemical tolerances should be discussed in more detail with a Remedial Method Statement (RMS).

Because the Marlstone Rock Formation is encountered at shallow depth underlying the Whitby Rock Formation, any excavations for foundations or service trenches may realise material from the Marlstone Rock Formation which will be unsuitable for re-use within residential private garden areas. If materials are to be re-they will need to be managed in accordance with the RMS/MMP strategy.

Full radon protective measures are necessary according to current guidance.

6.3 Waste Management

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose. Further details are given in Appendix G.

Should significant cut/fill be proposed, a Materials Management Plan (MMP) will need to be produced where arising's are to be re-used off site. Natural arising's which are impacted with elevated concentrations of arsenic can be managed through this process provided they are to be re-used at a site already impacted by elevated concentrations of naturally occurring arsenic. Should it be proposed to take these arising's to a site which is not impacted by elevated concentrations of naturally occurring arsenic, further tiers of risk assessment and liaison with the Environment Agency are likely to be necessary in support of this operation. Where these arising's require off-site disposal to landfill, it is considered these are likely to be classified as either Non-hazardous or Hazardous based upon the total arsenic concentrations.

6.3.1 Waste Recommendations

Prior to disposal, the characteristics of any excavated soils will need classification in consultation with landfill sites and waste disposal contractors. Testing and analysis will be required to be carried out on the actual soil arisings which will constitute the waste.

6.3.2 Materials Management

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose.

If site-won material is to be re-used on site, a Materials Management Plan will be required, signed off by a Qualified Person as defined in the 'Development Industry Code of Practice' (CL:AIRE, March 2011).

7.0 GEOTECHNICAL ASSESSMENT

7.1 Geotechnical Categorization of the Proposed Development

Eurocode 7, Section 2 advocates the use of geotechnical categorization of the proposed structures to establish the design requirements. For the purposes of this investigation, the proposed structures have been classed as Geotechnical Category 1.

7.2 Groundwork

7.2.1 Site Preparation

An underground water supply traverses the site in the eastern section from the road to the north, to Wykham Farm Cottage and will need to be considered when planning excavations within that area.

Topsoil should be removed from beneath all building and hardstanding areas.

7.2.2 Groundworks

Instability of excavation faces was noted during excavation of trial pits TP06, 07, 08 and 09 within a sloping section in the western section of the site. This was prevalent within the weathered materials of the Dyrham Formation in that area.

Temporary trench support, or battering of excavation sides, is likely to be required for all excavations that are to be left open for any length of time, and will definitely be required where man entry is required. Particular attention should be paid to excavation at, or close to, site boundaries/adjoining existing roads/structures/buildings, where collapse of excavation faces could have a disproportionate effect.

A risk assessment of the stability of any open excavation should be undertaken by a competent person and appropriate measures adopted to ensure safe working practise in and around open excavations. Further guidance on responsibilities and requirements for working near, and in, excavations can be obtained from the Construction Design and Management Regulations (2015).

Groundwater has been monitored at between approximately 2.8m and 1.4m depth in BH's 1 & 2 respectively in the east of the site and at 5.0m within BH3 in the west of the site (approximately 122 to 126mAOD). Groundwater ingress should be anticipated where excavating below the water table, ingress rates are likely to be relatively low within the cohesive soils and more rapid within the limestone beds. Water seepages into excavations are likely to be adequately controlled by sump pumping.

Excavations should be readily achievable with standard excavation plant where within the cohesive soils, however heavy duty excavation plant/breaking equipment is likely to be required where excavations are to extend into the ferruginous limestones.

At this stage, Hydrock is not aware of proposals for re-levelling of the site. However, it may be necessary to consider reuse of existing soils as part of redevelopment proposals. Should earthworks be required, an earthworks specification will be necessary to ensure the appropriate management and reuse of the existing soils and that the elevated natural levels of arsenic are considered within it. Once site proposals have been further defined more specific consideration will need to be given to the re-use of materials and reference should be made back to this office if an earthworks specification is required. The earthworks may need to be undertaken under a Materials Management Plan (see Section 6.3.2).

7.2.3 Earthworks/Reuse of Site-Won Materials

An initial assessment has been completed on the potential to re-use site-won materials as an engineered fill material, which indicates the soils which are likely to be re-used can be classified as follows:

- Weathered natural soils - Class 2 cohesive (more than 15% passing the 63µm sieve) - General Fill.
- Distinctly weathered natural rock – Class 1 - General Fill.

Compaction testing carried out on samples of the Dyrham Formation indicate Optimum Moisture Contents of 42%, with corresponding Maximum Dry Density value of 1.28Mg/m3.

Recorded natural moisture contents in the Dyrham Formation range from 23% to 46%, with an average of 33%, indicating that they are 'dry' of Optimum Moisture Content but should be suitable for re-use where moisture content ranges are within range equivalent to between 95% and 105% maximum dry density at 5% average void ratio.

Recorded natural moisture contents in the Whitby Mudstone Formation range from 24% to 34%, with an average of 29%, indicating that they are within Optimum Moisture Content and should be suitable for re-use where moisture content ranges are within range equivalent to between 95% and 105% maximum dry density at 5% average void ratio.

Compaction testing carried out on samples of the Whitby Mudstone Formation indicate Optimum Moisture Contents of between 30% and 25%, with corresponding Maximum Dry Density values between 1.43Mg/m^3 and 1.53Mg/m^3.

Where it is proposed to re-use site won materials, it will be necessary to develop an appropriate Site Specific Earthworks Specification which can be adopted as part of the contract documentation. The basis for the Specification should be BS 6031:2009 and the latest version of the SHW, Series 600 Earthworks.

Where an increased end-performance of the material is required over and above those defined for General Fill materials additional testing and specification will be required. However, if the soils are to be used below structures they should be reclassified as Class 7 Selected Fill as defined in the Specification for Highway Works (Highways Agency 2014). Where the as dug material does not meet the requirements of a Class 7 Fill, but is still required for use below structures, it can be treated with hydraulic binders to form a suitable Class 9 fill. The exact sub-class under Class 9 will depend on the hydraulic binder used. This will be subject to detailed design by a specialist Contractor.

7.3 Foundations

The recommendations in this report follow NHBC Standards Chapter 4.2 (2017).

It is understood that the development will comprise semi-detached and detached housing, a school and local centre. It is not known whether there will be significant change in level prior to the construction.

The topsoil is considered unsuitable for use as founding soils on the basis of its relatively low strength and high compressibility and should be fully penetrated by all new foundations.

The weathered zone of residual clay soils of the Whitby Mudstone Formation, Marlstone Rock Formation and Dyrham Formation are of medium volume change potential.

Trees are noted in hedge rows on the field boundaries as shown on Hydrock drawing C-4841/G003, although they are of unrecorded size, species or maturity. Plots constructed within influencing distance of these trees (whether on- or off-site and whether to remain or be removed), should be constructed in accordance with NHBC Standards in relation to deepening due to trees.

An area of weaker ground was recorded within the Dyrham Formation in the west of the site and within the Marlstone Rock Formation in the south east of the site. Current outline development drawings (see drawing ref: Illustrative Master Plan within Appendix A) indicate that the area described above will be used for Public Open Space (POS). If the development layout is to change going forward, further consideration as to the foundations required within the Dyrham Formation will be required. It should be noted that the masterplan is yet to be fully developed.

On the basis of the above, minimum founding depths within the Whitby Mudstone Formation and Marlstone Rock Formation will be 0.90m bgl. Because of the extent of fine grained material and clay bands between limestone within the Marlstone Rock Formation, deepening due to trees may be necessary depending on the proximity and type of trees. Foundations that are carried deep to avoid the influence of trees may be stepped up, in accordance with the requirements of EC7, BS EN 1997 as long as a suitable founding stratum is present at shallower depth.

If trees are to be removed, the roots should be grubbed out and foundations extended to below the zone of disturbance created by this activity.

The allowable bearing pressure for foundations takes into consideration the risk of shear failure of the ground (ultimate limit state) and acceptable limits of settlement (serviceability limit state).

Foundations which span founding materials of different stiffness should have mesh reinforcement placed at the top and bottom.

The depth of foundations should be designed, and the formations inspected by, a Geotechnical Engineer. Any sub-formation materials deemed as unsuitable such as soft or loose zones should be excavated and replaced with well compacted suitable granular fill or lean mix concrete.

Foundation excavations should be protected from water and inclement weather including frost and any water should be removed by pumping from a sump in the base of the excavation.

7.3.1 Strip or Trench Fill Foundations

Traditional strip or trench fill foundations are considered suitable for the proposed development.

Based on the design soil parameters provided in earlier sections of this report, as a guide based on lower bound undrained shear strength of 60kPa, an allowable net bearing pressure of 120kN/m^2 should be available for a strip or trench fill foundation bearing within the natural residual (fine) soils of the Whitby Mudstone Formation and Marlstone Rock Formation at 0.90m bgl or deeper. This value includes a factor of safety of 3.0 against general shear failure and should result in total settlements of not more than 25mm for foundations up to 1m wide, keeping differential settlements within acceptable limits.

Foundations in excess of 2.5m depth should be designed by an Engineer in accordance with the requirements of NHBC Standards.

Excavation of trench fill foundations to depths in excess of 2.5m bgl is unlikely to be economical and may be impracticable to undertake. Care should be taken to ensure the verticality of deep, narrow foundations to prevent eccentric loading.

NB: should enlarging the foundations be considered (for example because loads are such that the quoted bearing pressure is inadequate based on the size of foundation identified) this will probably lead to increased settlements and the above recommendations should be reviewed.

7.3.2 Heave Protection

Deepening of foundations in accordance with NHBC Standards/BRE 298 will be required where foundations are within the zone of influence of existing, removed or proposed trees and proposed shrub planting. For existing (and any known removed) trees this will require a tree survey to be undertaken by an arboriculturist in accordance with BS 5873:2012 which must include off-site trees that could have an effect on foundation design, in addition to trees on site. Where foundations are within the influence of trees and are deeper than 1.5m bgl, a suitable compressible material or void former will be required.

Where foundations require deepening to greater than 2.5m below ground level, they must be designed by an engineer, as specified in NHBC Technical Requirement R5.

7.4 Ground Floor Slabs

As clay soils of medium to high volume change potential are present at the site, it is recommended that suspended floor slabs should be adopted, in accordance with NHBC Standards.

7.5 Roads and Pavements

In situ CBR values were on average above 2.5% at a depth of 0.40m or deeper. In shallower soils at locations CBR10, 11, 12 and 13, CBR values of less than 2.5% were encountered at and will have to be treated as soft spots (see below) if encountered. Correlation of the plasticity index (after Black, 1962) of the soils on site indicate that a CBR of 3% will be achievable.

Based on the above results, it is considered likely an equilibrium CBR of 2.5% will be achievable over the majority of the site below 0.40m depth of current ground level and can be used for preliminary design, subject to *in situ* testing during construction.

Proof rolling of the formation level will be required and any loose or soft spots should be removed and replaced with an engineered fill, in accordance with a suitable Specification. The formation level will also need to be protected during inclement weather from deterioration; all slopes should be trimmed to falls to shed rain water and the surface sealed to limit infiltration.

Prior to the placement of the founding materials and the construction of the road pavement, the sub-formation and formation will need to be inspected and checked in accordance with a suitable specification to ensure the ground conditions are as expected. All testing should be carried out in accordance with DMRB IAN 73/06 to confirm that the ground conditions at time of construction are consistent with the previous design parameters.

Where the CBR is found to be less than 2.5%, the sub-grade may be unsuitable for both the trafficking of site plant and as support for a permanent foundation, without improvement works being undertaken. Improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5. In summary, consideration may be given to the following potential remedial techniques:

- excavation and re-engineering or replacement of weaker soils;
- the inclusion of geosynthetic reinforcement within the unbound layers of the capping and sub-grade; and
- where cohesive soils are present and they are deemed suitable for treatment with hydraulic binders, to employ modification and/or stabilisation techniques on the formation.

7.6 Soakaways and Drainage

Indicative infiltration rates for the ground investigation are presented in Appendix E and are summarised in Table 7.1.

Table 7.1: Infiltration Testing Data

Stratum	Recorded Indicative Infiltration Rate	Comments
Marlstone Rock Formation (SA07)	1.58×10^{-4}	Values taken from run 3 of 3
Dyrham Formation (SA09)	8.28×10^{-4}	
Whitby Mudstone Formation (SA01-06 and SA08)	Fail	Only one run completed on all

Although the above data indicates that soakaways may be possible, the tests were undertaken within an area of limestone in which there is questionable capacity and continuity due to the presence of clay bands in between the limestone. Furthermore the above results were not indicative of infiltration rates across site, as the seven other tests undertaken failed. More detailed consideration will be required before soakaways could be recommended as suitable in this instance.

7.7 Buried Concrete

Based on guidelines provided in BRE Special Digest 1 (BRE 2005), the soils can be classified as Design Sulfate Class DS-1 and ACEC Class AC-1 (see Section 4.2.2).

7.8 Interaction between Geotechnical and Geo-Environmental Recommendations

An integrated approach to geo-environmental and geotechnical design solutions is required in order to derive the solution for site development. Whilst potential geo-environmental impacts on geotechnical recommendations have been discussed within the appropriate sections, a brief summary of the main issue is given below.

Finished floor levels are key to minimising excavation in to the Marlstone Rock Formation. If arisings are generated from the Marlstone Rock Formation a considered approach within the Remedial Method Statement and Materials Management Plan will need to be followed in order to re-use these materials due to the elevated levels of arsenic. An iterative approach will be required to setting site levels so that if materials are generated from the Marlstone Rock Formation, these arisings can be accommodated elsewhere on site. Regulatory approval to the Remedial Method Statement will be needed to confirm correct level is proposed. Further works to refine the boundary between the Whitby Mudstone Formation and Marlstone Rock Formation should be undertaken to enable a potential volume of arsenic impacted arising’s to be determined.

8.0 UNCERTAINTIES AND LIMITATIONS

8.1 Site-Specific Comments

A final layout of the site is not known. An Illustrative Master Plan which may represent the final layout has been used within the geo-environmental remedial recommendations and is contained within Appendix A.

It is not known currently whether there will be a change in site level.

8.2 General Comments

Hydrock Consultants Limited (Hydrock) has prepared this report in accordance with the instructions of Gallagher Estates (the Client), under the terms of appointment for Hydrock. Hydrock shall not be responsible for any use of the report or its contents for any purpose other than that for which it was prepared and provided. Should the Client require to pass copies of the report to other parties for information, the whole of the report should be so copied, but no professional liability or warranty shall be extended to other parties by Hydrock in this connection without the explicit written agreement thereto by Hydrock. The report may be assigned by the Client by way of absolute legal agreement to a purchaser of all or part of the site to which the report refers (“The Site”) without the consent of Hydrock being required and such assignment shall be effective upon written notice thereof being given to Hydrock. No further assignments shall be permitted, unless expressly agreed in writing by Hydrock. In the event of the Client entering into a legal joint venture to develop The Site, the report can be regarded as having been issued by Hydrock jointly in favour of the Client and the joint venture partner, and in respect of the report Hydrock would owe the joint venture partner the same duty of care that Hydrock owed to the Client when Hydrock was instructed to prepare the report subject to all the matters contained or referred to in the report.

This report details the findings of work carried out in December 2016. The report has been prepared by Hydrock on the basis of available information obtained during the study period. Although every reasonable effort has been made to gather all relevant information, all potential environmental constraints or liabilities associated with the site may not have been revealed.

Hydrock has used reasonable skill, care and diligence in the design of the investigation of the site. The inherent variation of ground conditions allows only definition of the actual conditions at the locations and depths of trial pits and boreholes at the time of the investigation. At intermediate locations, conditions can only be inferred.

Groundwater findings described are only representative of the dates on which they were made and levels may vary.

Unless otherwise stated, the recommendations in this report assume that ground levels will remain as existing. If there is to be any re-profiling (e.g. to create development platforms or for flood alleviation) then the recommendations may not apply.

Information provided by third parties has been used in good faith and is taken at face value; however, Hydrock cannot guarantee its accuracy or completeness. It is assumed that previous reports provided have been assigned to the Client and can be relied upon. Should this not be the case Hydrock should be informed immediately as additional work may be required.

The work has been carried out in general accordance with recognised best practice. The various methodologies used are explained in Appendix G. Unless otherwise stated, no assessment has been made for the presence of radioactive substances or unexploded ordnance. Where the phrase ‘suitable for use’ is used in this report, it is in keeping with the terminology used in planning control and does not imply any specific warranty or guarantee offered by Hydrock.

The chemical analyses reported were scheduled for the purposes of risk assessment with respect to human health, plant life and controlled waters as discussed in the report. Whilst the results may be useful in applying the Hazardous Waste Assessment Methodology given in Environment Agency Technical Guidance WM3, they are not primarily intended for that purpose and additional analysis may be required should waste classification be required for consideration of off-site disposal of contaminated soils. Separate analyses will be required to meet the Waste Acceptance Criteria for specific landfill sites.

Unless otherwise stated, the chemical testing carried out for this report was not scoped to comply with the requirements of the water supply company and further work may be required.

The preliminary risk assessment process may identify potential risks to site demolition and redevelopment workers. However, consideration of occupational health and safety issues is beyond the scope of this report.

Please note that notwithstanding any site observations concerning the presence or otherwise of archaeological sites, asbestos-containing materials or invasive weeds such as Japanese knotweed, this report does not constitute a formal survey of these potential hazards.

Any site boundary line depicted on plans does not imply legal ownership of land.

9.0 RECOMMENDATIONS FOR FURTHER WORK

The following further works will be required:

- discussions with regulatory bodies regarding the conclusions of this report;
- further delineation of arsenic concentrations at the site;
- estimation of the potential volume of arsenic impacted arising’s;
- develop Remedial Strategy / Materials Management Strategy and seek approval of documents;
- discussions with service providers regarding the materials suitable for pipework etc.;
- foundation depth assessment in relation to trees, following a tree survey to BS 5837:2012;
- preparation of an Earthworks Specification;
- remediation of the site; and
- verification of the remedial works.

10.0 REFERENCES

ALLEN, D. L., BREWERTON, L. J., COLEBY, L. M., GIBBS, B. R., LEWIS, M. A., MACDONALD, A. M., WAGSTAFF, S. J. and WILLIAMS, A.T. 1997. The physical properties of major aquifers in England and Wales. *British Geological Survey Technical Report WD/97/34.* 312pp. Environment Agency R&D Publication 8.

ASSOCIATION OF GROUND INVESTIGATION SPECIALISTS. 2006. *Guidelines for Good Practice in Site Investigation*. Issue 2. AGS, Beckenham.

BRE. 1980. Low-rise buildings on shrinkable clay soils: Part 1. *BRE Digest 240.* Building Research Establishment, Garston, 4pp.

BRE. 1999. The influence of trees on house foundations in clay soils. *BRE Digest 298.* Building Research Establishment, Garston, 8pp.

BRE. 1991. Soakaways. *BRE Digest 365*. BRE, Garston.

BRE. 2005. Concrete in aggressive ground. *BRE Special Digest 1, 3rd Edition.* BRE, Garston.

BRITISH STANDARDS INSTITUTION. 1986. British Standard Code of practice for Foundations. *BS 8004*. BSI, London.

BRITISH STANDARDS INSTITUTION. 2003. Geotechnical investigation and testing - Identification and classification of rock - Part 1: Identification and description. *BS EN ISO 14689-1 Incorporating Corrigendum No.1.* BSI, London

BRITISH STANDARDS INSTITUTION. 2004. Eurocode 7 – Geotechnical design - Part 1: General rules. *BS EN 1997-1. Incorporating Corrigendum No.1.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2006. Concrete – complementary British Standard to BS EN 206-1 – Part 1: Method of specifying and guidance to the specifier. *BS 8500-1.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2007. Eurocode 7 – Geotechnical design - Part 2: Geotechnical investigation and testing. *BS EN 1997-2.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2009. Code of practice for earthworks. *BS 6031 Incorporating Corrigendum No.1:2010.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2011. Code of Practice for Investigation of Potentially Contaminated sites. *BS 10175 Incorporating Amendment No.1:2013.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2012. Trees in relation to design, demolition and construction – Recommendations. *BS 5837*. BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Specification for topsoil. *BS 3882*. BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. *BS 8485.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Code of practice for ground investigations. *BS 5930.* BSI, London.

CARD, G., WILSON, s. and MORTIMER, S. 2012. A pragmatic approach to ground gas risk assessment. CL:AIRE Research Bulletin RB17. CL:AIRE, London.

CIEH and CL:AIRE. May 2008. *Guidance on comparing soil contamination data with a critical concentration.* Chartered Institute of Environmental Health and Contaminated Land: Applications in Real Environments, London, 66pp.

CL:AIRE. March 2011. *The Definition of Waste: Development Industry Code of Practice, Version 2*. Contaminated Land: Applications in the Real Environment (CL:AIRE), London.

CLAYTON, C.R.I. 1995. The Standard Penetration Test (SPT): methods and use. *CIRIA Report R143*, CIRIA, London.

CONCRETE SOCIETY, THE. 2013. Concrete industrial ground floors. A guide to design and construction. *Technical Report 34 (4th Ed.)*. The Concrete Society, Camberley. 88pp.

DCLG. March 2012. National Planning Policy Framework. DCLG, London.

DCLG. March 2012. Technical Guidance top the National Planning Policy Framework. DCLG, London.

DEFRA. March 2014. SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. Defra, London.

ENVIRONMENT AGENCY. 2003. In Vitro Methods for the Measurement of Oral Bioaccessibility of Selected Metals and Metalloids in Soils: a Critical Review. R&D Technical Report P5-062/tR/01.

ENVIRONMENT AGENCY. 2004. Model procedures for the management of land contamination. *Contaminated Land Report 11.* The Environment Agency.

ENVIRONMENT AGENCY. February 2005. Environment Agency's Science Update on the use of Bioaccessibility Testing in Risk Assessment of Land Contamination.

ENVIRONMENT AGENCY. 2006. Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination. The Environment Agency, Bristol, 123pp.

ENVIRONMENT AGENCY. 2009. Soil Guideline Value s for inorganic arsenic in soil. Science Report SC050021/arsenic SGV. Environment Agency, Bristol. 11pp.

ENVIRONMENT AGENCY. 2015. Waste classification. Guidance on the classification and assessment of waste (1st Ed.) *Technical Guidance WM3.* The Environment Agency.

HATANAKA, M. and UCHIDA, A. 1996. Empirical correlation between penetration resistance and effective friction of sandy soil. *Soils & Foundations*, **36 (4)**, 1-9. Japanese Geotechnical Society.

HEALY, P.R. & HEAD, J.M. 1984. Construction over abandoned mine workings. *CIRIA Special Publication SP32.* CIRIA, London.

HIGHWAYS AGENCY. 2009. Design Guidance for Road Pavement Foundations (Draft HD25). *Interim Advice Note 73/06. Rev 1.* Highway Agency, London.

HIGHWAYS AGENCY. 2014. Manual of Contract Documents for Highway Works, *Specification for Highway Works: Volume 1, Amendment August 2014*. Highway Agency, London.

JONES, H. K., MORRIS, B. L., CHENEY, C. S., BREWERTON, L. J., MERRIN, P. D., LEWIS, M. A., MACDONALD, A. M., COLEBY, L. M., TALBOT, J. C., MCKENZIE, A. A., BIRD, M. J., CUNNINGHAM, J. and ROBINSON, V. K. 2000. The physical properties of minor aquifers in England and Wales. *British Geological Survey Technical Report WD/00/04.* 234pp. Environment Agency R&D Publication 68.

MALLETT, H., COX, L., WILSON, S., and CORBAN, M. 2014. Good practice on the testing and verification of protection systems for buildings against hazardous ground gases. *CIRIA Report C735.* CIRIA, London.

MILES, J. C. H., APPLETON, J. D., REES, D. M., GREEN, B. M. R., ADLAM. K. A. M. and MYRES. A. H. 2007. Indicative Atlas of Radon in England and Wales. Health Protection Agency and British Geological Survey. Report HPA-RPD-033.

NATHANAIL, P., McCAFFREY, C., OGDEN, R., FOSTER, N., GILLETT, A. & HAYNES, D. 2004. Uptake of arsenic by vegetables for human consumption: a study of Wellingborough allotment plots. Land Contamination & Reclamation, 12 (3), 219-238.

NHBC. 2014. NHBC Standards, Part 1 Introduction and Technical Requirements. NHBC, Milton Keynes.

NHBC. 2014. NHBC Standards, Part 4 Foundations. NHBC, Milton Keynes.

NHBC. 2014. NHBC Standards, Chapter 4.2 Building near trees. NHBC, Milton Keynes.

RAWLINS, B. G., McGRATH, S. P., SCHEIB, A. J., CAVE, N., LISTER, T. R., INGHAM, M., GOWING, C. and CARTER, S. 2012 .*The advanced geochemical atlas of England and Wales.* British Geological Survey, Keyworth.

SCIVYER, C. 2015. Radon: Guidance on protective measures for new buildings. Building Research Establishment Report BR 211. BRE, Garston.

STONE, K., MURRAY, A., COOKE, S., FORAN, J. and GOODERHAM, L. 2009. Unexploded ordnance (UXO), a guide to the construction industry. *CIRIA Report C681*. CIRIA, London. 141 pp.

STROUD, M. A. 1975. The standard penetration test in insensitive clays and soft rocks. *Proceedings of the European Symposium on penetration testing*, **2**, 367-375.

UKTAG. November 2013 (updated January 2014). *Updated recommendations on environmental standards. River Basin Management (2015-21).* UK Technical Advisory Group on the Water Framework Directive.

WATER UK HBF. January 2014. Contaminated Land Assessment Guidance. Water UK and the Home Builders Federation. 12pp.

WFD-UKTAG. July 2014. UKTAG River & Lake Assessment Method, Specific Pollutants (Metals), Metal Bioavailability Assessment Tool (M-BAT). Water Framework Directive – United Kingdom Technical Advisory Group. Stirling.

Appendix A

Drawings

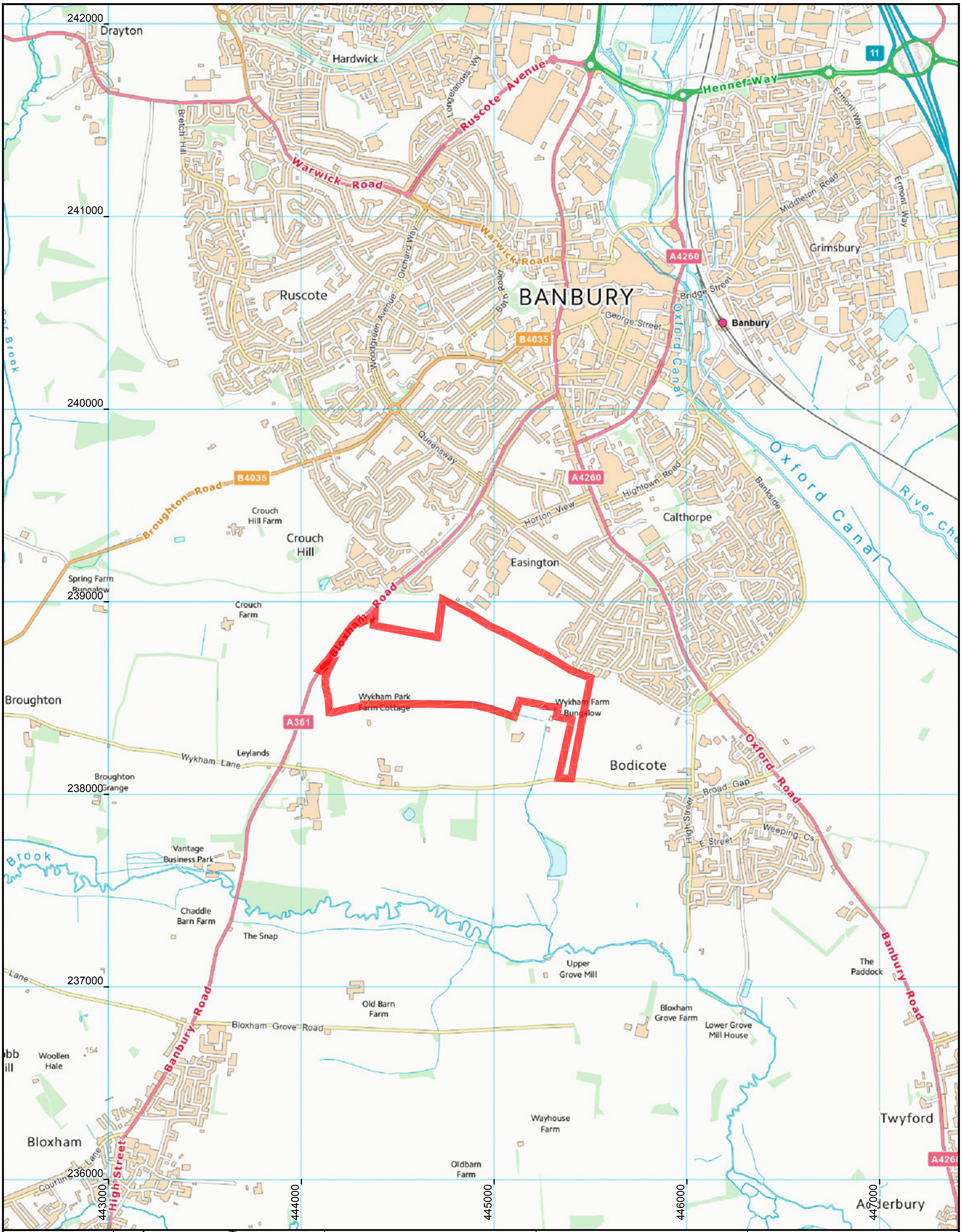
Drawings included in this report:

WPF-HYD-XX-GI-DR-G-1000

WPF-HYD-XX-GI-DR-G-1001

WPF-HYD-XX-GI-DR-G-1002

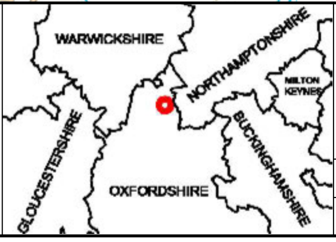
WPF-HYD-XX-GI-DR-G-1003



OS NORTH

Site Ref: SP43

0 500
Metres



P1	FIRST ISSUE					
	IB	15/02/17	RC	15/02/17	RoH	15/02/17
REV.	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock

Over Court Barns
Over Lane
Almondsbury, Bristol BS32 4DF
TEL: 01454 619 533
FAX: 01454 614 125
E-Mail: bristol@hydrock.com
or visit www.hydrock.com

CLIENT
GALLAGHER ESTATES

PROJECT
Wykham Park Farm

TITLE
SITE LOCATION PLAN

HYDROCK PROJECT NO.
C-04841-C

SCALE @ A4
1:25,000

PURPOSE OF ISSUE
SUITABLE FOR INFORMATION

STATUS
S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
WPF-HYD-XX-GI-DR-G-1000

REVISION
P1

KEY PLAN

▭	Site Boundary
▨	Trial Pit
⊕	Borehole
▲	CBR in-situ tests
◄(01)	Photograph location and reference number

NOTES

1. This drawing has been based on the following drawings and information:
- Greenhatch Group topographical survey drawing no 17711 OGL - Rev.1, Date Nov2012

REV.						
P1	FIRST ISSUE					
	IB	15/02/17	RC	22/03/17	RoH	22/03/17
REV.	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock

Over Court Barns
Over Lane
Almondsbury, Bristol BS32 4DF
TEL: 01454 619 533
FAX: 01454 614 125
E-Mail: bristol@hydrock.com
or visit www.hydrock.com

CLIENT
GALLAGHER
ESTATES

PROJECT
Wykham Park Farm

TITLE
EXPLORATORY HOLE LOCATION PLAN

HYDROCK PROJECT NO.
C-04841-C

SCALE @ A1
1:1000

PURPOSE OF ISSUE
SUITABLE FOR INFORMATION

STATUS
S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
WPF-HYD-XX-GI-DR-G-1001

REVISION
P1

KEY PLAN

▭	Site Boundary
▣	Trial Pit
⊕	Borehole
▲	CBR in-situ tests
— — —	Line dividing geology formations
▨	Whitby Mudstone Formation
▨	Marlstone Rock Formation
▨	Dryham Formation

NOTES

1. This drawing has been based on the following drawings and information:
· Greenhatch Group topographical survey drawing no 17711 OGL - Rev.1, Date Nov2012

P1	FIRST ISSUE					
	IB	08/03/17	RC	08/03/17	RoH	08/03/17
REV.	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock
Over Court Barns
Over Lane
Almondsbury, Bristol BS32 4DF
TEL: 01454 619 533
FAX: 01454 614 125
E-Mail: bristol@hydrock.com
or visit www.hydrock.com

CLIENT
GALLAGHER
ESTATES

PROJECT
Wykham Park Farm

TITLE
GEOLOGICAL ZONATION PLAN

HYDROCK PROJECT NO.
C-04841-C

SCALE @ A1
1:1000

PURPOSE OF ISSUE
SUITABLE FOR INFORMATION

STATUS
S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
WPF-HYD-XX-GI-DR-G-1002

REVISION
P1

KEY PLAN

▭	Site Boundary
▚	Trial Pit
⊕	Borehole
▲	CBR in-situ tests
— — —	Line dividing geology formations
▨	Whitby Mudstone Formation
▨	Marlstone Rock Formation
▨	Dryham Formation

NOTES

1. This drawing has been based on the following drawings and information:
- Greenhatch Group topographical survey drawing no 17711 OGL - Rev.1, Date Nov2012
- Proposed development: Illustrative Master Plan

P1	FIRST ISSUE					
	IB	08/03/17	RC	08/03/17	RoH	08/03/17
REV.	REVISION NOTES/COMMENTS					
	DRAWN BY	DATE	CHECKED BY	DATE	APPROVED BY	DATE

Hydrock

Over Court Barns
Over Lane
Almondsbury, Bristol BS32 4DF
TEL: 01454 619 533
FAX: 01454 614 125
E-Mail: bristol@hydrock.com
or visit www.hydrock.com

CLIENT

GALLAGHER
ESTATES

PROJECT

Wykham Park Farm

TITLE

GEOLOGICAL ZONATION PLAN

HYDROCK PROJECT NO.
C-04841-C

SCALE @ A1
1:1000

PURPOSE OF ISSUE
SUITABLE FOR INFORMATION

STATUS
S2

DRAWING NO. (PROJECT CODE-ORGINATOR-ZONE-LEVEL-TYPE-ROLE-NUMBER)
WPF-HYD-XX-GI-DR-G-1003

REVISION
P1

Appendix B

Site Walkover Photographs

Plate 1: Site overview

Plate 2: Site overview

Plate 3: Site overview

Plate 4: Site overview

Plate 5: Site overview

Appendix C

Reports by Others

Wardell Armstrong. August 2014. Wykham Park Farm, Banbury – Desk Study Report ref: CA10769.

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING, QUARRYING AND MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

GALLAGHER ESTATES

WYKHAM PARK FARM, BANBURY

Desk Study Report

August 2014

your earth our world

Wardell Armstrong
22 Windsor Place, Cardiff, CF10 3BY, United Kingdom
Telephone: +44 (0)29 2072 9191 Facsimile: +44 (0)29 2038 7261 www.wardell-armstrong.com

wardell armstrong
your earth our world

DATE ISSUED:	August 2014
JOB NUMBER:	CA10769
REPORT NUMBER:	001

GALLAGHER ESTATES

WYKHAM PARK FARM, BANBURY

Desk Study Report

August 2014

PREPARED BY:

Samuel Folarin	Senior Geo-Environmental Engineer	[redacted]

APPROVED BY:

Matt Jordan	Technical Director	[redacted]

Wardell Armstrong is the trading name of Wardell Armstrong LLP, Registered in England No. OC307138.

Registered office: Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom

UK Offices: Stoke-on-Trent, Birmingham, Cardiff, Carlisle, Edinburgh, Greater Manchester, London, Newcastle upon Tyne, Penryn, Sheffield, Truro, West Bromwich. International Offices: Almaty, Moscow

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES AND QUARRYING
WASTE RESOURCE MANAGEMENT

CONTENTS

APPENDICES

1 INTRODUCTION

Wardell Armstrong LLP has been commissioned by Gallagher Estates to provide engineering consultancy services for the development of the site known as Wykham Park Farm, Banbury, Oxfordshire (approximately 1.7km south of Banbury Town Centre). It is understood that the site is to be developed for residential purposes.

Making reference to the development proposals, Wardell Armstrong LLP has carried out a Phase 1 Geo-Environmental Desk Study of the site in order to identify anticipated ground conditions and environmental risks.

1.1 Report Objective

The objective of this report is to detail a desk-based review of the environmental data available for the site. Assessment of this information allows for an overview of the historical and current contaminative setting of the site and its surrounding area. A geo-environmental assessment of the site will ensure the requirements of the proposed development are met. This has facilitated an assessment of the following in particular:

- Geo-environmental conditions at the site;
- Land contamination risks associated with the site; and
- Statutory records in relation to the site (which requires consideration as part of the planning process).

This report describes the historical, geological, hydrogeological and environmental setting of the site. The desk study element of this report has been prepared by reference to sources of information readily available in local archives and Wardell Armstrong in-house records. Information has been obtained from GroundSure and the Environment Agency. A copy of the GroundSure Data and Insight reports are included as Appendix 1.

The results and conclusions of this report should be confirmed at or prior to construction.

2 SITE SETTING

2.1 Site Location

The site is located approximately 1.7 kilometres south of Banbury town centre although the residential suburb (known as Easington) associated with Banbury extends to the north western boundary of the site. The site location is illustrated in Figure 1 below.

Figure 1 – Wykham Park Farm, Banbury

Reproduced from Google Maps

The proposed development area is centred at National Grid Reference 44851, 38674 and comprises five delineated fields and a section of one field which are all currently being used for arable farming. The field boundaries within the site are demarcated with mature hedgerows. There is a small wooded area located in the north western corner of the site and trees are also present along the majority of the site boundary.

There is a single track which runs through the western section of the site in a north to south direction from Bloxham Road in the north down to Wykham Lane to the south of the site. A drainage feature, which is indicated to flow west to east, is present within the trees in the eastern section of the southern boundary.

The site is bound to the north in part by open fields and by a track known as 'Salt Way' beyond which is residential development and school playing fields.

The eastern and southern boundaries of the site are mainly vegetated field boundaries with Wykham Farm Cottage located adjacent to the site in the south east. The site is bound to the west by the Bloxham Road (A361) in the north by open fields beyond which is residential development and by Wykham Park lodge and open fields in the south.

In terms of land use, the site has always historically been associated with undeveloped land and has always been linked with agriculture, aerial photos have indicated some previous cultivation of the land (circa 1945).

The Ordnance Survey plans and topography maps for the area indicate the site is generally topographically flat with a gently slope from west to east. The western and majority of the site area is occupied by a plateau at approximately 130m AOD, falling gently south-eastwards from a high point of 133m AOD on the north western corner and steepening towards a low point of approximately 125m AOD on the south-eastern corner. The plateau gradients vary broadly between 1:45 and 1:50, whereas those on the land to the south steepen to 1:8. Inspecting currently available desk based research the site appears to be completely clear apart from areas of vegetation, with no evidence of deposited waste materials on the site.

Due to the site history and the ongoing use of the site as arable farm land it was not considered necessary to undertake a walkover survey of the site for this preliminary exercise. Reference to the most recently published ordnance survey mapping (2014) and information from available online aerial photography of the site has been used to provide a site description.

2.2 Site History

Past editions of published Ordnance Survey County Series and National Grid plans dating between 1881 and 2014 have been reviewed in order to determine the development history of the site and the immediate surroundings. The historical plans for the site are included within Appendix 1.

Table 1: Site History

Date	Description	Source
1881	The site is within an area of agricultural/undeveloped land. The areas to the north, east, south and west are indicated to be open fields. This earliest available mapping indicates that the site comprised a number of fields with a few trees recorded along the field boundaries. A small triangular shaped wooded area is marked in the northwest corner of the site. The site is bound in part to the west by a road which runs in a northeast southwest direction. This road is crossed by a track named as 'Salt Way' to the north of the site which forms part of the northern site boundary. Outside the site boundary several buildings are indicated. A small cluster of buildings are shown adjacent to the south eastern boundary of the site. Wykham Farm is shown approximately 90m to the south of the site boundary, and a couple of unnamed buildings are indicated approximately 75m from the site boundary to the west of Wykham Farm. Park Farm is located 350m to the south of the site. Wykham Park is shown 550m to the southeast of the site comprising several buildings including a chapel surrounded by a wooded area. Horton Infirmary is shown 850m to the north-east of the site. Bodicote village is shown approximately 700m to the south-east of the site boundary. In addition further north-west (approximately 550m from the site boundary) a rifle range is shown, behind which a small quarry and brickworks. Sor Brook which meanders in an east west direction is shown 1km to the south of the site. The Oxford Canal is shown 1400m to the north east of the site running in a north-west to south-east direction. The river Cherwell is located 1600m to the north-east of the site running approximately in a north-west to south-east direction.	1:10,560 scale County Series

Date	Description	Source
1899-1900	The site features and surrounding area have not significantly changed. There are tracks, which are now more evident, in the western and eastern section of the site. Both tracks run in a south to north direction, providing access to the fields for the landowners of Wykham Farm and Park Farm. This mapping also records an old clay pit, located approximately 250m to the northwest of the site.	1:10,560 scale County Series
1920-1923	The site features and surrounding area have not significantly changed. However, a lodge has been constructed on the western boundary of the site. Allotments are also now shown to the east of the site.	1:10,560 scale County Series
1938	Mapping now shows an area of residential development in Easington to the north of the site. A school is also shown in this area. Bodicote village has expanded to the east of the site.	1:10,560 scale County Series
1954	The site features and surrounding area have not significantly changed. Further expansion is seen in the Easington residential development.	1:10,560 scale Provisional
1976	The mapping published in 1976 details further development of Easington to the north of the site with large housing estates, schools, playing fields and a hospital recorded on the mapping. Along part of the southern site boundary a drain is now shown flowing in a west to east direction into a stream (which flows north to south) located to the southeast of the site. There are no further changes shown on site.	1:10,000 scale National Grid
1982	Although the site features and surrounding area have not significantly changed, this is the first plan which identifies Tudor Hall School, stables and tennis courts at Wykham Park.	1:10,000 scale National Grid
1992	The mapping published in 1992 shows further development of Easington and Bodicote. There is now a reservoir shown, 600m from the site boundary located on the stream to the south of the site. There are no other significant changes shown on the recent editions of published mapping to the site or the surrounding area.	1:10,000 scale National Grid

Date	Description	Source
1992 (continued)	A pond is shown in the location of the former clay pit noted on the 1882 mapping 250m northwest of the site.	
2002	Although the site features and surrounding area have not significantly changed, the Easington urban sprawl has now reached the pond identified in the 1992 mapping.	1:10,000 scale Raster
2010-2014	The site features and surrounding area have not significantly changed.	1:10,000 scale National Grid

On-site

The earliest available mapping indicates that the site comprised a number of fields with a few trees recorded along the field boundaries. A small triangular shaped wooded area is marked in the northwest corner of the site. The site is bound in part to the west by a road which runs in a northeast southwest direction. This road is crossed by a track named as 'Salt Way' to the north of the site which forms part of the northern site boundary.

Surrounding Area

Outside the site boundary several buildings are indicated. A small cluster of buildings are shown adjacent to the south eastern boundary of the site. Wykham Farm is shown approximately 90m to the south of the site boundary, and a couple of unnamed buildings are indicated approximately 75m from the site boundary to the west of Wykham Farm. Park Farm is located 350m to the south of the site. Wykham Park is shown 550m to the southeast of the site comprising several buildings including a chapel surrounded by a wooded area. Horton Infirmary is shown 850m to the northeast of the site. Bodicote village is shown approximately 700m to the south east of the site boundary.

The mapping published in 1992 shows further development of Easington and Bodicote. There is now a reservoir shown, 600m from the site boundary located on the stream to the south of the site. There are no other significant changes shown on the recent editions of published mapping to the site or the surrounding area. A pond is shown in the location of the former clay pit noted on the 1882 mapping 250m northwest of the site.

3 RECORDED GEOLOGY, HYDROGEOLOGY & SITE SENSITIVITY

3.1 Recorded Geology

3.1.1 Superficial Deposits

No superficial deposits are recorded to be present on site.

3.1.2 Solid Geology

The published geological mapping for the area (BGS Digital Geological map of Great Britain at 1:10,000 scale and 1:10,560 scale geological map sheets SP 43 NE and SP 43 NW 1973) indicates the site to be mostly underlain by the Upper Lias now known as the Whitby Mudstone Formation of the Lias Group of Jurassic Age (Toarcian). The Whitby Mudstone Formation generally comprises fossiliferous mudstone, siltstone, sandstone and occasional limestone bands. The eastern section of the site and the south western corner of the site is recorded to be underlain by the Marlstone Rock Bed now known as the Marlstone Rock Formation of the Lias Group of Jurassic Age (Toarcian/Pliensbachian). The Marlstone Rock Formation generally comprises ferruginous limestone, interbedded ferruginous sandstone and subordinate ferruginous mudstone. It is known that elevated concentrations of some metals and metalloids, including arsenic, can be associated with soils derived from the Marlstone Rock Formation in the Banbury area.

The very most south-western and south-eastern extents of site are identified to be underlain by the Dyrham Formation of the Lias Group of Jurassic Age (Pliensbachian). The Dyrham Mudstone Formation generally comprises pale to dark grey and greenish grey, silty and sandy mudstone, with interbedded silt or very fine-grained sand (locally muddy or silty), weathering yellow.

The geology of the site is shown on the Geological Mapping contained within the GroundSure GeoInsight Report included in Appendix 1.

3.1.3 BGS Boreholes

There are no BGS boreholes recorded within the site or its immediate surrounding area.

3.2 Hydrogeology

The Environment Agency (EA) Website has been consulted in respect of the underlying aquifer designation. Reference has also been made to the maps provided within the GroundSure Report. The reviewed information indicates that the underlying strata is mainly classified as unproductive strata in the central and northern section of the site i.e. the Whitby Mudstone Formation and 'Secondary A' aquifer in the southern section of the site i.e. the Marlstone Rock Formation. The strata classified as a Secondary A aquifer typically contain permeable layers capable of supporting water supplies at a local rather than strategic scale. It is noted that such waters can, in some cases form an important source of base flow to rivers. As such the aquifer beneath the site can be classed as a potential receptor for any contamination present on site.

The very most south-western and south-eastern extents of site are identified to be underlain by the Dyrham Formation. The Dyrham Formation is classified as a Secondary Aquifer with undifferentiated layers. This designation has been assigned in cases where it has not been possible to attribute either category Secondary A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type.

Information published by the GroundSure report indicates that the soils beneath the site are classified as soils of high to low permeability potential – indicating a minor aquifer with variable permeability. Soils with high permeability potential are likely to readily transmit liquid discharges because they are either shallow, or susceptible to rapid by-pass flow directly to rock, gravel or groundwater. Water flow within the bedrock is identified as being a mix of via pore space and fractures.

The site is not located within a Groundwater Source Protection Zone.

3.3 Hydrology

The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary. This flows westwards into a ditch which feeds into another ditch located to the south of Wykham Farm Cottage (located to the south east of the site).

This subsequent ditch flows southwards into the Sor Brook located approximately 1km to the south of the site. Approximately 600m to the south of the site there is a small reservoir. There are also several small ponds located around the site. The closest ponds are located 250m to the north west of the site, and 500m to the south of the site.

3.4 Site Sensitivity

Information published by GroundSure indicates that the only aspect of concern regarding site sensitivity is nitrate vulnerability. The entire site and surrounding area is indicated to be within a nitrate vulnerable zone (NVZ). Farmers with land in NVZs must follow mandatory rules to tackle nitrate loss from agriculture.

The nitrate pollution prevention regulations bring into force the European Commission nitrates directive. The latest review came into force on 17 May 2013. The regulations mean that land that drains into waters polluted by nitrates are designated as Nitrate Vulnerable Zones. The Nitrates Directive is implemented by separate regulations in England and Wales. The Environment Agency is responsible for enforcing and assessing farmers' compliance with these regulations in England.

There is no designation of Sites of Special Scientific Interest, Special Areas of Conservation, or Special Protection Areas on site or in the immediate surrounding area. However, there are records of Environmentally Sensitive Areas identified as Upper Thames Tributaries (Natural England) located 1.5km and 1.7km north-east of the site.

3.5 Ground Stability and Mining / Mineral Extraction

The environmental desk study data report suggests the following stability hazards may apply to the site:

- The potential for collapsible ground at the site is very low;
- The potential for landslide ground stability hazards on the site are very low;
- The potential for running sand ground stability hazards on the site is considered to be negligible; and
- The potential for shrinking or swelling clay ground stability hazards across site are detailed as being low to negligible.

There are no records of coal mining affected areas or BGS recorded mineral sites on site or within the immediate surrounding area.

3.6 Radon Gas

The Building Research Establishment (BRE) 'Guidance on Protective Measures for New Dwellings' (BR211) has been consulted along with the information provided within the GroundSure report. The documentation indicates that the site is located within an area where full radon protective measures are required. It is recommended that subsequent to planning consent being awarded a radon protection report from the British Geological Survey (BGS) is obtained which would provide further detailed information on this to assist in the detailed planning and construction of the proposed development.

4 ENVIRONMENTAL SETTING

Information published by the Environment Agency has been obtained via a GroundSure data report dated 8 July 2014. The data report provides environmental information, the following assessment is undertaken regarding the site location and a suitable radius around the study area. The information includes details of sites that are recorded to hold abstraction or discharge consents, recorded pollution incidents, licensed waste sites, sites subject to environmental authorisations (air pollution controls etc.) and sites that have, or historically have potentially contaminative uses.

4.1 Abstraction Licences

The GroundSure report indicates that there are three recorded groundwater abstractions recorded within 1km of site.

The closest recorded groundwater abstraction is located 560m to the west of the site and relates to the use of Thames Groundwater for general farming and domestic use at Crouch Farm, Banbury.

The other two groundwater abstraction licences within 1km of site refer to a location 864m north-west of the site and relates to the use of Thames Groundwater for spray irrigation at Crouch Hill Farm and Banbury Self Pick (farm shop).

There are four recorded surface water abstraction licences (at two locations) within 1km of the study site. Two of the licences are recorded at a location 311m to the south-west of the site and relates to the use of Thames surface water for spray irrigation at Wykham Park Farm (point A). The remaining two abstraction licences are recorded 570m to the south of the site and relates to the use of Thames surface water for spray irrigation at Wykham Park Farm (point B).

There are no potable water abstraction licences within 1km of the site, although this specific licence category is recorded 1.2km to the south-east of site relating to Bodicote Pumping Station using Thames surface water.

4.2 Discharge Consents

There are six recorded discharge consents within 500m of the site (not including various permit versions of the same licence). The closest consent is located 91m north-west of the site and is registered to Crouch Farm at Ham Road, Bloxham for discharge of sewage to Marlstone Rock Bed. There is also a discharge consent located 159m north-west of site which is registered to a Thames Water pumping station at Broughton Road, Banbury. This is in relation to the sewage discharge to Sor Brook.

4.3 Pollution Incidents to Controlled Water

There are no records of pollution incidences to controlled water within 500m of the site.

4.4 Flooding

The Environment Agency website indicates that the site is located within Flood Zone 1 (an area with little or no risk of flooding). This assessment corresponds with data provided within the GroundSure report obtained for the site.

4.5 Landfill Sites and Waste Management Facilities

There are no BGS recorded, registered landfill sites or licensed waste management facilities within 1km of the site. In addition there are no registered waste transfer sites, treatment/disposal, or integrated pollution control registered waste sites within 1km of the site.

However, there is a record of one historical landfill within 1km of site. This record relates to a site 911m north of the study site, located on Broughton Road, Banbury. This historic landfill is detailed to have received inert and industrial waste.

4.6 Pollution Incident / Contaminated Land Register

There are no local pollution incidents recorded on the National Incidents Recording System or Contaminated Land Register. There are no entries or notices on either register for the site or in the wider surrounding area.

4.7 Local Authority Pollution Prevention and Controls

There are no local authority pollution prevention and controls recorded within 500m of the study site.

4.8 Potential Contaminative Uses

The report identifies no major industrial or contaminative activities on site; however the report does specify the location of generic tanks (unknown contents) 26m north-east of the site.

The report identifies five other industrial activities within 250m of the site area:

- Carpet retailer and fitters (John Winters) located 176m to the north-east of site;
- Garden centre (Alagra Products) located 182m to the north-east of site;
- Electricity Substation located 213m to the north-east of site;
- Water Pumping Station located 222m to the north-east of site; and
- Electricity Substation located 247m to the north-east of site.

4.9 Fuel Station

There are no fuel station entries within a 500m radius of the site.

4.10 Underground High Pressure Oil and Gas Pipelines

There are no underground high pressure oil and gas pipelines fuel station entries within a 500m radius of the site.

4.11 Hazardous Substances

The desk study research indicates there have been no incidents or indication of hazardous substances on site or within the immediate surrounding area.

To assess whether there is any history of hazardous materials use/handling which could potentially impact the site, the desk study research covers records of the following:

- Control of Major Accident Hazards Sites (COMAH);
- Explosive Sites;
- Notification of Installations Handling Hazardous Substances (NIHHS);
- Planning Hazardous Substance Consents; and/or
- Planning Hazardous Substance Enforcements.

5 PRELIMINARY LAND CONTAMINATION ASSESSMENT

5.1 Legislative Background

The primary legislative mechanism for contaminated land management in the UK is Part 2A of the Environmental Protection Act, 1990 (EPA). Part 2A was introduced into the EPA under Section 57 of the Environment Act 1995 to help deal with the substantial legacy of land contamination. Part 2A applies where there is unacceptable risk, assessed on the basis of the current use and the relevant circumstances of the land. It is not directed to assessing risks in relation to a future use of the land that would require a specific grant of planning permission.

Revised Part 2A Statutory Guidance was issued by the Secretary of State in April 2012. As part of this guidance, a new category system has been proposed to define whether land should be classified as Contaminated Land. Land falling under Categories 1 and 2 being designated as Contaminated and 3 and 4 as non-contaminated. New Category 4 screening levels are proposed, but are not yet available.

The control of development and land use in the future is the responsibility of the planning system, which is the principal regulatory driver for this site. In March 2012, the Government released the National Planning Policy Framework (NPPF) which replaced all previous planning policy statements and guideline (PPS/PPG) documents including Planning Policy Statement (PPS) 23 Planning and Pollution Control. However, it should be noted that the NPPF does not change the statutory basis on which planning decisions are founded and emphasises the requirement for sustainable development.

A fundamental principle of sustainable development is that the condition of land, its use and its development should be protected from potential hazards. The NPPF states that:

120. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location.

The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account. Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.

121. Planning policies and decisions should also 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 IIA of the Environmental Protection Act 1990; and
- Adequate site investigation information, prepared by a competent person, is presented.

Following a review of the background geo-environmental information for the site, a preliminary conceptual site model has been formulated to identify sources of contamination, potential pathways and potential receptors on and in the immediate vicinity of the site.

It should be noted that some uncertainties exist due to the limited site-specific data available. However, potential contaminants and receptors have been identified based on the desk based site review. Pathways have been established on reasonable scientific knowledge of the behaviour of the contaminants in the ground.

Environment Agency guidance provided in CLR11 indicates conceptual site model (CSM) should identify those contaminants, pathways and receptors which are ‘likely’ to represent an ‘unacceptable’ risk either to human health or the surrounding environment.

6 CONCEPTUAL SITE MODEL

6.1 Conceptual Site Model

A Conceptual Site Model (CSM) for the site has been developed and assesses potential contaminants, potential sources of contamination, potential receptors and potential pathways by which the receptors may be exposed. With respect to land contamination, potential receptors include human health, controlled waters, flora and fauna and buildings and structures. A pathway is a route or routes by which a receptor is exposed to a contamination source. Pathways can also determine the likelihood of the contamination source contacting a receptor. It should be noted that some uncertainties exist due to the limited site-specific data available.

6.2 Sources

The desk study research did not identify any widespread potential contaminant sources on-site; however a more extensive overview has been taken with considerations for possible sources. No industrial processes or significant material storage has been identified at the site. Sources of contamination may potentially exist within unforeseen ground conditions.

The historical mapping for the site identified potential offsite sources of contamination to comprise the following:

- Two electricity substations – one located 213m to the north-east of site and the other located 247m to the north-east;
- A water pumping station located 222m to the east of site.

On Site

	Source	Potential Contaminant
1.	*Leached Agricultural Inputs*	*Excess Nitrogen / Pesticides and Herbicides* *Comments:* Soils do not absorb the excess nitrate ions, which then move downward freely with drainage water, and are leached into groundwater, streams and oceans. Until it is possible to confirm that no extensive agricultural processes have taken place on site presently or historically (discussions with land owners, site operatives, occupants or local residents) then excess nitrogen should be considered a potential contaminant. Nitrogen leaching is a major concern in areas of farmland.
2.	*Agricultural machinery and other vehicular operation*	Fuel and oil based hydrocarbon contamination associated with spills and leakages from agricultural vehicles
3.	*Decomposing materials*	Potential for ground gas within any made ground and decomposing materials.

Adjacent Sites

	Source	Potential Contaminant
1.	*Potential Buildings in Surrounding Area*	Possible asbestos containing materials used within construction of buildings (especially at the southern boundary – Wykham Farm Cottage).
2.	*Discharge to surface water / groundwater – i.e. sewage pumping stations,*	Wide range of potential contamination: Raw sewage, illegal dumping of waste, petrol and diesel fuels, etc. The closest sewage network discharge consent is 158m to the north-west of site. However, there are several sewage network discharge consents in the wider area surrounding site. The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary. Until groundwater flow and direction has been assessed further, throughflow remains a potential pathway from the various sources until confirmed otherwise.
3.	*Leached Agricultural Inputs*	Excess nitrogen input from surrounding agricultural grounds. Excess pesticides and herbicides should also be considered.
4.	*Agricultural machinery and other vehicular operation*	Fuel and oil based hydrocarbon contamination associated with spills and leakages from agricultural vehicles

6.3 Pathways

A number of possible pathways have been identified whereby potential receptors can be exposed to, or affected by, the identified contaminants:

- Groundwater/perched groundwater;
- Surface water runoff;
- Dermal contact, ingestion or inhalation of soil contaminants by site users;
- Ingestion of contaminated soil;
- Inhalation of contaminated dust and gases;
- Uptake of contaminants from soil by flora;
- Uptake of contaminants into home grown produce; and
- Migration of soil borne contaminants via airborne dust.

6.4 Receptors

Receptors are essentially anything or anyone that can be adversely affected by contamination once a source and a pathway have been established.

The presence of potential receptors has been evaluated using our understanding of the current and future land use(s) of the site. Consideration of potential receptors in the immediate surrounding area ensures the accurate assessment of potential on-site contamination impacting off-site locations.

Potential receptor	Present?	Reason
Current users of the site and visitors	Possible	The site is generally unoccupied and is unlikely to be securely fenced allowing unauthorised access.
Future users of the site	Possible	Proposed development for new residential area. Site development and subsequent site users/visitors.
Construction workers on site	Possible	Workforce used to construct the development and associated services.
Groundwater	Possible	Sections of the site are underlain by a Secondary A Aquifer.

Potential receptor	Present?	Reason
Surface/Controlled Waters	Yes	The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary. This flows westwards into a ditch. There are also several small ponds located around the site. The closest pond is located 250m to the north west of the site.
Major Ecosystems	No	There are no designated areas within the site or its immediate surroundings.
Flora and Fauna	Yes	Although no major ecosystems are present on site, it is very likely to be a habitat for an array of flora and fauna.
Adjacent Sites	Yes	It should also be reiterated that it is highly likely surrounding areas are used for agricultural processes.

Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Construction Workers	Potential contaminants onsite and migrating from offsite	Dermal contact, ingestion and/or inhalation of soil, dust, vapours	Human Health	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area. Further intrusive site investigation required to assess actual risk.	Unlikely	Medium
Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Future Users of proposed residential property located on site.	Potential contaminants onsite and migrating from offsite	Contact and accidental ingestion of surface soils. Inhalation and ingestion of dust.	Residential occupants / visitors.	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area. Further intrusive site investigation required to assess actual risk.	Unlikely	Medium
Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Migration of contaminants from the site in to the underlying aquifer	Potential contaminants in the soil on site.	Leaching and/or percolation to underlying strata.	Secondary A Aquifer	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area. Further intrusive site investigation required to assess actual risk.	Potentially	Medium/ High
Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Impacted groundwater abstraction and use	Potential geochemistry of underlying groundwater	Abstraction of groundwater	Groundwater use	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area. The closest recorded groundwater abstraction is located 560m to the west of the site.	Very Unlikely	Low

Scenario	Source	Pathway	Receptor	Potential pollution linkage	Complete?	Risk Rating
Migration of contamination from site into surface water courses	Potential contaminants in the soil on site	Migration of contamination through surface water runoff.	Surface runoff	No potentially significant sources of contamination have been identified on site and no significant sources have been identified within the immediate surrounding area. The nearest hydrological receptor identified is a stream source located on site, approximately 10m from the southern boundary. Approximately 600m to the south of the site there is a small reservoir. There are also several small ponds located around the site. The closest ponds are located 250m to the north west of the site, and 500m to the south of the site.	Potentially	Medium

7 CONCLUSIONS & RECOMMENDATIONS

Conclusions are drawn from the preceding information in terms of potential sources of contamination, possible receptors that may be affected by any sources of contamination and any pathways that may exist. The basic risk assessment allows identification of the suitability of the site for its proposed use and evaluation of any environmental liability that may be attached to the site. From the information researched as part of this desk study it is considered that the potential for contamination across the site is low, however confirmation of this should be attained by means of a full site investigation undertaken across the site.

The land use history and review of current site use has indicated that the site has been in use for arable farming since the date of the earliest available published mapping (1881). It is considered unlikely that significant contamination of the site will have resulted from this land use.

Against the background of the desk study research, a summary of the potential development constraints have been detailed. These constraints and potential sources of contamination will need to be considered prior to development of the land at the subject site, Wykham Park Farm, for residential housing:

- The possibility of cohesive soils being at shallow depths, which have the potential to heave / shrink due to the influence of trees;
- The potential for localised soil contamination associated with agricultural use within the area of site. Leached agricultural inputs, i.e. fertiliser, pesticides, herbicides, etc.;
- The possible presence of localised ground gases associated with topsoil materials;
- The presence of the stream source located on site, approximately 10m from the southern boundary;
- Discharge to surface water / groundwater – i.e. sewage pumping stations; and
- Elevated concentrations of metals/metalloids associated with the Marlstone Rock Formation.

7.1 Access Restrictions

Current access routes should be evaluated with regards to any future works, i.e. large plant.

7.2 Groundwater Flow and Direction

Further hydrogeological and hydrological assessment should be made concerning groundwater flow and direction. This would allow for an evaluation on potential sources of contamination from the wider area (in relation to groundwater and surface water pathways).

7.3 Foundations

Further geotechnical assessment would have to be made to fully evaluate the foundation requirements of any proposed development.

Mature trees and hedges are present at various sections of the site and depending on the results of any geotechnical laboratory testing; there may be a requirement to deepen foundations locally to account for the potential influence of heave / shrinkage. It would therefore be prudent to make reference to the most recent tree survey report to facilitate a plot specific foundation assessment for the site.

7.4 Contamination

The desk study researches have indicated that the site area has remained undeveloped since the first available maps. It is therefore anticipated that much of the site area will comprise natural materials with low contaminant levels.

7.5 Ground Gases

Due to the presence of ditches on site, it may be possible that organic-rich materials may be encountered on site which could potentially give rise to ground gases. During spells of heavy rain organic matter may be transported onto site.

The Local Authority may require gas monitoring to be undertaken as part of the investigation works. Monitoring should be undertaken during varying climatic conditions to satisfy the local authority that the conditions are representative of the gas regime at the site. A subsequent ground gas risk assessment will confirm whether gas precaution measures will be required.

7.6 Existing Services

Consideration will need to be given to the water pumping network currently surrounding the wider site area. It is unlikely that there are any services present on site, however, as part of the proposal for an intrusive site investigation, an extensive review of site services should be carried out.

7.7 Proposed Investigations

As indicated in the preceding text, there will be a requirement for site investigations, laboratory testing and assessments to be undertaken to provide the necessary information to further assess the development potential of the site. It is considered that future works should include:

- An access assessment, to clearly define access route(s) as being suitable in relation to the proposed works.
- A series of trial pits and boreholes across the proposed development area to investigate the shallow ground conditions.
- In-situ geotechnical tests, to obtain geotechnical data in relation to foundation design. In addition to this, representative samples should be obtained for laboratory geochemical and geotechnical testing to provide valuable data for foundation and infrastructure design. Testing is likely to include grading and plasticity index testing as a minimum to confirm the potential influence of the surrounding trees.
- The most recent tree survey report should be reviewed to facilitate a plot specific foundation assessment for site.
- The installation of gas and groundwater monitoring standpipes to facilitate long-term monitoring of the site.
- Chemical contamination testing for standard Total Petroleum Hydrocarbons (TPH) and Polycyclic Aromatic Hydrocarbons (PAHs), asbestos (if required) and any other potential contaminants identified during the course of the works should be undertaken on selected samples of near surface materials.

wardell-armstrong.com

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)29 2072 9191

EDINBURGH
Suite 2/3, Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)1942 260101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)20 7242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

PENRYN
Tremough Innovation Centre
Tremough Campus
Penryn
Cornwall
TR10 9TA
Tel: +44 (0)1872 560738

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapeltown
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TRURO
Wheal Jane
Baldhu
Truro
Cornwall
TR3 6EH
Tel: +44 (0)1872 560738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

International offices:

ALMATY
29/6 Satpaev Avenue
Rakhat Palace Hotel
Office Tower, 7th Floor
Almaty
050040
Kazakhstan
Tel : +7-727-3341310

MOSCOW
Suite 2, Block 10,
Letnikovskaya St.
Moscow, Russia
115114
Tel: +7(495) 980 07 67

Wardell Armstrong Archaeology:

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)1228 564820

your earth our world

Appendix D

Exploratory Hole Logs

Hydrock

Project: Wykham Park Farm

Trialpit No
TP01
Page No. 1 of 1

Method: Trial Pit
Date(s): 19/12/2016
Logged By: JM
Checked By [redacted]

Client: Gallagher Estates
Co-ords: 444160.13, 238663.04
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 127.13m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
1.00	B		
1.00	D		
1.00	ES		
1.50	B		
1.50	D		
1.50	ES		
1.50	HSV	100kPa	
2.50	B		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	126.83	
Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone and sandstone. Stratum forms possible colluvium or residually weathered mudstone. (DYRHAM FORMATION)	1.60	(1.30)	125.53	
Soft yellowish brown and beige very sandy slighty gravelly silty residual CLAY with pockets of clayey SAND. Gravel is fine to medium sub-rounded to angular sandstone. Stratum is damp in places. (DYRHAM FORMATION)	2.80	(1.20)	124.33	
Stiff yellowish brown and beige slightly sandy slightly gravelly clayey residual SILT. Gravel is fine to coarse sub-angular to sub-rounded mudstone and sandstone. (DYRHAM FORMATION)	3.60	(0.80)	123.53	

Base of Excavation at 3.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. Groundwater seepage encountered at 3.20m depth.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

HoleBASE SI - Hydrock Trialhole Template

Hydrock

Project: Wykham Park Farm

Trialpit No
TP02
Page No. 1 of 1

Method: Trial Pit

Date(s): 19/12/2016

Logged By: JM

Checked By: [redacted]

Client: Gallagher Estates

Co-ords: 444136.72, 238600.61

Stability: Stable

Dimensions: 2.20m × 0.80m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 124.11m OD

Plant: JCB 3CX

Samples / Tests Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	123.81	▨
0.50 0.50 1.00 1.00	D ES D ES			Firm reddish brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded mudstone and sandstone. Stratum forms possible colluvium or residually weathered mudstone. (DYRHAM FORMATION)	1.30	(1.00)	122.81	▨
2.00 2.00 2.00 2.50	B D ES B		▼	Soft yellowish brown and beige very sandy slighty gravelly silty residual CLAY with pockets of clayey SAND. Gravel is fine to medium sub-rounded to angular sandstone. Stratum is damp in places. (DYRHAM FORMATION)	3.20	(1.90)	120.91	▨

Base of Excavation at 3.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. Groundwater encountered at 3.00m.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP03

Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked B
Client: Gallagher Estates	Co-ords: 444144.97, 238542.10	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 123.48m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	123.13	▨
0.50 0.50 0.60	D ES HSV	 120kPa		Firm high strength reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone and sandstone. Stratum forms possible colluvium or residually weathered mudstone. (DYRHAM FORMATION)	1.20	(0.85)	122.28	▨
1.20 1.20 1.60 2.00	D ES HSV B	 140kPa 		Stiff high strength yellowish brown slightly sandy slightly gravelly slightly cobbly residual silty residual CLAY. Gravel and cobbles are fine to medium sub-rounded to sub-angular mudstone. (DYRHAM FORMATION)	3.00	(1.80)	120.48	▨
				Base of Excavation at 3.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP04
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked B
Client: Gallagher Estates	Co-ords: 444154.54, 238494.64	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 123.73m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results
0.20	D	
0.20	ES	
0.50	B	
0.50	D	
0.50	ES	
0.60	HSV	90kPa
1.00	D	
1.00	ES	
1.50	B	
1.50	D	
1.70	HSV	100kPa

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	123.48
Firm high strength reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone and sandstone. Stratum forms possible colluvium or residually weathered mudstone. (DYRHAM FORMATION)	1.50	(1.25)	122.23
Stiff high strength yellowish brown slightly sandy slightly gravelly silty residual CLAY. Gravel is fine to medium sub-rounded to sub-angular mudstone. (DYRHAM FORMATION)	3.00	(1.50)	120.73
Base of Excavation at 3.00m			

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit extended to machines maximum reach.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP05 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444158.54, 238440.69	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 121.95m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.				
0.20	D							
0.20	ES					(0.40)		
					0.40		121.55	
				Stiff firm in places very high strength slightly sandy CLAY. Stratum possibly forms a residual soil. (DYRHAM FORMATION)				
0.70	ES							
0.80	D							
0.80	HSV	160kPa						
						(1.10)		
1.20	D							
1.20	ES							
1.50	B				1.50		120.45	
				Stiff yellowish brown slightly gravelly residual silty CLAY showing signs of lithorelict structure. Gravel is fine to coarse sub-rounded to sub-angular friable mudstone. (DYRHAM FORMATION)				
						(1.30)		
					2.80		119.15	
				Base of Excavation at 2.80m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP06
Page No. 1 of 1

Method: Trial Pit
Date(s): 15/12/2016
Logged By: JM
Checked B[redacted]

Client: Gallagher Estates
Co-ords: 444197.37, 238731.07
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 129.81m OD
Plant: JCB 3CX

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.10	D		
0.10	ES		
0.20	ES		
0.30	D		
0.90	D		
0.90	ES		
1.40	D		
1.40	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	129.61	▨
Stiff orangish brown very sandy gravelly residual CLAY. Gravel is fine to coarse sub-angular to angular mudstone and sandstone. (DYRHAM FORMATION)	0.90	(0.70)	128.91	▨
Stiff orangish brown slightly gravelly sandy residual CLAY with occasional cobbles and boulders. Gravel and cobbles are fine to coarse angular mudstone and sandstone. (DYRHAM FORMATION)	1.60	(0.70)	128.21	▨

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as unstable.4. No groundwater encountered.5. Difficult excavation conditions encountered at base of trial pit.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP07
Page No. 1 of 1

Method: Trial Pit
Date(s): 15/12/2016
Logged By: JM
Checked [redacted]

Client: Gallagher Estates
Co-ords: 444208.71, 238592.19
Stability: Stable
Dimensions: 2.20m 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.07m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.77	▨
0.50 0.50	D ES			Firm reddish brown cobbly CLAY. Cobbles are fine to coarse sub-rounded limestone and mudstone. (DYRHAM FORMATION)	0.65	(0.35)	129.42	▨
1.00 1.00 1.20	D ES B			Stiff high strength reddish brown slightly sandy cobbly residual CLAY. Cobbles are fine to medium sub-angular sandstone and mudstone. (DYRHAM FORMATION)	1.45	(0.80)	128.62	▨
				Reddish brown clayey sandy gravelly fine to coarse sub-angular to angular residual mudstone and sandstone COBBLES. (DYRHAM FORMATION)	1.70	(0.25)	128.37	▨
				Weak brown distinctly weathered MUDSTONE. (DYRHAM FORMATION)	1.80	(0.10)	128.27	▨

Base of Excavation at 1.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as unstable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Mudstone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP08
Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444212.46, 238542.83	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 129.92m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results
0.20	D	
0.20	ES	
0.50	B	
0.50	D	
0.50	ES	
1.00	B	
1.00	D	
1.00	ES	
1.50	D	
2.20	B	
2.20	D	
2.20	ES	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	129.72
Soft reddish brown sandy slightly gravelly silty residual CLAY. Gravel is fine to medium sub-rounded sandstone and mudstone. Material is slightly damp in places. (MARLSTONE ROCK FORMATION)	0.70	(0.50)	129.22
Firm reddish brown slightly sandy silty cobbly CLAY with lithorelict structure and iron oxide staining along discontinuities. Gravel and cobbles are sub-rounded to sub-angular mudstone and sandstone. (MARLSTONE ROCK FORMATION)	2.90	(2.20)	127.02
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	3.00	(0.10)	126.92

Base of Excavation at 3.00m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as unstable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP09
Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444215.59, 238501.72	Stability: Unstable	Dimensions: 3.50m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 129.21m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
1.00	B		
1.00	D		
1.00	ES		
2.30	B		
2.30	D		
2.30	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.91	▨
Firm reddish brown sandy slightly gravelly cobbly clayey residual SILT. Gravel and cobbles are fine to coarse sub-angular to angular siltstone mudstone and sandstone. (MARLSTONE ROCK FORMATION)	2.20	(1.90)	127.01	⁙
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	2.30	(0.10)	126.91	▦

Base of Excavation at 2.30m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are unstable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Geological boundary between Dryham Formation and Marlstone Rock encountered in Trial Pit location.7. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No

TP10

Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444220.02, 238454.64	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 128.55m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results
0.20	D	
0.20	ES	
0.50	D	
0.50	ES	
1.00	B	
1.00	D	
1.00	ES	
1.70	D	
2.00	B	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	128.15	▨
Firm reddish brown residual MUDSTONE recovered as very clayey very sandy GRAVEL with medium cobble content. (DYRHAM FORMATION)	2.70	(2.30)	125.85	▤

Base of Excavation at 2.70m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit becoming difficult to excavate at 2.70m. 6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP11
Page No. 1 of 1

Method: Trial Pit
Date(s): 16/12/2016
Logged By: JM
Checked [redacted]

Client: Gallagher Estates
Co-ords: 444215.39, 238454.90
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 128.47m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	128.07	
0.50 0.50 1.00 1.00	D ES D ES			Firm reddish brown slightly sandy gravelly CLAY with frequent cobbles. Gravel and cobbles are fine to coarse sub-angular to sub-rounded mudstone. (DYRHAM FORMATION)	2.00	(1.60)	126.47	
				Base of Excavation at 2.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit becoming difficult to excavate at 1.80m. 6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No TP12

Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444228.21, 238782.43	Stability: Stable	Dimensions: 2.20m × 0.80m; Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 136.08m OD	Plant: JCB 3CX	

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.90	HSV	80kPa	
1.00	B		
1.00	D		
1.00	ES		
1.40	HSV	100kPa	
1.80	B		
1.80	D		
1.80	ES		
2.80	B		
2.80	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	135.83
Firm reddish brown slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded friable limestone.	0.90	(0.65)	135.18
Stiff high strength reddish brown slightly sandy slightly gravelly silty residual CLAY. Stratum is slightly damp. (DYRHAM FORMATION)	1.50	(0.60)	134.58
Stiff high strength light reddish brown slightly sandy slightly gravelly residual CLAY with occasional tree roots. Gravel is fine to coarse sub-angular to sub-rounded friable mudstone. (DYRHAM FORMATION)	2.40	(0.90)	133.68
Stiff grey and orangish brown slightly gravelly residual CLAY showing signs of lithorelict structure. (DYRHAM FORMATION)	2.80	(0.40)	133.28

Base of Excavation at 2.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket to 1.90m, toothed bucket used from 1.90m to 2.80m.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit located adjacent to a mature Oak tree.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm		Trialpit No TP13 Page No. 1 of 1
Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444280.23, 238858.95	Stability: Stable	Dimensions: 2.20m × 0.80m	Scale:
Hydrock Project No: C-04841-C	Ground Level: 132.08m OD	Plant: JCB 3CX		1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	131.68	
0.50 0.50	D ES			Stiff brown very gravelly residual CLAY with frequent cobbles. Gravel and cobbles are fine to coarse sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.40)	131.28	
				Reddish brown clayey sandy gravelly fine to coarse sub-angular to angular residual limestone COBBLES. (MARLSTONE ROCK FORMATION)	0.90	(0.10)	131.18	
1.00 1.00 1.00	B D ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	131.08	

Base of Excavation at 1.00m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP14 Page No. 1 o[redacted]	
Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked B	
Client: Gallagher Estates	Co-ords: 444286.46, 238775.68	Stability: Stable	Dimensions: 2.20m 0.80m	Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.90m OD	Plant: JCB 3CX		

Samples / Tests								
Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	131.70	
0.40 0.50	ES ES			Reddish brown very clayey gravelly sub-rounded to sub-angular limestone COBBLES.	0.60	(0.40)	131.30	
0.70 0.70	D ES			Stiff brown gravelly cobbly residual CLAY with traces of fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.95	(0.35)	130.95	
1.10 1.10	D ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION) Base of Excavation at 1.00m	1.00	(0.05)	130.90	

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

	Project: Wykham Park Farm		Trialpit No TP15 Page No. 1 of 1
Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444289.23, 238725.07	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.04m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
1.20	D		
1.20	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.74	▨
Stiff brown gravelly cobbly residual CLAY with traces of fossils. Gravel and cobbles are fine to coarse sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.40	(1.10)	129.64	▤
Reddish brown clayey sandy gravelly fine to coarse sub-angular to angular residual limestone COBBLES. (MARLSTONE ROCK FORMATION)	1.50	(0.10)	129.54	⁘
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.60	(0.10)	129.44	▦

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm	Trialpit No **TP16** Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444296.67, 238602.25	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 131.56m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	131.16	▨
0.60 0.60 0.60 0.80 0.90 0.90	B D ES HSV D ES	 200kPa 		Stiff very high strength brown gravelly cobbly residual CLAY with traces of fossils. Gravel is fine to coarse sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	130.56	▨
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.46	▨
				Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP17
Page No. 1 of 1

Method: Trial Pit

Date(s): 15/12/2016

Logged By: JM

Checked B[redacted]

Client: Gallagher Estates

Co-ords: 444302.86, 238539.34

Stability: Stable

Dimensions: 2.20m × 0.80m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 130.97m OD

Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.60	HSV	200kPa	
0.80	B		
0.80	D		
0.80	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.67	▨
Firm very high strength reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded friable mudstone. (WHITBY MUDSTONE FORMATION)	0.65	(0.35)	130.32	⁘
Reddish brown clayey sandy gravelly fine to coarse sub-angular to angular residual limestone COBBLES. (MARLSTONE ROCK FORMATION)	0.75	(0.10)	130.22	∴
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	0.80	(0.05)	130.17	▤

Base of Excavation at 0.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No

TP18

Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: JM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444306.54, 238481.10	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.70m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	130.45	
0.50 0.50	D ES			Stiff reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded to sub-angular limestone. (MARLSTONE ROCK FORMATION)	0.55	(0.30)	130.15	
				Reddish brown clayey sandy gravelly fine to coarse sub-angular to angular residual limestone COBBLES. (MARLSTONE ROCK FORMATION)	0.90	(0.35)	129.80	
1.00 1.00	D ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.70	
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP19 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444320.36, 238870.49	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 132.94m OD	Plant: JCB 3CX	

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.50	HSV	120kPa	
0.80	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.15	(0.15)	132.79	▨
Stiff high strength grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.15	(1.00)	131.79	▨
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.20	(0.05)	131.74	▨

Base of Excavation at 1.20m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP20
Page No. 1 of 1

Method: Trial Pit

Date(s): 13/12/2016

Logged By: JM

Checked By [redacted]

Client: Gallagher Estates

Co-ords: 444318.45, 238791.40

Stability: Stable

Dimensions: 2.20m × 0,80m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 132.88m OD

Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	132.58	▨
0.50 0.50	D ES			Stiff brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.60)	131.98	▒
1.00 1.00 1.00	D ES HSV	 120kPa		Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	131.88	▦
				Stiff high strength thickly laminated grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone and limestone. (MARLSTONE ROCK FORMATION)	1.35	(0.35)	131.53	▒
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.40	(0.05)	131.48	▦
				Base of Excavation at 1.40m				

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP21
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444313.84, 238738.18	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 132.69m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
1.00	B		
1.00	D		
1.00	ES		
1.00	HSV	130kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	132.39	▨
Firm reddish brown rarely cobbly CLAY. Cobbles are sub-rounded limestone.	0.60	(0.30)	132.09	▨
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.25	(0.65)	131.44	▨
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.30	(0.05)	131.39	

Base of Excavation at 1.30m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP22
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444354.77, 238693.45	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 132.65m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	D	
1.00	ES	
1.00	HSV	120kPa
1.20	B	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	132.35	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	132.05	▤
Stiff high strength locally friable mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.50)	131.55	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	131.45	▦

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP23
Page No. 1 of 1

Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444325.15, 238634.27	Stability: Stable	Dimensions: 1.80m × 0.60m / Scale:
Hydrock Project No: C-04841-C	Ground Level: 132.36m OD	Plant: JCB 3CX	1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	132.06	▨
0.30	D							
0.30	ES			Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	131.66	☰
0.50	B							
0.50	D							
0.50	ES							
0.60	HSV	110kPa						
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	0.80	(0.10)	131.56	▤

Base of Excavation at 0.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP24
Page No. 1 of 1

Method: Trial Pit
Date(s): 19/12/2016
Logged By: SM
Checked [redacted]

Client: Gallagher Estates
Co-ords: 444329.84, 238565.00
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 131.82m OD
Plant: JCB 3CX

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	110kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.52	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	131.32	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.40)	130.92	
Soft to firm reddish brown slightly friable gravelly CLAY with occasional sub-angular to sub-rounded cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.20)	130.72	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	130.62	

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP25
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 19/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444336.98, 238491.33	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.93m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	130.58	▨
Brown clayey cobbly fine to coarse sub-angular to angular residual GRAVEL with traces of fossils. (MARLSTONE ROCK FORMATION)	1.00	(0.65)	129.93	⁙
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	129.83	▤
Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP26
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444444.97, 238842.85	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 132.05m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	120kPa	
1.30	B		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	131.65
Stiff brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.40)	131.25
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.90	(0.10)	131.15
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone and limestone. (MARLSTONE ROCK FORMATION)	1.45	(0.55)	130.60
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	130.55

Base of Excavation at 1.50m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP27
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444437.49, 238752.48	Stability: Stable	Dimensions: 2.20m × 0.80m — Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.91m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20	D			Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	131.51	▨
0.50	D			Stiff high strength brown slightly gravelly residual CLAY with occasional fossils. Gravel of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	130.91	▒
0.90	HSV	100kPa						
1.00 1.00	B D			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.81	▤

Base of Excavation at 1.10m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP28
Page No. 1 of

Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444433.08, 238692.97	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 131.99m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	ES		
1.00	HSV	130kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.69	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	131.39	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION) ... *frequent partially weathered creamy grey limestone cobbles*	1.10	(0.50)	130.89	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	130.79	

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP29
Page No. 1 o[redacted]

Method: Trial Pit
Date(s): 19/12/2016
Logged By: SM
Checked

Client: Gallagher Estates
Co-ords: 444378.92, 238634.93
Stability: Stable
Dimensions: 1.80m 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 132.07m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.77	
				Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	131.57	
				Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.60)	130.97	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	130.87	
				Base of Excavation at 1.20m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP30
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked B
Client: Gallagher Estates	Co-ords: 444378.33, 238564.66	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.53m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	120kPa	
1.40	B		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.23
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	131.13
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.70)	130.43
Soft to firm reddish brown slightly friable gravelly CLAY with occasional sub-angular to sub-rounded cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.30	(0.20)	130.23
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.40	(0.10)	130.13

Base of Excavation at 1.40m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP31
Page No. 1 o[redacted]

Method: Trial Pit

Date(s): 19/12/2016

Logged By: JM

Checked B

Client: Gallagher Estates

Co-ords: 444383.04, 238491.18

Stability: Stable

Dimensions: 2.20m × 0.80m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 130.84m OD

Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.54	▨
0.50 0.50	D ES			Brown clayey cobbly fine to coarse sub-angular to angular residual GRAVEL of limestone grading to a stiff gravelly CLAY in places with traces of fossils. (MARLSTONE ROCK FORMATION)	0.90	(0.60)	129.94	⁘
1.00 1.00 1.00	B D ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.84	▤

Base of Excavation at 1.00m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP32 Page No. 1 of 1
Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444519.66, 238830.43	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.57m OD	Plant: JCB 3CX	

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	B		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	131.22	
Stiff brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.65	(1.30)	129.92	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.70	(0.05)	129.87	

Base of Excavation at 1.70m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP33
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444516.00, 238739.27	Stability: Stable	Dimensions: 2.20m × 0.80m / Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.41m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.60	HSV	120kPa	
1.00	D		
1.00	ES		
1.20	HSV	120kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	131.01	▨
Stiff high strength brown slightly gravelly residual CLAY with occasional fossils. Gravel of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	130.41	▨
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.31	▨
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded limestone. (MARLSTONE ROCK FORMATION)	1.55	(0.45)	129.86	▨
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.60	(0.05)	129.81	▨

Base of Excavation at 1.60m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP34
Page No. 1 of 1

Method: Trial Pit
Date(s): 12/12/2016
Logged By: SM
Checked By [redacted]
Client: Gallagher Estates
Co-ords: 444504.83, 238689.25
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25
Hydrock Project No: C-04841-C
Ground Level: 131.75m OD
Plant: JCB 3CX

Samples / Tests

Depth (m)	Type	Results
0.30	B	
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	D	
1.00	ES	
1.00	HSV	120kPa

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.45	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	131.25	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.20	(0.70)	130.55	
Strong brownish grey distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.30	(0.10)	130.45	

Base of Excavation at 1.30m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP35
Page No. 1 of 1

Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444434.13, 238636.08	Stability: Stable	Dimensions: 1.80m × 0.60m / Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.59m OD	Plant: JCB 3CX	

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	130kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.29	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	131.19	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.50)	130.69	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.00	(0.10)	130.59	

Base of Excavation at 1.00m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP36
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked By
Client: Gallagher Estates	Co-ords: 444431.28, 238565.24	Stability: Stable	Dimensions: 1.80m x 0.60m
Hydrock Project No: C-04841-C	Ground Level: 131.31m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.01	
0.30 0.30	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	130.91	
0.50 0.50	D ES			Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.30)	130.61	
				Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.80	(0.10)	130.51	
1.00 1.00 1.00	D ES HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	1.30	(0.50)	130.01	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.40	(0.10)	129.91	

Base of Excavation at 1.40m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP37
Page No. 1 of 1

Method: Trial Pit	Date(s): 19/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444438.15, 238491.71	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.83m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	130.63	▨
				Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-rounded limestone. (Sub-soil)	0.40	(0.20)	130.43	▨
0.50 0.50	D ES			Stiff reddish brown slightly sandy gravelly cobbly residual CLAY with frequent fossils. Gravel and cobbles are fine to coarse sub-round to sub-angular limestone. (MARLSTONE ROCK FORMATION)	1.00	(0.60)	129.83	▨
1.00 1.00	D ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	129.73	▨
				Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP38
Page No. 1 of 1

Method: Trial Pit
Date(s): 12/12/2016
Logged By: JM
Checked By: [redacted]

Client: Gallagher Estates
Co-ords: 444573.74, 238821.50
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 131.25m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.60	HSV	120kPa	
1.20	HSV	120kPa	
1.50	D		
1.50	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	130.85	
Stiff high strength brown slightly gravelly slightly cobbly silty residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	130.25	
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.15	
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure. Gravel and cobbles of fine to medium sub-rounded to sub-angular and limestone. (MARLSTONE ROCK FORMATION)	1.45	(0.35)	129.80	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	129.75	

Base of Excavation at 1.50m

2
3
4
5

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP39 Page No. 1 of 1
Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444566.76, 238730.94	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.12m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	B		
0.50	D		
0.50	ES		
0.95	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	130.72	
Stiff brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.40)	130.32	
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.90	(0.10)	130.22	
Stiff high strength thickly laminated brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure. Gravel and cobbles of fine to medium sub-rounded limestone. (MARLSTONE ROCK FORMATION)	1.45	(0.55)	129.67	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	129.62	

Base of Excavation at 1.50m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP40 Page No. 1 of 1
Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444556.21, 238685.68	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.34m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.04	
0.30 0.30	D ES							
0.50 0.50	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	130.64	
1.00 1.00	D HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)				
1.50 1.50 1.50	B D HSV	 140kPa		*... occasional red staining from 1.5 to 1.7m*	1.70	(1.00)	129.64	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.80	(0.10)	129.54	
				Base of Excavation at 1.80m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP42 Page No. 1 of 1
Method: Trial Pit	Date(s): 19/12/2016	Logged By: JM	Checked By:
Client: Gallagher Estates	Co-ords: 444500.41, 238491.99	Stability: Stable	Dimensions: 2.20m 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.76m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.90	HSV	120kPa	
1.00	B		
1.20	D		
1.20	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.46	
Firm reddish brown slightly sandy slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	130.16	
Stiff high strength brown and grey slightly sandy gravelly residual CLAY. Gravel is fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.40)	129.76	
Stiff reddish brown slightly sandy gravelly cobbly residual CLAY with frequent fossils. Gravel and cobbles are fine to coarse sub-round to sub-angular limestone. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	129.66	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.20	(0.10)	129.56	

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP41 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked By[redacted]
Client: Gallagher Estates	Co-ords: 444501.42, 238566.07	Stability: Stable	Dimensions: 1.80m 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.18m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.88	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	130.68	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.40)	130.28	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.00	(0.10)	130.18	

Base of Excavation at 1.00m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP44
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked By:
Client: Gallagher Estates	Co-ords: 444620.47, 238722.72	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.97m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.70	HSV	120kPa	
1.00	B		
1.00	D		
1.00	ES		
1.20	HSV	120kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	130.62	
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.45)	130.17	
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.85	(0.05)	130.12	
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded to sub-angular limestone. (MARLSTONE ROCK FORMATION)	1.45	(0.60)	129.52	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	129.47	

Base of Excavation at 1.50m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP43
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked B [redacted]
Client: Gallagher Estates	Co-ords: 444624.67, 238812.61	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 131.04m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.70	HSV	130kPa	
1.00	B		
1.00	D		
1.00	ES		
1.60	D		
1.60	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	130.64	▨
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.65	(1.25)	129.39	▨
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.70	(0.05)	129.34	▨

Base of Excavation at 1.70m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm		Trialpit No TP46 Page No. 1 of 1
Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM
		Checked By:
Client: Gallagher Estates	Co-ords: 444567.16, 238636.80	Stability: Stable
		Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 131.08m OD	Plant: JCB 3CX
		Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	130kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.78
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.70)	130.08
Firm to stiff brown extremely gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	129.98
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	129.88

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP45
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444616.43, 238679.21	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 131.18m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
0.30 0.30	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.88	▨
0.50 0.50	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	130.48	
0.90	HSV	110kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.30)	130.18	
1.00	D			Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.08	
				Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP47 Page No. 1 of
Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444565.12, 238566.02	Stability: Stable	Dimensions: 1.80m 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.84m OD	Plant: JCB 3CX	

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.20	HSV	140kPa	
1.50	B		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.54	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	130.44	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.40	(1.00)	129.44	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION) Base of Excavation at 1.50m	1.60	(0.20)	129.24	▦

1
2
3
4
5

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP48
Page No. 1 of 1

Method: Trial Pit	Date(s): 19/12/2016	Logged By: JM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444560.18, 238491.79	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.38m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.08	▨
0.50 0.50 0.60	D ES HSV	 100kPa		Stiff high strength brown and grey slightly sandy gravelly residual CLAY. Gravel is fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.50)	129.58	▨
0.90 0.90 0.90	B D ES			Stiff reddish brown slightly sandy gravelly cobbly residual CLAY with frequent fossils. Gravel and cobbles are fine to coarse sub-round to sub-angular limestone. (MARLSTONE ROCK FORMATION)	0.90	(0.10)	129.48	▨
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.38	▨
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP49
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444680.58, 238801.90	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.89m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.60	HSV	120kPa	
1.00	D		
1.00	ES		
1.20	HSV	120kPa	
1.75	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.45	(0.45)	130.44	
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.45)	129.99	
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (WHITBY MUDSTONE FORMATION)	1.00	(0.10)	129.89	
Stiff high strength thickly laminated brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.75	(0.75)	129.14	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.80	(0.05)	129.09	

Base of Excavation at 1.80m

1
2
3
4
5

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm	Trialpit No **TP50** Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked B [redacted]
Client: Gallagher Estates	Co-ords: 444673.67, 238676.68	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 131.01m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	B		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.30	HSV	200kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	130.61	▨
Firm reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded friable mudstone. (WHITBY MUDSTONE FORMATION)	0.65	(0.25)	130.36	▒
Stiff brown and grey slightly sandy gravelly residual CLAY. Gravel is fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.25)	130.11	▒
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	130.01	▦
Stiff high strength brown gravelly cobbbly residual CLAY with traces of fossils. Gravel and cobbles are fine to coarse sub-angular limestone. (MARLSTONE ROCK FORMATION)	1.50	(0.50)	129.51	▒
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.60	(0.10)	129.41	▦

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP51
Page No. 1 of [redacted]

Method: Trial Pit
Date(s): 19/12/2016
Logged By: SM
Checked B[redacted]

Client: Gallagher Estates
Co-ords: 444623.81, 238637.61
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.95m OD
Plant: JCB 3CX

Samples / Tests								
Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
0.30 0.30 0.40 0.50 0.50	D ES HSV D ES	 120kPa		Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.65	
				Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	130.45	
				Firm to stiff brown extremely gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.40)	130.05	
1.00 1.00 1.00	B D ES			Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.95	
				Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	1.40	(0.40)	129.55	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.50	(0.10)	129.45	
				Base of Excavation at 1.50m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Hydrock

Project: Wykham Park Farm

Trialpit No
TP52
Page No. 1 of 1

Method: Trial Pit
Date(s): 19/12/2016
Logged By: SM
Checked B[redacted]

Client: Gallagher Estates
Co-ords: 444618.16, 238565.97
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.69m OD
Plant: JCB 3CX

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	B		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.20	HSV	140kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.39
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel and occasional cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.40	(1.10)	129.29
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.60	(0.20)	129.09

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP53 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 19/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444626.02, 238491.58	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.09m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	129.74	▨
0.60 0.60 0.60	B D ES			Stiff brown and grey slightly sandy gravelly residual CLAY. Gravel is fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.45)	129.29	▨
				Stiff reddish brown slightly sandy gravelly cobbly residual CLAY with frequent fossils. Gravel and cobbles are fine to coarse sub-round to sub-angular limestone. (MARLSTONE ROCK FORMATION)	0.90	(0.10)	129.19	▨
1.00	ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.09	▨
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Hydrock

Project: Wykham Park Farm

Trialpit No
TP54
Page No. 1 of 1

Method: Trial Pit
Date(s): 13/12/2016
Logged By: JM
Checked [redacted]

Client: Gallagher Estates
Co-ords: 444707.69, 238730.53
Stability: Stable
Dimensions: 2.20m 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.71m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	B		
0.50	D		
0.50	ES		
0.60	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.45	(0.45)	130.26
Stiff high strength grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.35)	129.91
Stiff yellow brown becoming grey thickly laminated gravelly slightly residual CLAY with frequent fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular to angular mudstone. (WHITBY MUDSTONE FORMATION)	0.95	(0.15)	129.76
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.05)	129.71

Base of Excavation at 1.00m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP55
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444727.00, 238672.51	Stability: Stable	Dimensions: 1.80m × 0.60m; Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.56m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	D	
1.00	ES	
1.30	HSV	120kPa
1.50	D	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.26	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	129.86	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION) *... occasional red staining from 1.4 to 1.6m*	1.50	(0.80)	129.06	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.60	(0.10)	128.96	

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP56
Page No. 1 of

Method: Trial Pit
Date(s): 19/12/2016
Logged By: SM
Checked By [redacted]

Client: Gallagher Estates
Co-ords: 444681.78, 238637.74
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.74m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	120kPa	
1.00	D		
1.00	ES		
1.20	HSV	140kPa	
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.44
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	130.24
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.40)	129.84
Firm to stiff brown extremely gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.10)	129.74
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.40	(0.40)	129.34
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.50	(0.10)	129.24

Base of Excavation at 1.50m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP57 Page No. 1 of 1
Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444696.90, 238566.00	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 130.39m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	130kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	130.04	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.05)	129.99	☰
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.20	(0.80)	129.19	☰
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.30	(0.10)	129.09	▦
Base of Excavation at 1.30m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No **TP58** Page No. 1 of 1	
Method: Trial Pit	Date(s): 19/12/2016	Logged By: JM	Checked By [redacted]	
Client: Gallagher Estates	Co-ords: 444703.83, 238491.54	Stability: Stable	Dimensions: 2.20m 0.80m	Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.52m OD	Plant: JCB 3CX		

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.70	ES		
0.80	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	129.27	▨
Stiff reddish brown slightly sandy gravelly cobbly residual CLAY with frequent fossils. Gravel and cobbles are fine to coarse sub-round to sub-angular limestone. (MARLSTONE ROCK FORMATION)	0.80	(0.55)	128.72	▩
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	0.90	(0.10)	128.62	▦

Base of Excavation at 0.90m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP59
Page No. 1 [redacted]

Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked
Client: Gallagher Estates	Co-ords: 444748.40, 238988.83	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 131.45m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.40	HSV	180kPa	
0.50	B		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	131.05
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.50)	130.55
Stiff yellow brown with red staining of thickly laminated gravelly slightly cobbly residual CLAY with frequent fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular to angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.10)	130.45
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.35

Base of Excavation at 1.10m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP60 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444747.35, 238939.74	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 131.10m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results
0.20	D	
0.20	ES	
0.50	D	
0.50	ES	
0.80	HSV	120kPa
1.00	D	
1.00	ES	
1.50	B	
1.50	D	

Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD
	Brown clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	130.75
	Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.65)	130.10
	Stiff grey with brown mottling of slightly gravelly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.55	(0.55)	129.55
	Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.60	(0.05)	129.50

Base of Excavation at 1.60m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP61
Page No. 1 of 1

Method: Trial Pit
Date(s): 13/12/2016
Logged By: JM
Checked By [redacted]

Client: Gallagher Estates
Co-ords: 444739.74, 238886.44
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.95m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.80	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0,30)	130.65	
Firm reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	130.35	
Stiff high strength grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.25	(0.65)	129.70	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.30	(0.05)	129.65	

Base of Excavation at 1.30m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket. 7. Trial pit located adjaent to decidious trees and possible historical artificial excavations.

Logged in general accordance with BS5930:2015

Hydrock

Hydrock	Project: Wykham Park Farm	Trialpit No TP62 Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked B[redacted]	
Client: Gallagher Estates	Co-ords: 444730.49, 238798.38	Stability: Stable	Dimensions: 2.20m 0.80m	Scale:
Hydrock Project No: C-04841-C	Ground Level: 130.74m OD	Plant: JCB 3CX		1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20	D			Brown clayey TOPSOIL with frequent rootlets.	0.45	(0.45)	130.29	▨
0.20	ES							
0.50	D			Stiff high strength grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.55)	129.74	⁘
0.50	ES							
0.60	HSV	120kPa						
1.00	D			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	129.64	▦
1.00	ES			Base of Excavation at 1.10m				

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP63 Page No. 1 of 1	
Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked B[redacted]	
Client: Gallagher Estates	Co-ords: 444726.52, 238731.61	Stability: Stable	Dimensions: 2.20m 0.80m	Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.62m OD	Plant: JCB 3CX		

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.70	HSV	120kPa	
0.80	D		
0.80	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	130.27	▨
Stiff high strength grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.45)	129.82	▨
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	0.85	(0.05)	129.77	▦

Base of Excavation at 0.85m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP64 Page No. 1 of 1
Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444763.45, 238665.42	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.39m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	120kPa	
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.09	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	129.99	▤
Stiff high strength locally friable residual CLAY with occasional fine to coarse sub-angular to sub-rounded gravel and occasional cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.60	(1.20)	128.79	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.70	(0.10)	128.69	▦

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP65
Page No. 1 of 1

Method: Trial Pit

Date(s): 13/12/2016

Logged By: JM

Checked B[redacted]

Client: Gallagher Estates

Co-ords: 444735.65, 238625.31

Stability: Stable

Dimensions: 2.20m × 0.80m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 130.38m OD

Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20	ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.08	
0.50 0.50 1.00	ES HSV ES	 120kPa 		Firm becoming stiff high strength thickly laminated yellow brown becoming grey thickly laminated gravelly slightly cobbly residual CLAY with frequent fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular to angular mudstone. (WHITBY MUDSTONE FORMATION)	1.30	(1.00)	129.08	
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.40	(0.10)	128.98	
				Base of Excavation at 1.40m				

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP66
Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444742.53, 238573.63	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.06m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.60	HSV	120kPa	
1.00	B		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown firm clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	129.66
Stiff high strength grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	129.06
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.96

Base of Excavation at 1.10m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm	Trialpit No TP67 Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked By: [redacted]	
Client: Gallagher Estates	Co-ords: 444751.30, 238510.35	Stability: Stable	Dimensions: 2.20m × 0.80m	Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.26m OD	Plant: JCB 3CX		

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.90	HSV	120kPa	
1.00	B		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	129.06	
Stiff brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.50)	128.56	
Stiff high strength yellow brown with red staining of thickly laminated gravelly cobbly residual CLAY with frequent fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular to angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.30)	128.26	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.16	

Base of Excavation at 1.10m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP68 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444813.71, 238930.99	Stability: Stable	Dimensions: 2.20m 0.80m / Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.94m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Brown firm clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.64	
0.50 0.50 0.50	D ES HSV	140kPa		Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils. Gravel and cobbles of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.70)	129.94	
1.00 1.00 1.50 1.50	D ES B D			Stiff yellowish brown with red staining of thickly laminated gravelly cobbly residual CLAY with frequent fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular to angular mudstone. (WHITBY MUDSTONE FORMATION)	1.75	(0.75)	129.19	
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.80	(0.05)	129.14	
				Base of Excavation at 1.80m				

2

3

4

5

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP69 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444798.85, 238867.54	Stability: Stable	Dimensions: 2.20m × 0.80m — Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.80m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	B		
0.50	D		
0.50	ES		
0.60	HSV	200kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.50	
Firm reddish brown sligtly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded mudstone.	0.60	(0.30)	130.20	
Stiff high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.25	(0.65)	129.55	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.30	(0.05)	129.50	

Base of Excavation at 1.30m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP70
Page No. 1 of 1

Method: Trial Pit
Date(s): 13/12/2016
Logged By: JM
Checked B[redacted]

Client: Gallagher Estates
Co-ords: 444788.09, 238794.89
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.52m OD
Plant: JCB 3CX

Samples / Tests

Depth (m)	Type	Results
0.20	D	
0.20	ES	
0.50	D	
0.50	ES	
0.90	HSV	100kPa
1.00	D	
1.00	ES	
1.50	B	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	130.32
Firm reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.55	(0.35)	129.97
Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.65	(1.10)	128.87
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.70	(0.05)	128.82

Base of Excavation at 1.70m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP71
Page No. 1 of 1

Method: Trial Pit

Date(s): 13/12/2016

Logged By: JM

Checked B[redacted]

Client: Gallagher Estates

Co-ords: 444783.96, 238729.69

Stability: Stable

Dimensions: 2.20m × 0.80m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 130.33m OD

Plant: JCB 3CX

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.40	ES		
0.50	D		
0.50	ES		
0.50	HSV	200kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	130.08	▨
Firm reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.45	(0.20)	129.88	░
Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.55	(1.10)	128.78	░
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.60	(0.05)	128.73	

Base of Excavation at 1.60m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Hydrock

Project: Wykham Park Farm

Trialpit No
TP72
Page No. 1 of 1

Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444817.15, 238655.72	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 130.24m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.40	D		
0.40	ES		
0.50	D		
0.50	ES		
0.80	HSV	110kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.94	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	129.54	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.50	(0.80)	128.74	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.60	(0.10)	128.64	▦

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP73
Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444773.24, 238628.83	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 130.35m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests							
Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD
0.20 0.20	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.05
0.50 0.50 0.60	D ES HSV	 180kPa		Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone and limestone. (WHITBY MUDSTONE FORMATION)	0.90	(0.60)	129.45
1.00 1.00	D ES			Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (WHITBY MUDSTONE FORMATION)	1.00	(0.10)	129.35
				Stiff thickly laminated grey with brown mottling of slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone and limestone. (WHITBY MUDSTONE FORMATION)	1.45	(0.45)	128.90
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	128.85

Base of Excavation at 1.50m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP74 Page No. 1 of 1
Method: Trial Pit	Date(s): 15/12/2016	Logged By: JM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444786.32, 238574.15	Stability: Stable	Dimensions: 2.20m 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.97m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	B		
0.50	D		
0.50	ES		
0.60	HSV	180kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	129.57
Stiff brown gravelly cobbly residual CLAY with traces of fossils. Gravel and cobbles are fine to coarse sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	128.97
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.87
Stiff very high strength brown gravelly cobbly residual CLAY with traces of fossils and signs of lithorelict structure. Gravel and cobbles are fine to coarse sub-angular limestone. (MARLSTONE ROCK FORMATION)	1.50	(0.40)	128.47
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.60	(0.10)	128.37

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP75
Page No. 1 of 1

Method: Trial Pit
Date(s): 15/12/2016
Logged By: JM
Checked By [redacted]

Client: Gallagher Estates
Co-ords: 444807.20, 238509.30
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 129.44m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Firm reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	129.04	
0.50 0.50 0.50 0.60	B D ES HSV	 180kPa		Stiff very high strength brown very gravelly slightly cobbly residual CLAY. Gravel and cobbles are fine to coarse sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.50)	128.54	
1.00 1.00	D ES			Reddish brown clayey sandy gravelly fine to coarse sub-angular to angular residual limestone COBBLES. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	128.44	
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.34	

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP76
Page No. 1 of 1

Method: Trial Pit	Date(s): 14/12/2016	Logged By: JM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 444872.13, 238893.82	Stability: Stable	Dimensions: 2.20m 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.54m OD	Plant: JCB 3CX	

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.40	B		
0.40	D		
0.40	ES		
0.60	HSV	200kPa	
1.00	D		
1.00	ES		
1.00	HSV	200kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	130.34
Firm reddish brown slightly gravelly CLAY with lithorelics of fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.40)	129.94
Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.45	(0.85)	129.09
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	129.04

Base of Excavation at 1.50m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP77 Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: JM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444869.49, 238799.20	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.31m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.01	
0.40 0.40 0.60 0.60 0.60	D ES D ES HSV	 140kPa		Firm reddish brown slightly gravelly CLAY with lithorelics of fine to medium sub-rounded mudstone.	0.70	(0.40)	129.61	
1.00 1.00 1.10	D ES HSV	 240kPa		Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.15	(0.45)	129.16	
				Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.20	(0.05)	129.11	
				Base of Excavation at 1.20m				

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP78
Page No. 1 of 1

Method: Trial Pit
Date(s): 14/12/2016
Logged By: JM
Checked By: [redacted]
Client: Gallagher Estates
Co-ords: 444877.27, 238729.37
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25
Hydrock Project No: C-04841-C
Ground Level: 130.34m OD
Plant: JCB 3CX

Samples / Tests Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.40	D		
0.40	ES		
0.60	D		
0.60	ES		
0.60	HSV	180kPa	
0.80	HSV	210kPa	
1.00	B		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.04	
Firm reddish brown slightly gravelly CLAY. Gravel is fine to medium sub-rounded mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	129.74	
Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	1.25	(0.65)	129.09	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.30	(0.05)	129.04	

Base of Excavation at 1.30m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP79 Page No. 1 of 1
Method: Trial Pit	Date(s): 12/12/2016	Logged By: SM	Checked By:
Client: Gallagher Estates	Co-ords: 444875.94, 238655.59	Stability: Stable	Dimensions: 1.80m 0,60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.45m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.15	
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.60)	129.55	
0.90	B			Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.45	
1.00 1.00 1.20 1.50	D ES HSV D	 120kPa 		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	1.60	(0.60)	128.85	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.70	(0.10)	128.75	
				Base of Excavation at 1.70m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP80
Page No. 1 of 1

Method: Trial Pit
Date(s): 14/12/2016
Logged By: JM
Checked By:

Client: Gallagher Estates
Co-ords: 444886.92, 238591.55
Stability: Stable
Dimensions: 2.20m × 0.80m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.15m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.90	HSV	220kPa	
1.00	B		
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.85	
Stiff brown slightly gravelly slightly cobbly residual CLAY. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	129.55	
Weak to medium strong yellowish brown distinctly weathered LIMESTONE recovered as slightly clayey limestone gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.70	(0.10)	129.45	
Stiff very high strength brown slightly gravelly slightly cobbly residual CLAY with occasional fossils and signs of lithorelict structure towards the base. Gravel and cobbles of fine to medium sub-rounded to sub-angular limestone. (MARLSTONE ROCK FORMATION)	1.35	(0.65)	128.80	
Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.40	(0.05)	128.75	

Base of Excavation at 1.40m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP81
Page No. 1 of 1

Method: Trial Pit	Date(s): 14/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444886.42, 238548.44	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 129.67m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.37	
0.50 0.50 0.50 0.80	D ES HSV HSV	 140kPa 200kPa		Stiff high strength brown slightly gravelly slightly cobbly residual CLAY. Gravel and cobbles of fine to medium sub-rounded to sub-angular mudstone. (WHITBY MUDSTONE FORMATION) *... becoming very high strength after 0.8m*	0.95	(0.65)	128.72	
1.00 1.00	D ES			Strong yellowish brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.05)	128.67	

Base of Excavation at 1.00m

General Remarks:
1. Exploratory hole scanned using a CAT and Genny prior to breaking ground.2. Trial pit sides are stable.3. No groundwater was encountered.4. No signs of visual or olfactory contamination encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit location reinstated using arisings which were compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP82
Page No. 1 of 1

Method: Trial Pit
Date(s): 15/12/2016
Logged By: SM
Checked By: [redacted]
Client: Gallagher Estates
Co-ords: 444887.00, 238499.80
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25
Hydrock Project No: C-04841-C
Ground Level: 128.93m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	120kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.63	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	128.33	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.20	(0.60)	127.73	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.30	(0.10)	127.63	▦

Base of Excavation at 1.30m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP83
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444958.29, 238818.72	Stability: Stable	Dimensions: 1.80m 0.60m
Hydrock Project No: C-04841-C	Ground Level: 130.01m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests							
Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.71
0.30 0.30	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	129.51
0.50 0.50 1.00 1.00 1.00	D ES D ES HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.60)	128.91
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	128.81
				Base of Excavation at 1.20m			

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm		Trialpit No **TP84** Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM
Client: Gallagher Estates	Co-ords: 444939.46, 238733.89	Stability: Stable
Hydrock Project No: C-04841-C	Ground Level: 130.04m OD	Plant: JCB 3CX

Checked By [redacted]

Dimensions: 1.80m × 0.60m

Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.74	▨
0.30 0.30	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	129.54	▤
0.50 0.50	D ES			Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.60)	128.94	▤
1.00 1.00 1.00	D ES HSV	 130kPa		Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	128.84	▦
				Base of Excavation at 1.20m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP85 Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444933.56, 238681.12	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 130.08m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	120kPa	
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.78	
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	129.48	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.60	(1.00)	128.48	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.70	(0.10)	128.38	
Base of Excavation at 1.70m				

1
2
3
4
5

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP86 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444932.71, 238650.86	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 130.38m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.70	HSV	110kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	130.08	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	129.98	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.40)	129.58	
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.10)	129.48	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.00	(0.10)	129.38	

Base of Excavation at 1.00m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP87 Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444932.13, 238590.17	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.78m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.90	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.48	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	129.38	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	128.78	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.68	▦
Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP88
Page No. 1 of 1

Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 444930.79, 238547.18	Stability: Stable	Dimensions: 1.80m × 0.60m — Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.51m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.21	
0.30 0.30	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	129.11	
0.50 0.50 0.80	D ES HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.50)	128.61	
1.00 1.00	D ES			Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.00	(0.10)	128.51	
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm	Trialpit No TP89 Page No. 1 of 1

Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444938.08, 238497.37	Stability: Stable	Dimensions: 1.80m 0.60m
Hydrock Project No: C-04841-C	Ground Level: 129.01m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	140kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.71	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	128.41	▨
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.30	(0.70)	127.71	▨
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.40	(0.10)	127.61	▨

Base of Excavation at 1.40m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP90
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444997.20, 238776.70	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 129.85m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	110kPa	
1.50	B		
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.55
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	129.45
Stiff locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.40)	129.05
Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.00	(0.20)	128.85
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	1.70	(0.70)	128.15
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.80	(0.10)	128.05

Base of Excavation at 1.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP91
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444999.92, 238687.71	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.61m OD	Plant: JCB 3CX	

Samples / Tests								
Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.31	
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	129.01	
1.00 1.00 1.00	D ES HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.50)	128.51	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	128.41	
				Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP92
Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444997.34, 238638.45	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 129.72m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.42	▨
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	129.12	☰
1.00 1.00 1.00	D ES HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.30	(0.70)	128.42	☰
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.40	(0.10)	128.32	▦

Base of Excavation at 1.40m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No

TP93

Page No. 1 of 1

Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444986.85, 238583.32	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 129.33m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.95	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.03	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	128.63	▒
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.30)	128.33	☰
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.23	▦

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP94 Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 444989.39, 238539.54	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 129.08m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.90	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.78	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	128.38	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.30)	128.08	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	127.98	▦

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP95 Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 444981.33, 238483.40	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 128.87m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.30 0.30	D ES			Firm brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.57	▨
				Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	128.47	⁙
0.50 0.50	D ES			Stiff locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.50)	127.97	☰
1.00 1.00	D ES			Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	127.87	▦
1.20	B			Stiff locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION) ... *with occasional sand lenses*	1.20	(0.20)	127.67	☰
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.30	(0.10)	127.57	▦
				Base of Excavation at 1.30m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP96 Page No. 1 of 1	
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]	
Client: Gallagher Estates	Co-ords: 445061.06, 238760.51	Stability: Stable	Dimensions: 1.80m 0.60m	Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.48m OD	Plant: JCB 3CX		

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	110kPa	
1.50	B		
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.18	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	129.08	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.60	(1.20)	127.88	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.70	(0.10)	127.78	▦

Base of Excavation at 1.70m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP97
Page No. 1 of 1

Method: Trial Pit
Date(s): 13/12/2016
Logged By: SM
Checked B[redacted]

Client: Gallagher Estates
Co-ords: 445051.67, 238684.41
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 129.31m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.01	
0.30	D							
0.30	ES							
				Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	128.91	
0.50	D							
0.50	ES							
				Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.50)	128.41	
0.80	HSV	130kPa						
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.00	(0.10)	128.31	
1.00	D							
1.00	ES							
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP98
Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445041.28, 238632.20	Stability: Stable	Dimensions: 1.80m × 0.60m; Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 129.38m OD	Plant: JCB 3CX	

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.08
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	128.88
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.50)	128.38
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	128.28

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP99
Page No. 1 of 1

Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445046.44, 238578.89	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 128.89m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.59	
0.30 0.30	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	128.39	
0.50 0.50	D ES			Stiff locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.40)	127.99	
1.00 1.00	D ES			Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.00	(0.10)	127.89	
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP100

Page No. 1 of 1

Method: Trial Pit

Date(s): 13/12/2016

Logged By: SM

Checked By: [redacted]

Client: Gallagher Estates

Co-ords: 445047.30, 238531.85

Stability: Stable

Dimensions: 1.80m × 0.60m

Scale: 1:25

Hydrock Project No: C-04841-C

Ground Level: 128.68m OD

Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.30 0.30	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.38	
0.50 0.50	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	128.18	
1.00 1.00 1.00	D ES HSV	 120kPa		Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.60)	127.58	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	127.48	

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP101 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445049.62, 238493.94	Stability: Stable	Dimensions: 1.80m 0.60m — Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 128.31m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	ES		
0.50	D		
0.50	ES		
0.90	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.01	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	127.61	▤
Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.80	(0.10)	127.51	▦
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	1.00	(0.20)	127.31	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	127.21	▦

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP102 Page No. 1 of 1
Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445055.16, 238450.71	Stability: Stable	Dimensions: 1.80m 0.60m
Hydrock Project No: C-04841-C	Ground Level: 127.78m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.30 0.30	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	127.48	▨
0.50 0.50	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	127.28	▤
0.70	HSV	110kPa		Stiff high strength locally friable residual dessicated CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.40)	126.88	▤
1.00 1.00	D ES			Firm to stiff brown gravelly cobbly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone and frequent strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.40	(0.50)	126.38	▤
1.50	B			Strong brownish grey distinctly weathered LIMESTONE with occasional red banding (MARLSTONE ROCK FORMATION)	1.60	(0.20)	126.18	▦
				Base of Excavation at 1.60m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.6. Trial pit terminated at 1.80m due to stiffness of clay at base.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm			Trialpit No TP103 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445116.74, 238717.99	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 128.95m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.20	HSV	120kPa	
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.65
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	128.55
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.40	(1.00)	127.55
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.50	(0.10)	127.45

Base of Excavation at 1.50m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP104 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 445099.10, 238623.11	Stability: Stable	Dimensions: 1.80m 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 128.89m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.20	HSV	140kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.59	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	128.19	▤
Partially weathered creamy grey LIMESTONE recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles. (MARLSTONE ROCK FORMATION)	0.80	(0.10)	128.09	▦
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	1.30	(0.50)	127.59	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.40	(0.10)	127.49	▦

Base of Excavation at 1.40m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP105 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445117.29, 238584.80	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 128.39m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.00	HSV	130kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.09	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	127.89	▤
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.60)	127.29	▤
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	127.19	▦

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP106
Page No. 1 of

Method: Trial Pit	Date(s): 14/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445123.08, 238529.21	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 127.75m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.50	B		
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	127.45	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	127.15	☰
Stiff locally friable residual dessicated CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.20)	126.95	☰
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of limestone. Clay stiffens with depth. (MARLSTONE ROCK FORMATION)	1.80	(1.00)	125.95	⁘

Base of Excavation at 1.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP107
Page No. 1 of [redacted]

Method: Trial Pit
Client: Gallagher Estates
Hydrock Project No: C-04841-C
Date(s): 13/12/2016
Co-ords: 445121.11, 238489.15
Ground Level: 127.51m OD
Logged By: SM
Stability: Stable
Plant: JCB 3CX
Checked B
Dimensions: 1.80m 0.60m
Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	127.21	
0.30 0.30	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	127.01	
0.50 0.50	D ES			Stiff locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.20)	126.81	
				Strong brownish grey distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	0.80	(0.10)	126.71	

Base of Excavation at 0.80m

1
2
3
4
5

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

HoleBASE SI - Hydrock Trialhole Template

Hydrock

Project: Wykham Park Farm			Trialpit No TP108 Page No. 1 of 1
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445173.08, 238706.27	Stability: Stable	Dimensions: 1.80m × 0.60m / Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 128.39m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.30 0.30	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.09	▨
0.50 0.50	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	127.79	▤
1.00 1.00	D ES			Stiff high strength locally friable residual dessicated CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.40)	127.39	▤
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	127.29	▦
				Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP109
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445178.97, 238653.76	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 127.48m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	127.18	▨
0.30 0.30 0.50 0.50 1.00 1.00 1.00	D ES D ES B D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.20	(0.90)	126.28	▤
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.30	(0.10)	126.18	▦
				Base of Excavation at 1.30m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP110
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked B [redacted]
Client: Gallagher Estates	Co-ords: 445167.66, 238594.32	Stability: Stable	Dimensions: 1.80m × 0.60m; Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 127.92m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	B	
1.00	D	
1.00	ES	

Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
	Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	127.62	▨
	Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	127.52	▨
	Stiff high strength locally friable residual mottled yellow and grey slightly sandy slightly gravelly silty CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.60)	126.92	▨
	Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	126.82	▨

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No

TP111

Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445246.11, 238675.56	Stability: Stable	Dimensions: 1.80m × 0.60m — Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 127.18m OD	Plant: JCB 3CX	

Samples / Tests								
Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
0.30 0.30 0.50 0.50	D ES D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	126.88	▨
				Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	126.48	⁘
1.00 1.00	D ES			Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.30)	126.18	⁘
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	126.08	▦
				Base of Excavation at 1.10m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP112
Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445231.26, 238597.91	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 126.53m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	D	
1.00	ES	
1.50	B	
1.50	D	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	126.23	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.40)	125.83	
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.50	(0.80)	125.03	
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.70	(0.20)	124.83	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.80	(0.10)	124.73	

Base of Excavation at 1.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP113
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445336.14, 238679.35	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 125.99m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	125.69	
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.70)	124.99	
1.00 1.00 1.50	D ES D			Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	2.00	(1.00)	123.99	
2.00 2.00	B D			Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION) Base of Excavation at 2.10m	2.10	(0.10)	123.89	

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP114
Page No. 1 of 1

Method: Trial Pit
Date(s): 16/12/2016
Logged By: SM
Checked By [redacted]
Client: Gallagher Estates
Co-ords: 445293.42, 238643.00
Stability: Stable
Dimensions: 1.80m × 0.60m
Scale: 1:25
Hydrock Project No: C-04841-C
Ground Level: 126.44m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	126.14	
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.60)	125.54	
1.00 1.00	D ES			Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.20	(0.30)	125.24	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.30	(0.10)	125.14	
				Base of Excavation at 1.30m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Hydrock

Project: Wykham Park Farm

Trialpit No

TP115

Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445282.25, 238584.60	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 125.53m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	125.23	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	125.13	
Firm to stiff brown gravelly residual CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.70	(0.30)	124.83	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	0.80	(0.10)	124.73	

Base of Excavation at 0.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP116
Page No. 1 of 1

Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445348.47, 238639.30	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 125.34m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.50	B		
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	125.04	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.20	(0.90)	124.14	
Stiff locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.70	(0.50)	123.64	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.80	(0.10)	123.54	

Base of Excavation at 1.80m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP117 Page No. 1 of 1
Method: Trial Pit	Date(s): 15/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445338.49, 238587.21	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 124.51m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.50	D		
2.00	B		
2.50	HSV	140kPa	
3.00	B		
3.00	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	124.21	
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.50	(1.20)	123.01	
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.80	(0.30)	122.71	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION) *... becoming very stiff after 2.8m*	3.00	(1.20)	121.51	
Base of Excavation at 3.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP118
Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445353.66, 238487.35	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 123.57m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	D	
1.00	ES	

Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
	Brown clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	123.37	▨
	Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.70)	122.67	▤
	Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.20)	122.47	▤
	Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	122.37	▦

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP119
Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445348.26, 238428.29	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 122.43m OD	Plant: JCB 3CX	

Samples / Tests

Depth (m)	Type	Results
0.30	D	
0.30	ES	
0.50	D	
0.50	ES	
1.00	D	
1.00	ES	
1.50	D	
1.50	HSV	140kPa
2.00	B	

Water-Strikes

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	122.23
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.80)	121.43
Stiff high strength slightly dessicated locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of limestone. (MARLSTONE ROCK FORMATION)	2.10	(1.10)	120.33

Base of Excavation at 2.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP120
Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445431.91, 238622.89	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 126.43m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	126.13	
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.90	(0.60)	125.53	
1.00 1.00	D ES			Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.10	(0.20)	125.33	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.20	(0.10)	125.23	

Base of Excavation at 1.20m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock	Project: Wykham Park Farm	Trialpit No TP121 Page No. 1 of 1

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked [redacted]
Client: Gallagher Estates	Co-ords: 445392.61, 238592.16	Stability: Stable	Dimensions: 1.80m × 0.60m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 126.11m OD	Plant: JCB 3CX	

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
				Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	125.81	▨
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	0.80	(0.50)	125.31	▤
1.00 1.00 1.50	D ES D			Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of limestone. (WHITBY MUDSTONE FORMATION)	1.70	(0.90)	124.41	▤
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.80	(0.10)	124.31	▦
				Base of Excavation at 1.80m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP122 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 20/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445439.78, 238475.08	Stability: Stable	Dimensions: 2.20m 0.80m
Hydrock Project No: C-04841-C	Ground Level: 125.37m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.50	HSV	50kPa	
1.00	B		
1.00	D		
1.00	ES		
1.00	HSV	60kPa	

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.35	(0.35)	125.02	
Soft medium strength reddish brown slightly sandy gravelly CLAY with lithorelict structure of fine to coarse sub-angular to sub-rounded mudstone. Stratum is damp. (WHITBY MUDSTONE FORMATION)	1.30	(0.95)	124.07	
Reddish brown very clayey fine to coarse sub-angular sandy gravelly residual LIMESTONE cobbles. (MARLSTONE ROCK FORMATION)	1.45	(0.15)	123.92	
Strong yellow brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.50	(0.05)	123.87	

Base of Excavation at 1.50m

1
2
3
4
5

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP123
Page No. 1 of 1

Method: Trial Pit	Date(s): 20/12/2016	Logged By: JM	Checked By: [redacted]
Client: Gallagher Estates	Co-ords: 445431.34, 238432.22	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 125.00m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests

Depth (m)	Type	Results
0.20	D	
0.20	ES	
0.50	D	
0.50	ES	
0.80	HSV	80kPa
1.00	D	
1.00	ES	
1.00	HSV	30kPa
1.30	HSV	60kPa
1.50	B	

Water-Strikes: [redacted]

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	124.75	▨
Soft locally firm low to medium strength reddish brown slightly sandy gravelly slightly cobbly residual CLAY. Stratum is slightly damp. Gravel and cobbles are fine to coarse sub-rounded to sub-angular limestone. (MARLSTONE ROCK FORMATION)	2.00	(1.75)	123.00	▨
Strong yellow brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	2.10	(0.10)	122.90	▨

Base of Excavation at 2.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP124 Page No. 1 of 1
Method: Trial Pit	Date(s): 20/12/2016	Logged By: JM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 445423.07, 238388.08	Stability: Stable	Dimensions: 2.20m × 0.80m Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 124.52m OD	Plant: JCB 3CX	

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		
0.60	HSV	70kPa	
0.80	HSV	80kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	124.27	▨
Firm medium strength reddish brown sandy slightly gravelly residual CLAY. Gravel is fine to coarse sub-rounded to sub-angular limestone. (MARLSTONE ROCK FORMATION)	0.85	(0.60)	123.67	▨
Reddish brown very clayey slightly sandy fine to coarse sub-angular to angular residual limestone recovered as GRAVEL and COBBLES with lithorelict structure. (MARLSTONE ROCK FORMATION)	1.20	(0.35)	123.32	▨
Strong yellow brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.25	(0.05)	123.27	

Base of Excavation at 1.25m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP125 Page No. 1 of [redacted]
Method: Trial Pit	Date(s): 20/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445414.37, 238343.70	Stability: Stable	Dimensions: 2.20m 0.80m
Hydrock Project No: C-04841-C	Ground Level: 123.89m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	123.64	▨
0.50 0.50	D ES			Reddish brown clayey gravelly fine to medium residual SAND. Gravel is sub-angular fine to medium limestone. (MARLSTONE ROCK FORMATION)	0.90	(0.65)	122.99	░
1.00 1.00 1.00	B D ES			Strong yellow brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.00	(0.10)	122.89	▦
				Base of Excavation at 1.00m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP126

Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 20/12/2016	Logged By: JM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445403.98, 238290.94	Stability: Stable	Dimensions: 2.20m × 0.80m
Hydrock Project No: C-04841-C	Ground Level: 122.71m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.20 0.20	D ES			Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	122.46	▨
				Firm reddish brown sandy slightly gravelly residual CLAY. Gravel is fine to coarse sub-rounded to sub-angular limestone. (MARLSTONE ROCK FORMATION)	0.50	(0.25)	122.21	▨
0.50 0.50	D ES			Brown clayey sandy fine to coarse sub-angular to angular residual limestone GRAVEL and COBBLES. (MARLSTONE ROCK FORMATION)	0.60	(0.10)	122.11	▨
				Strong yellow brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	0.70	(0.10)	122.01	▨
				Base of Excavation at 0.70m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP127
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 20/12/2016	Logged By: JM	Checked By
Client: Gallagher Estates	Co-ords: 445392.13, 238227.44	Stability: Stable	Dimensions: 2.20m 0.80m
Hydrock Project No: C-04841-C	Ground Level: 121.31m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.20	D		
0.20	ES		
0.50	D		
0.50	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Reddish brown slightly sandy clayey TOPSOIL with frequent rootlets.	0.25	(0.25)	121.06
Reddish brown clayey fine residual SAND with increaseing gravel content with depth. Gravel is fine to medium angular to sub-rounded limestone. (MARLSTONE ROCK FORMATION)	1.00	(0.75)	120.31
Strong yellow brown distinctly weathered LIMESTONE. (MARLSTONE ROCK FORMATION)	1.10	(0.10)	120.21

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit refusal on distinctly weathered Limestone.6. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP128

Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked B[redacted]
Client: Gallagher Estates	Co-ords: 445365.53, 238092.70	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 119.83m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests Depth (m)	Type	Results	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
				Brown clayey TOPSOIL with frequent rootlets.	0.20	(0.20)	119.63	
0.30 0.30 0.50 0.50	D ES D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of limestone. (MARLSTONE ROCK FORMATION)	0.60	(0.40)	119.23	
1.00 1.00	D ES			Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with frequent strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.30	(0.70)	118.53	
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.40	(0.10)	118.43	

Base of Excavation at 1.40m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP129
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 16/12/2016	Logged By: SM	Checked By
Client: Gallagher Estates	Co-ords: 445489.73, 238579.11	Stability: Stable	Dimensions: 1.80m × 0.60m — Scale: 1:25
Hydrock Project No: C-04841-C	Ground Level: 125.89m OD	Plant: JCB 3CX	

Samples / Tests			
Depth (m)	Type	Results	Water-Strikes
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.50	D		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.40	(0.40)	125.49
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as medium to coarse sub-angular to sub-rounded gravel and cobbles of mudstone. (WHITBY MUDSTONE FORMATION)	1.10	(0.70)	124.79
Firm to stiff brown gravelly residual CLAY. Gravel is sub-angular to sub-rounded medium to coarse of limestone with occasional strong cobbles of limestone. (MARLSTONE ROCK FORMATION)	1.70	(0.60)	124.19
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.80	(0.10)	124.09

Base of Excavation at 1.80m

1
2
3
4
5

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock	Project: Wykham Park Farm		Trialpit No TP130 Page No. 1 of
Method: Trial Pit	Date(s): 13/12/2016	Logged By: SM	Checked By [redacted]
Client: Gallagher Estates	Co-ords: 445120.65, 238783.00	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 129.13m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
1.00	D		
1.00	ES		
1.30	HSV	120kPa	
1.50	B		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Firm brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	128.83	▨
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.40	(0.10)	128.73	
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.50	(1.10)	127.63	
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.60	(0.10)	127.53	

Base of Excavation at 1.60m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930 2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP131
Page No. 1 of [redacted]

Method: Trial Pit	Date(s): 19/12/2016	Logged By: SM	Checked By
Client: Gallagher Estates	Co-ords: 444497.95, 238636.61	Stability: Stable	Dimensions: 1.80m × 0.60m
Hydrock Project No: C-04841-C	Ground Level: 131.47m OD	Plant: JCB 3CX	Scale: 1:25

Samples / Tests			Water-Strikes
Depth (m)	Type	Results	
0.30	B		
0.30	D		
0.30	ES		
0.50	D		
0.50	ES		
0.80	HSV	120kPa	
1.00	D		
1.00	ES		

Stratum Description	Depth mbgl	Thickness (m)	Level m OD
Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	131.17
Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.50	(0.20)	130.97
Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.50)	130.47
Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.10	(0.10)	130.37

Base of Excavation at 1.10m

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Hydrock

Project: Wykham Park Farm

Trialpit No
TP132
Page No. 1 of [redacted]

Method: Trial Pit
Date(s): 20/12/2016
Logged By: SM
Checked By:

Client: Gallagher Estates
Co-ords: 444847.11, 238587.05
Stability: Stable
Dimensions: 1.80m 0.60m
Scale: 1:25

Hydrock Project No: C-04841-C
Ground Level: 130.11m OD
Plant: JCB 3CX

Samples / Tests			Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level m OD	Legend
Depth (m)	Type	Results						
0.30 0.30	D ES			Brown clayey TOPSOIL with frequent rootlets.	0.30	(0.30)	129.81	▨
0.50 0.50	D ES			Soft to firm reddish brown slightly friable CLAY with occasional lithorelicts recovered as fine to medium sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	0.60	(0.30)	129.51	– –
1.00 1.00	D ES			Stiff high strength locally friable residual mottled yellow and grey CLAY with occasional fine to coarse sub-angular to sub-rounded gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.20	(0.60)	128.91	– –
				Strong brownish grey distinctly weathered LIMESTONE (MARLSTONE ROCK FORMATION)	1.30	(0.10)	128.81	▦
				Base of Excavation at 1.30m				

General Remarks:
1. Trial pit location scanned with a CAT and Genny prior to breaking ground.2. Trial pit excavated using a toothless bucket.3. Trial Pit walls observed as stable.4. No groundwater encountered.5. Trial pit reinstated using arisings compacted in layers using an excavator bucket.

Logged in general accordance with BS5930:2015

Project : Wykham Park Farm

Borehole No
BH01
Page No. 1 of 2

Method : Dynamic Sampled & Rotary Cored
Date(s) : 18/01/2017
Logged By : SM
Drilled By [redacted]
Client : Gallagher Estates
Co-ords : 445429.10, 238411.40
Checked By :
Flush : Water
Hydrock Project No : C-04841-C
Ground Level : 124.85mAOD

Sample/Core Run (m) Smpl. Ø (mm) Smpl. rec. %	Samples /Tests Depth (m)	Type	Results	Mechanical Log TCR	SCR	RQD	If: Min Mean Max	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level mAOD	Legend	Instrum-entation / Backfill
									Reddish brown slightly sandy clayey TOPSOIL with frequent fine rootlets.	0.25	(0.25)	124.60		
1.20 - 2.10 128mm 90% rec	1.20	SPT	N=3 (1,0,0,1,1,1)						Firm reddish brown slightly sandy gravelly destructured CLAY. Gravel is fine to coarse sub-rounded to sub-angular limestone and mudstone. (MARLSTONE ROCK FORMATION)	2.50	(2.25)	122.35		
2.10 - 3.10	2.10	SPT	N=26 (1,0,1,1,1,23)											
				60	40	10	NI 50 150		Strong brownish cream coarse grained LIMESTONE. (MARLSTONE ROCK FORMATION)	2.70	(0.20)	122.15		
3.10 - 4.20	3.10	SPT	N=26 (1,1,4,6,8,8)						Weak distinctly weathered brownish cream LIMESTONE. Medium spaced fractures with a reddish brown stained slightly sandy clay infill. (MARLSTONE ROCK FORMATION)	3.30	(0.60)	121.55		
				100	50	20			Extremely stiff mottled yellow and grey gravelly CLAY. Gravel medium to coarse sub-angular to sub-rounded of limestone with occasional red brown staining throughout strata. (MARLSTONE ROCK FORMATION)	3.60	(0.30)	121.25		
									Medium strength brownish cream partially weathered LIMESTONE. Medium spaced fractures with a reddish brown stained clay infill. (MARLSTONE ROCK FORMATION)	3.70	(0.10)	121.15		
									Extremely stiff mottled yellow and grey gravelly CLAY. Gravel medium to coarse sub-angular to sub-rounded of limestone with occasional red brown staining throughout strata.	4.00	(0.30)	120.85		

Continued on Next Sheet

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
	18/01	0830	0.00				Water	
	18/01	1300	5.70	2.10	140	2.60	Water	

General Remarks :
1. Handpit to 1.2m prior to drilling. 2. No visual or olfactory evidence of contamination. 3. Water flush used so groundwater unknown. 4. Exploratory hole scanned with CAT and Genny prior to breaking ground. 5. Well was fitted with a gas and groundwater monitoring installation. 6. Water flush lost at 2.05m.

Logged in general accordance with BS9530:2015

Hydrock	Project : Wykham Park Farm	Borehole No BH01 Page No. 2 o[redacted]

Method : Dynamic Sampled & Rotary Cored	Date(s) : 18/01/2017	Logged By : SM	Drilled By
Client : Gallagher Estates	Co-ords : 445429.10, 238411.40	Checked By :	Flush : Water
Hydrock Project No : C-04841-C	Ground Level : 124.85mAOD		

Sample/Core Run (m) Smpl. Ø (mm) Smpl. rec. %	Samples /Tests Depth (m)	Type	Results	Mechanical Log TCR	SCR	RQD	If: Min Mean Max	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level mAOD	Legend	Instrumentation / Backfill
									(MARLSTONE ROCK FORMATION)					
4.20 - 5.70	4.20	SPT	N=49 (1,6,8,12,13,16)				NI 40 100		Medium strength brownish cream partially weathered LIMESTONE. Medium spaced fractures with a reddish brown stained clay infill. (MARLSTONE ROCK FORMATION)	4.30	(0.30)	120.55		
									Extremely stiff mottled yellow and grey gravelly CLAY. Gravel medium to coarse sub-angular to sub-rounded of limestone with occasional red brown staining throughout strata. (MARLSTONE ROCK FORMATION)	4.60	(0.30)	120.25		
				100	0	0	NI 40 130		Medium strength dark grey LIMESTONE. Frequent medium spaced fractures infilled with grey clay with occasional red-brown staining. (MARLSTONE ROCK FORMATION)	5.50	(0.90)	119.35		
									Strong grey LIMESTONE. (MARLSTONE ROCK FORMATION)	5.70	(0.20)	119.15		
	5.70	SPT	50/45mm (25,,50)						End of Borehole at 5.70m					

Depth scale: 5, 6, 7, 8

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks :
1. Handpit to 1.2m prior to drilling. 2. No visual or olfactory evidence of contamination. 3. Water flush used so groundwater unknown. 4. Exploratory hole scanned with CAT and Genny prior to breaking ground. 5. Well was fitted with a gas and groundwater monitoring installation. 6. Water flush lost at 2.05m.

Logged in general accordance with BS9530:2015

Hydrock

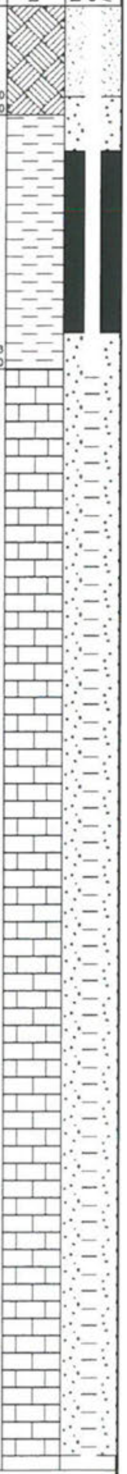
Project : Wykham Park Farm

Borehole No
BH02
Page No. 1 o

Method : Dynamic Sampled & Rotary Cored	Date(s) : 18/01/2017	Logged By : SM	Drilled By [redacted]
Client : Gallagher Estates	Co-ords : 445116.90, 238466.17	Checked By :	Flush : Water
Hydrock Project No : C-04841-C	Ground Level : 127.30mAOD		

Sample/Core Run (m) Smpl. Ø (mm) Smpl. rec. %	Samples /Tests			Mechanical Log				Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level mAOD
	Depth (m)	Type	Results	TCR	SCR	RQD	If. Min Mean Max					
									Firm brown clayey TOPSOIL with frequent fine rootlets.	0.30	(0.30)	127.00
									Firm reddish brown destructured CLAY with lithorelics of sub-angular to sub-rounded fine to medium gravel of mudstone. (WHITBY MUDSTONE FORMATION)	1.00	(0.70)	126.30
1.00 - 2.30	1.00	SPT	50/260mm (12,12,11,12,16,11)	100	0	0	25 40 170		Medium strength brown cream LIMESTONE. Medium spaced fractures with brown slightly sandy clay infill and occasional reddish brown staining throughout strata. (MARLSTONE ROCK FORMATION)		(3.60)	
2.30 - 3.60	2.30	SPT	N=11 (1,6,5,2,3,1)	100	20	20						
3.60 - 5.10	3.60	SPT	50/30mm (12,13,50)									

Legend / Instrum-entation / Backfill



Continued on Next Sheet

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
	18/01	1400	0.00				Water	
	18/01	1700	2.30			1.80	Water	
	19/01	0830	2.30	1.50	140	1.90	Water	
	19/01	1100	5.10	1.50	140	2.10	Water	

General Remarks :
1. Handpit to 1.0m prior to drilling. 2. No visual or olfactory evidence of contamination. 3. Water flush used so groundwater unknown. 4. Exploratory hole scanned with CAT and Genny prior to breaking ground. 5. Well was fitted with a gas and groundwater monitoring installation.

Hydrock

Project : Wykham Park Farm

Borehole No
BH02
Page No. 2 of 2

Method : Dynamic Sampled & Rotary Cored	Date(s) : 18/01/2017	Logged By : SM	Drilled By [redacted]
Client : Gallagher Estates	Co-ords : 445116.90, 238466.17	Checked By :	Flush : Water
Hydrock Project No : C-04841-C	Ground Level : 127.30mAOD		

Sample/Core Run (m) Smpl. Ø (mm) Smpl. rec. %	Samples /Tests Depth (m)	Type	Results	Mechanical Log TCR	SCR	RQD	If: Min Mean Max	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level mAOD	Legend	Instrumentation / Backfill
				100	15	15			Medium strength brown cream LIMESTONE. Medium spaced fractures with brown slightly sandy clay infill and occasional reddish brown staining throughout strata. (MARLSTONE ROCK FORMATION)	4.60		122.70		
	5.10	SPT	50/240mm (6,9,11,15,18,6)						Firm greyish brown with infrequent yellowish mottling very gravelly CLAY. Gravel is fine to medium sub-angular to sub-rounded weak grey limestone with occasional reddish brown staining. (MARLSTONE ROCK FORMATION)	5.10	(0.50)	122.20		
									End of Borehole at 5.10m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks :
1. Handpit to 1.0m prior to drilling. 2. No visual or olfactory evidence of contamination. 3. Water flush used so groundwater unknown. 4. Exploratory hole scanned with CAT and Genny prior to breaking ground. 5. Well was fitted with a gas and groundwater monitoring installation.

Logged in general accordance with BS9530:2015

Hydrock

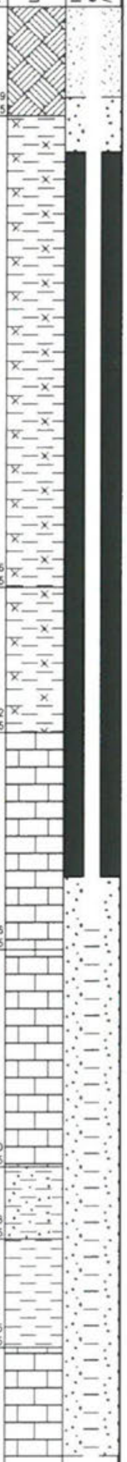
Project : Wykham Park Farm

Borehole No
BH03
Page No. 1 of 2

Method : Dynamic Sampled & Rotary Cored	Date(s) : 19/01/2017	Logged By : SM	Drilled By : [redacted]
Client : Gallagher Estates	Co-ords : 444215.41, 238522.61	Checked By :	Flush : Water
Hydrock Project No : C-04841-C	Ground Level : 130.25mAOD		

Sample/Core Run (m) Smpl. Ø (mm) Smpl. rec. %	Samples /Tests Depth (m)	Type	Results	Mechanical Log TCR	SCR	RQD	If Min Mean Max	Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level mAOD
									Firm brown clayey TOPSOIL with frequent fine rootlets.	0.30	(0.30)	129.95
1.20 - 2.20 128mm 100% rec	1.20	SPT	N=5 (1,1,2,1,1,1)						Firm brown slightly gravelly silty CLAY. Gravel fine to medium sub-angular to sub-rounded of medium to coarse weak limestone. (MARLSTONE ROCK FORMATION)	1.60	(1.30)	128.65
									Stiff brown slightly gravelly silty CLAY. Gravel fine to medium sub-angular of coarse weak limestone. (MARLSTONE ROCK FORMATION)	2.00	(0.40)	128.25
2.20 - 3.60	2.20	SPT	50/270mm (9,11,10,13,16,11)				10 45 150		Weak brown gravel of distinctly weathered LIMESTONE recovered as a fine to coarse sub-angular to sub-rounded gravel with occasional red staining. (MARLSTONE ROCK FORMATION) *... Recovered as a gravel likely tue to in-situ testing during the drilling process*	2.60	(0.60)	127.65
				100	20	15			Medium strength brown LIMESTONE with medium spaced sub-horizontal fractures. No infilling noted. (MARLSTONE ROCK FORMATION)	3.20	(0.60)	127.05
									Stiff brown very gravelly CLAY. Gravel fine to medium sub-angular to sub-rounded of limestone. (MARLSTONE ROCK FORMATION) *... Red staining from 3.3 to 3.4m*	3.40	(0.20)	126.85
3.60 - 5.10	3.60	SPT	N=33 (3,6,7,7,9,10)						Extremely stiff friable thinly laminated grey and yellowish brown mottled CLAY. Frequent weak sub-angular to sub-rounded medium gravel of mudstone. (MARLSTONE ROCK FORMATION)	3.70	(0.30)	126.55
							20 40 160		Medium strength reddish brown LIMESTONE. Red staining throughout strata. (MARLSTONE ROCK FORMATION)			

Legend | Instrumentation / Backfill



Continued on Next Sheet

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)
	19/01	0000	5.10	2.20	140	3.60	Water	
	19/01	1130	0.00				Water	

General Remarks :
1. Handpit to 1.2m prior to drilling. 2. No visual or olfactory evidence of contamination. 3. Water flush used so groundwater unknown. 4. Exploratory hole scanned with CAT and Genny prior to breaking ground. 5. Well was fitted with a gas and groundwater monitoring installation. 6. Water flush lost at 3.8m.

Logged in general accordance with BS5930:2015

Hydrock

Project : Wykham Park Farm

Borehole No
BH03
Page No. 2

Method : Dynamic Sampled & Rotary Cored	Date(s) : 19/01/2017	Logged By : SM	Drilled By [redacted]
Client : Gallagher Estates	Co-ords : 444215.41, 238522.61	Checked By :	Flush : Water
Hydrock Project No : C-04841-C	Ground Level : 130.25mAOD		

Sample/Core Run (m) Smpl. Ø (mm) Smpl. rec. %	Samples /Tests			Mechanical Log				Water-Strikes	Stratum Description	Depth mbgl	Thickness (m)	Level mAOD	Legend	Instrumentation / Backfill
	Depth (m)	Type	Results	TCR	SCR	RQD	If. Min Mean Max							
									Medium strength reddish brown LIMESTONE. Red staining throughout strata. (MARLSTONE ROCK FORMATION)	4.40	(0.70)	125.85		
				100	20	10			Stffl yellowish grey friable CLAY. Frequent sub-angular medium to coarse gravel of weak mudstone. (DYRHAM FORMATION)	5.10	(0.70)	125.15		
	5.10	SPT	N=38 (4,6,10,11,8,9)						End of Borehole at 5.10m					

Progress and Observations

Rig	Date	Time	Borehole Depth (m)	Casing Depth (m)	Casing Diam.(mm)	Water Depth (m)	Flush Type	Returns (colour)

General Remarks :
1. Handpit to 1.2m prior to drilling. 2. No visual or olfactory evidence of contamination. 3. Water flush used so groundwater unknown. 4. Exploratory hole scanned with CAT and Genny prior to breaking ground. 5. Well was fitted with a gas and groundwater monitoring installation. 6. Water flush lost at 3.8m.

Logged in general accordance with BS9530:2015

Appendix E

Geotechnical Test Results

Variable Head Permeability Test Certificate

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-04841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH01 (R1)
		Date Tested:	23 January 2017

Permeabiltiy Test Type	Borehole	No	Falling Head	Yes
	Standpipe	Yes	Rising Head	No
	All water depths are measured from datum.		Ground level	No
			Casing/standpipe	Yes
			Other	No
Borehole Details	Ground Level			mOD
	Borehole Depth			mbgl
	Casing Depth			mbgl
	Casing Height			m
	Borehole Diameter	D		m
	Response length	L		m
	Borehole Area	A		m^2
Standpipe Details	Top of response zone		2.20	mbgl
	Base of response zone		5.70	mbgl
	Height of standpipe above Ground Level		0.00	m
	Standpipe Diameter	d	0.060	m
	Filter Zone Diameter	D	0.120	m
	Length of Filter zone	L	3.50	m
	Standpipe Area	A	0.0028	m^2
Water Details	Water depth before test from datum		2.80	m
	#Baseline water depth for analysis from datum		2.80	m
Selected Case Study, from BS 5930: 1990: Fig. 6 or 7	**g**		**Test carried out in Peizometer or Standpipe**	
Area used for determination of permeability		**A**	**0.002827m^2**	
Intake Factor used in permeability formula		**F**	**0.7486**	

Baseline water level

This level must be above top of response zone and below final water level at the end of test

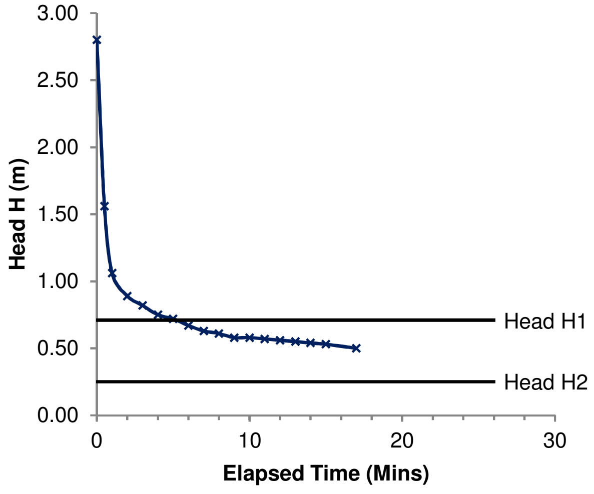
For Falling Head Test, this is the water level before the artifical raise in Head

For Rising Head Test, this is the water level before the Head is allowed to rise naturally

Summary of Test Findings

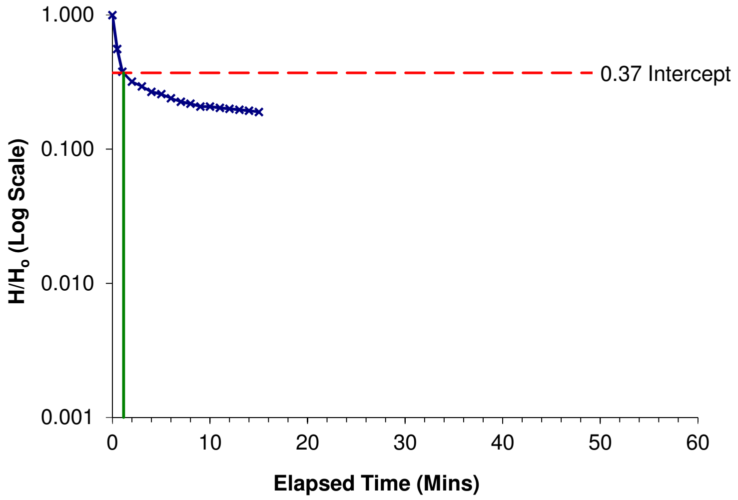
General Approach

Plot of H against Time



Basic Time Lag Approach

Plot of H/H_o against Time



Permeability Results

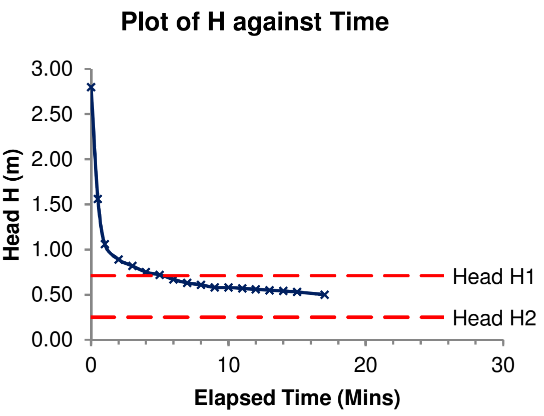
General Approach:	k = [A/F(t_2-t_1) loge (H_1/H_2)]	#N/A	m/sec
Basic Time Lag Approach:	k = A/FT	5.52E-05	m/sec

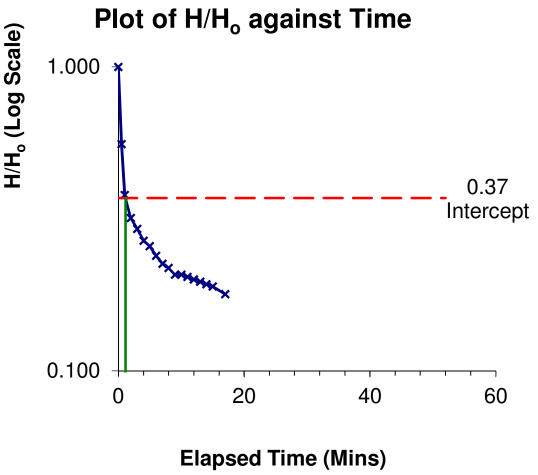
Variable Head Permeability Test Data and Analysis Sheet

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-04841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH01 (R1)
		Date Tested:	23 January 2017

Head Data		Field Data	
Head (H) (m)	Head Ratio (H/H_o)	Depth to water from datum (m)	Elapsed Time (t) (mins)
2.80	1.000	0.00	0.0
1.56	0.557	1.24	0.5
1.06	0.379	1.74	1.0
0.89	0.318	1.91	2.0
0.82	0.293	1.98	3.0
0.75	0.268	2.05	4.0
0.72	0.257	2.08	5.0
0.67	0.239	2.13	6.0
0.63	0.225	2.17	7.0
0.61	0.218	2.19	8.0
0.58	0.207	2.22	9.0
0.58	0.207	2.22	10.0
0.57	0.204	2.23	11.0
0.56	0.200	2.24	12.0
0.55	0.196	2.25	13.0
0.54	0.193	2.26	14.0
0.53	0.189	2.27	15.0
0.50	0.179	2.30	17.0
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		





Data Assessment			
Is it appropriate to use General Approach		**Yes**	*Use General Approach*
Does Plot of Time vs Head Ratio go below H/Ho = 0.37		**Yes**	*Use Basic Time Lag*
General Approach:			
Selected H_1 from Tabulated Data	0.71	Corresponding Elapsed Time, t_1	#N/A
Selected H_2 from Tabulated Data	0.25	Corresponding Elapsed Time, t_2	#N/A
Basic Time Lag Approach:			
Head Ratio H/Ho >0.37	0.38	Corresponding Elapsed Time	1.0 mins
Head Ratio H/Ho <0.37	0.32	Corresponding Elapsed Time	2.0 mins
Basic Time Lag Time T		**1.1 Mins**	

Hydrock

Variable Head Permeability Test Certificate

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-4841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH01 (R2)
		Date Tested:	23 January 2017

Permeabiltiy Test Type	Borehole	No	Falling Head	Yes
	Standpipe	Yes	Rising Head	No
	All water depths are measured from datum.		Ground level	No
			Casing/standpipe	Yes
			Other	No
Borehole Details	Ground Level			mOD
	Borehole Depth			mbgl
	Casing Depth			mbgl
	Casing Height			m
	Borehole Diameter	D		m
	Response length	L		m
	Borehole Area	A		m²
Standpipe Details	Top of response zone		2.20	mbgl
	Base of response zone		5.70	mbgl
	Height of standpipe above Ground Level		0.00	m
	Standpipe Diameter	d	0.060	m
	Filter Zone Diameter	D	0.120	m
	Length of Filter zone	L	3.50	m
	Standpipe Area	A	0.0028	m²
Water Details	Water depth before test from datum		2.30	m
	#Baseline water depth for analysis from datum		2.80	m
Selected Case Study, from BS 5930: 1990: Fig. 6 or 7	**g**		**Test carried out in Peizometer or Standpipe**	
Area used for determination of permeability		**A**	**0.002827m²**	
Intake Factor used in permeability formula		**F**	**0.7486**	

\# Baseline water level

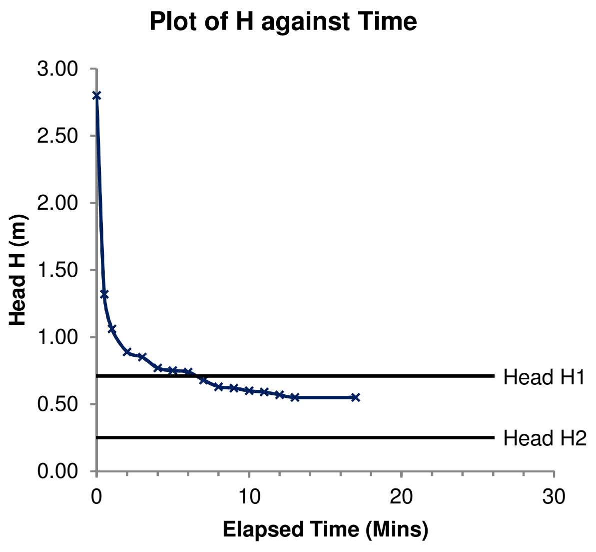
This level must be above top of response zone and below final water level at the end of test

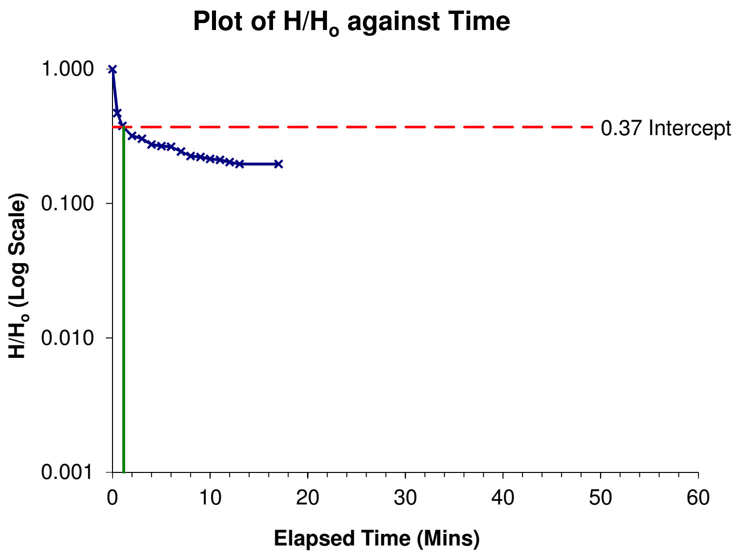
For Falling Head Test, this is the water level before the artifical raise in Head

For Rising Head Test, this is the water level before the Head is allowed to rise naturally

Summary of Test Findings

General Approach	Basic Time Lag Approach





Permeability Results

General Approach:	$k = [A/F(t_2-t_1) \text{ loge } (H_1/H_2)]$	#N/A	m/sec
Basic Time Lag Approach:	$k = A/FT$	5.52E-05	m/sec

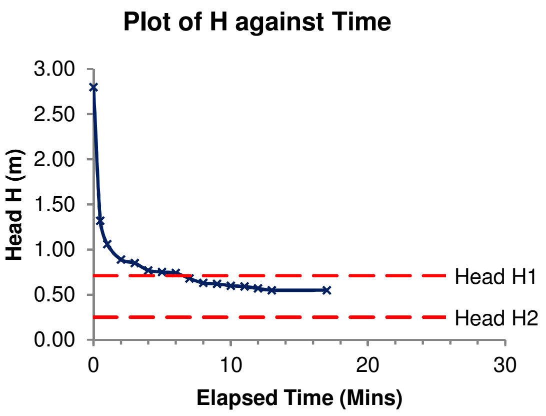
Variable Head Permeability Test Data and Analysis Sheet

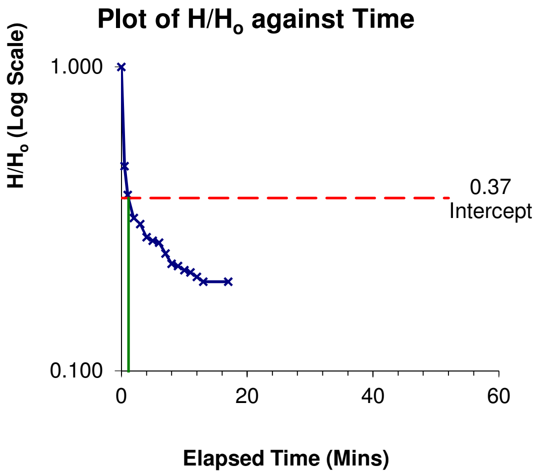
Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client: Gallagher Estates
Site Name: Wykham Park Farm
Site Address: Wykham Lane, Banbury OX16 9UP

Contract Number: C-4841
Client Reference: N/A
Borehole Reference: BH01 (R2)
Date Tested: 23 January 2017

Head Data		Field Data	
Head (H) (m)	Head Ratio (H/H_o)	Depth to water from datum (m)	Elapsed Time (t) (mins)
2.80	1.000	0.00	0.0
1.32	0.471	1.48	0.5
1.06	0.379	1.74	1.0
0.89	0.318	1.91	2.0
0.85	0.304	1.95	3.0
0.77	0.275	2.03	4.0
0.75	0.268	2.05	5.0
0.74	0.264	2.06	6.0
0.68	0.243	2.12	7.0
0.63	0.225	2.17	8.0
0.62	0.221	2.18	9.0
0.60	0.214	2.20	10.0
0.59	0.211	2.21	11.0
0.57	0.204	2.23	12.0
0.55	0.196	2.25	13.0
0.55	0.196	2.25	17.0
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		





Data Assessment		
Is it appropriate to use General Approach	**Yes**	*Use General Approach*
Does Plot of Time vs Head Ratio go below H/Ho = 0.37	**Yes**	*Use Basic Time Lag*

General Approach:			
Selected H_1 from Tabulated Data	0.71	Corresponding Elapsed Time, t_1	#N/A
Selected H_2 from Tabulated Data	0.25	Corresponding Elapsed Time, t_2	#N/A

Basic Time Lag Approach:			
Head Ratio H/Ho >0.37	0.38	Corresponding Elapsed Time	1.0 mins
Head Ratio H/Ho <0.37	0.32	Corresponding Elapsed Time	2.0 mins
Basic Time Lag Time T	**1.1 Mins**		

Variable Head Permeability Test Certificate

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-4841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH01 (R3)
		Date Tested:	23 January 2017

Permeabiltiy Test Type	Borehole	No	Falling Head	Yes
	Standpipe	Yes	Rising Head	No
	All water depths are measured from datum.		Ground level	No
			Casing/standpipe	Yes
			Other	No
Borehole Details	Ground Level			mOD
	Borehole Depth			mbgl
	Casing Depth			mbgl
	Casing Height			m
	Borehole Diameter	D		m
	Response length	L		m
	Borehole Area	A		m²
Standpipe Details	Top of response zone		2.20	mbgl
	Base of response zone		5.70	mbgl
	Height of standpipe above Ground Level		0.00	m
	Standpipe Diameter	d	0.060	m
	Filter Zone Diameter	D	0.120	m
	Length of Filter zone	L	3.50	m
	Standpipe Area	A	0.0028	m²
Water Details	Water depth before test from datum		2.25	m
	#Baseline water depth for analysis from datum		2.80	m
Selected Case Study, from BS 5930: 1990: Fig. 6 or 7	**g**		**Test carried out in Peizometer or Standpipe**	
Area used for determination of permeability		**A**	**0.002827m²**	
Intake Factor used in permeability formula		**F**	**0.7486**	

\# Baseline water level

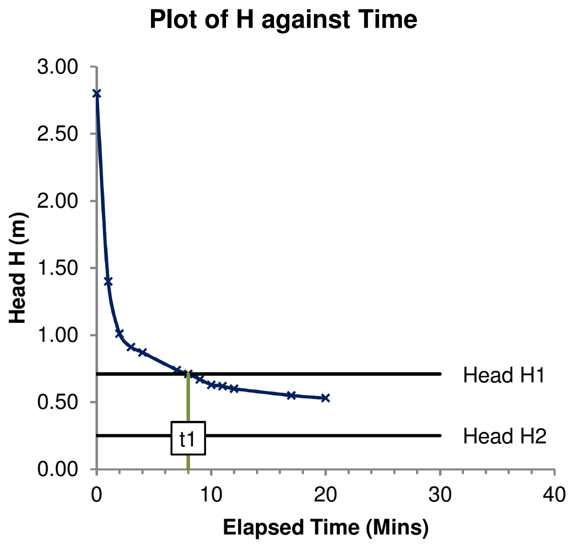
This level must be above top of response zone and below final water level at the end of test

For Falling Head Test, this is the water level before the artifical raise in Head

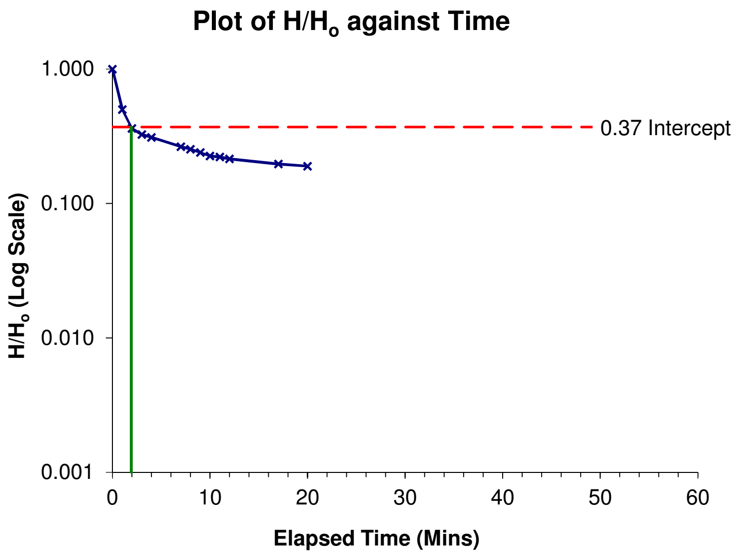
For Rising Head Test, this is the water level before the Head is allowed to rise naturally

Summary of Test Findings

General Approach



Basic Time Lag Approach



Permeability Results

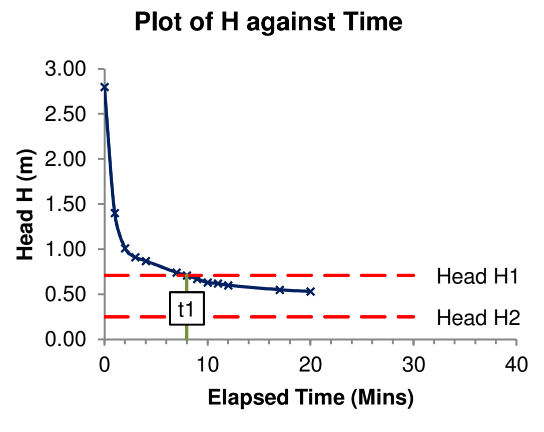
General Approach:	$k = [A/F(t_2-t_1) \text{ loge } (H_1/H_2)]$	#N/A	m/sec
Basic Time Lag Approach:	$k = A/FT$	3.26E-05	m/sec

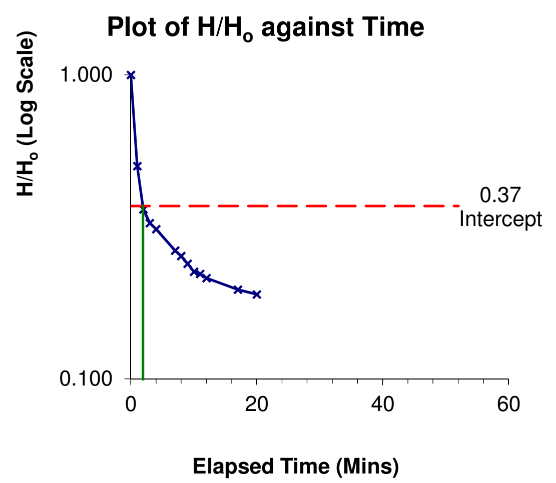
Variable Head Permeability Test Data and Analysis Sheet

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-4841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH01 (R3)
		Date Tested:	23 January 2017

Head Data		Field Data	
Head (H) (m)	Head Ratio (H/H_o)	Depth to water from datum (m)	Elapsed Time (t) (mins)
2.80	1.000	0.00	0.0
1.40	0.500	1.40	1.0
1.01	0.361	1.79	2.0
0.91	0.325	1.89	3.0
0.87	0.311	1.93	4.0
0.74	0.264	2.06	7.0
0.71	0.254	2.09	8.0
0.67	0.239	2.13	9.0
0.63	0.225	2.17	10.0
0.62	0.221	2.18	11.0
0.60	0.214	2.20	12.0
0.55	0.196	2.25	17.0
0.53	0.189	2.27	20.0
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		
2.80	1.000		





Data Assessment			
Is it appropriate to use General Approach		**Yes**	*Use General Approach*
Does Plot of Time vs Head Ratio go below H/Ho = 0.37		**Yes**	*Use Basic Time Lag*
General Approach:			
Selected H_1 from Tabulated Data	0.71	Corresponding Elapsed Time, t_1	8.0 mins
Selected H_2 from Tabulated Data	0.25	Corresponding Elapsed Time, t_2	#N/A
Basic Time Lag Approach:			
Head Ratio H/Ho >0.37	0.50	Corresponding Elapsed Time	1.0 mins
Head Ratio H/Ho <0.37	0.36	Corresponding Elapsed Time	2.0 mins
Basic Time Lag Time T		**1.9 Mins**	

Variable Head Permeability Test Certificate

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client: Gallagher Estates
Site Name: Wykham Park Farm
Site Address: Wykham Lane, Banbury OX16 9UP

Contract Number: C-4841
Client Reference: N/A
Borehole Reference: BH02 (R1)
Date Tested: 23 January 2017

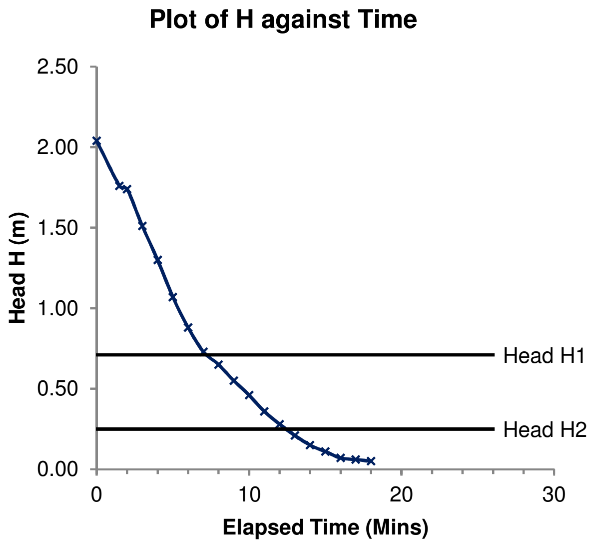
Permeabiltiy Test Type	Borehole	No		Falling Head	Yes
	Standpipe	Yes		Rising Head	No
	All water depths are measured from datum.			Ground level	No
				Casing/standpipe	Yes
				Other	No
Borehole Details	Ground Level				mOD
	Borehole Depth				mbgl
	Casing Depth				mbgl
	Casing Height				m
	Borehole Diameter	D			m
	Response length	L			m
	Borehole Area	A			m²
Standpipe Details	Top of response zone		1.00		mbgl
	Base of response zone		5.02		mbgl
	Height of standpipe above Ground Level		0.00		m
	Standpipe Diameter	d	0.060		m
	Filter Zone Diameter	D	0.120		m
	Length of Filter zone	L	4.02		m
	Standpipe Area	A	0.0028		m²
Water Details	Water depth before test from datum		2.04		m
	#Baseline water depth for analysis from datum		2.04		m
Selected Case Study, from BS 5930: 1990: Fig. 6 or 7	g		**Test carried out in Peizometer or Standpipe**		
Area used for determination of permeability		**A**	**0.002827m²**		
Intake Factor used in permeability formula		**F**	**0.7560**		

\# Baseline water level

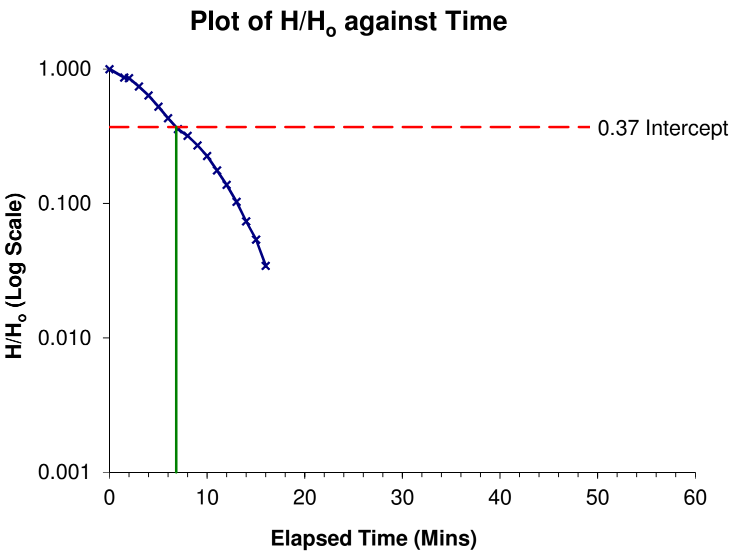
This level must be above top of response zone and below final water level at the end of test
For Falling Head Test, this is the water level before the artifical raise in Head
For Rising Head Test, this is the water level before the Head is allowed to rise naturally

Summary of Test Findings

General Approach



Basic Time Lag Approach



Permeability Results

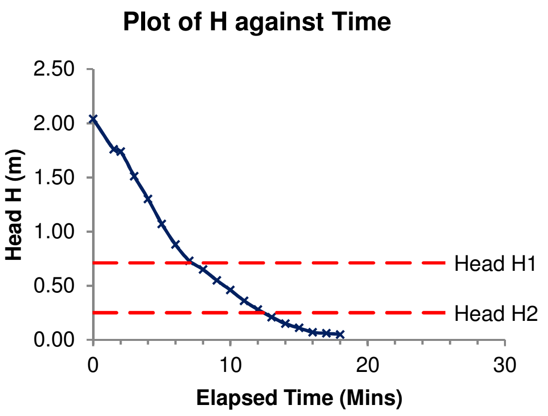
General Approach:	$k = [A/F(t_2-t_1) \log e (H_1/H_2)]$	#N/A	m/sec
Basic Time Lag Approach:	$k = A/FT$	9.12E-06	m/sec

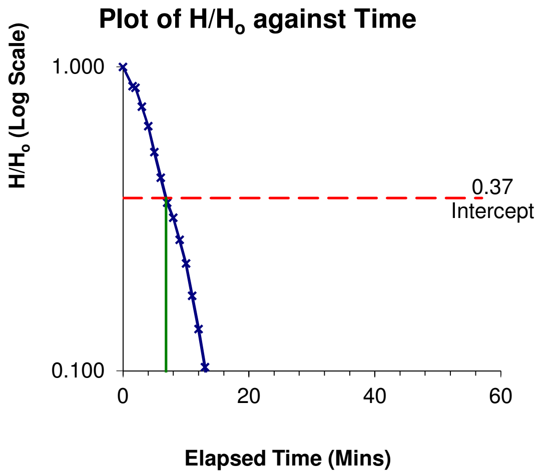
Variable Head Permeability Test Data and Analysis Sheet

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-4841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH02 (R1)
		Date Tested:	23 January 2017

Head Data		Field Data	
Head (H) (m)	Head Ratio (H/H_o)	Depth to water from datum (m)	Elapsed Time (t) (mins)
2.04	1.000	0.00	0.0
1.76	0.863	0.28	1.5
1.74	0.853	0.30	2.0
1.51	0.740	0.53	3.0
1.30	0.637	0.74	4.0
1.07	0.525	0.97	5.0
0.88	0.431	1.16	6.0
0.73	0.358	1.31	7.0
0.65	0.319	1.39	8.0
0.55	0.270	1.49	9.0
0.46	0.225	1.58	10.0
0.36	0.176	1.68	11.0
0.28	0.137	1.76	12.0
0.21	0.103	1.83	13.0
0.15	0.074	1.89	14.0
0.11	0.054	1.93	15.0
0.07	0.034	1.97	16.0
0.06	0.029	1.98	17.0
0.05	0.025	1.99	18.0
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		





Data Assessment		
Is it appropriate to use General Approach	**Yes**	*Use General Approach*
Does Plot of Time vs Head Ratio go below H/Ho = 0.37	**Yes**	*Use Basic Time Lag*

General Approach:			
Selected H_1 from Tabulated Data	0.71	Corresponding Elapsed Time, t_1	#N/A
Selected H_2 from Tabulated Data	0.25	Corresponding Elapsed Time, t_2	#N/A
Basic Time Lag Approach:			
Head Ratio H/Ho >0.37	0.43	Corresponding Elapsed Time	6.0 mins
Head Ratio H/Ho <0.37	0.36	Corresponding Elapsed Time	7.0 mins
Basic Time Lag Time T		**6.8 Mins**	

Variable Head Permeability Test Certificate

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

Client:	Gallagher Estates	Contract Number:	C-4841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH02 (R2)
		Date Tested:	23 January 2017

Permeabiltiy Test Type	Borehole	No	Falling Head	Yes
	Standpipe	Yes	Rising Head	No
	All water depths are measured from datum.		Ground level	No
			Casing/standpipe	Yes
			Other	No

Borehole Details	Ground Level			mOD
	Borehole Depth			mbgl
	Casing Depth			mbgl
	Casing Height			m
	Borehole Diameter	D		m
	Response length	L		m
	Borehole Area	A		m^2
Standpipe Details	Top of response zone		1.00	mbgl
	Base of response zone		5.02	mbgl
	Height of standpipe above Ground Level		0.00	m
	Standpipe Diameter	d	0.060	m
	Filter Zone Diameter	D	0.120	m
	Length of Filter zone	L	4.02	m
	Standpipe Area	A	0.0028	m^2
Water Details	Water depth before test from datum		1.99	m
	#Baseline water depth for analysis from datum		2.04	m
Selected Case Study, from BS 5930: 1990: Fig. 6 or 7	**g**		**Test carried out in Peizometer or Standpipe**	
Area used for determination of permeability		**A**	**0.002827m^2**	
Intake Factor used in permeability formula		**F**	**0.7560**	

\# Baseline water level

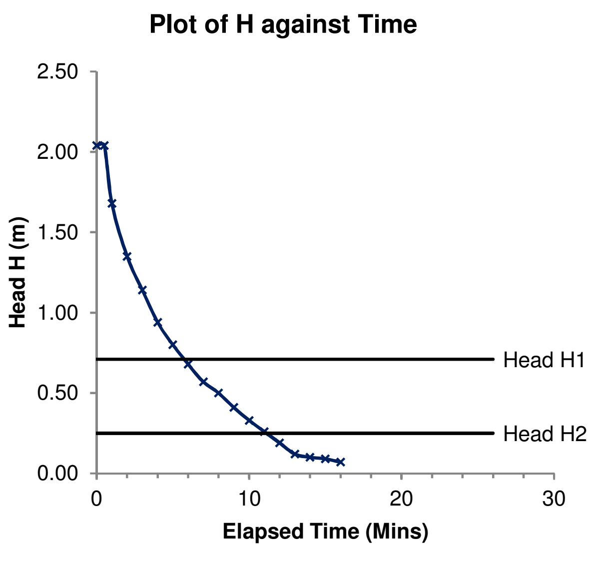
This level must be above top of response zone and below final water level at the end of test

For Falling Head Test, this is the water level before the artifical raise in Head

For Rising Head Test, this is the water level before the Head is allowed to rise naturally

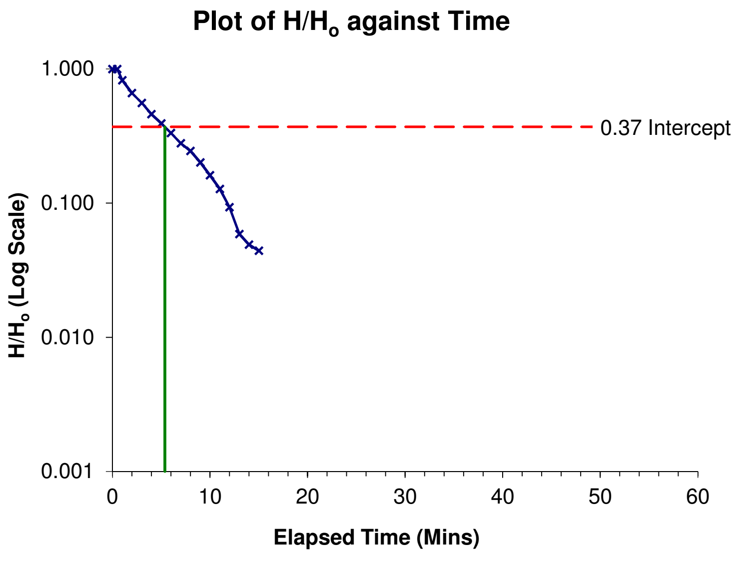
Summary of Test Findings

General Approach



Plot of H against Time

Basic Time Lag Approach



Plot of H/H_o against Time

Permeability Results

General Approach:	$k = [A/F(t_2-t_1)\ \mathrm{loge}\ (H_1/H_2)]$	#N/A	m/sec
Basic Time Lag Approach:	$k = A/FT$	1.16E-05	m/sec

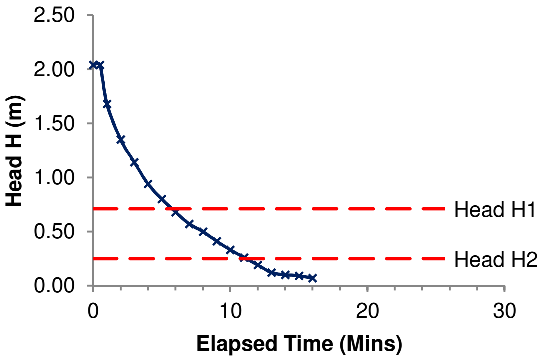
Variable Head Permeability Test Data and Analysis Sheet

Tested in accordance with BS 5930:1999 (Amended 2007) Section 25.4 Permeability

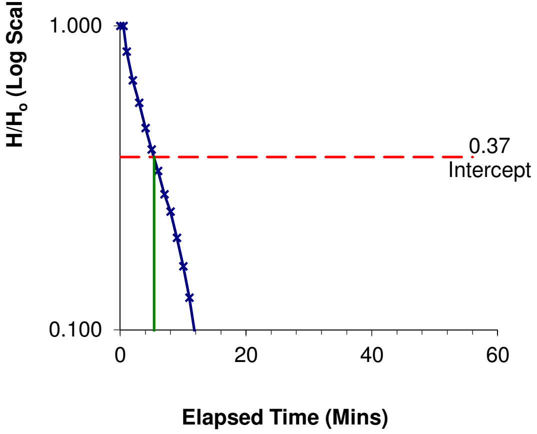
Client:	Gallagher Estates	Contract Number:	C-4841
Site Name:	Wykham Park Farm	Client Reference:	N/A
Site Address:	Wykham Lane, Banbury OX16 9UP	Borehole Reference:	BH02 (R2)
		Date Tested:	23 January 2017

Head Data		Field Data	
Head (H) (m)	Head Ratio (H/H_o)	Depth to water from datum (m)	Elapsed Time (t) (mins)
2.04	1.000	0.00	0.0
2.04	1.000	0.00	0.5
1.68	0.824	0.36	1.0
1.35	0.662	0.69	2.0
1.14	0.559	0.90	3.0
0.94	0.461	1.10	4.0
0.80	0.392	1.24	5.0
0.68	0.333	1.36	6.0
0.57	0.279	1.47	7.0
0.50	0.245	1.54	8.0
0.41	0.201	1.63	9.0
0.33	0.162	1.71	10.0
0.26	0.127	1.78	11.0
0.19	0.093	1.85	12.0
0.12	0.059	1.92	13.0
0.10	0.049	1.94	14.0
0.09	0.044	1.95	15.0
0.07	0.034	1.97	16.0
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		
2.04	1.000		

Plot of H against Time



Plot of H/H_o against Time



Data Assessment		
Is it appropriate to use General Approach	**Yes**	*Use General Approach*
Does Plot of Time vs Head Ratio go below H/Ho = 0.37	**Yes**	*Use Basic Time Lag*

General Approach:			
Selected H_1 from Tabulated Data	0.71	Corresponding Elapsed Time, t_1	#N/A
Selected H_2 from Tabulated Data	0.25	Corresponding Elapsed Time, t_2	#N/A

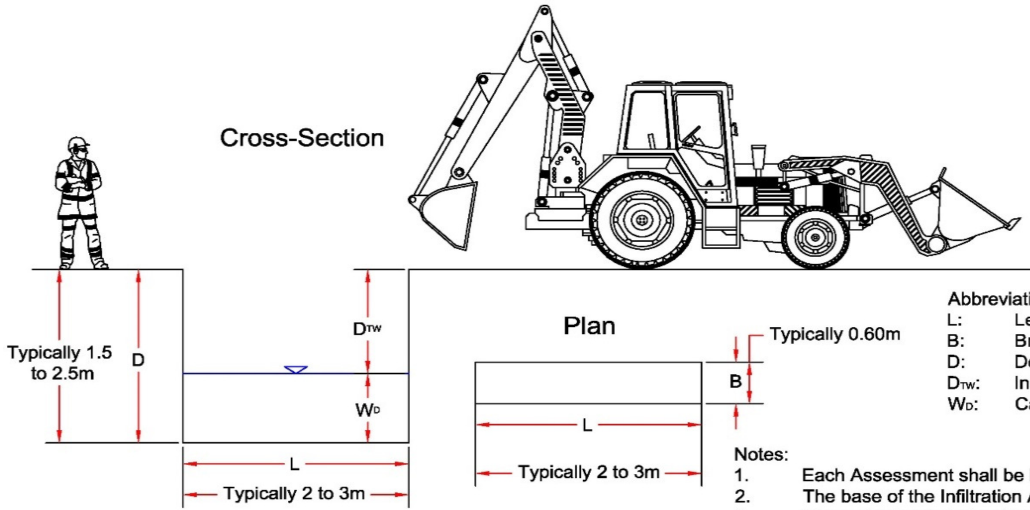
Basic Time Lag Approach:			
Head Ratio H/Ho >0.37	0.39	Corresponding Elapsed Time	5.0 mins
Head Ratio H/Ho <0.37	0.33	Corresponding Elapsed Time	6.0 mins
Basic Time Lag Time T		**5.4 Mins**	

1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA01 **Date of start** 14/12/2016 **Date at end** 14/12/2016

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Calculated Water Depth (W_D) $= D - D_{TW}$

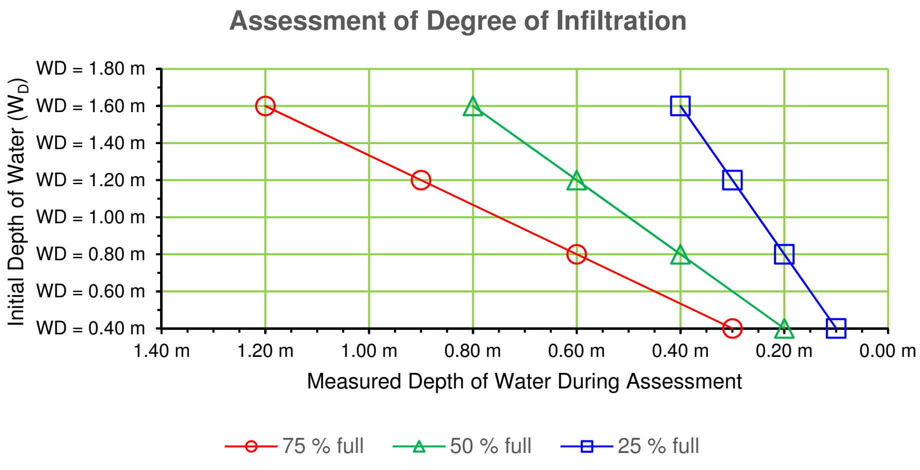
Maximum Fill Volume (V_w) $= W_D \times B \times L$

Corrected Water Volume (V_{wc}) $= V_w \times$ Gravel Porosity (P_t)

Notes:

1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

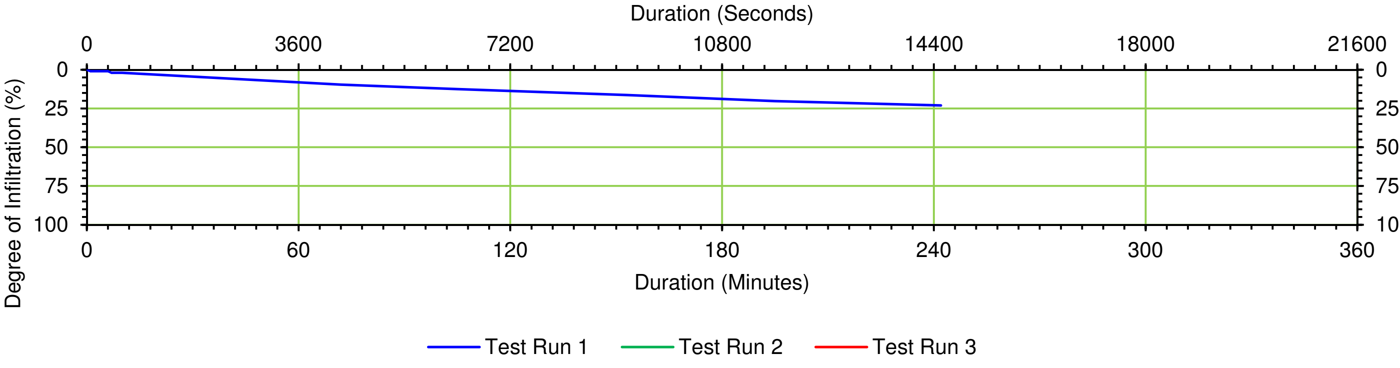
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C

Client: Gallagher Estates

Test Location SA01 **Date of start** 14/12/2016 **Date at end** 14/12/2016

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			1.700m	Trial Pit Length (L)				Trial Pit Length (L)			
Trial Pit Breadth / Width (B)			0.600m	Trial Pit Breadth / Width (B)				Trial Pit Breadth / Width (B)			
Effective Depth (D)			1.700m	Effective Depth (D)				Effective Depth (D)			
Time at Start of Filling			10.56	Time at Start of Filling				Time at Start of Filling			
Time at End of Filling			11.00	Time at End of Filling				Time at End of Filling			
Depth from Surface to Water (D_{TW})			0.660m	Depth below Surface to Water (D_{TW})				Depth below Surface to Water (D_{TW})			
Water Depth (W_D)			1.040m	Water Depth (W_D)			-	Water Depth (W_D)			-
Maximum Fill Volume (V_W)			1.061m³	Maximum Fill Volume (V_W)			-	Maximum Fill Volume (V_W)			-
Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No
Porosity of Gravel Backfill (P_t)				Porosity of Gravel Backfill (P_t)				Porosity of Gravel Backfill (P_t)			
Corrected Water Volume (V_{WC})			1.061m³	Corrected Water Volume (V_{WC})			-	Corrected Water Volume (V_{WC})			-
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.000	0.660	0								
1	11.010	0.670	60								
1	11.020	0.670	120								
1	11.030	0.670	180								
1	11.040	0.670	240								
1	11.050	0.670	300								
1	11.060	0.670	360								
1	11.070	0.680	420								
1	11.080	0.680	480								
1	11.090	0.680	540								
1	11.100	0.680	600								
1	12.120	0.760	4320								
1	12.450	0.790	6300								
1	13.330	0.830	9180								
1	14.150	0.870	11700								
1	15.020	0.900	14520								
			14520								
			14520								
			14520								
			14520								
			14520								
			14520								
			14520								
25% water loss (75% full)			0.920m	**25% water loss (75% full)**			-	**25% water loss (75% full)**			-
50% water loss (50% full)			1.180m	**50% water loss (50% full)**			-	**50% water loss (50% full)**			-
75% water loss (25% full)			1.440m	**75% water loss (25% full)**			-	**75% water loss (25% full)**			-
25% time (seconds)			-	**25% time (seconds)**			-	**25% time (seconds)**			-
75% time (seconds)			-	**75% time (seconds)**			-	**75% time (seconds)**			-
Vp 75-25			0.530m³	**Vp 75-25**			-	**Vp 75-25**			-
ap 50 (Actual area from test)			3.412m³	**ap 50 (Actual area from test)**			-	**ap 50 (Actual area from test)**			-
tp 75 - 25				**tp 75 - 25**				**tp 75 - 25**			
Soil Infiltration Rate		-		**Soil Infiltration Rate**		-		**Soil Infiltration Rate**		-	



1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

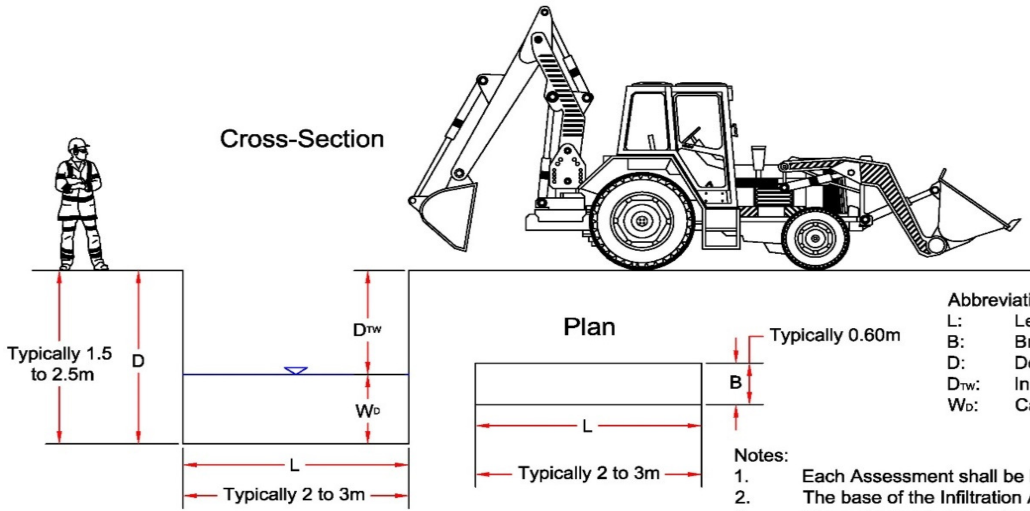
Site: Wykham Park Farm C-04582-C

Client: Gallagher Estates

Test Location SA02 **Date of start** 14/12/2016 **Date at end** 14/12/2016

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Calculated Water Depth (W_D) = D - D_{TW}

Maximum Fill Volume (V_w) = W_D x B x L

Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

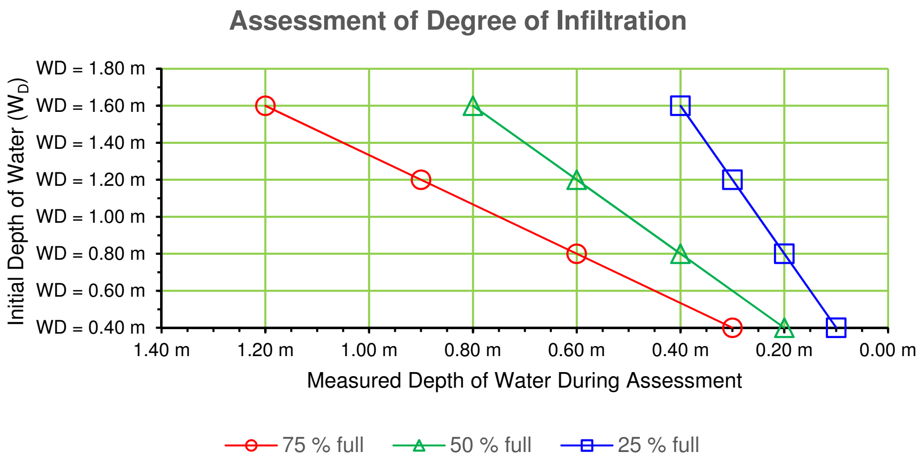
Notes:

1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		**W_D**		**W_D**	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						

SITE OBSERVATIONS - VOLUME LOSS

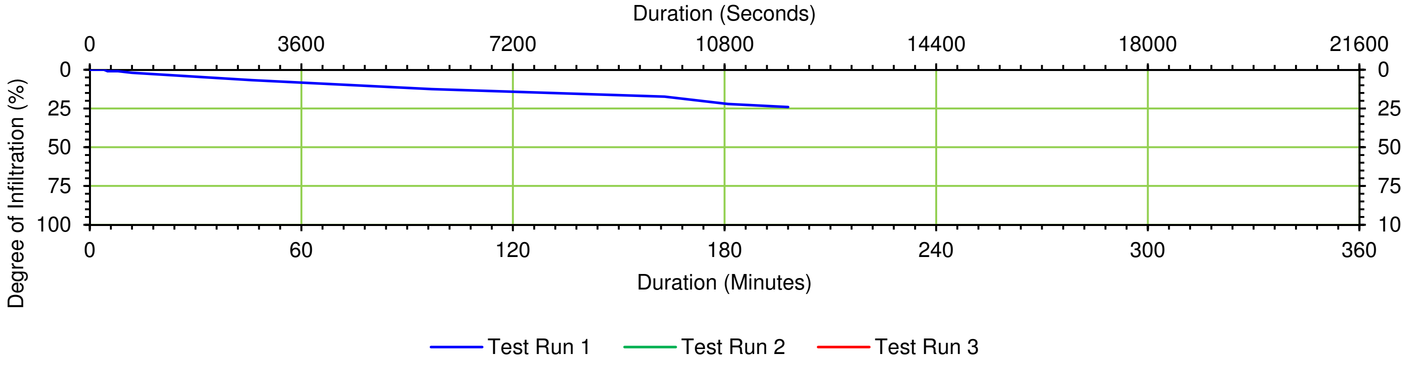
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.



1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA02 **Date of start** 14/12/2016 **Date at end** 14/12/2016

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				**Pit Dimensions (m)**				**Pit Dimensions (m)**			
Trial Pit Length (L)			1.600m	Trial Pit Length (L)				Trial Pit Length (L)			
Trial Pit Breadth / Width (B)			0.600m	Trial Pit Breadth / Width (B)				Trial Pit Breadth / Width (B)			
Effective Depth (D)			1.500m	Effective Depth (D)				Effective Depth (D)			
Time at Start of Filling			11.53	Time at Start of Filling				Time at Start of Filling			
Time at End of Filling			11.57	Time at End of Filling				Time at End of Filling			
Depth from Surface to Water (D_{TW})			0.460m	Depth below Surface to Water (D_{TW})				Depth below Surface to Water (D_{TW})			
Water Depth (W_D)			1.040m	Water Depth (W_D)			-	Water Depth (W_D)			-
Maximum Fill Volume (V_W)			0.998m^3	Maximum Fill Volume (V_W)			-	Maximum Fill Volume (V_W)			-
Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No
Porosity of Gravel Backfill (P_t)				Porosity of Gravel Backfill (P_t)				Porosity of Gravel Backfill (P_t)			
Corrected Water Volume (V_{WC})			0.998m^3	Corrected Water Volume (V_{WC})			-	Corrected Water Volume (V_{WC})			-
Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.570	0.460	0								
1	11.580	0.460	60								
1	11.590	0.460	120								
1	12.000	0.460	180								
1	12.010	0.460	240								
1	12.020	0.470	300								
1	12.030	0.470	360								
1	12.040	0.470	420								
1	12.050	0.470	480								
1	12.090	0.480	720								
1	12.430	0.530	2760								
1	13.340	0.590	5820								
1	14.400	0.640	9780								
1	14.580	0.690	10860								
1	15.150	0.710	11880								
			11880								
			11880								
			11880								
			11880								
			11880								
			11880								
			11880								
			11880								
25% water loss (75% full)			0.720m	**25% water loss (75% full)**			-	**25% water loss (75% full)**			-
50% water loss (50% full)			0.980m	**50% water loss (50% full)**			-	**50% water loss (50% full)**			-
75% water loss (25% full)			1.240m	**75% water loss (25% full)**			-	**75% water loss (25% full)**			-
25% time (seconds)			-	**25% time (seconds)**			-	**25% time (seconds)**			-
75% time (seconds)			-	**75% time (seconds)**			-	**75% time (seconds)**			-
Vp 75-25			0.499m^3	**Vp 75-25**			-	**Vp 75-25**			-
ap 50 (Actual area from test)			3.248m^3	**ap 50 (Actual area from test)**			-	**ap 50 (Actual area from test)**			-
tp 75 - 25				**tp 75 - 25**				**tp 75 - 25**			
Soil Infiltration Rate		-		**Soil Infiltration Rate**		-		**Soil Infiltration Rate**		-	

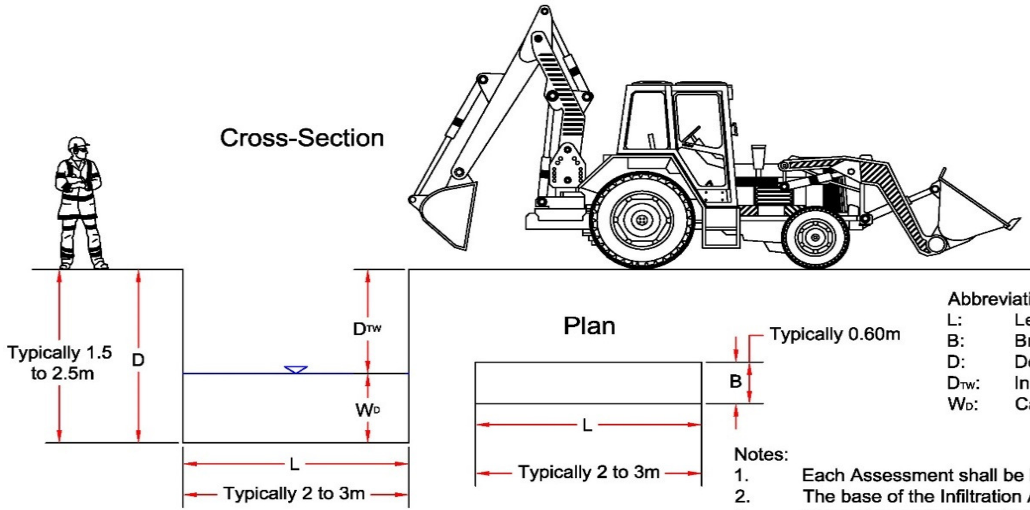


1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA03 **Date of start** 14/12/2016 **Date at end** 14/12/2016

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Calculated Water Depth (W_D) $= D - D_{TW}$

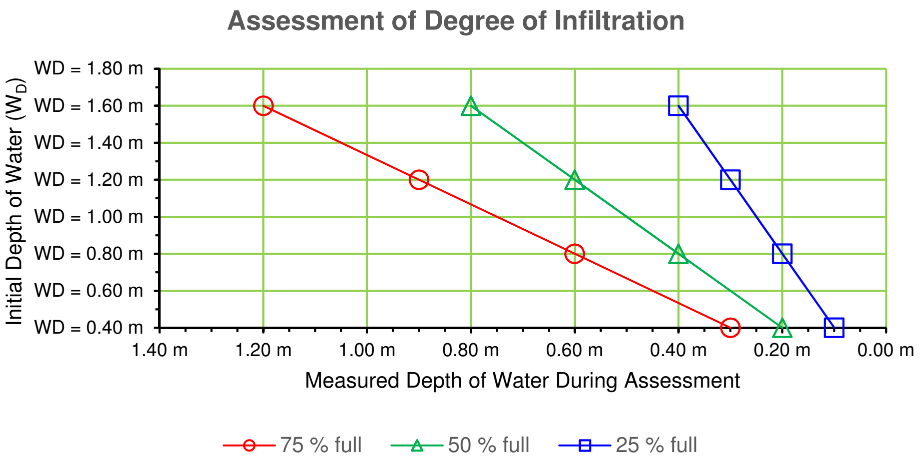
Maximum Fill Volume (V_w) $= W_D \times B \times L$

Corrected Water Volume (V_{wc}) $= V_w$ x Gravel Porosity (P_t)

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						

SITE OBSERVATIONS - VOLUME LOSS

Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.



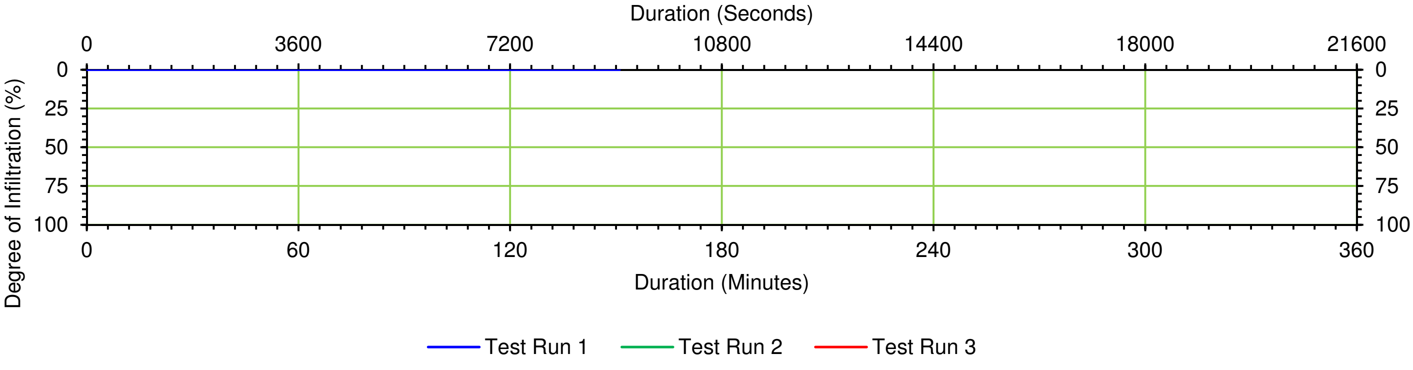
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA03 **Date of start** 14/12/2016 **Date at end** 14/12/2016

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	1.600m	Trial Pit Length (L)		Trial Pit Length (L)	
Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)		Trial Pit Breadth / Width (B)	
Effective Depth (D)	1.100m	Effective Depth (D)		Effective Depth (D)	
Time at Start of Filling	12.57	Time at Start of Filling		Time at Start of Filling	
Time at End of Filling	13.00	Time at End of Filling		Time at End of Filling	
Depth from Surface to Water (D_{TW})	0.260m	Depth below Surface to Water (D_{TW})		Depth below Surface to Water (D_{TW})	
Water Depth (W_D)	0.840m	Water Depth (W_D)	-	Water Depth (W_D)	-
Maximum Fill Volume (V_W)	0.806m^3	Maximum Fill Volume (V_W)	-	Maximum Fill Volume (V_W)	-
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.806m^3	Corrected Water Volume (V_{WC})	-	Corrected Water Volume (V_{WC})	-

Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	13.000	0.260	0								
1	13.010	0.260	60								
1	13.020	0.260	120								
1	13.030	0.260	180								
1	13.040	0.260	240								
1	13.050	0.260	300								
1	13.060	0.260	360								
1	13.070	0.260	420								
1	13.080	0.260	480								
1	13.090	0.260	540								
1	13.100	0.260	600								
1	13.310	0.260	1860								
1	14.120	0.260	4320								
1	14.560	0.260	6960								
1	15.310	0.260	9060								
			9060								
			9060								
			9060								
			9060								
			9060								
			9060								
			9060								
			9060								

25% water loss (75% full)	0.470m	**25% water loss (75% full)**	-	**25% water loss (75% full)**	-
50% water loss (50% full)	0.680m	**50% water loss (50% full)**	-	**50% water loss (50% full)**	-
75% water loss (25% full)	0.890m	**75% water loss (25% full)**	-	**75% water loss (25% full)**	-
25% time (seconds)	-	**25% time (seconds)**	-	**25% time (seconds)**	-
75% time (seconds)	-	**75% time (seconds)**	-	**75% time (seconds)**	-
Vp 75-25	0.403m^3	**Vp 75-25**	-	**Vp 75-25**	-
ap 50 (Actual area from test)	2.808m^3	**ap 50 (Actual area from test)**	-	**ap 50 (Actual area from test)**	-
tp 75 - 25		**tp 75 - 25**		**tp 75 - 25**	
Soil Infiltration Rate	-	**Soil Infiltration Rate**	-	**Soil Infiltration Rate**	-

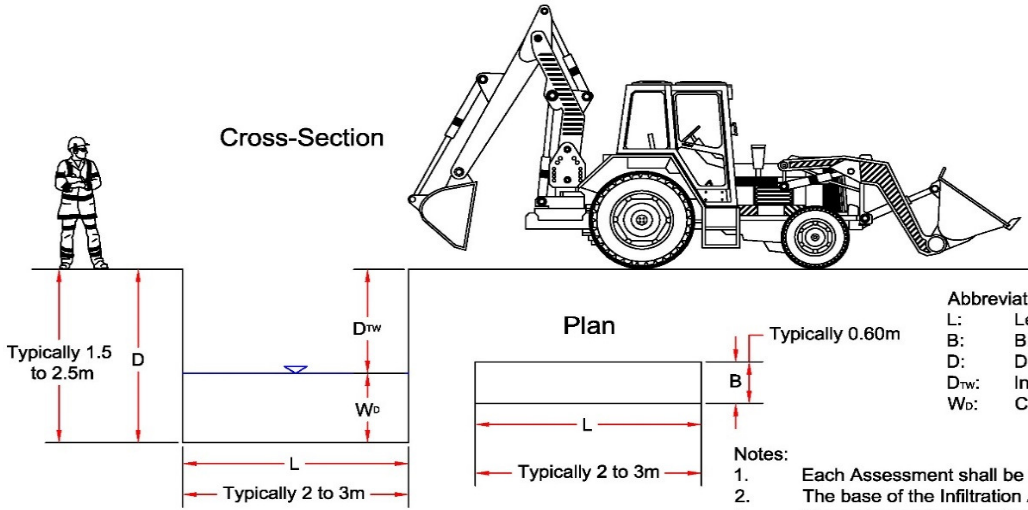


1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA04 **Date of start** 15.12.16 **Date at end** 15.12.16

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Calculated Water Depth (W_D) $= D - D_{TW}$

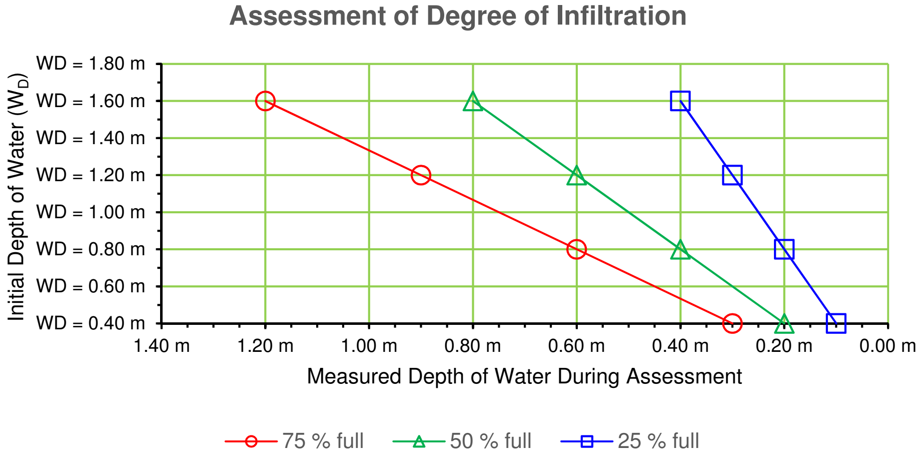
Maximum Fill Volume (V_w) $= W_D \times B \times L$

Corrected Water Volume (V_{wc}) $= V_w$ x Gravel Porosity (P_t)

Notes:

1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS

Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

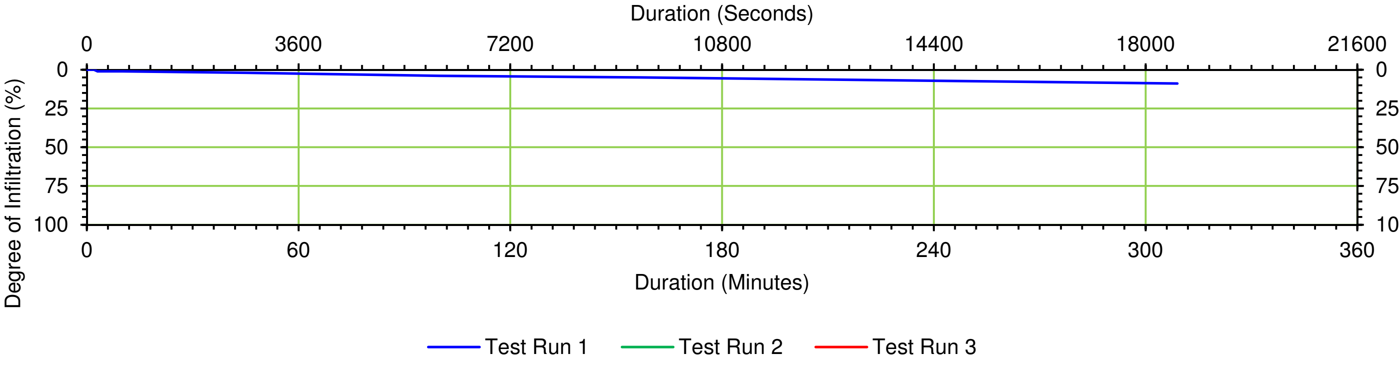
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA04 **Date of start** 15.12.16 **Date at end** 15.12.16

Test Run 1		Test Run 2		Test Run 3	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	1.600m	Trial Pit Length (L)		Trial Pit Length (L)	
Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)		Trial Pit Breadth / Width (B)	
Effective Depth (D)	1.600m	Effective Depth (D)		Effective Depth (D)	
Time at Start of Filling	9.19	Time at Start of Filling		Time at Start of Filling	
Time at End of Filling	9.23	Time at End of Filling		Time at End of Filling	
Depth from Surface to Water (D_{TW})	0.590m	Depth below Surface to Water (D_{TW})		Depth below Surface to Water (D_{TW})	
Water Depth (W_D)	1.010m	Water Depth (W_D)	-	Water Depth (W_D)	-
Maximum Fill Volume (V_W)	0.970m³	Maximum Fill Volume (V_W)	-	Maximum Fill Volume (V_W)	-
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.970m³	Corrected Water Volume (V_{WC})	-	Corrected Water Volume (V_{WC})	-

Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.230	0.590	0								
1	9.240	0.590	60								
1	9.250	0.590	120								
1	9.260	0.600	180								
1	9.270	0.600	240								
1	9.280	0.600	300								
1	9.290	0.600	360								
1	9.300	0.600	420								
1	9.310	0.600	480								
1	9.320	0.600	540								
1	9.330	0.600	600								
1	10.080	0.610	2700								
1	10.370	0.620	4440								
1	11.030	0.630	6000								
1	12.000	0.640	9420								
1	14.320	0.680	18540								
			18540								
			18540								
			18540								
			18540								
			18540								
			18540								
			18540								

25% water loss (75% full)	0.843m	**25% water loss (75% full)**	-	**25% water loss (75% full)**	-
50% water loss (50% full)	1.095m	**50% water loss (50% full)**	-	**50% water loss (50% full)**	-
75% water loss (25% full)	1.348m	**75% water loss (25% full)**	-	**75% water loss (25% full)**	-
25% time (seconds)	-	**25% time (seconds)**	-	**25% time (seconds)**	-
75% time (seconds)	-	**75% time (seconds)**	-	**75% time (seconds)**	-
Vp 75-25	0.485m³	**Vp 75-25**	-	**Vp 75-25**	-
ap 50 (Actual area from test)	3.182m³	**ap 50 (Actual area from test)**	-	**ap 50 (Actual area from test)**	-
tp 75 - 25		**tp 75 - 25**		**tp 75 - 25**	
Soil Infiltration Rate	-	**Soil Infiltration Rate**	-	**Soil Infiltration Rate**	-

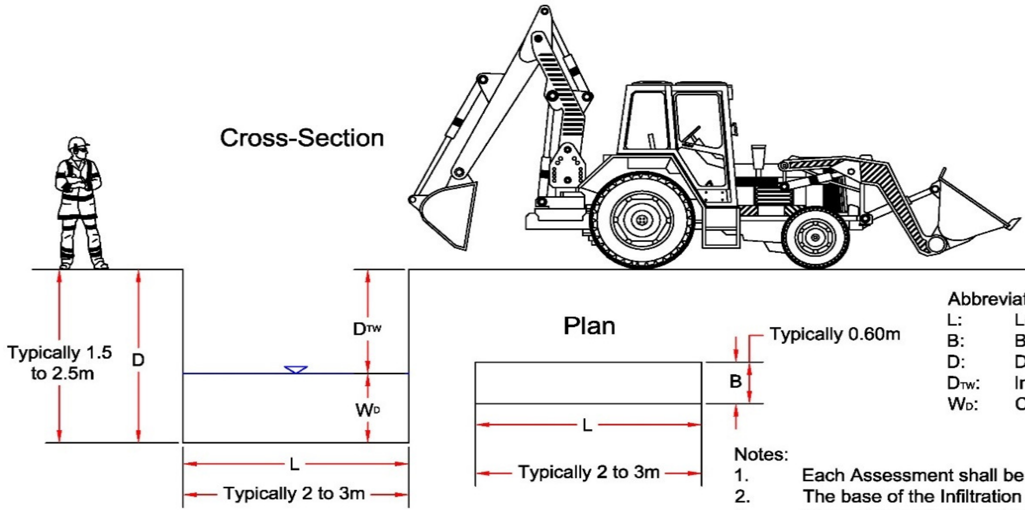


1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA05 **Date of start** 15.12.16 **Date at end** 15.12.16

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:
L: Length of Infiltration Assessment Pit.
B: Breadth / Width of Infiltration Assessment Pit.
D: Depth of Infiltration Assessment Pit.
D_{TW}: Initial Depth to Top of Water.
W_D: Calculated Water Depth.

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Calculated Water Depth (W_D) = D - D_{TW}

Maximum Fill Volume (V_w) = W_D x B x L

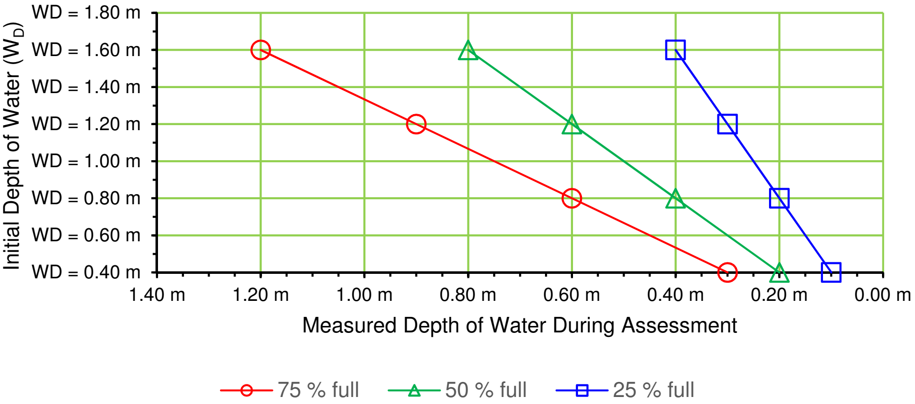
Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		**W_D**		**W_D**	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						

SITE OBSERVATIONS - VOLUME LOSS

Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

Assessment of Degree of Infiltration



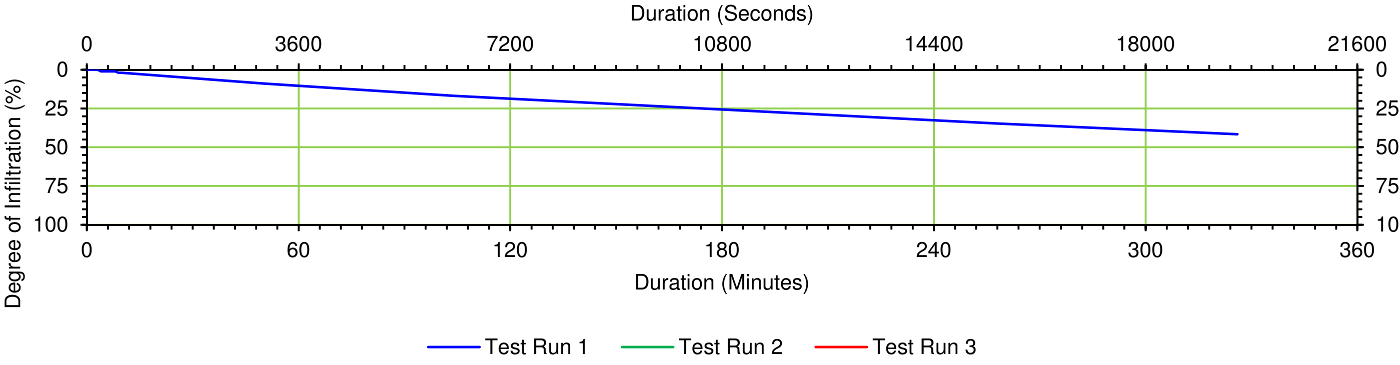
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA05 **Date of start** 15.12.16 **Date at end** 15.12.16

Test Run 1		**Test Run 2**		**Test Run 3**	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	1.500m	Trial Pit Length (L)		Trial Pit Length (L)	
Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)		Trial Pit Breadth / Width (B)	
Effective Depth (D)	1.800m	Effective Depth (D)		Effective Depth (D)	
Time at Start of Filling	10.15	Time at Start of Filling		Time at Start of Filling	
Time at End of Filling	10.18	Time at End of Filling		Time at End of Filling	
Depth from Surface to Water (D_{TW})	0.790m	Depth below Surface to Water (D_{TW})		Depth below Surface to Water (D_{TW})	
Water Depth (W_D)	1.010m	Water Depth (W_D)	-	Water Depth (W_D)	-
Maximum Fill Volume (V_W)	0.909m³	Maximum Fill Volume (V_W)	-	Maximum Fill Volume (V_W)	-
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.909m³	Corrected Water Volume (V_{WC})	-	Corrected Water Volume (V_{WC})	-

Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	10.180	0.790	0								
1	10.190	0.790	60								
1	10.200	0.790	120								
1	10.210	0.790	180								
1	10.220	0.800	240								
1	10.230	0.800	300								
1	10.240	0.800	360								
1	10.250	0.800	420								
1	10.260	0.800	480								
1	10.270	0.810	540								
1	10.280	0.810	600								
1	11.080	0.880	3000								
1	12.020	0.960	6240								
1	14.360	1.140	15480								
1	15.440	1.210	19560								
			19560								
			19560								
			19560								
			19560								
			19560								
			19560								
			19560								
			19560								

25% water loss (75% full)	1.043m	**25% water loss (75% full)**	-	**25% water loss (75% full)**	-
50% water loss (50% full)	1.295m	**50% water loss (50% full)**	-	**50% water loss (50% full)**	-
75% water loss (25% full)	1.548m	**75% water loss (25% full)**	-	**75% water loss (25% full)**	-
25% time (seconds)	10475 sec	**25% time (seconds)**	-	**25% time (seconds)**	-
75% time (seconds)	-	**75% time (seconds)**	-	**75% time (seconds)**	-
Vp 75-25	0.455m³	**Vp 75-25**	-	**Vp 75-25**	-
ap 50 (Actual area from test)	3.021m³	**ap 50 (Actual area from test)**	-	**ap 50 (Actual area from test)**	-
tp 75 - 25		**tp 75 - 25**		**tp 75 - 25**	
Soil Infiltration Rate	-	**Soil Infiltration Rate**	-	**Soil Infiltration Rate**	-

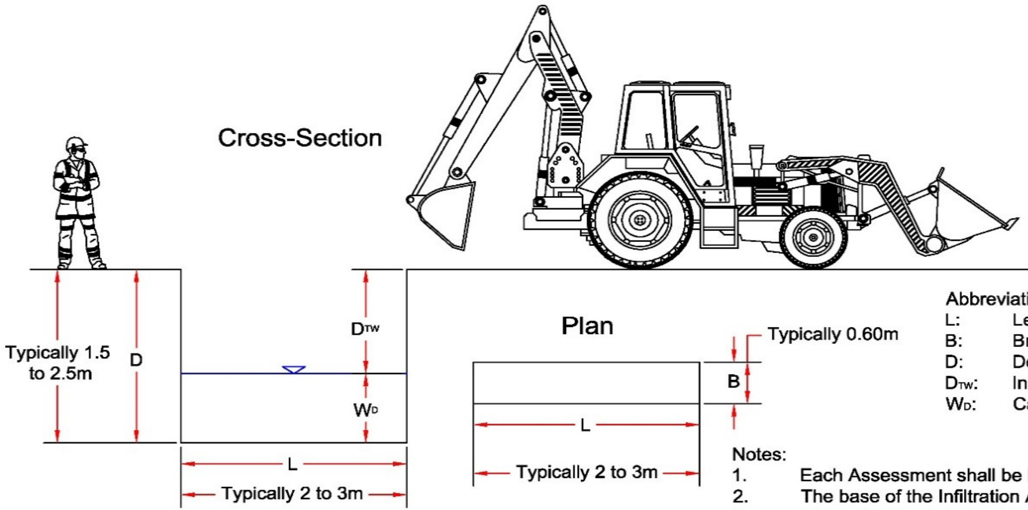


1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA06 **Date of start** 15.12.16 **Date at end** 15.12.16

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Calculated Water Depth (W_D) $= D - D_{TW}$

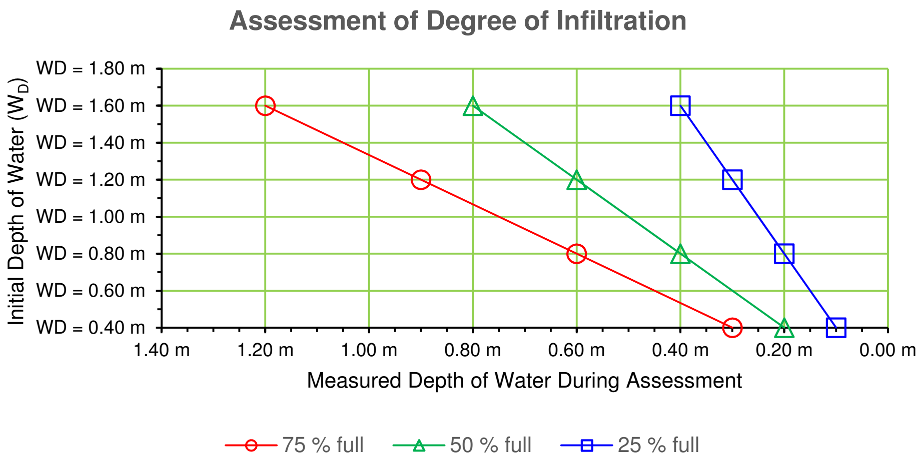
Maximum Fill Volume (V_w) $= W_D \times B \times L$

Corrected Water Volume (V_{wc}) $= V_w \times$ Gravel Porosity (P_t)

Notes:

1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS

Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C

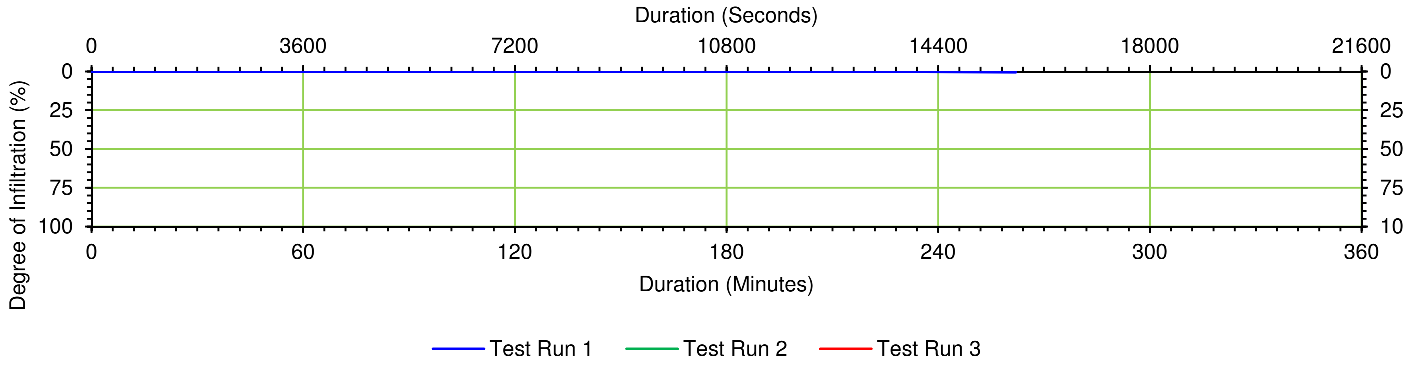
Client: Gallagher Estates

Test Location SA06 **Date of start** 15.12.16 **Date at end** 15.12.16

Test Run 1		**Test Run 2**		**Test Run 3**	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	1.800m	Trial Pit Length (L)		Trial Pit Length (L)	
Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)		Trial Pit Breadth / Width (B)	
Effective Depth (D)	1.250m	Effective Depth (D)		Effective Depth (D)	
Time at Start of Filling	11.13	Time at Start of Filling		Time at Start of Filling	
Time at End of Filling	11.18	Time at End of Filling		Time at End of Filling	
Depth from Surface to Water (D_{TW})	0.330m	Depth below Surface to Water (D_{TW})		Depth below Surface to Water (D_{TW})	
Water Depth (W_D)	0.920m	Water Depth (W_D)	-	Water Depth (W_D)	-
Maximum Fill Volume (V_W)	0.994m³	Maximum Fill Volume (V_W)	-	Maximum Fill Volume (V_W)	-
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.994m³	Corrected Water Volume (V_{WC})	-	Corrected Water Volume (V_{WC})	-

Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	11.180	0.330	0								
1	11.190	0.330	60								
1	11.200	0.330	120								
1	11.210	0.330	180								
1	11.220	0.330	240								
1	11.230	0.330	300								
1	11.240	0.330	360								
1	11.250	0.330	420								
1	11.260	0.330	480								
1	11.270	0.330	540								
1	11.280	0.330	600								
1	11.330	0.330	900								
1	11.560	0.330	2280								
1	14.380	0.330	12000								
1	15.400	0.335	15720								
			15720								
			15720								
			15720								
			15720								
			15720								
			15720								
			15720								
			15720								

25% water loss (75% full)	0.560m	**25% water loss (75% full)**	-	**25% water loss (75% full)**	-
50% water loss (50% full)	0.790m	**50% water loss (50% full)**	-	**50% water loss (50% full)**	-
75% water loss (25% full)	1.020m	**75% water loss (25% full)**	-	**75% water loss (25% full)**	-
25% time (seconds)	-	**25% time (seconds)**	-	**25% time (seconds)**	-
75% time (seconds)	-	**75% time (seconds)**	-	**75% time (seconds)**	-
Vp 75-25	0.497m³	**Vp 75-25**	-	**Vp 75-25**	-
ap 50 (Actual area from test)	3.288m³	**ap 50 (Actual area from test)**	-	**ap 50 (Actual area from test)**	-
tp 75 - 25		**tp 75 - 25**		**tp 75 - 25**	
Soil Infiltration Rate	-	**Soil Infiltration Rate**	-	**Soil Infiltration Rate**	-

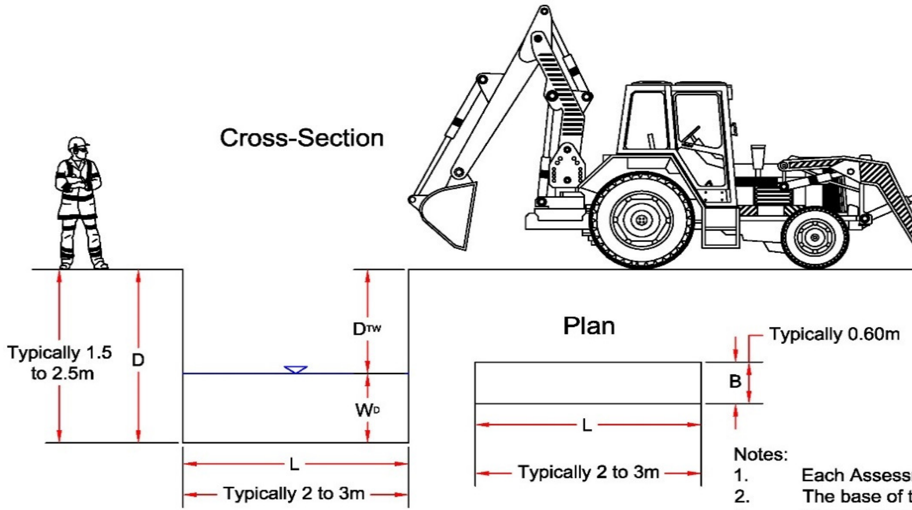


1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA07 **Date of start** 16.12.16 **Date at end** 16.12.16

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
	.
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Notes:
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Calculated Water Depth (W_D) = D - D_{TW}

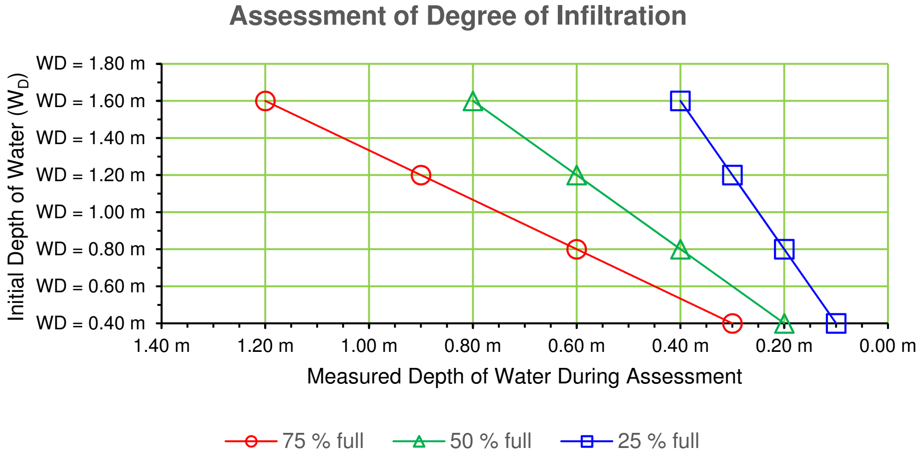
Maximum Fill Volume (V_W) = W_D x B x L

Corrected Water Volume (V_{WC}) = V_W x Gravel Porosity (P_t)

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		**W_D**		**W_D**	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						

SITE OBSERVATIONS - VOLUME LOSS

Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.



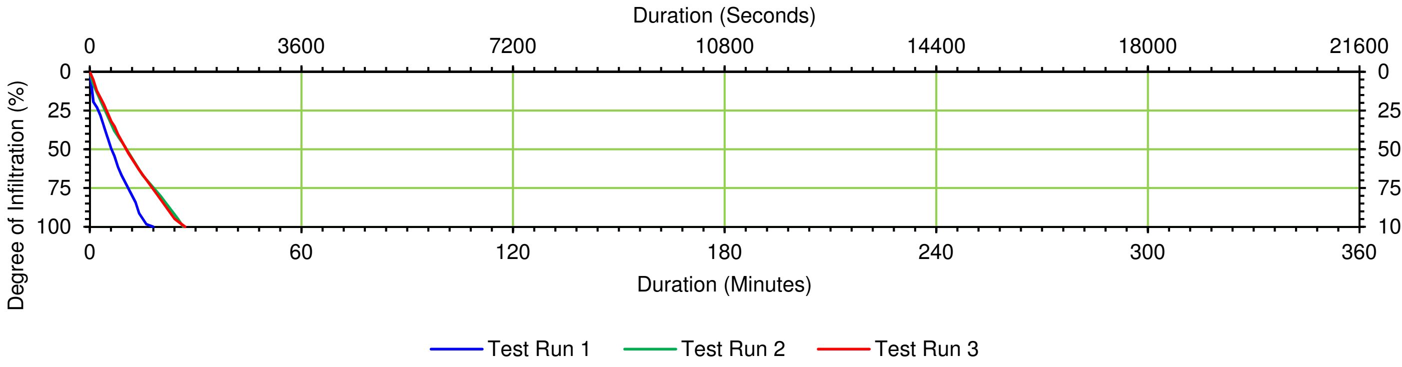
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA07 **Date of start** 16.12.16 **Date at end** 16.12.16

Test Run 1		**Test Run 2**		**Test Run 3**	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	1.600m	Trial Pit Length (L)	1.600m	Trial Pit Length (L)	1.600m
Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)	0.600m
Effective Depth (D)	0.900m	Effective Depth (D)	0.900m	Effective Depth (D)	0.890m
Time at Start of Filling	9.01	Time at Start of Filling	11.27	Time at Start of Filling	14.33
Time at End of Filling	9.03	Time at End of Filling	11.31	Time at End of Filling	14.36
Depth from Surface to Water (D_{TW})	0.330m	Depth below Surface to Water (D_{TW})	0.300m	Depth below Surface to Water (D_{TW})	0.320m
Water Depth (W_D)	0.570m	Water Depth (W_D)	0.600m	Water Depth (W_D)	0.570m
Maximum Fill Volume (V_W)	0.547m^3	Maximum Fill Volume (V_W)	0.576m^3	Maximum Fill Volume (V_W)	0.547m^3
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.547m^3	Corrected Water Volume (V_{WC})	0.576m^3	Corrected Water Volume (V_{WC})	0.547m^3

Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	9.030	0.330	0	1	11.310	0.300	0	1	14.360	0.320	0
1	9.040	0.440	60	1	11.320	0.350	60	1	14.370	0.350	60
1	9.050	0.460	120	1	11.340	0.410	180	1	14.380	0.390	120
1	9.060	0.490	180	1	11.350	0.440	240	1	14.400	0.440	240
1	9.070	0.530	240	1	11.360	0.470	300	1	14.410	0.470	300
1	9.080	0.570	300	1	11.370	0.500	360	1	14.420	0.500	360
1	9.090	0.610	360	1	11.380	0.530	420	1	14.430	0.520	420
1	9.100	0.640	420	1	11.390	0.550	480	1	14.440	0.550	480
1	9.110	0.680	480	1	11.400	0.570	540	1	14.470	0.620	660
1	9.120	0.710	540	1	11.410	0.590	600	1	14.500	0.680	840
1	9.160	0.810	780	1	11.460	0.700	900	1	14.550	0.770	1140
1	9.170	0.850	840	1	11.510	0.780	1200	1	15.000	0.860	1440
1	9.190	0.890	960	1	11.560	0.870	1500	1	15.030	0.890	1620
1	9.210	0.900	1080	1	11.575	0.900	1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620
			1080				1590				1620

25% water loss (75% full)	0.473m	**25% water loss (75% full)**	0.450m	**25% water loss (75% full)**	0.463m
50% water loss (50% full)	0.615m	**50% water loss (50% full)**	0.600m	**50% water loss (50% full)**	0.605m
75% water loss (25% full)	0.758m	**75% water loss (25% full)**	0.750m	**75% water loss (25% full)**	0.748m
25% time (seconds)	145 sec	**25% time (seconds)**	260 sec	**25% time (seconds)**	285 sec
75% time (seconds)	654 sec	**75% time (seconds)**	1088 sec	**75% time (seconds)**	1065 sec
Vp 75-25	0.274m^3	**Vp 75-25**	0.288m^3	**Vp 75-25**	0.274m^3
ap 50 (Actual area from test)	2.214m^3	**ap 50 (Actual area from test)**	2.280m^3	**ap 50 (Actual area from test)**	2.214m^3
tp 75 - 25	509 sec	**tp 75 - 25**	828 sec	**tp 75 - 25**	780 sec
Soil Infiltration Rate	**2.43E-04m/s**	**Soil Infiltration Rate**	**1.53E-04m/s**	**Soil Infiltration Rate**	**1.58E-04m/s**



1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

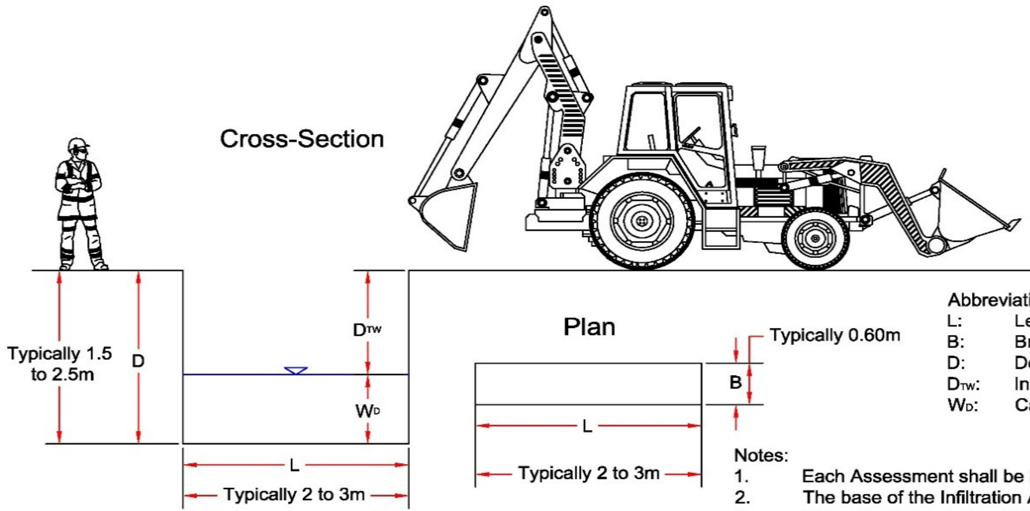
Site: Wykham Park Farm C-04582-C

Client: Gallagher Estates

Test Location SA08 **Date of start** 16.12.16 **Date at end** 16.12.16

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Notes:

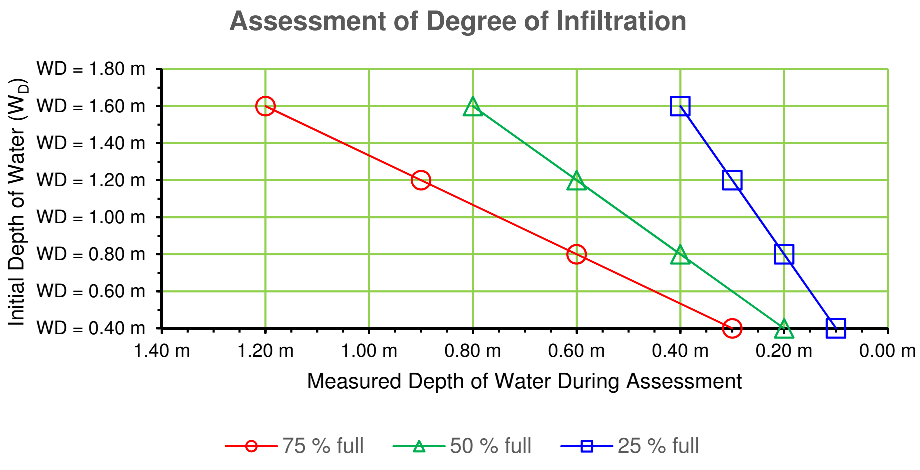
1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Calculated Water Depth (W_D) = D - D_{TW}

Maximum Fill Volume (V_w) = W_D x B x L

Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (*P_t*)

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		**W_D**		**W_D**	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						

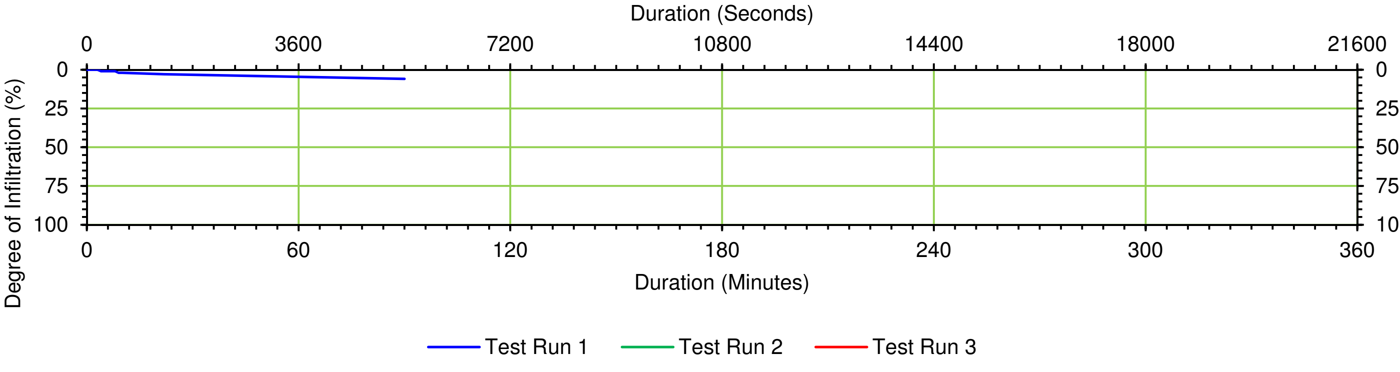


SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA08 **Date of start** 16.12.16 **Date at end** 16.12.16

Test Run 1				Test Run 2				Test Run 3			
Pit Dimensions (m)				Pit Dimensions (m)				Pit Dimensions (m)			
Trial Pit Length (L)			1.600m	Trial Pit Length (L)				Trial Pit Length (L)			
Trial Pit Breadth / Width (B)			0.600m	Trial Pit Breadth / Width (B)				Trial Pit Breadth / Width (B)			
Effective Depth (D)			2.250m	Effective Depth (D)				Effective Depth (D)			
Time at Start of Filling			10.27	Time at Start of Filling				Time at Start of Filling			
Time at End of Filling			10.31	Time at End of Filling				Time at End of Filling			
Depth from Surface to Water (D_{TW})			1.230m	Depth below Surface to Water (D_{TW})				Depth below Surface to Water (D_{TW})			
Water Depth (W_D)			1.020m	Water Depth (W_D)			-	Water Depth (W_D)			-
Maximum Fill Volume (V_W)			0.979m^3	Maximum Fill Volume (V_W)			-	Maximum Fill Volume (V_W)			-
Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No	Gravel used to backfill Test Pit			No
Porosity of Gravel Backfill (P_t)				Porosity of Gravel Backfill (P_t)				Porosity of Gravel Backfill (P_t)			
Corrected Water Volume (V_{WC})			0.979m^3	Corrected Water Volume (V_{WC})			-	Corrected Water Volume (V_{WC})			-
Time to soakaway				Time to soakaway				Time to soakaway			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	10.310	1.230	0								
1	10.320	1.230	60								
1	10.330	1.230	120								
1	10.340	1.230	180								
1	10.350	1.240	240								
1	10.360	1.240	300								
1	10.370	1.240	360								
1	10.380	1.240	420								
1	10.390	1.240	480								
1	10.400	1.250	540								
1	10.410	1.250	600								
1	10.530	1.260	1320								
1	12.010	1.290	5400								
			5400								
			5400								
			5400								
			5400								
			5400								
			5400								
			5400								
			5400								
			5400								
			5400								
25% water loss (75% full)			1.485m	**25% water loss (75% full)**			-	**25% water loss (75% full)**			-
50% water loss (50% full)			1.740m	**50% water loss (50% full)**			-	**50% water loss (50% full)**			-
75% water loss (25% full)			1.995m	**75% water loss (25% full)**			-	**75% water loss (25% full)**			-
25% time (seconds)			-	**25% time (seconds)**			-	**25% time (seconds)**			-
75% time (seconds)			-	**75% time (seconds)**			-	**75% time (seconds)**			-
Vp 75-25			0.490m^3	**Vp 75-25**			-	**Vp 75-25**			-
ap 50 (Actual area from test)			3.204m^3	**ap 50 (Actual area from test)**			-	**ap 50 (Actual area from test)**			-
tp 75 - 25				**tp 75 - 25**				**tp 75 - 25**			
Soil Infiltration Rate		-		**Soil Infiltration Rate**		-		**Soil Infiltration Rate**		-	



1 DAY INFILTRATION ASSESSMENT - AIDE MEMOIR

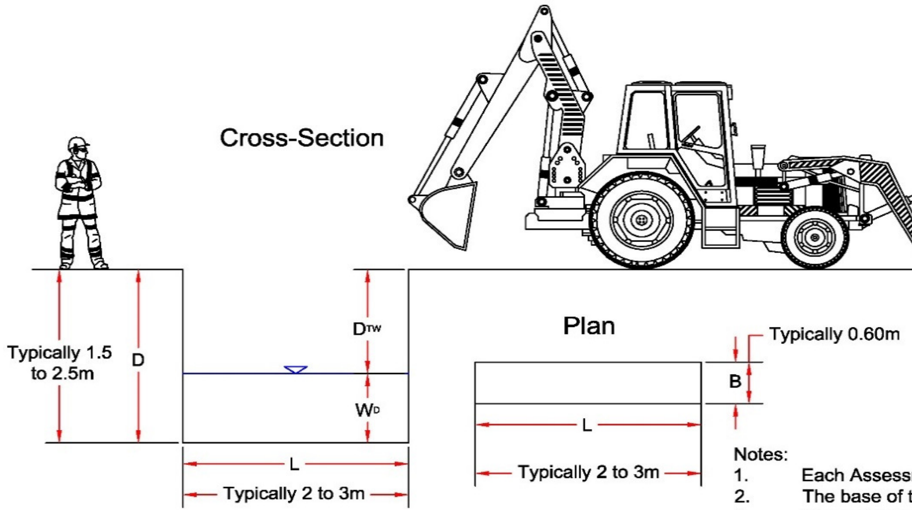
Site: Wykham Park Farm C-04582-C

Client: Gallagher Estates

Test Location SA09 **Date of start** 16.12.16 **Date at end** 16.12.16

ANTICIPATED GROUND PROFILE FROM DESK STUDY	ACTUAL GROUND PROFILE FROM EXCAVATION
GROUND LEVEL	GROUND LEVEL
BASE OF PIT	BASE OF PIT

INFILTRATION ASSESSMENT PIT TYPICAL DIMENSIONS



ACTUAL DIMENSIONS			
L			
B			
D			
D_{TW}			
W_D			

Abbreviations:

L:	Length of Infiltration Assessment Pit.
B:	Breadth / Width of Infiltration Assessment Pit.
D:	Depth of Infiltration Assessment Pit.
D_{TW}:	Initial Depth to Top of Water.
W_D:	Calculated Water Depth.

Calculated Water Depth (W_D) = D - D_{TW}

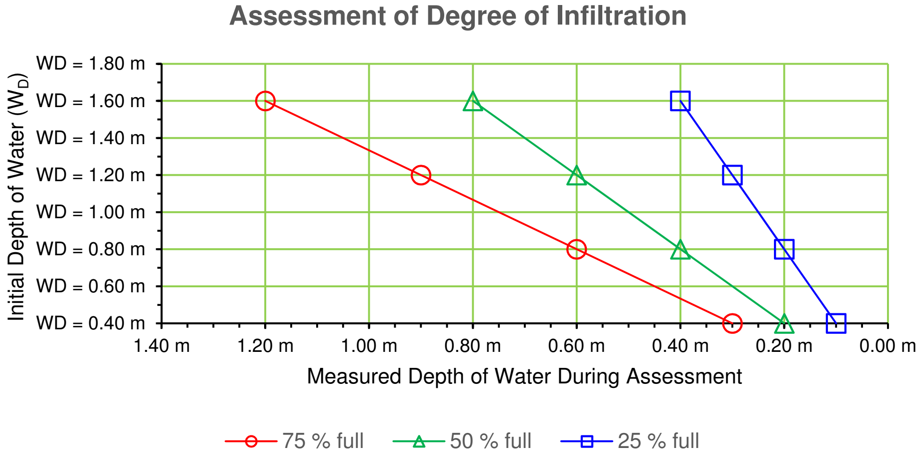
Maximum Fill Volume (V_w) = W_D x B x L

Corrected Water Volume (V_{wc}) = V_w x Gravel Porosity (P_t)

Notes:

1. Each Assessment shall be limited to a single stratum.
2. The base of the Infiltration Assessment Pit shall be below all Made Ground,
3. The water level shall not be raised above the base of the Made Ground.
4. The base of the Infiltration Assessment Pit shall be at least 1m into the stratum which is to be assessed.
5. The base of the Infiltration Assessment Pit shall be above the Water Table.
6. Minimum target depth of water of 1.0m.
7. Where any of the above conditions cannot be met, it shall be reported immediately to the Project Manager for additional guidance before the test is commenced.

Infiltration	RUN 1		RUN 2		RUN 3	
	W_D		W_D		W_D	
	W_{D1}	D_{TW1}	W_{D2}	D_{TW2}	W_{D3}	D_{TW3}
75% full						
25% full						



SITE OBSERVATIONS - VOLUME LOSS		
Test Run	Infiltration Records up to 6 Hours	Comments
1	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 2
2	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Refer to results of Run 3
3	<25%	Unlikely without significant attenuation
	<75%	Requires additional BRE DG365 testing
	>75%	Indicative Infiltration Rate achieved.

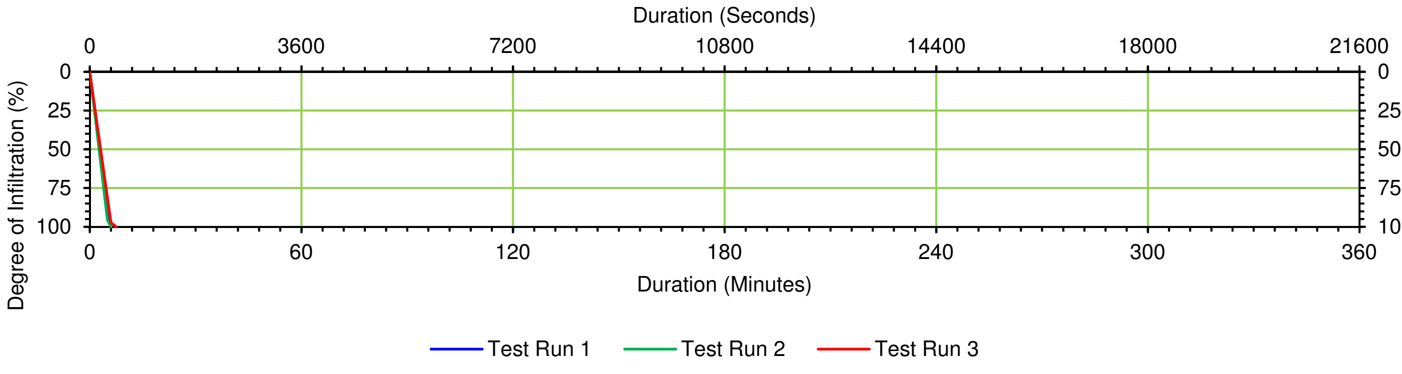
1 DAY INFILTRATION ASSESSMENT - WORKSHEET

Site: Wykham Park Farm C-04582-C
Client: Gallagher Estates
Test Location SA09 **Date of start** 16.12.16 **Date at end** 16.12.16

Test Run 1		**Test Run 2**		**Test Run 3**	
Pit Dimensions (m)		**Pit Dimensions (m)**		**Pit Dimensions (m)**	
Trial Pit Length (L)	1.400m	Trial Pit Length (L)	1.400m	Trial Pit Length (L)	1.400m
Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)	0.600m	Trial Pit Breadth / Width (B)	0.600m
Effective Depth (D)	1.700m	Effective Depth (D)	1.630m	Effective Depth (D)	1.630m
Time at Start of Filling	12.31	Time at Start of Filling	13.15	Time at Start of Filling	13.52
Time at End of Filling	12.31	Time at End of Filling	13.15	Time at End of Filling	13.52
Depth from Surface to Water (D_{TW})	0.570m	Depth below Surface to Water (D_{TW})	0.500m	Depth below Surface to Water (D_{TW})	0.500m
Water Depth (W_D)	1.130m	Water Depth (W_D)	1.130m	Water Depth (W_D)	1.130m
Maximum Fill Volume (V_W)	0.949m³	Maximum Fill Volume (V_W)	0.949m³	Maximum Fill Volume (V_W)	0.949m³
Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No	Gravel used to backfill Test Pit	No
Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)		Porosity of Gravel Backfill (P_t)	
Corrected Water Volume (V_{WC})	0.949m³	Corrected Water Volume (V_{WC})	0.949m³	Corrected Water Volume (V_{WC})	0.949m³

Time to soakaway				**Time to soakaway**				**Time to soakaway**			
Time		Depth to water	Duration	Time		Depth to water	Duration	Time		Depth to water	Duration
Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds	Day	Time	(m bgl)	Seconds
1	12.310	0.570	0	1	13.150	0.500	0	1	13.520	0.500	0
1	12.360	1.520	300	1	13.200	1.580	300	1	13.580	1.600	360
1	12.370	1.700	360	1	13.210	1.630	360	1	13.595	1.630	450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450
			360				360				450

25% water loss (75% full)	0.853m	**25% water loss (75% full)**	0.783m	**25% water loss (75% full)**	0.783m
50% water loss (50% full)	1.135m	**50% water loss (50% full)**	1.065m	**50% water loss (50% full)**	1.065m
75% water loss (25% full)	1.418m	**75% water loss (25% full)**	1.348m	**75% water loss (25% full)**	1.348m
25% time (seconds)	89 sec	**25% time (seconds)**	78 sec	**25% time (seconds)**	92 sec
75% time (seconds)	268 sec	**75% time (seconds)**	235 sec	**75% time (seconds)**	277 sec
Vp 75-25	0.475m³	**Vp 75-25**	0.475m³	**Vp 75-25**	0.475m³
ap 50 (Actual area from test)	3.100m³	**ap 50 (Actual area from test)**	3.100m³	**ap 50 (Actual area from test)**	3.100m³
tp 75 - 25	178 sec	**tp 75 - 25**	157 sec	**tp 75 - 25**	185 sec
Soil Infiltration Rate	**8.58E-04m/s**	**Soil Infiltration Rate**	**9.75E-04m/s**	**Soil Infiltration Rate**	**8.28E-04m/s**



STRUCTURAL SOILS LTD

INSITU TESTING REPORT

1774

Report No. 747025R.01(00)

Date	04-January-2017	Contract	Wykham Ln, Banbury

Client Hydrock Contracting Limited
Address Over Court Barns
Over Lane
Almondsbury
Bristol
BS32 4DF
For the Attention of Justin Morton

Order received	09-December-2016	Client Reference	None
Testing Started	14-December-2017	Client Order No.	POP002529
Testing Completed	20-December-2017	Instruction Type	Written

Tests marked 'Not UKAS Accredited' in this report are not included in the UKAS Accreditation Schedule for our Laboratory.

UKAS Accredited Tests

36no. Insitu CBR tests carried out at locations specified by client.

Not UKAS Accredited Tests

The results represent the ground conditions at the specified locations and depths at the time of testing.

Please Note: Remaining samples will be retained for a period of one month from today and will then be disposed of.
Test were undertaken on samples 'as received' unless otherwise stated.
Opinions and interpretations expressed in this report are outside the scope of accreditation for this laboratory.

TESTING VERIFICATION CERTIFICATE

UKAS
TESTING
1774

The test results included in this report are certified as:-

ISSUE STATUS: **FINAL**

In accordance with the Structural Soils Ltd Laboratory Quality Management System, results sheets and summaries of results issued by the laboratory are checked by an approved signatory. The integrity of the test data and results are ensured by control of the computer system employed by the laboratory as part of the Software Verification Program as detailed in the Laboratory Quality Manual.

This testing verification certificate covers all testing compiled on or before the following datetime: **04/01/2017 08:19:00**.

Testing reported after this date is not covered by this Verification Certificate.

[redacted]

Approved Signatory
Steven Philp (Laboratory/ Site Technician)

(Head Office)
Bristol Laboratory
Unit 1A, Princess Street
Bedminster
Bristol
BS3 4AG

Castleford Laboratory
The Potteries, Pottery Street
Castleford
West Yorkshire
WF10 1NJ

Hemel Laboratory
18 Frogmore Road
Hemel Hempstead
Hertfordshire
HP3 9RT

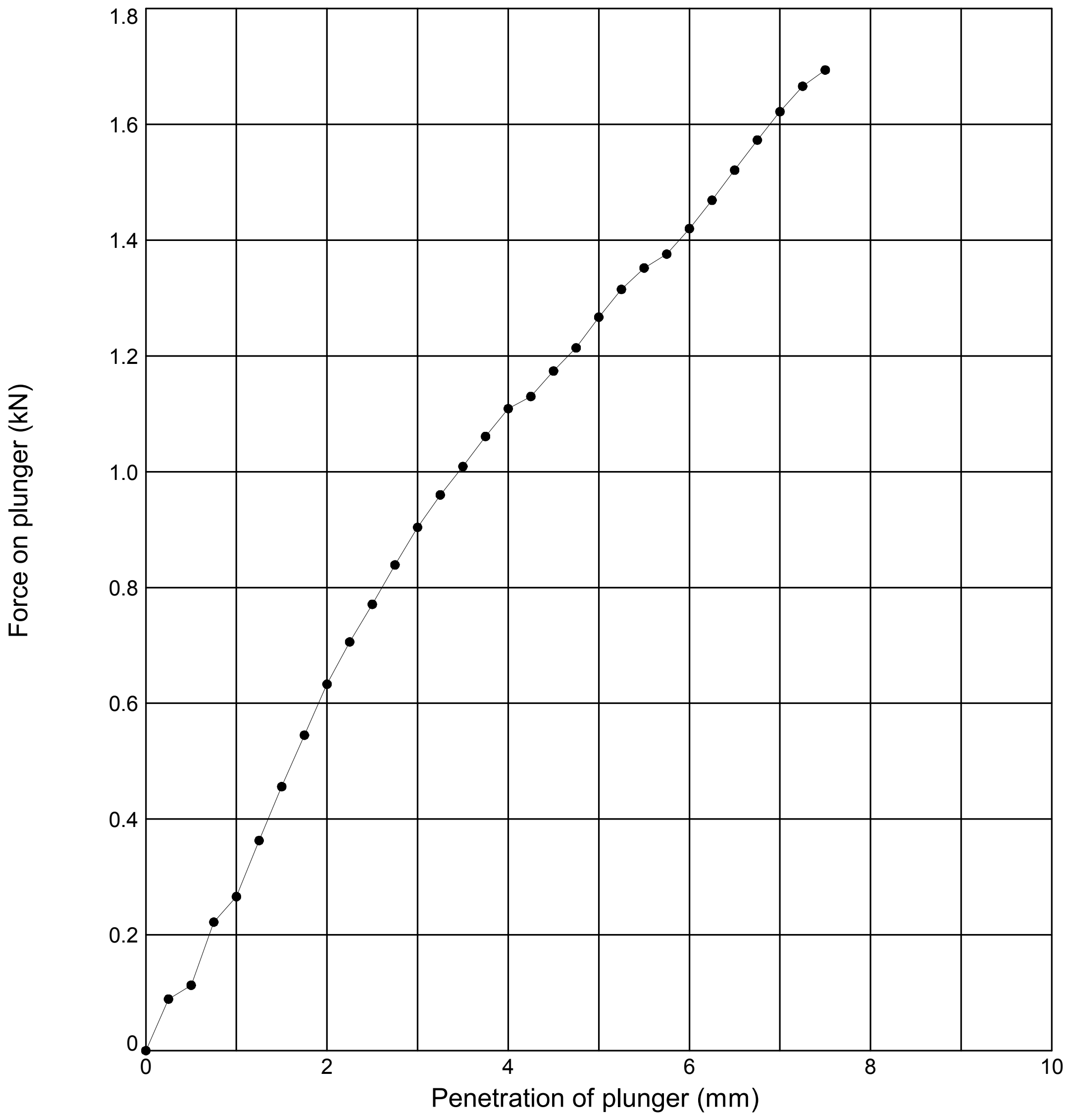
Tonbridge Laboratory
Anerley Court, Half Moon Lane
Hildenborough
Tonbridge
TN11 9HU

STRUCTURAL SOILS LTD	Contract: **Wykham Ln, Banbury**	Job No: **747025** AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR1A** Depth (m): **0.25** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **10**	CBR Value (%) : **6.3** Moisture Content (%) : **29**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

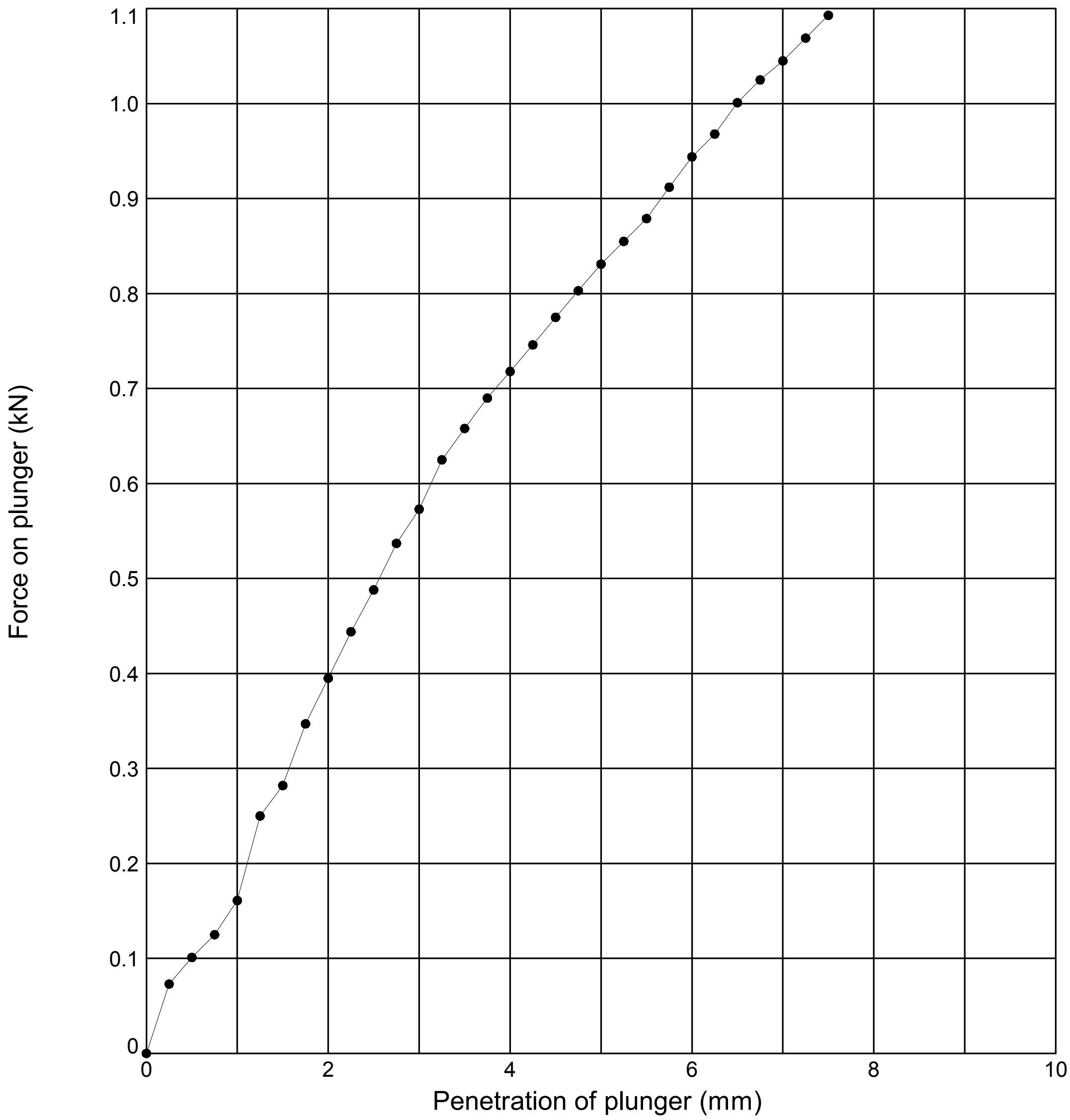
AGS

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR1B** Depth (m): **0.70** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **10**	CBR Value (%) : **4.2** Moisture Content (%) : **31**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract

Wykham Ln, Banbury

Contract Ref:

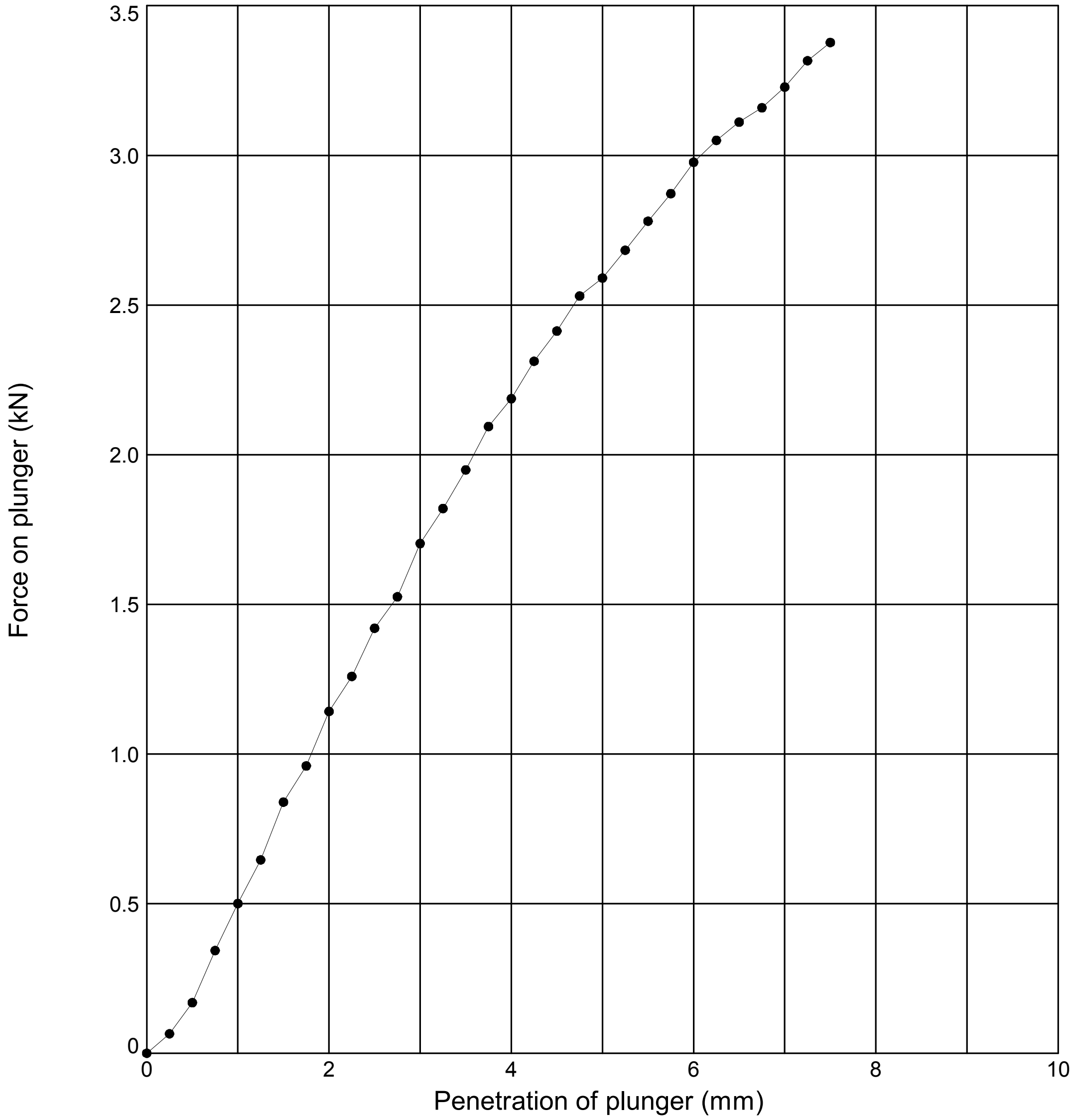
747025

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR2A** Depth (m): **0.35** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **13** Moisture Content (%) : **27**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

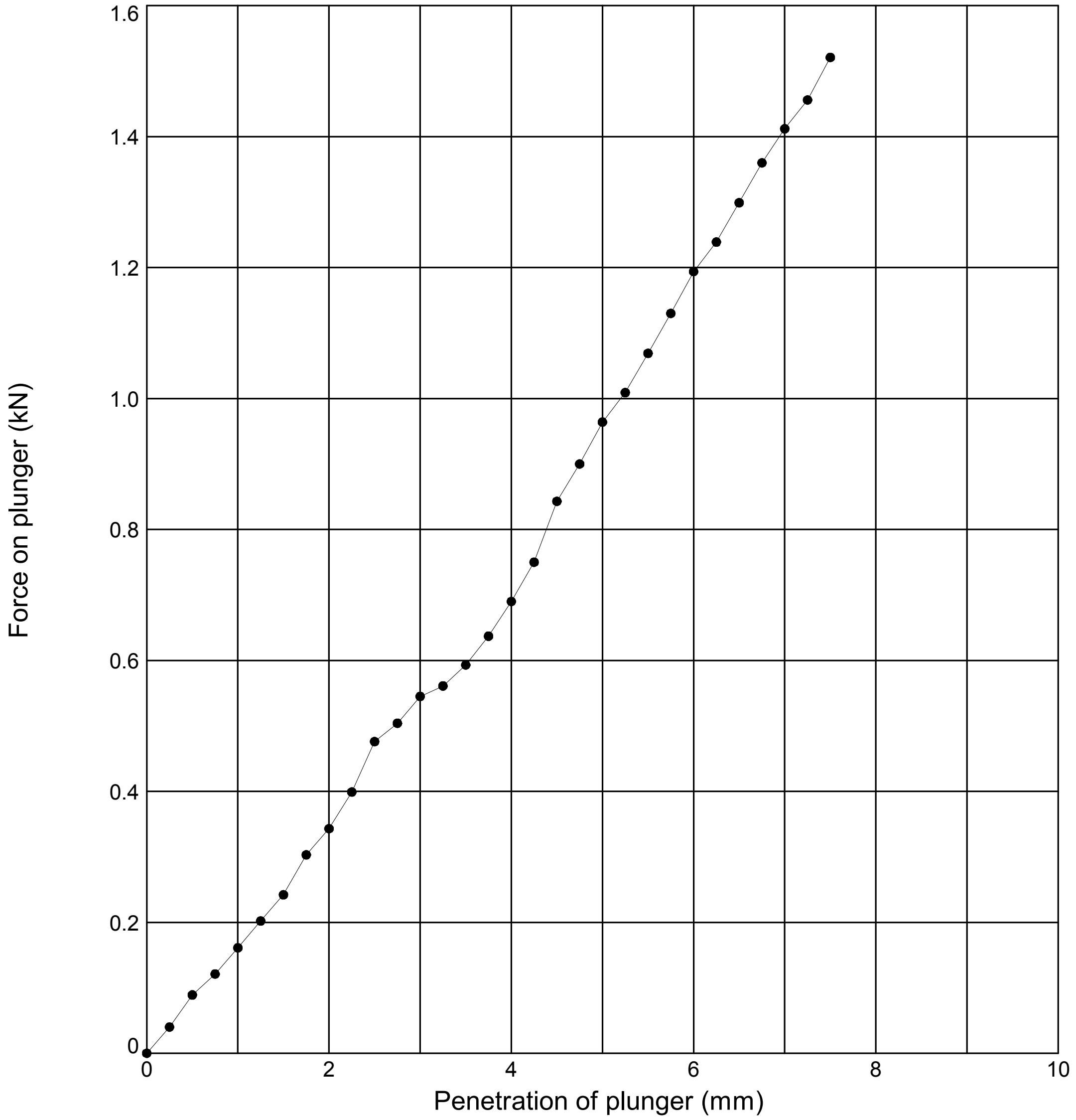
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk, | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR2B** Depth (m): **0.65** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **10**	CBR Value (%) : **4.8** Moisture Content (%) : **32**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

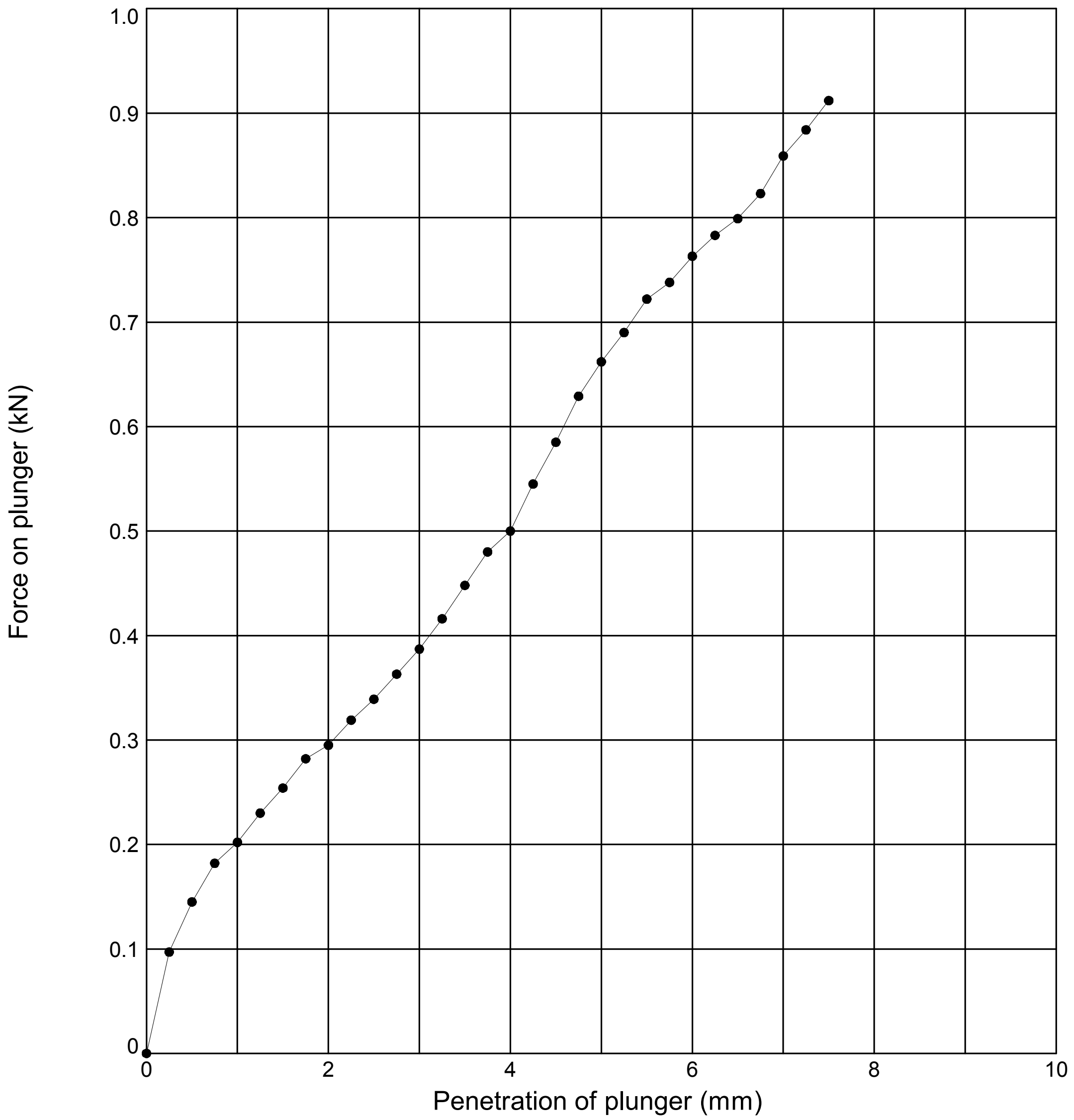
Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR3A** Depth (m): **0.20** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^oC) : **10**	CBR Value (%) : **3.3** Moisture Content (%) : **30**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

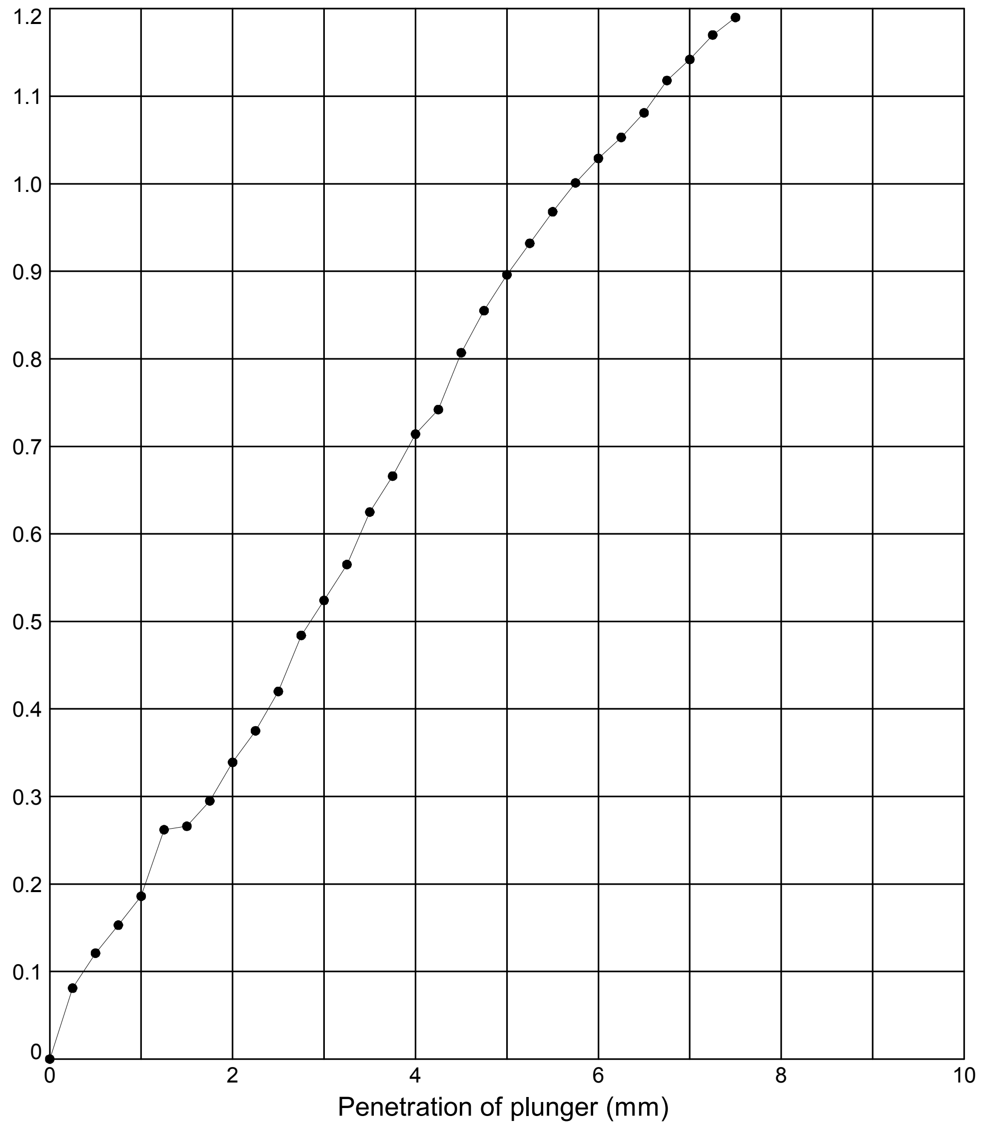
Contract
Wykham Ln, Banbury

Contract Ref:
747025

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR3B** Depth (m): **0.70** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^oC) : **10**	CBR Value (%) : **4.5** Moisture Content (%) : **29**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

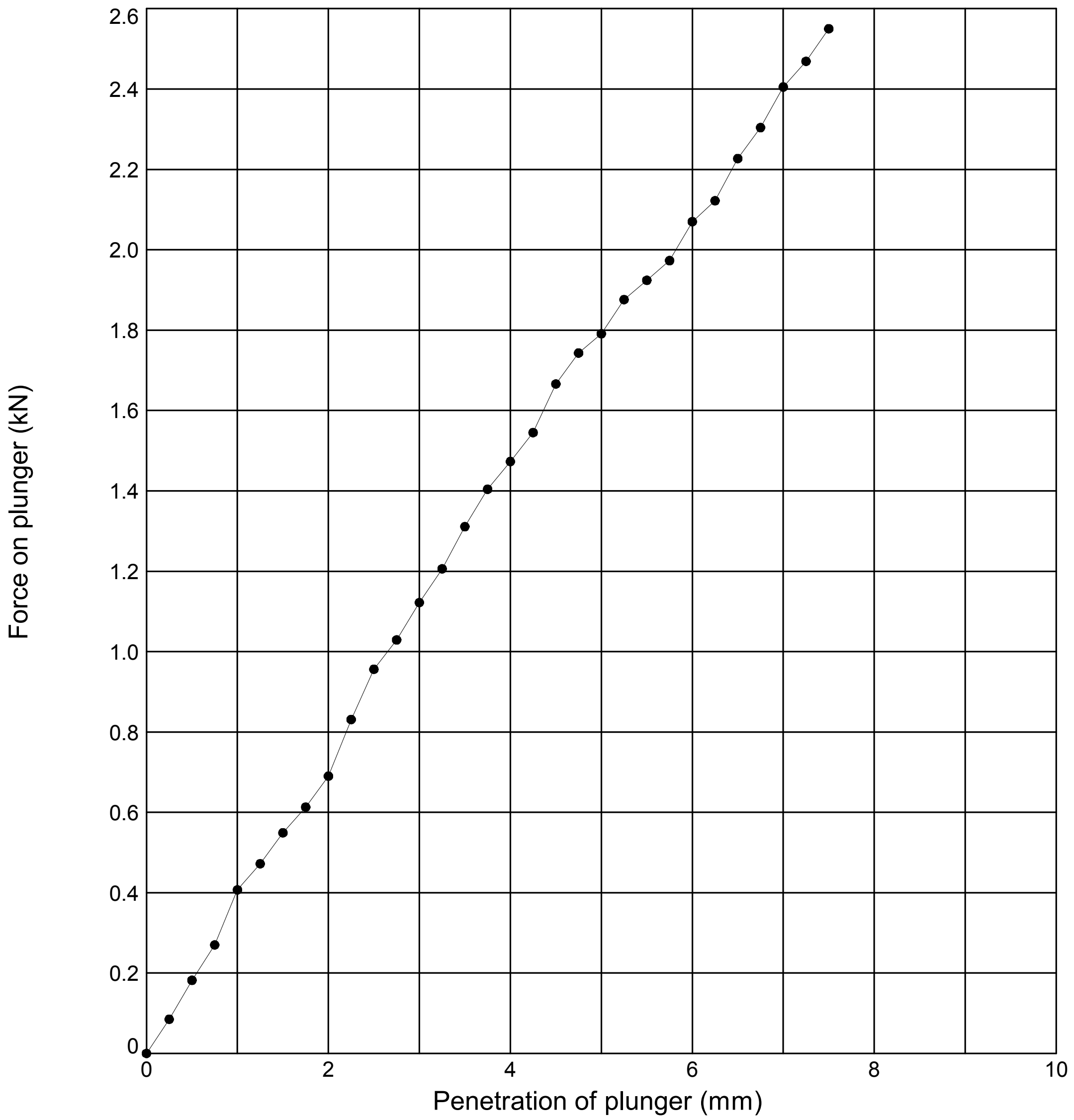
Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR4A** Depth (m): **0.25** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **9.0** Moisture Content (%) : **33**

Sample Description	Test Notes
Brown slightly clayey GRAVEL	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract
Wykham Ln, Banbury

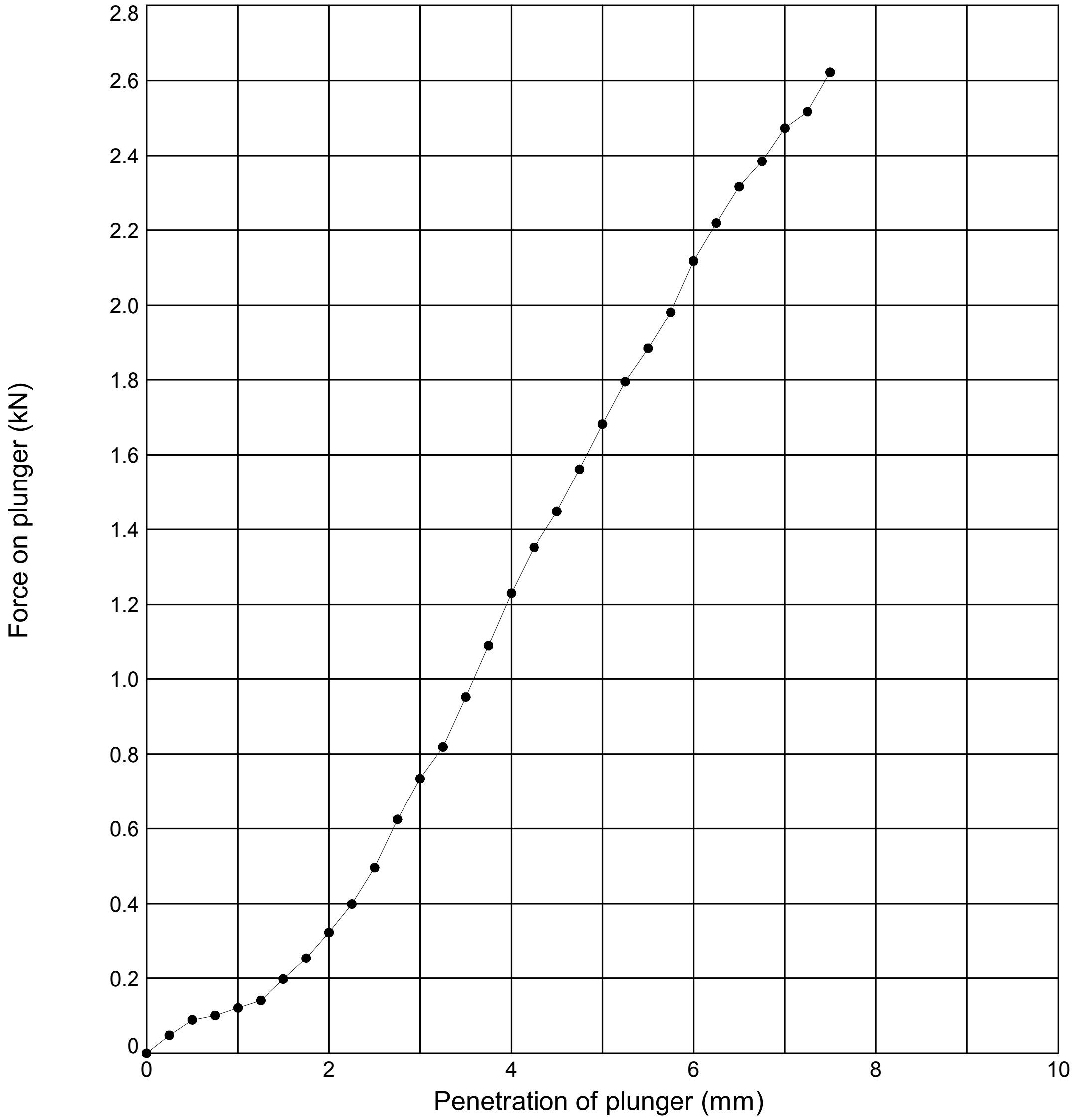
Contract Ref:
747025

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR4B** Depth (m): **0.60** Date: **16/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **8.4** Moisture Content (%) : **41**

Sample Description	Test Notes
Brown slightly clayey GRAVEL	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract

Wykham Ln, Banbury

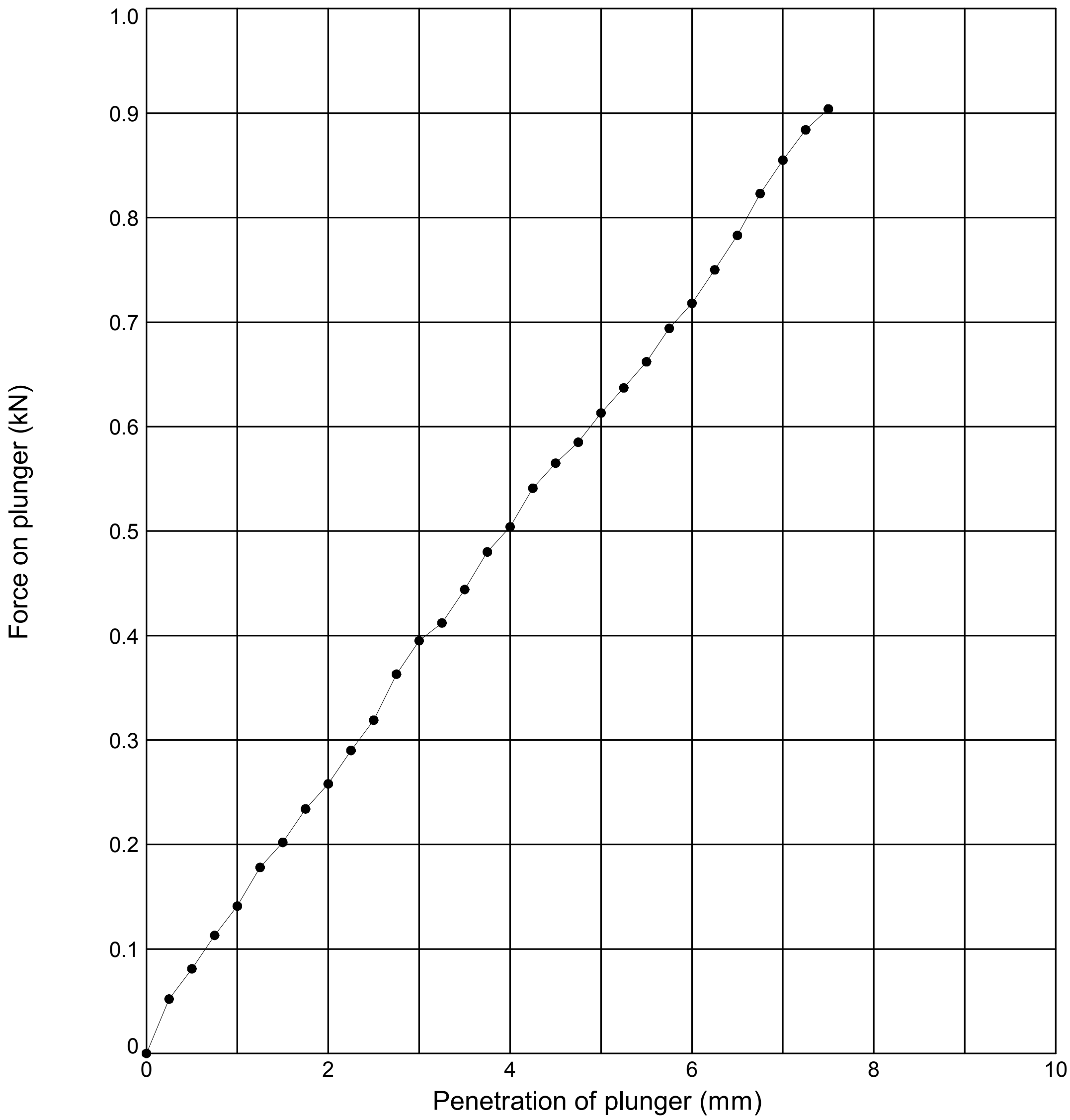
Contract Ref:

747025

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR5A** Depth (m): **0.30** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **3.1** Moisture Content (%) : **24**

Sample Description	Test Notes
Light greyish brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

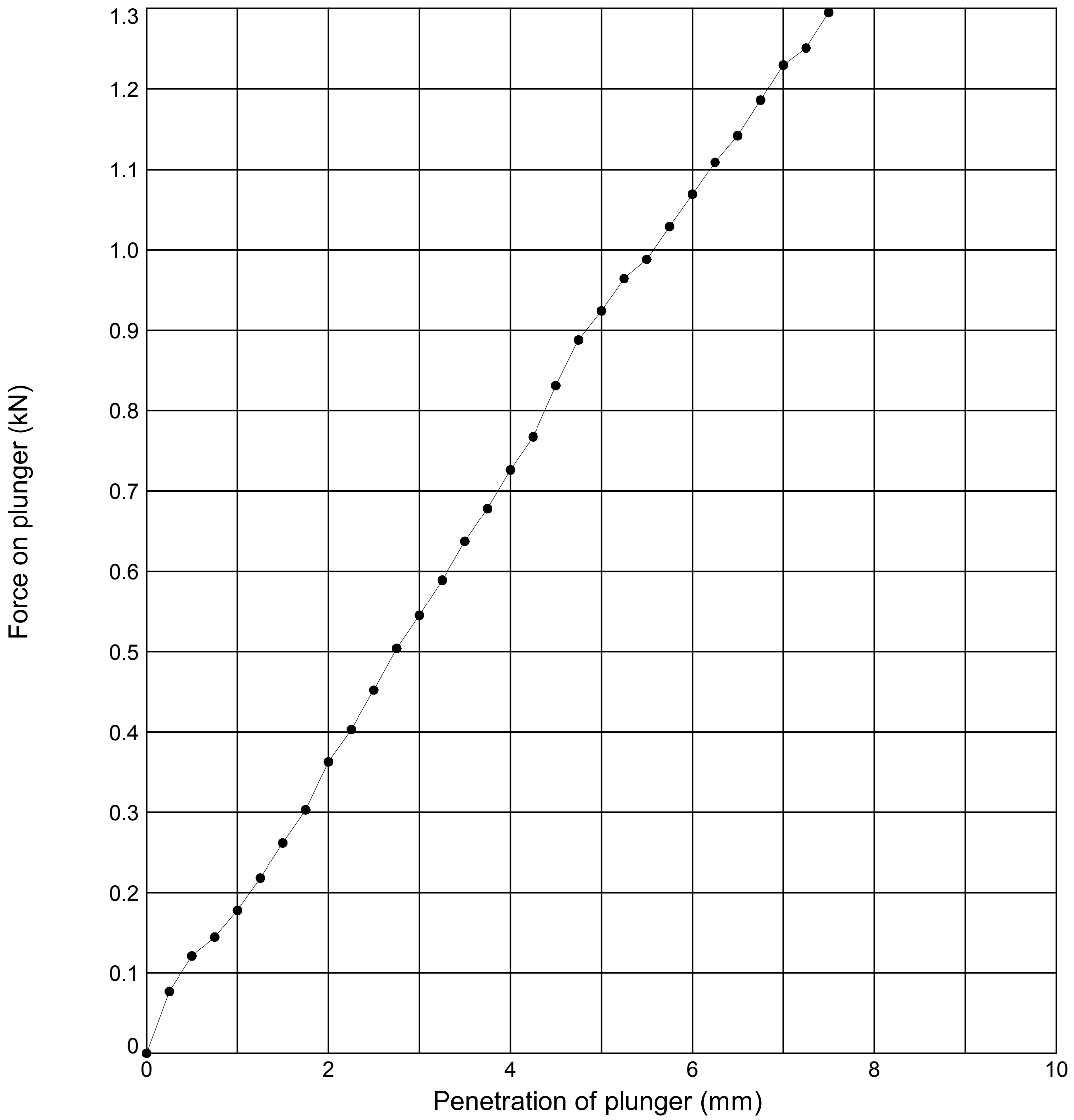
AGS

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06. Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR5B** Depth (m): **0.55** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **9**	CBR Value (%) : **4.6** Moisture Content (%) : **28**

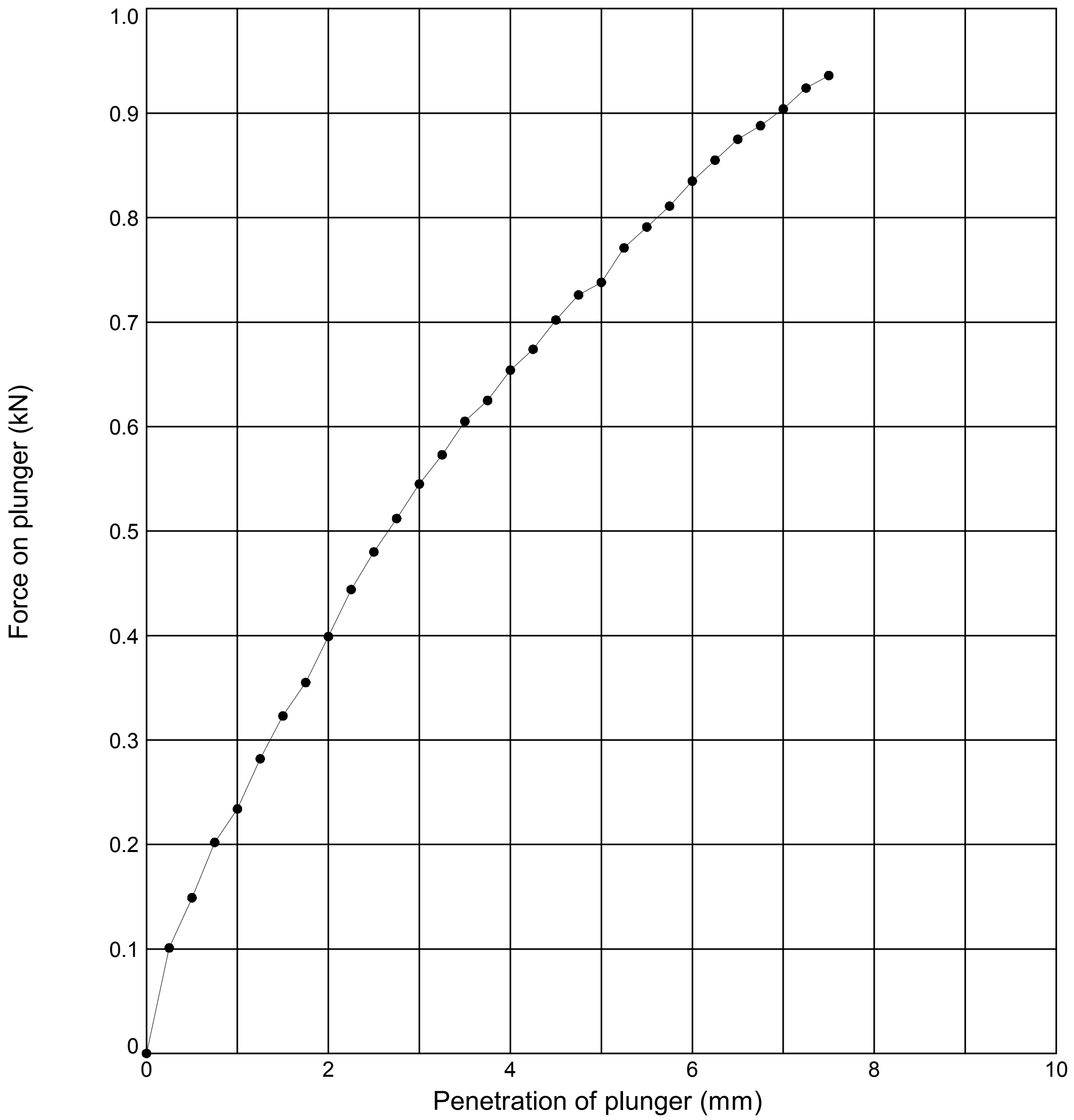
Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Compiled By		Date
	[redacted]	**MICHAEL STROWGER**	**03/01/17**
	Contract **Wykham Ln, Banbury**	Contract Ref: **747025**	AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR6A** Depth (m): **0.20** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **3.7** Moisture Content (%) : **31**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

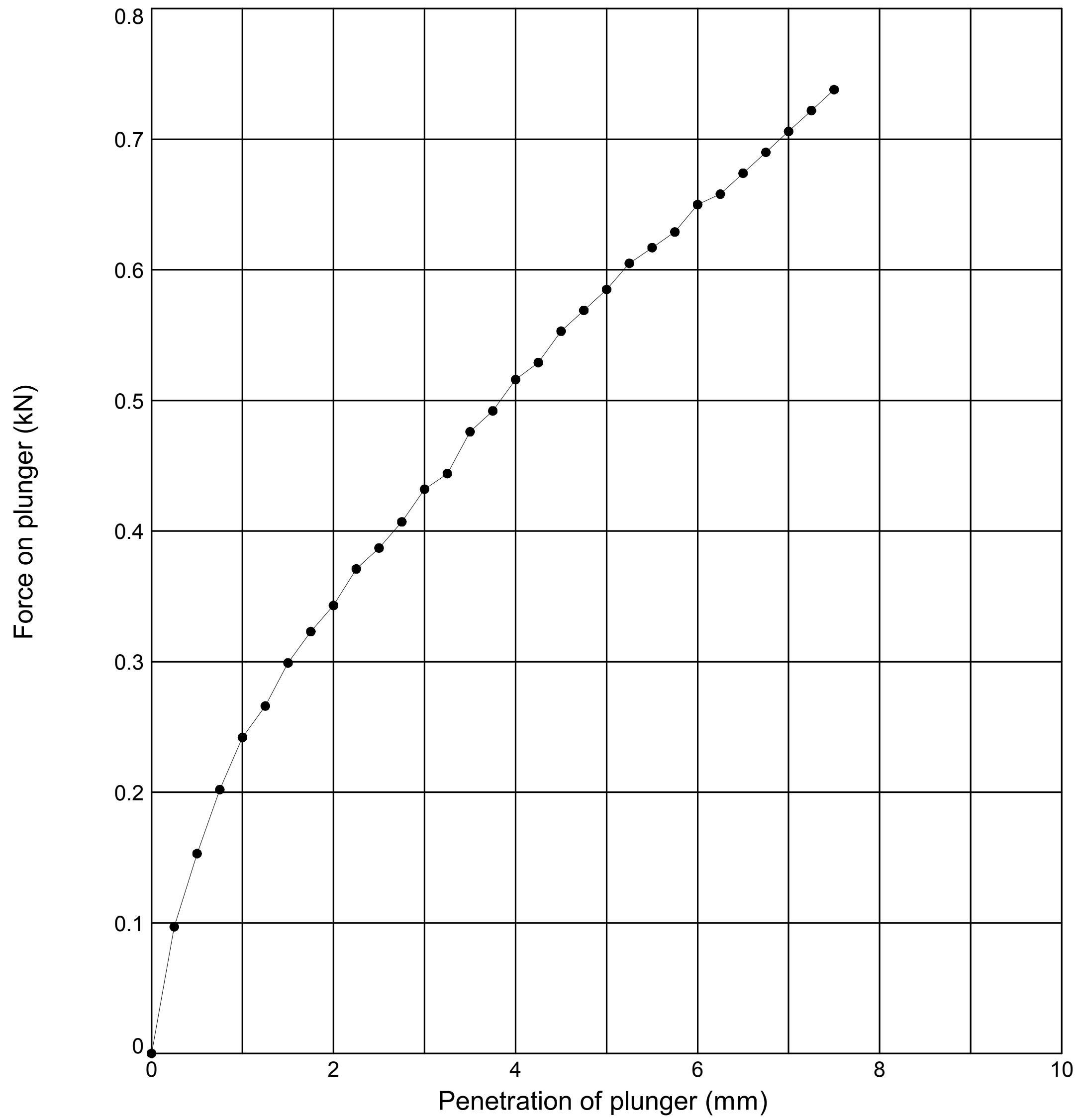
Contract
Wykham Ln, Banbury

Contract Ref:
747025

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR6B** Depth (m): **0.60** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **8**	CBR Value (%) : **2.9** Moisture Content (%) : **30**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

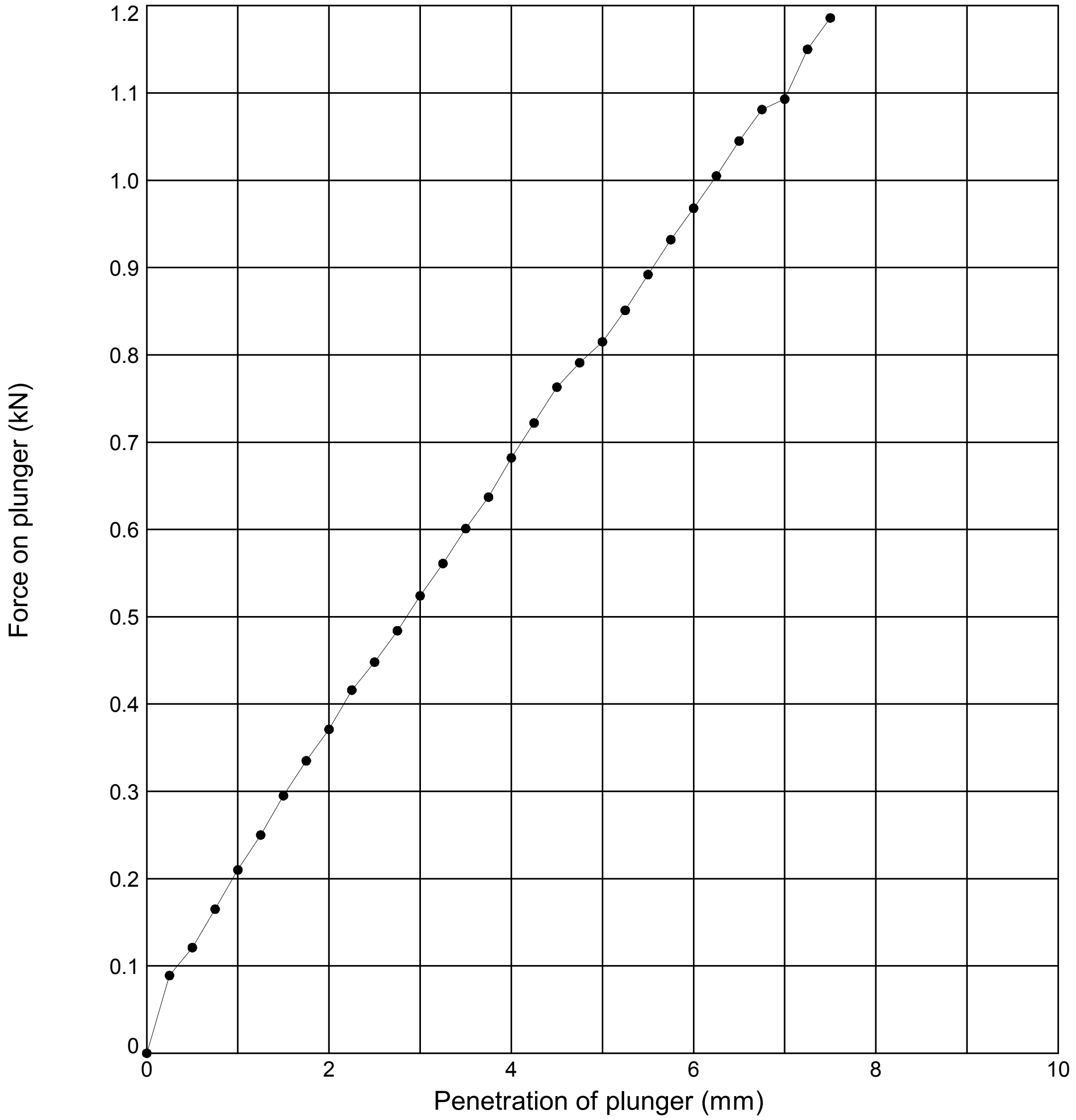
AGS

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk, | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR7A** Depth (m): **0.30** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **8**	CBR Value (%) : **4.1** Moisture Content (%) : **28**

Sample Description	Test Notes
Brown slightly sandy CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

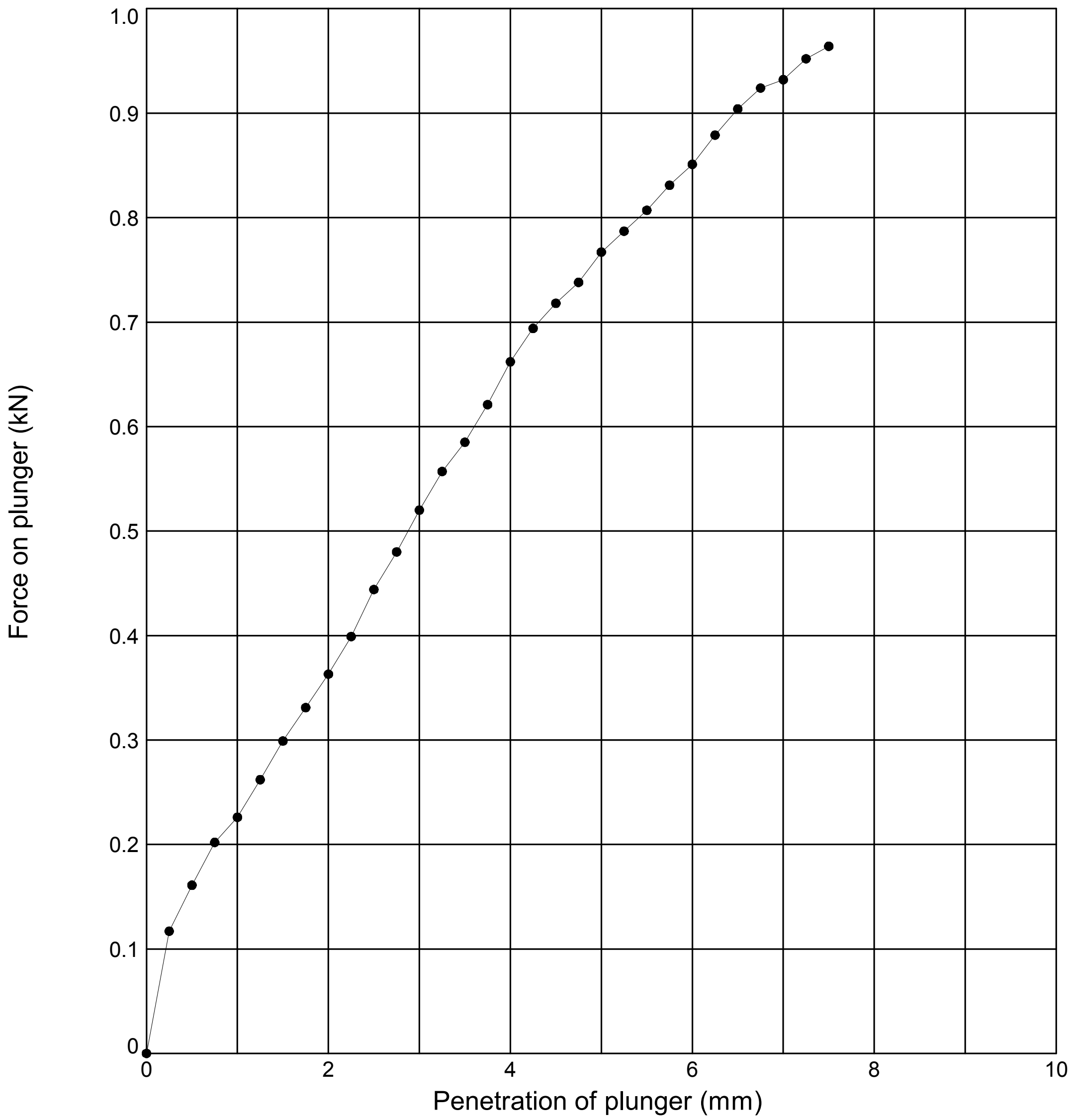
Contract: **Wykham Ln, Banbury**

Contract Ref: **747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR7B** Depth (m): **0.75** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **9**	CBR Value (%) : **3.8** Moisture Content (%) : **34**

Sample Description	Test Notes
Brown slightly sandy CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract

Wykham Ln, Banbury

Contract Ref:

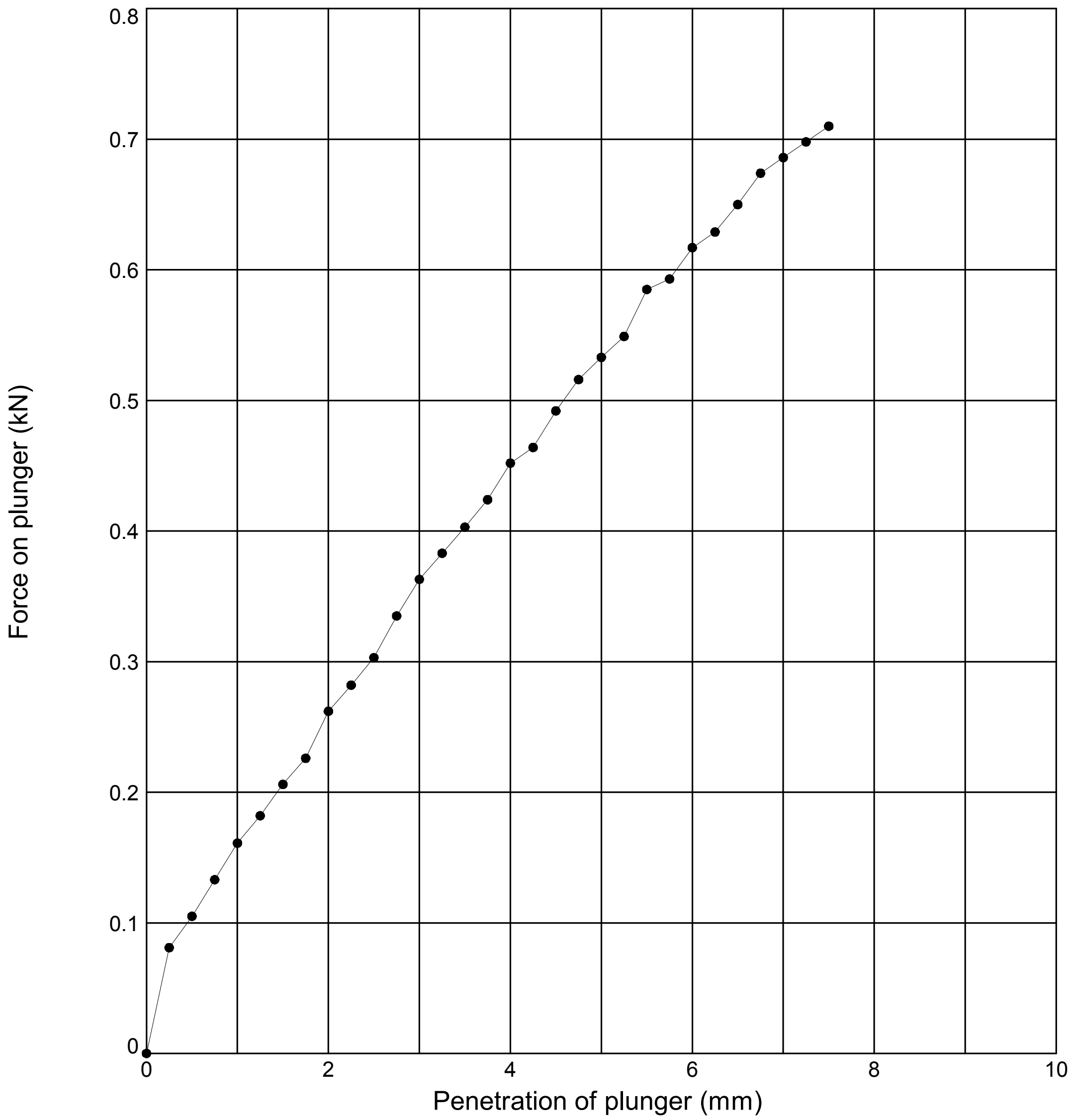
747025

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR8A** Depth (m): **0.25** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **8**	CBR Value (%) : **2.7** Moisture Content (%) : **34**

Sample Description	Test Notes
Brown slightly sandy CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contrac

Wykham Ln, Banbury

Contract Ref:

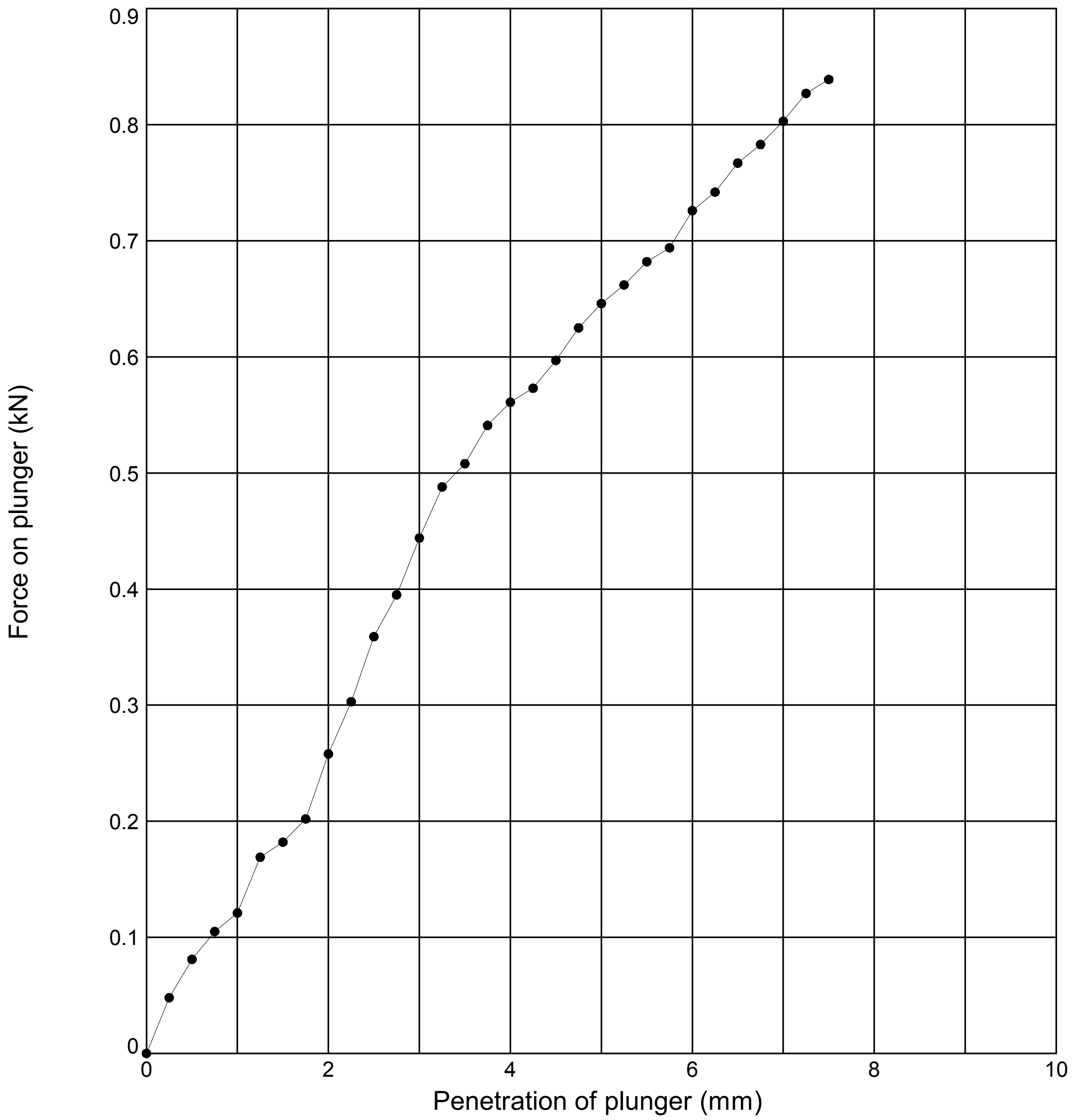
747025

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR8B** Depth (m): **0.55** Date: **15/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **3.2** Moisture Content (%) : **29**

Sample Description	Test Notes
Light brown mottled grey slightly sandy CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

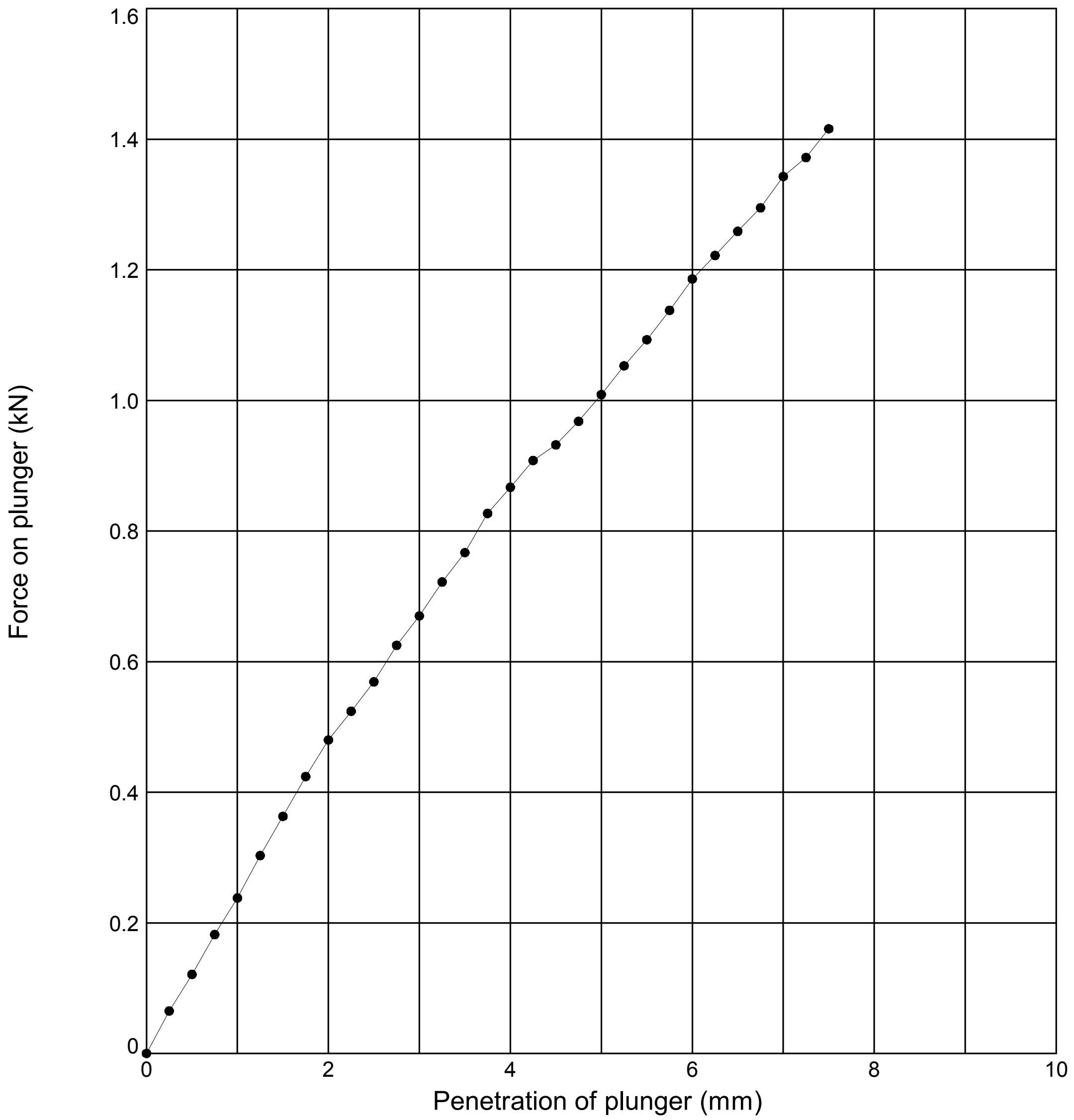
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR9A** Depth (m): **0.20** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **10**	CBR Value (%) : **5.0** Moisture Content (%) : **29**

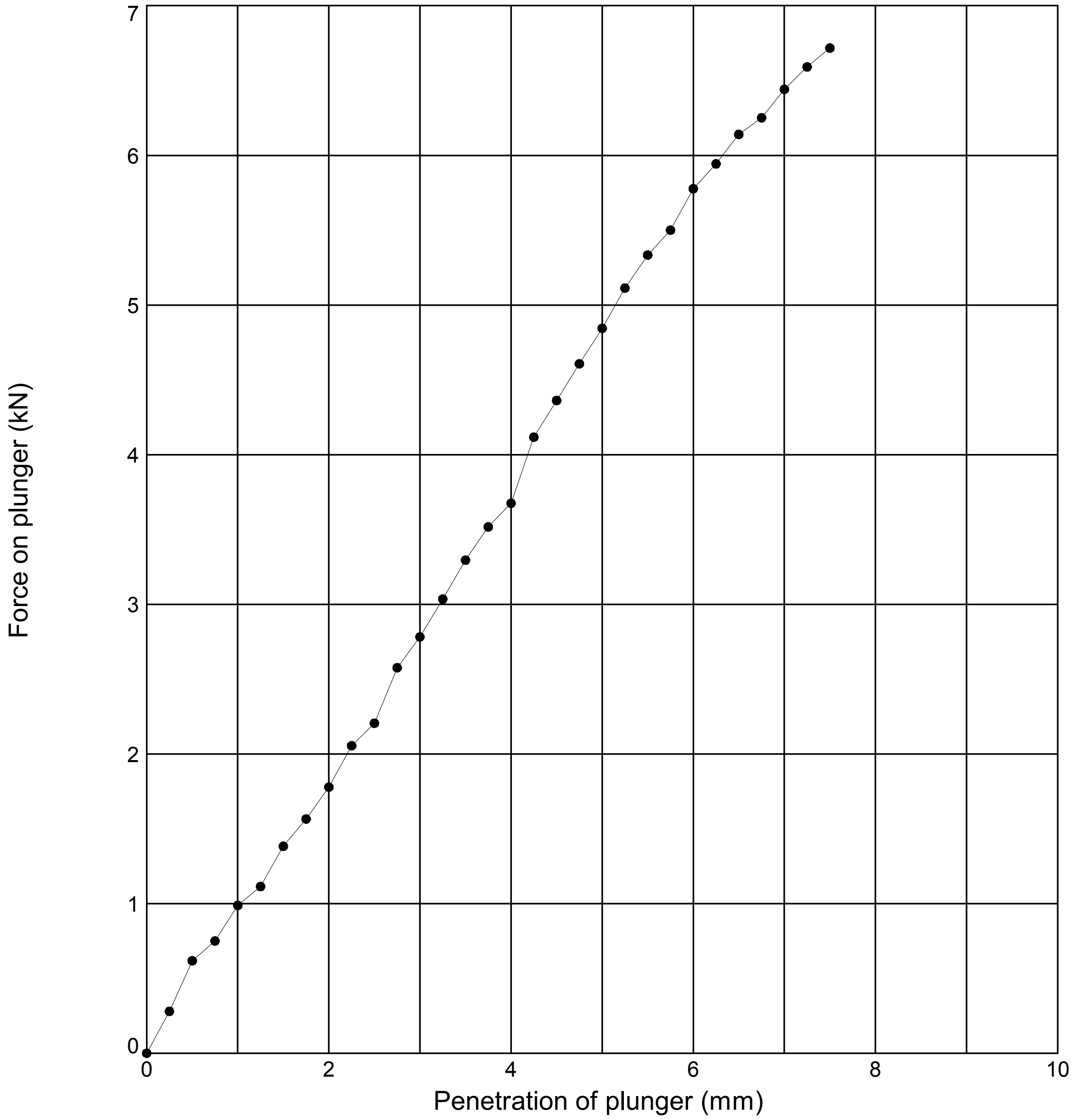
Sample Description	Test Notes
Brown slightly sandy CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Compiled By		Date
	[redacted]	**MICHAEL STROWGER**	**03/01/17**
	Contract **Wykham Ln, Banbury**	Contract Ref: **747025**	

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR9B** Depth (m): **0.70** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **11**	CBR Value (%) : **24** Moisture Content (%) : **20**

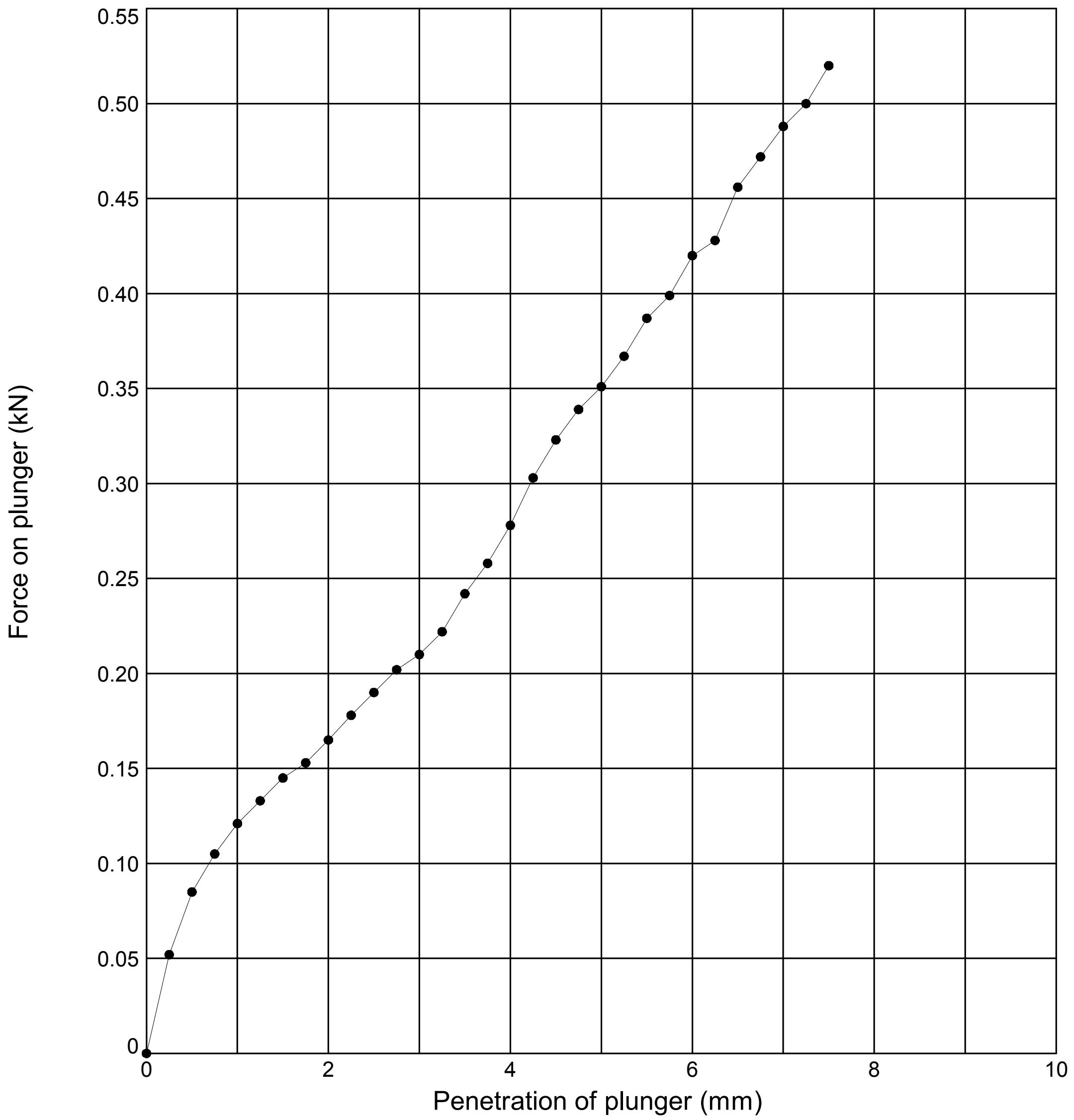
Sample Description	Test Notes
Brown slightly gravelly slightly sandy CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS 1a Princess Street Bedminster Bristol BS3 4AG	Compiled By		Date
	[redacted]	**MICHAEL STROWGER**	**03/01/17**
	Contract **Wykham Ln, Banbury**	Contract Ref: **747025**	

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR10A** Depth (m): **0.20** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **10**	CBR Value (%) : **1.8** Moisture Content (%) : **32**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract
Wykham Ln, Banbury

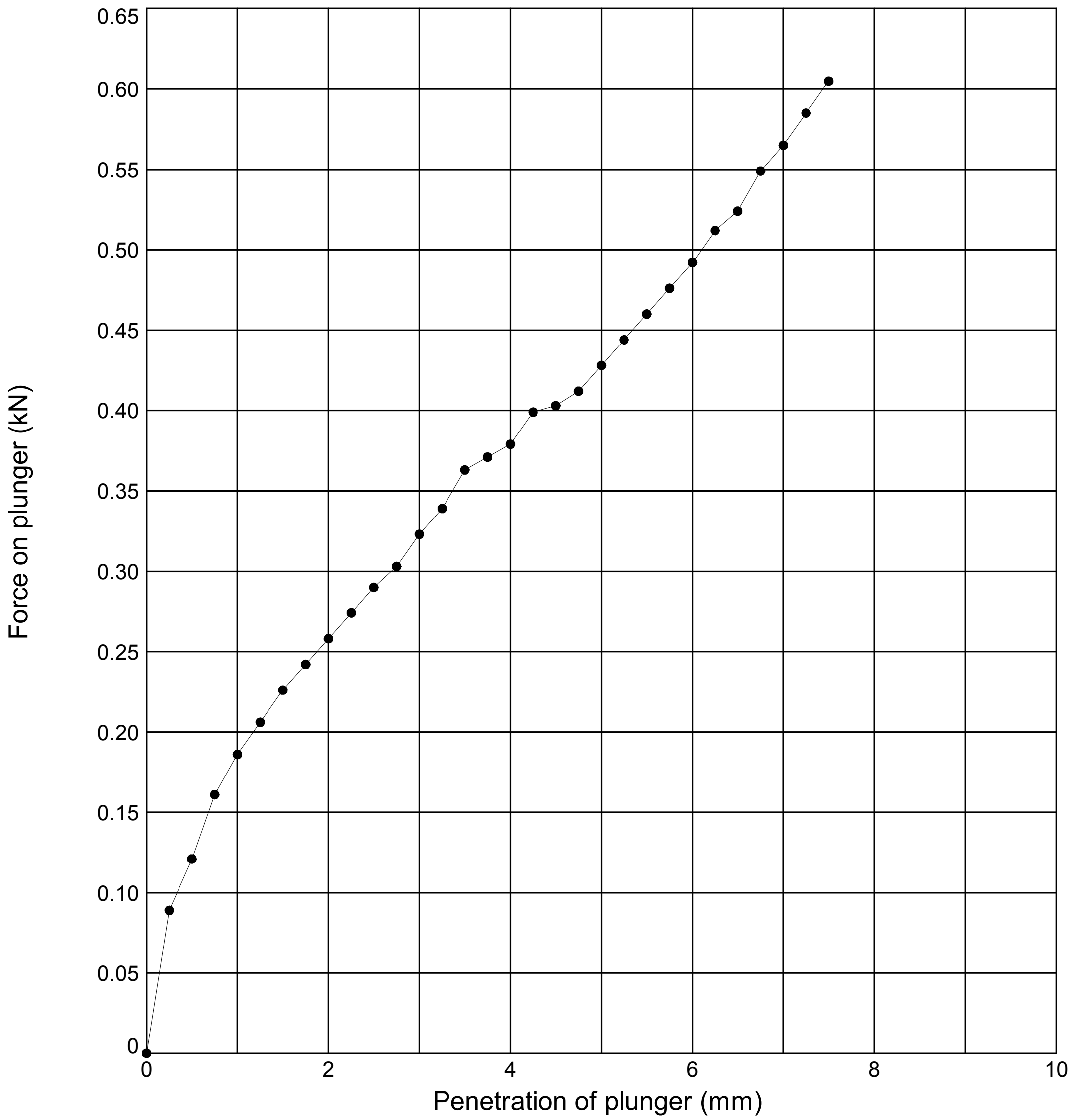
Contract Ref:
747025

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR10B** Depth (m): **0.50** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **11**	CBR Value (%) : **2.2** Moisture Content (%) : **33**

Sample Description	Test Notes
Yellowish brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

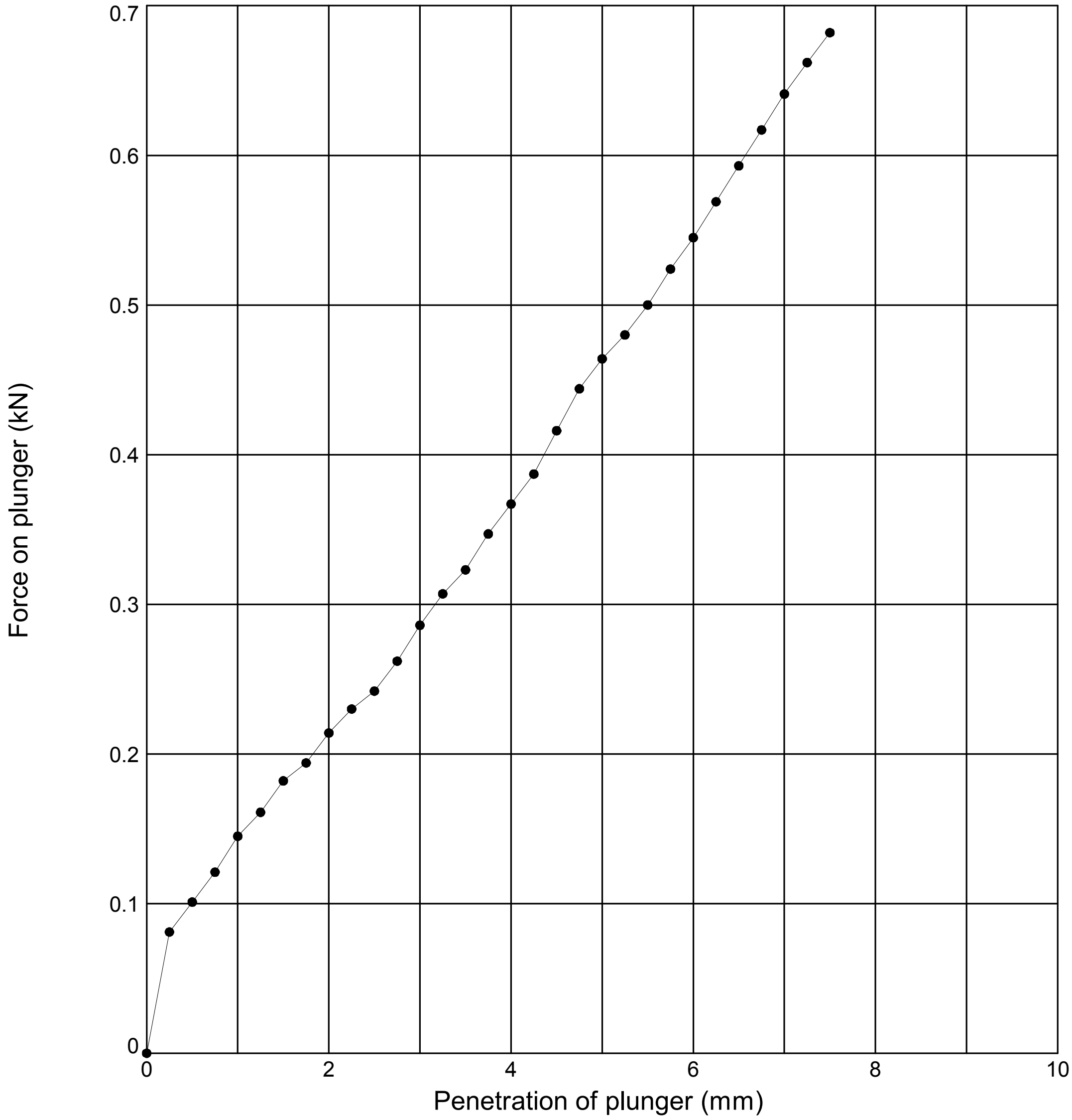
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR11A** Depth (m): **0.30** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **2.3** Moisture Content (%) : **28**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract

Wykham Ln, Banbury

Contract Ref:

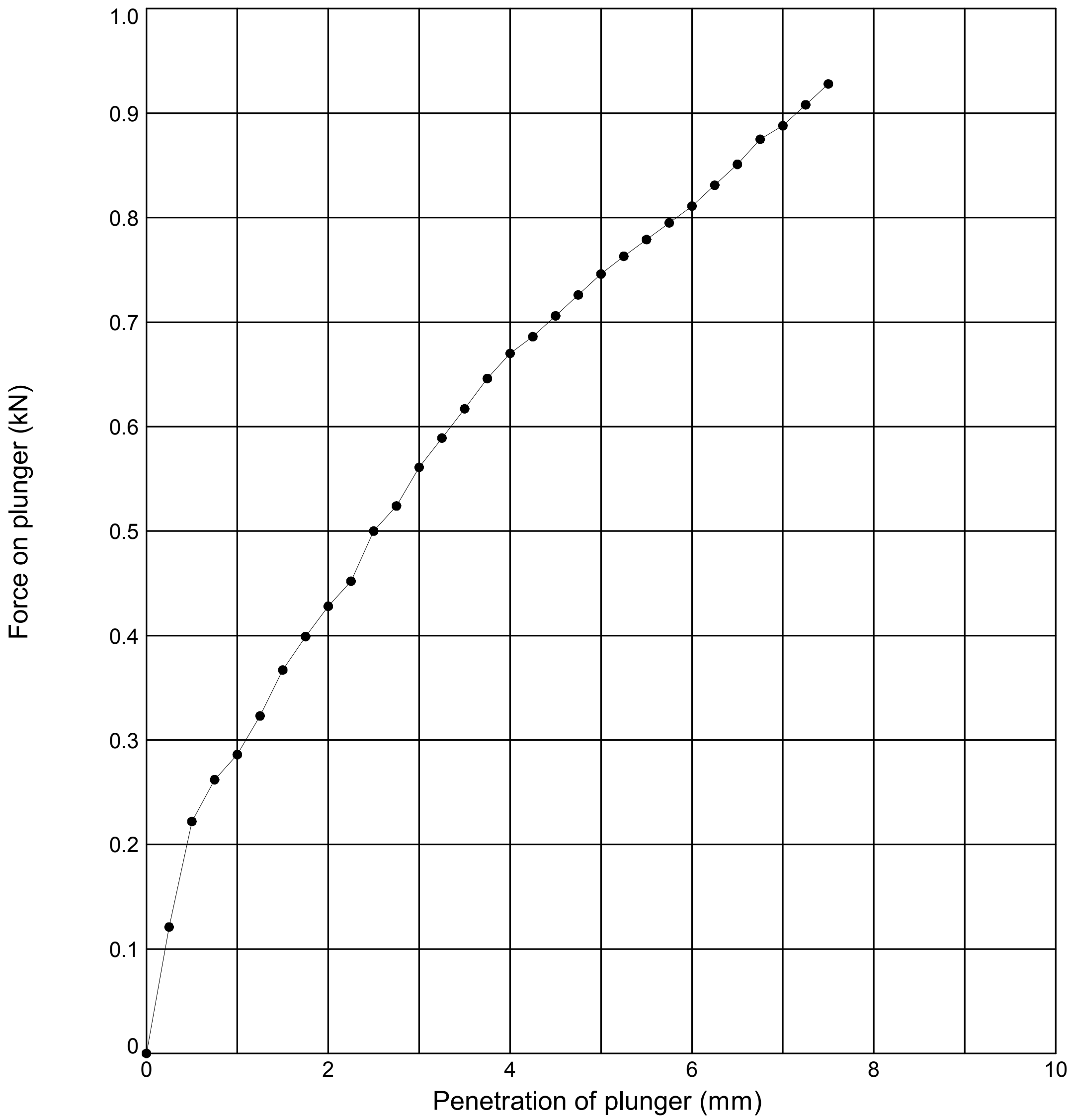
747025

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR11B** Depth (m): **0.60** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **10**	CBR Value (%) : **3.8** Moisture Content (%) : **38**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

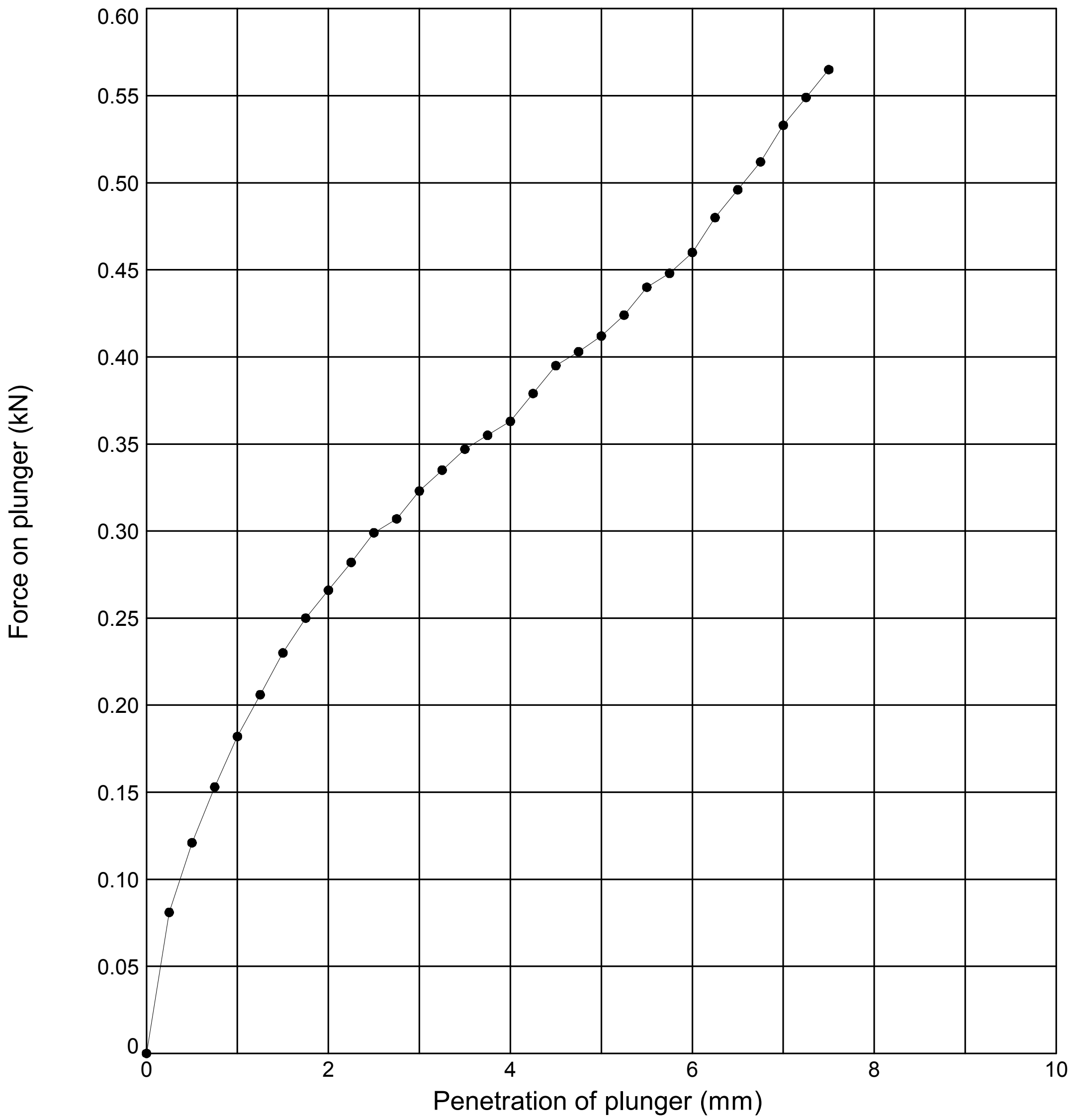
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR12A** Depth (m): **0.20** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **2.3** Moisture Content (%) : **31**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract

Wykham Ln, Banbury

Contract Ref:

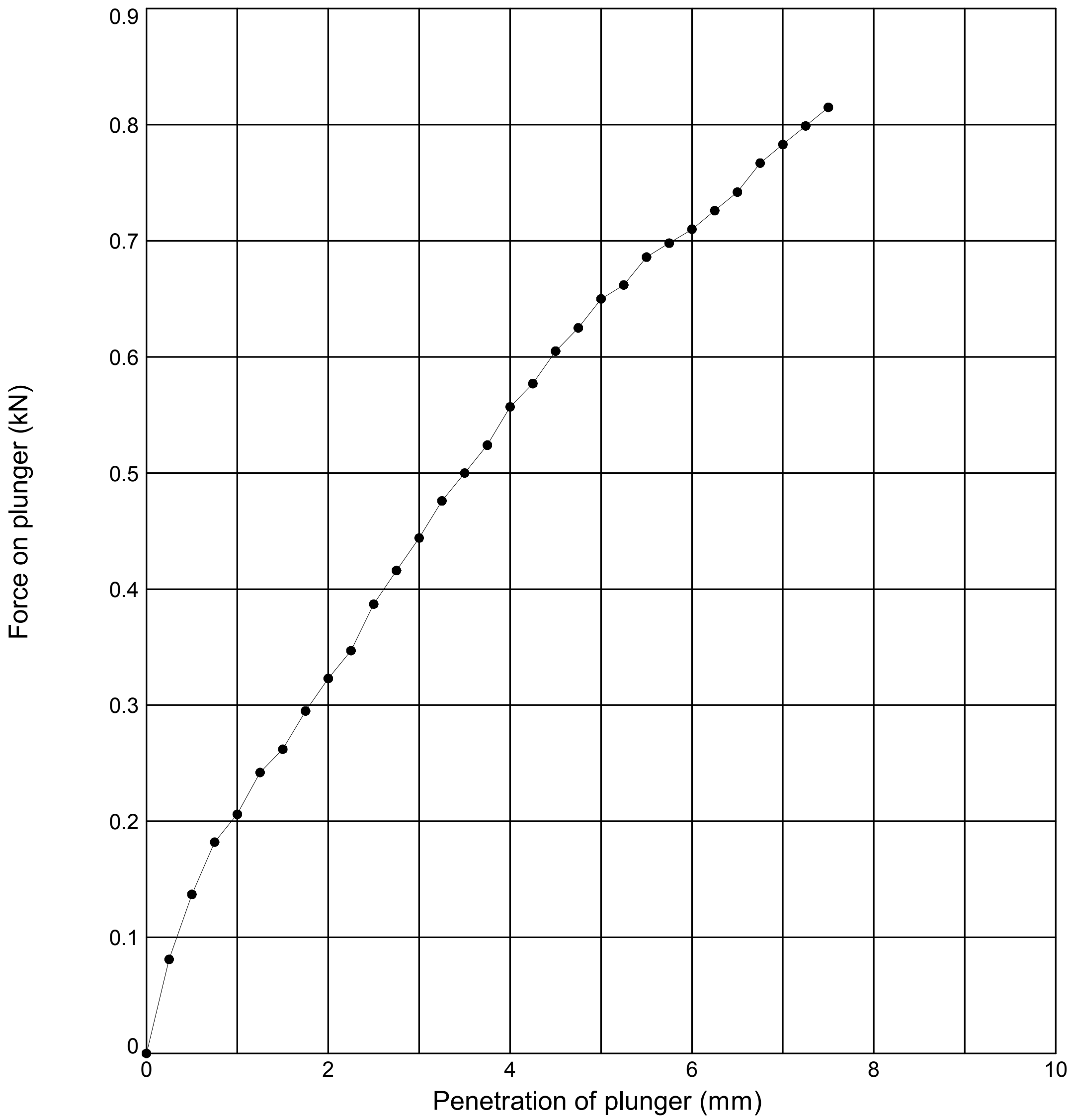
747025

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06. | 03/01/17 - 16:33 | MS4 |
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk,

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR12B** Depth (m): **0.50** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **11**	CBR Value (%) : **3.2** Moisture Content (%) : **32**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

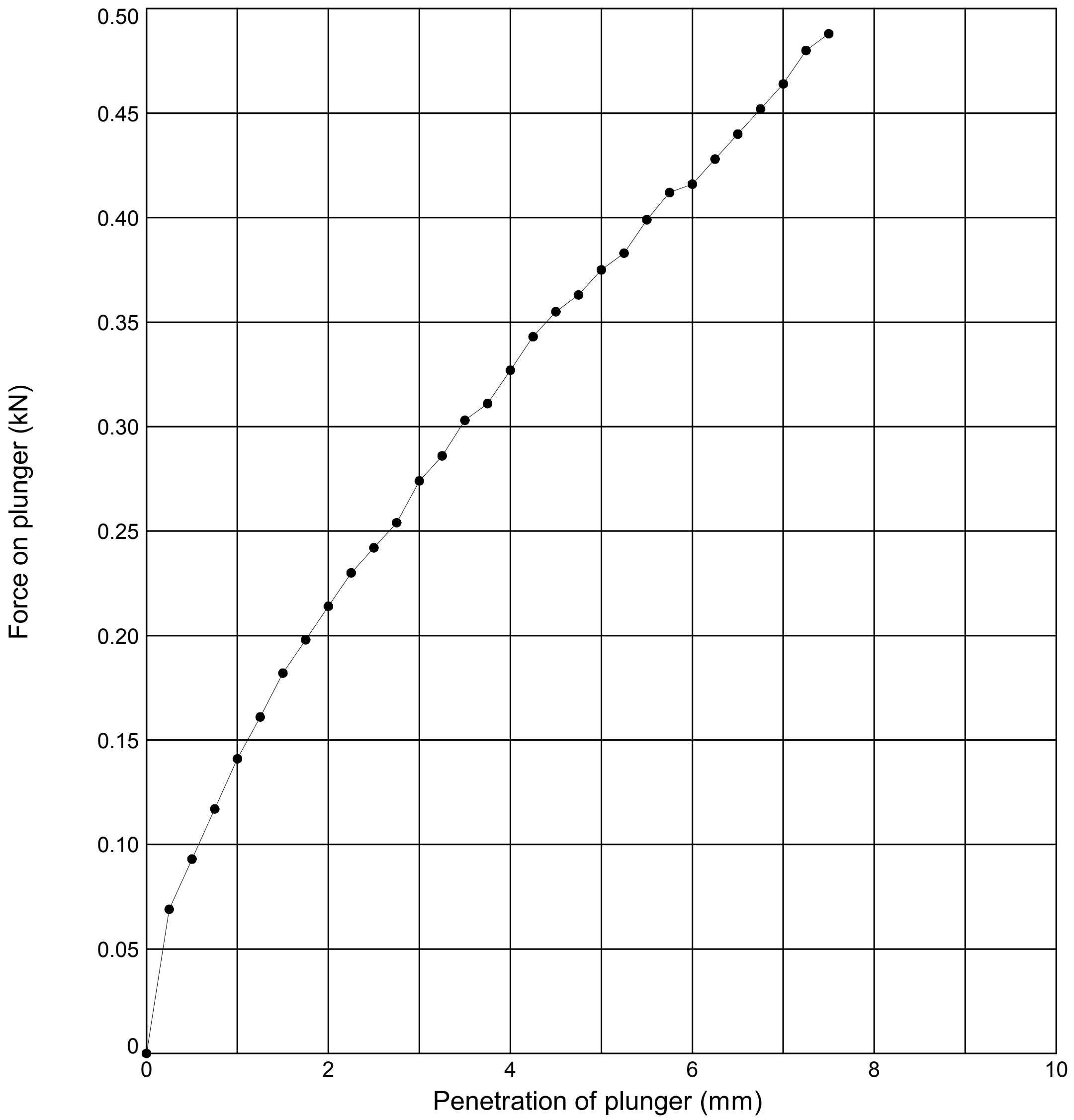
Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR13A** Depth (m): **0.30** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **10**	CBR Value (%) : **1.9** Moisture Content (%) : **31**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

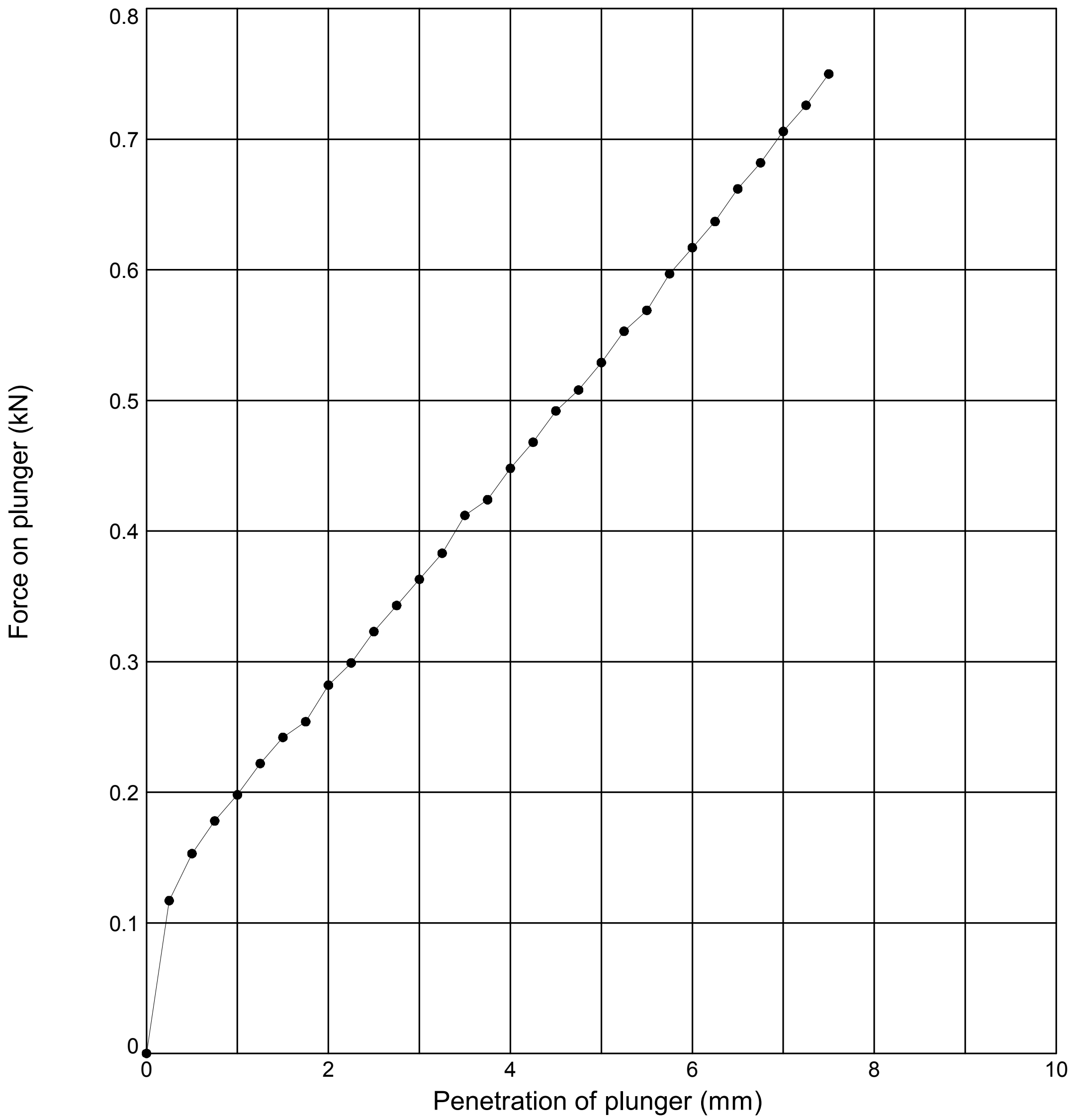
AGS

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk, | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR13B** Depth (m): **0.60** Date: **14/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **11**	CBR Value (%) : **2.6** Moisture Content (%) : **33**

Sample Description	Test Notes
Yellowish brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

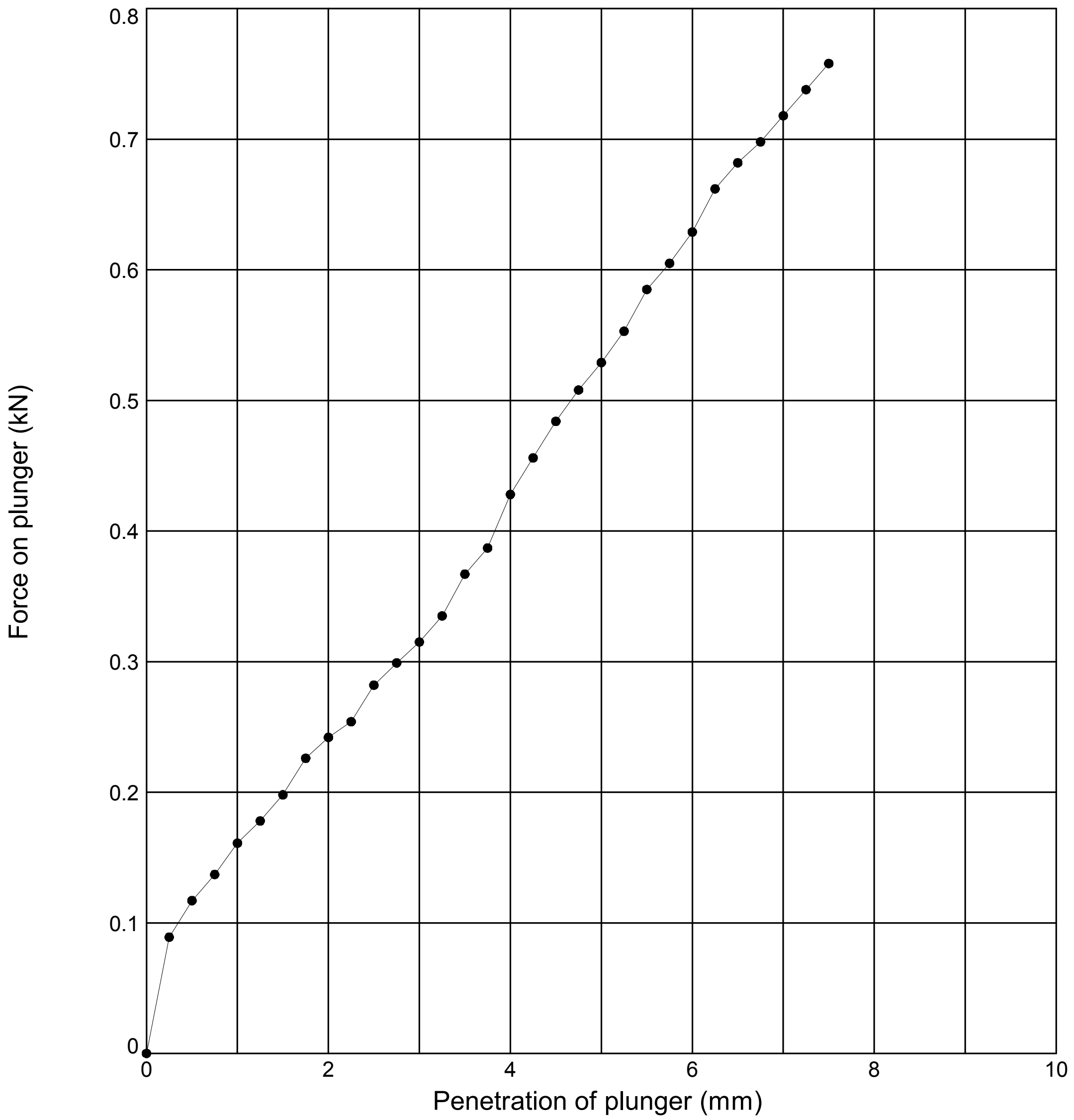
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR14A** Depth (m): **0.35** Date: **19/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **6**	CBR Value (%) : **2.6** Moisture Content (%) : **33**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

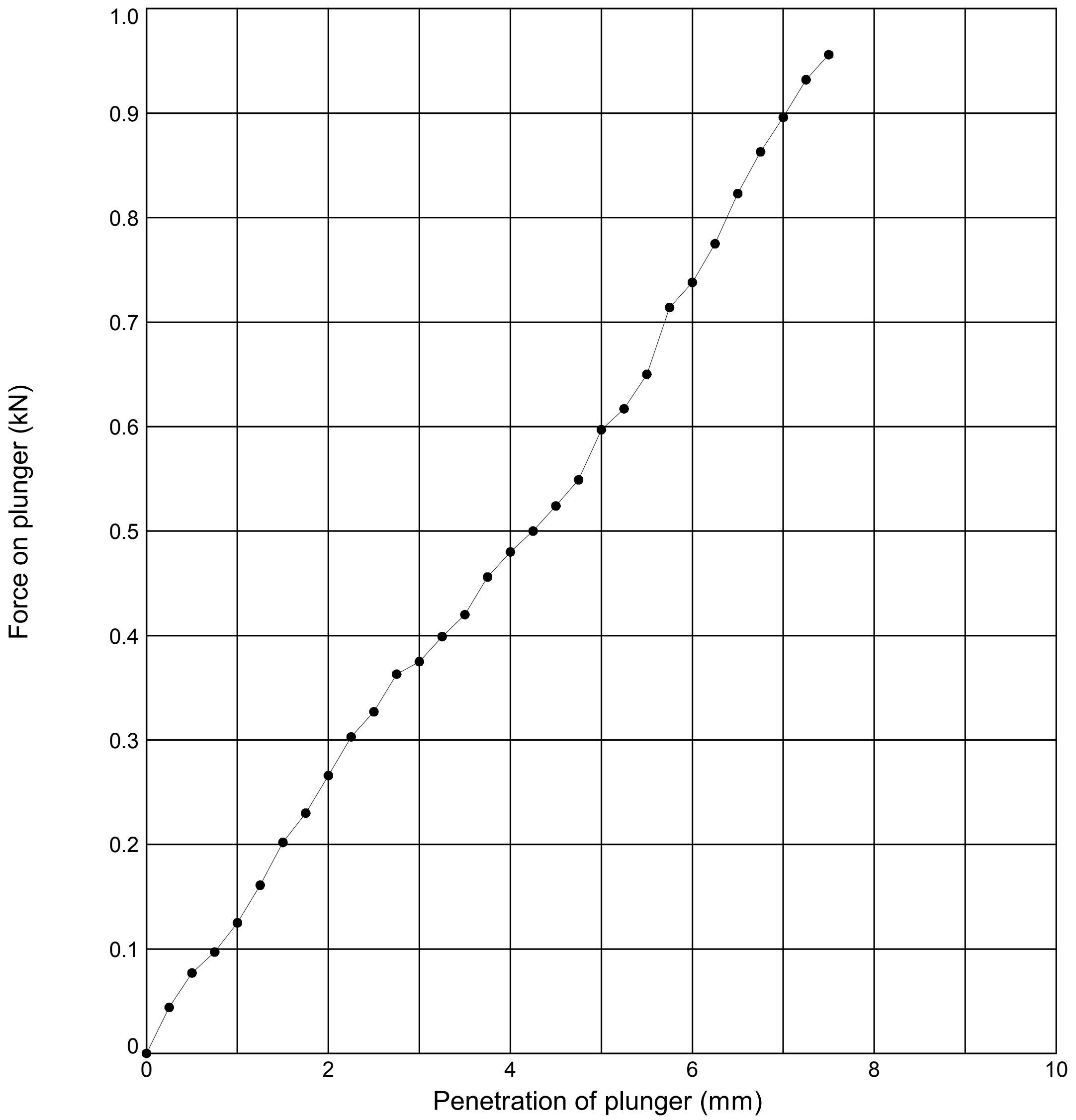
AGS

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk, | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR14B** Depth (m): **0.65** Date: **19/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **6**	CBR Value (%) : **3.0** Moisture Content (%) : **34**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

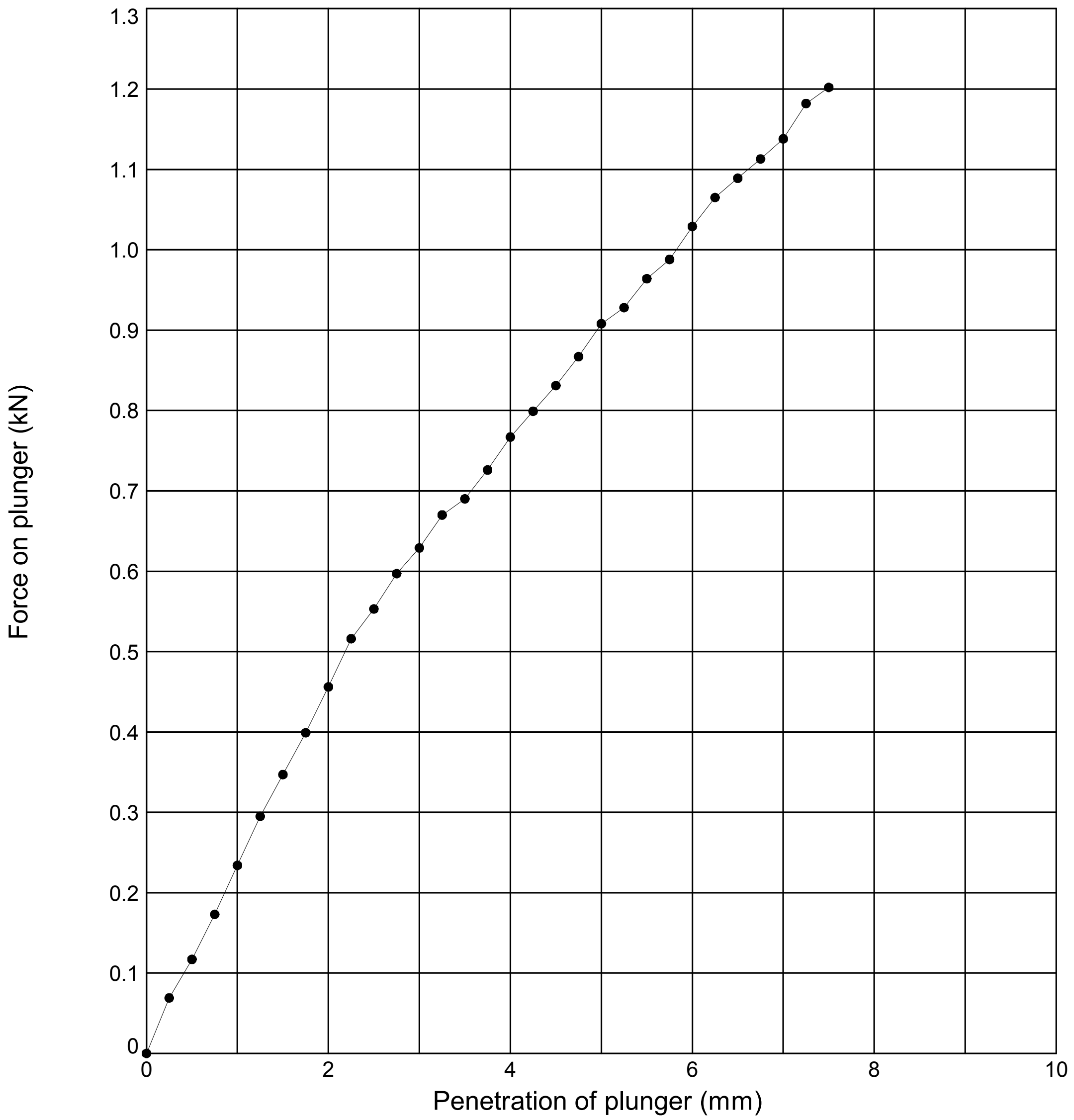
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR15A** Depth (m): **0.30** Date: **20/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **6**	CBR Value (%) : **4.5** Moisture Content (%) : **29**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

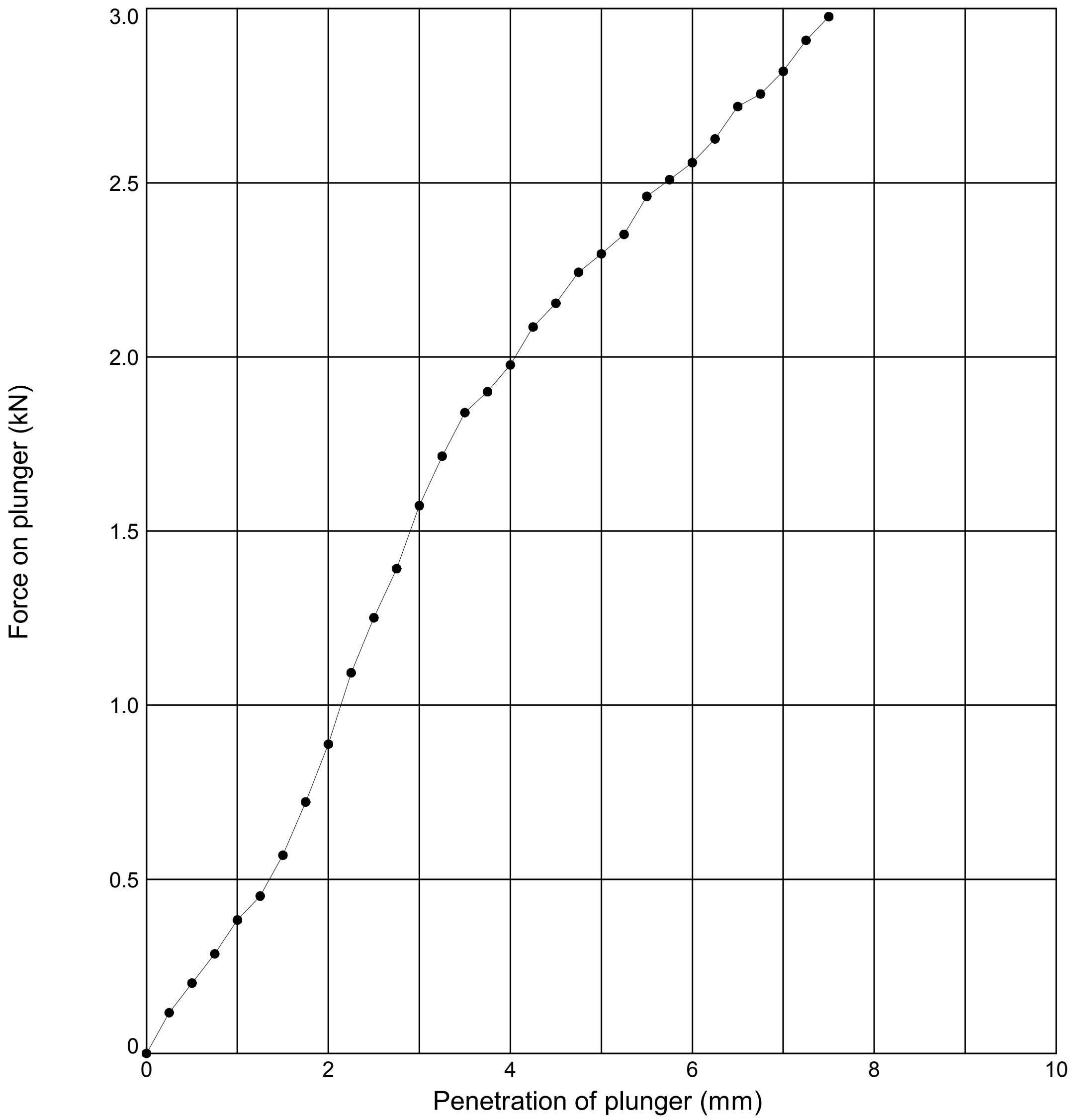
Contract: **Wykham Ln, Banbury**

Contract Ref: **747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR15B** Depth (m): **0.60** Date: **20/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **6**	CBR Value (%) : **11** Moisture Content (%) : **54**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract

Wykham Ln, Banbury

Contract Ref:

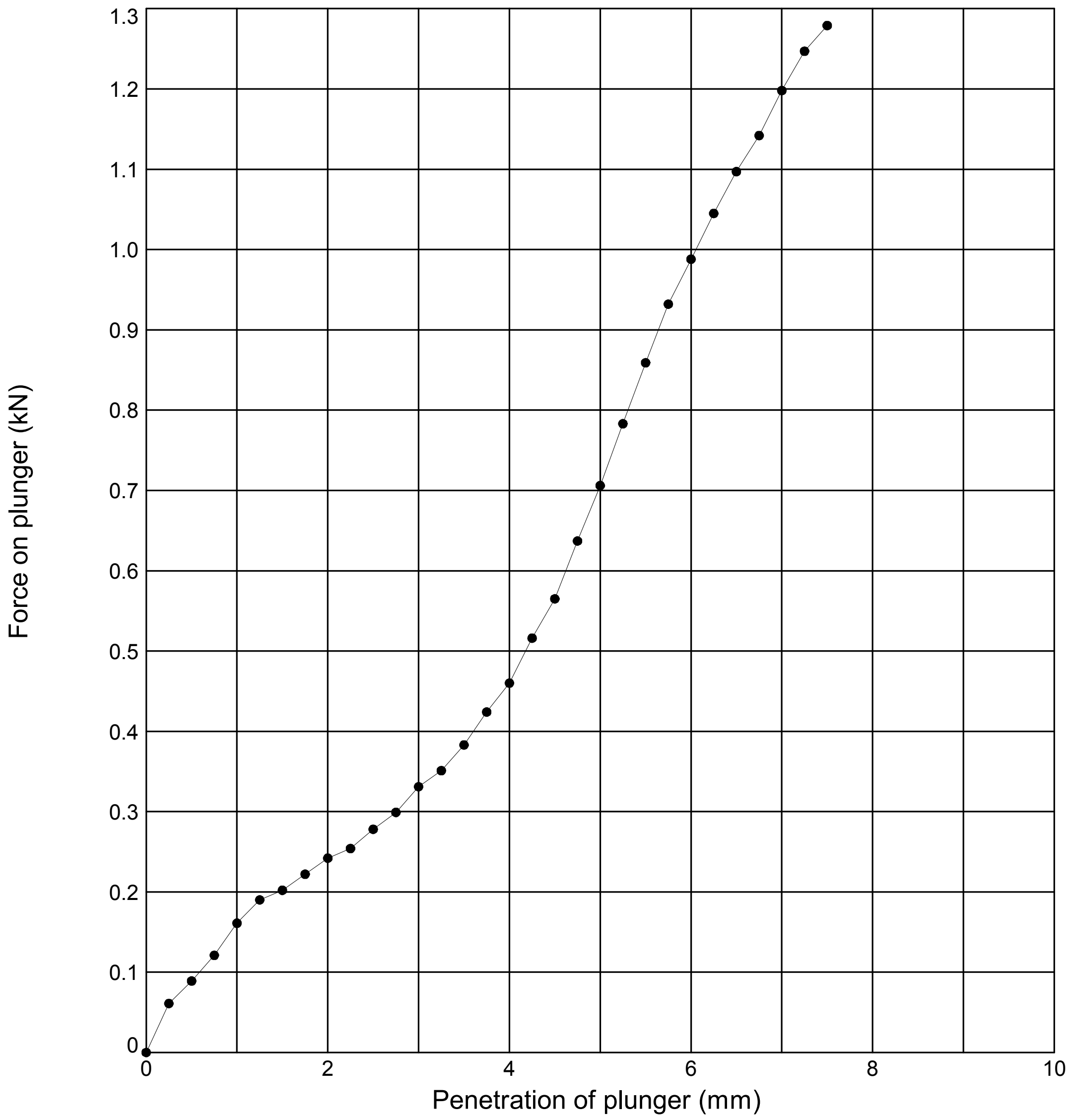
747025

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Email: ask@soils.co.uk, Web: www.soils.co.uk, | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR16A** Depth (m): **0.30** Date: **20/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **6**	CBR Value (%) : **3.5** Moisture Content (%) : **35**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

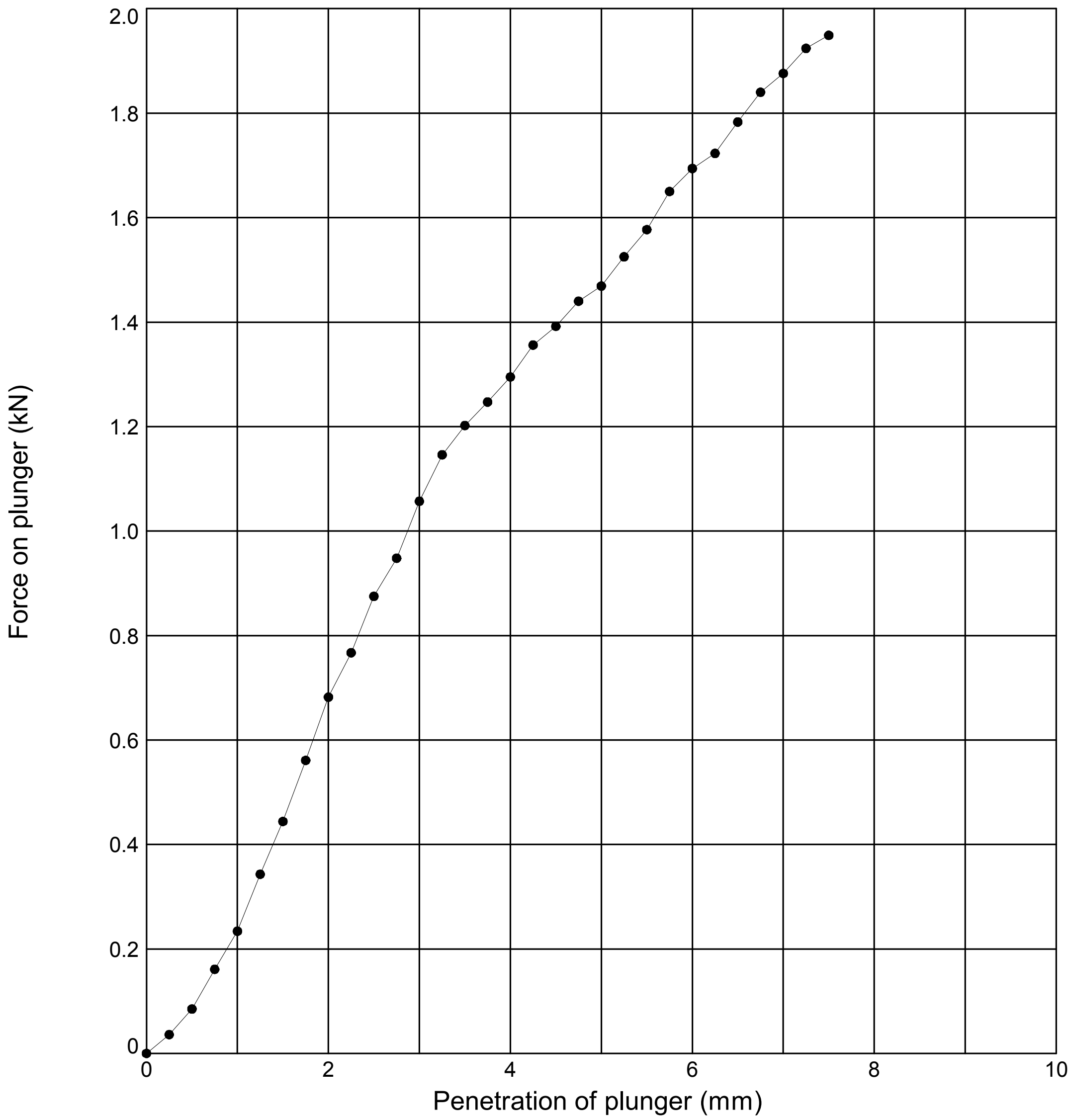
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Web: www.soils.co.uk, Email: ask@soils.co.uk. | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR16B** Depth (m): **0.50** Date: **20/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Sunny** Temperature (^{o}C) : **6**	CBR Value (%) : **7.3** Moisture Content (%) : **35**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

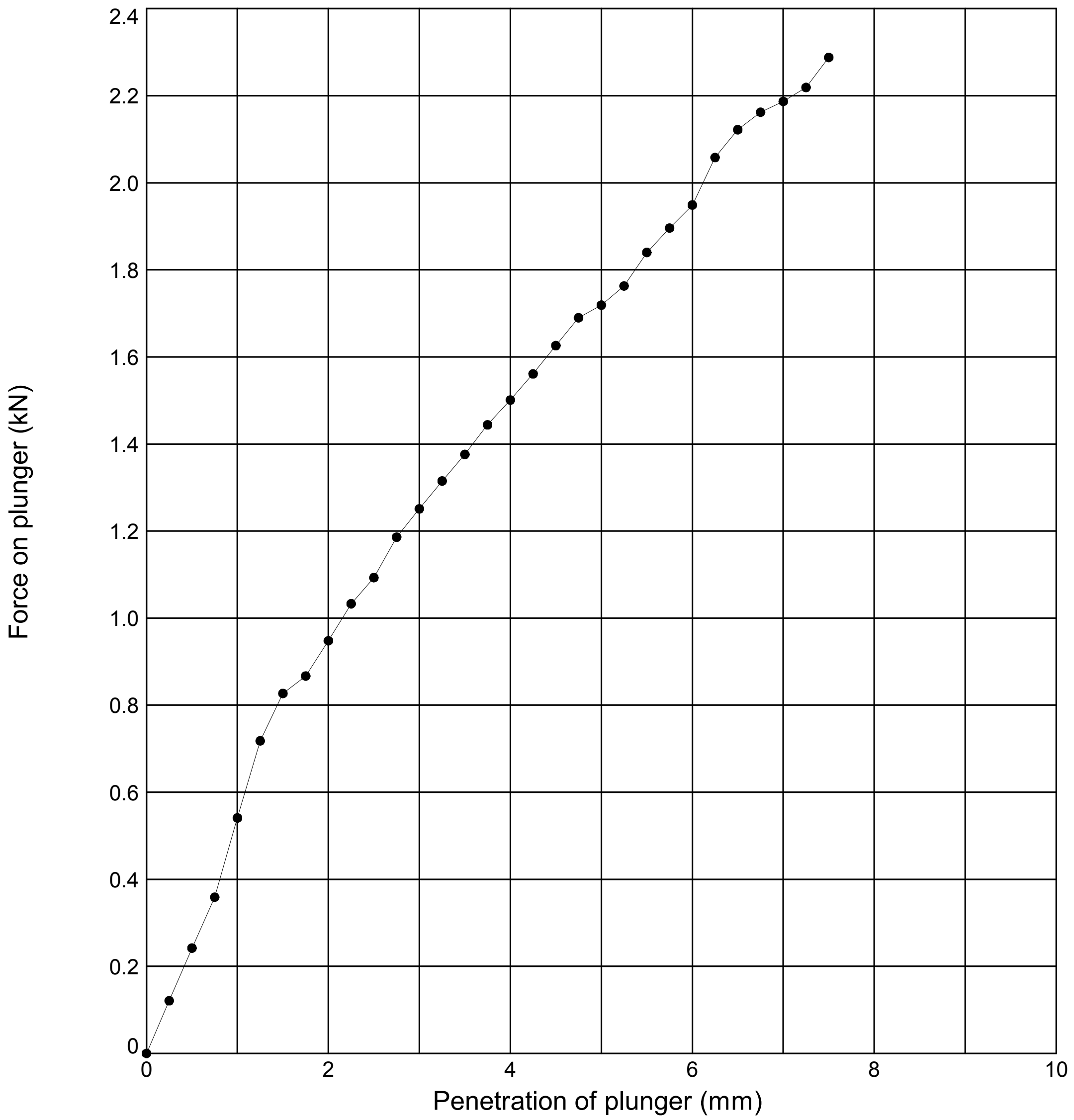
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

AGS

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR17A** Depth (m): **0.30** Date: **19/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **6**	CBR Value (%) : **8.6** Moisture Content (%) : **31**

Sample Description	Test Notes
Brown slightly gravelly CLAY	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

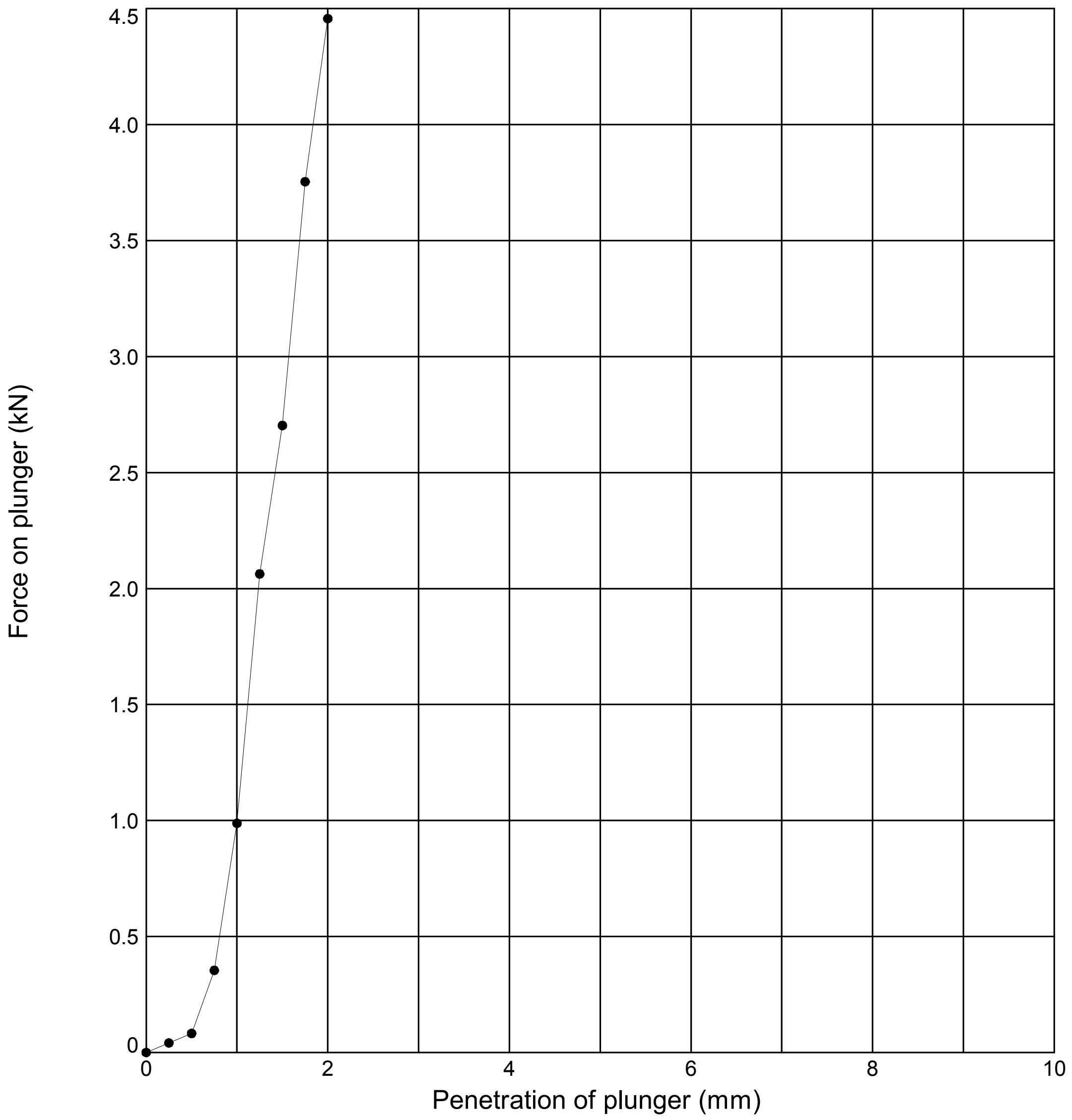
Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

GINT_LIBRARY_V8_06.GLB LibVersion: v8_06_014 PrjVersion: v8_06 - Core+In Situ Testing - 004 | Graph I - CBR - IN SITU - A4P | 747025.GPJ - v8_06.
Structural Soils Ltd, Branch Office - Bristol Lab: 1a Princess Street, Bedminster, Bristol, BS3 4AG. Tel: 0117-947-1000, Fax: 0117-947-1004, Email: ask@soils.co.uk, Web: www.soils.co.uk | 03/01/17 - 16:33 | MS4 |

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR17B** Depth (m): **0.50** Date: **19/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **6**	CBR Value (%) : **39** Moisture Content (%) : **26**

Sample Description	Test Notes
Dark orangish brown slightly clayey GRAVEL	Estimated particles >20 mm (%) : **10** Size and position of particles >20mm in relation to the plunger : **Unknown** Remarks : **Test stopped prematurely due to limits of equipment being reached.**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

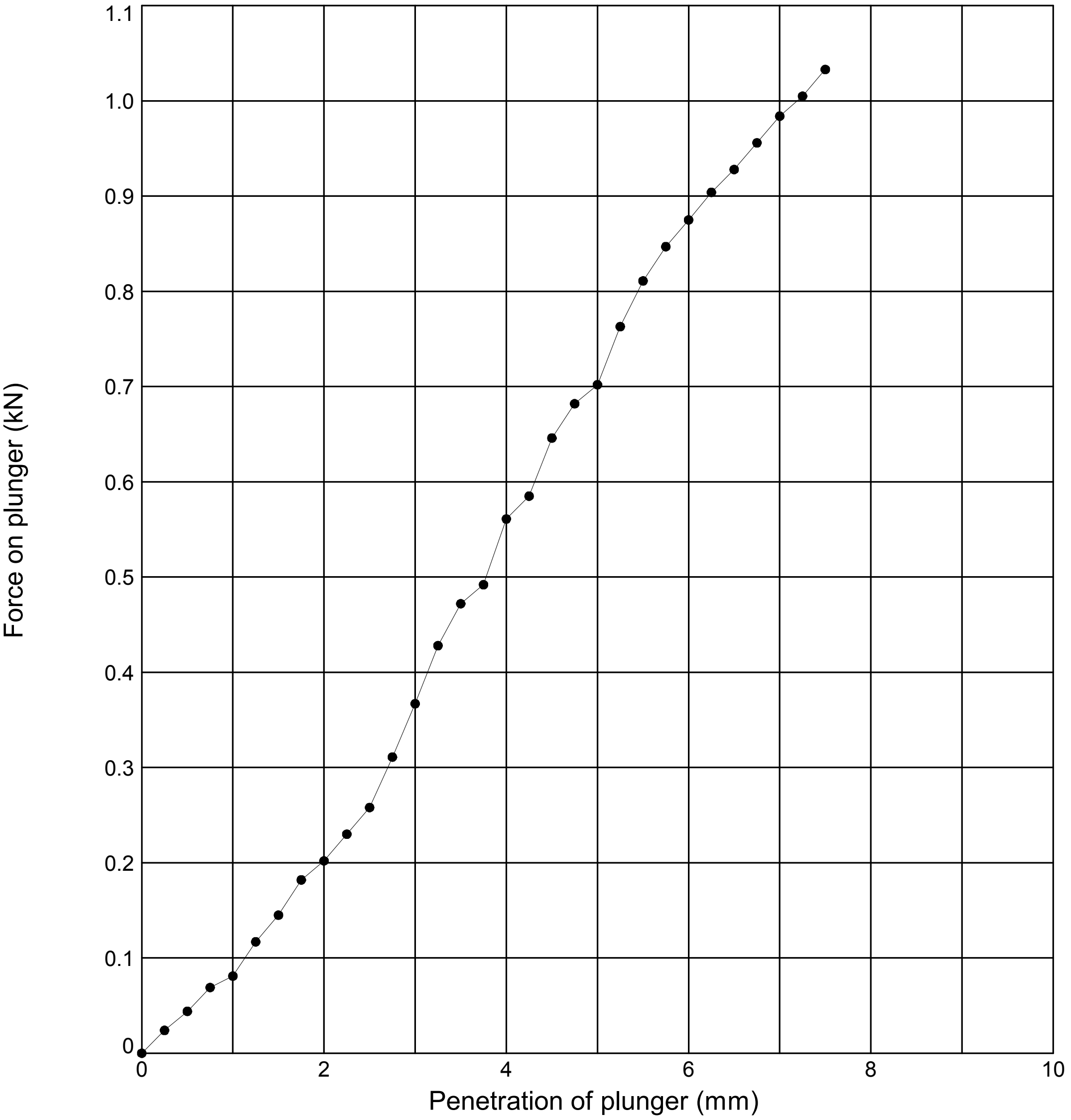
Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR18A** Depth (m): **0.45** Date: **19/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (^{o}C) : **6**	CBR Value (%) : **3.5** Moisture Content (%) : **31**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

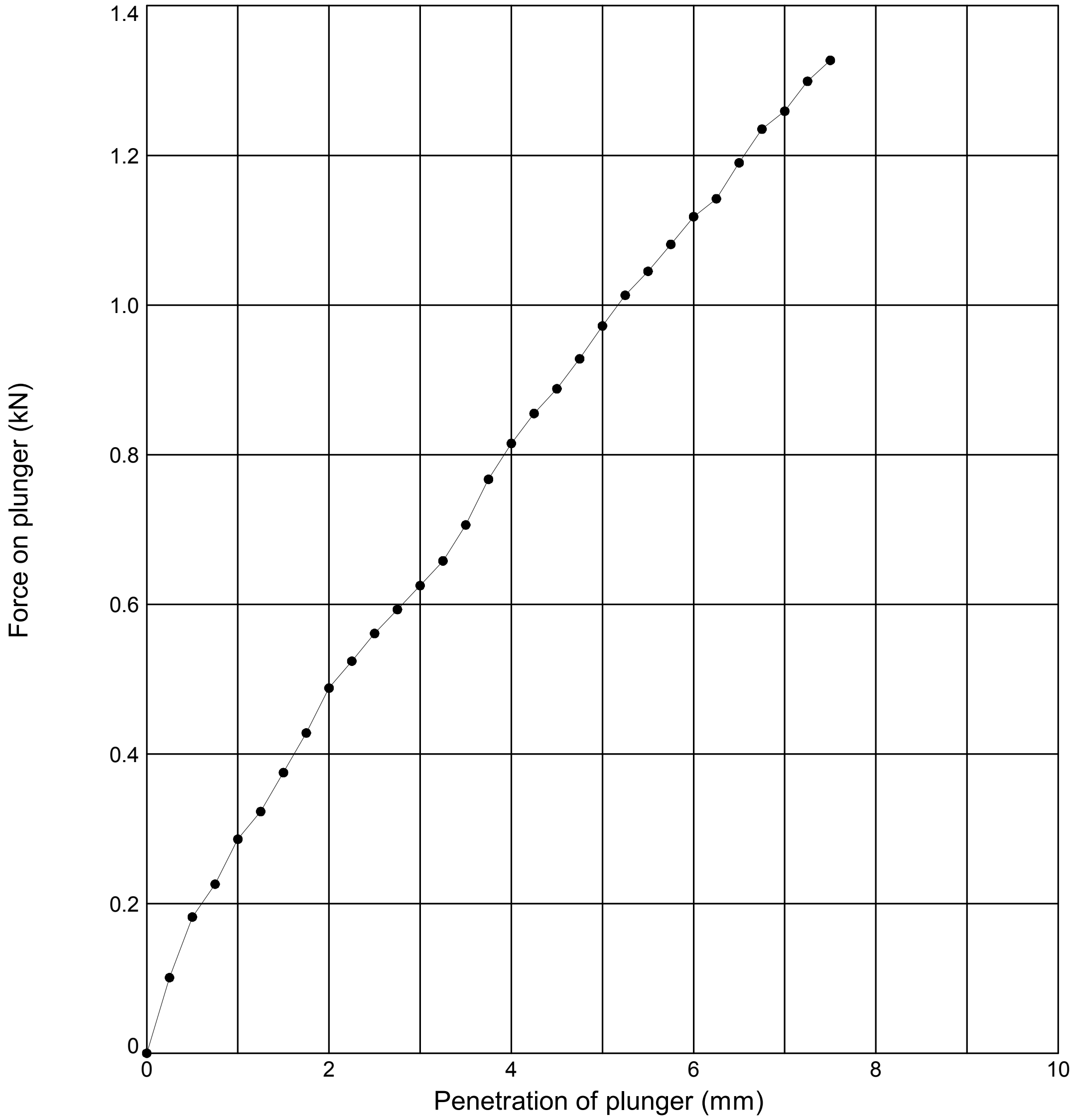
Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract	Contract Ref:
Wykham Ln, Banbury	**747025**

IN SITU CALIFORNIA BEARING RATIO TEST

In accordance with BS1377:Part 9:1990

Position Ref: **CBR18B** Depth (m): **0.70** Date: **19/12/16**



Test Details	Test Conditions	Test Results
Kentledge : **Landrover** Surcharge (kg) : **4.5** Surcharge Pressure (kPa) : **1**	Weather : **Cloudy** Temperature (°C) : **6**	CBR Value (%) : **4.9** Moisture Content (%) : **28**

Sample Description	Test Notes
Brown CLAY	Estimated particles >20 mm (%) : **0** Size and position of particles >20mm in relation to the plunger : **Unknown**

STRUCTURAL SOILS
1a Princess Street
Bedminster
Bristol
BS3 4AG

Compiled By		Date
[redacted]	**MICHAEL STROWGER**	**03/01/17**

Contract: **Wykham Ln, Banbury**

Contract Ref: **747025**

AGS

2718

Hydrock Consultants
Over Court Barns
Over Lane
Almondsbury
Bristol
BS32 4DF

For the attention of	Justin Morton	Version No.	1
		Page No.	1 of 22
		Date of Issue	26/01/2017

TEST REPORT

PROJECT/SITE	Wykham Park Farm	Samples received	03/01/2017
GEL REPORT NUMBER	32642	Schedule received	03/01/2017
Your ref/PO:	C-04841-C	Testing commenced	11/01/2017
Test report refers to	Schedule 1	Status	Final

SUMMARY OF RESULTS ATTACHED

TEST METHOD & DESCRIPTION	QUANTITY	ACCREDITED TEST
BS EN ISO 17892-1: 2014:5. Water Content	19	YES
BS1377: Part 2: 1990:4.2-4.4&5.2-5.4, Liquid & Plastic Limits	16	YES
BS1377: Part 2: 1990:9.2, Particle Size Distribution - Wet Sieve	14	YES
BS1377: Part 2: 1990:9.4, Particle Size Distribution - Pipette	4	YES
BS1377: Part 4: 1990:3, Dry Density/Moisture Content Relationship	3	YES

Remarks

This report may not be partially reproduced without written permission from this laboratory.

Approved Signatories:

S Robinson (Client Manager) C Andrew (Lab Manager)

W[redacted]es (Technical Support) J Hanson (Director) N Parry (Director)

[redacted]

Geotechnical Engineering Limited

WATER CONTENT

BS EN ISO 17892 - 1 : 2014 : 5

CLIENT HYDROCK

SITE WYKHAM PARK FARM

borehole /trial pit no.	sample		specimen depth (m)	specimen preparation	natural water content (%)	description and remarks
	no./type	depth (m)				
TP12	D	1.00	1.00	E	23.9	Brown slightly sandy slightly gravelly CLAY
TP12	D	1.80	1.80	E	29.3	Brown slightly sandy slightly gravelly CLAY
TP12	D	2.80	2.80	E	21.3	Light brownish grey slightly sandy slightly gravelly silty CLAY

general remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS EN ISO 17892 - 1 : 2014 Table 1

test method	CONTRACT	CHECKED
D - oven drying method at 60°C E - oven drying method at 105°C	**32642**	**SR**

Geotechnical Engineering Limited

LIQUID AND PLASTIC LIMITS

BS.1377 : PART 2 : 1990 : 4 and 5

CLIENT HYDROCK

SITE WYKHAM PARK FARM

borehole /trial pit no.	sample		specimen depth (m)	natural water content (%)	specimen preparation and test method	fraction >0.425 mm (%)	liquid limit (%)	plastic limit (%)	plasticity index (%)	description and remarks
	no./type	depth (m)								
TP01	D	1.50	1.50	23.7	BXE	42	30	17	13	Brown slightly sandy slightly gravelly CLAY
TP03	D	0.50	0.50	28.7	BXE	19	56	29	27	Brown slightly sandy slightly gravelly silty CLAY
TP05	D	0.80	0.80	33.2	BXE	35	52	28	24	Brown slightly sandy gravelly silty CLAY
TP08	D	1.00	1.00	46.6	BXE	53	79	39	40	Brown slightly sandy gravelly silty organic CLAY
TP116	D	0.50	0.50	27.1	BXE	53	59	25	34	Brown slightly sandy slightly gravelly silty CLAY
TP117	D	1.00	1.00	32.9	BXE	45	65	32	33	Brown slightly sandy gravelly silty CLAY
TP121	D	1.00	1.00	30.4	BYE	36	80	34	46	Brown slightly sandy slightly gravelly silty CLAY
TP22	D	1.00	1.00	30.2	BXE	5	63	29	34	Greyish brown slightly sandy slightly gravelly CLAY
TP27	D	1.00	1.00	31.4	BXE	21	66	31	35	Light brown slightly sandy slightly gravelly CLAY
TP38	D	0.50	0.50	26.8	BXE	8	62	23	39	Greyish brown slightly sandy slightly gravelly CLAY
TP41	D	1.00	1.00	27.8	BXE	10	63	27	36	Brown slightly sandy slightly gravelly CLAY
TP45	D	0.50	0.50	31.6	BXE	34	60	29	31	Reddish brown slightly sandy slightly gravelly CLAY
TP66	D	1.00	1.00	24.4	BXE	4	67	29	38	Brown slightly sandy slightly gravelly CLAY
TP69	B	0.50	0.50	34.2	BXE	50	60	34	26	brown slightly sandy gravelly CLAY
TP94	D	1.00	1.00	28.8	BXE	15	54	24	30	Brown slightly sandy slightly gravelly CLAY
TP97	D	0.50	0.50	26.6	BXE	3	64	28	36	Light brown slightly sandy slightly gravelly CLAY

general remarks

natural water content determined in accordance with BS EN ISO 17892 - 1 : 2014 (unless specified)

NP denotes non plastic

# denotes sample tested is smaller than that which is recommended in accordance with BS1377 or BS EN ISO 17892

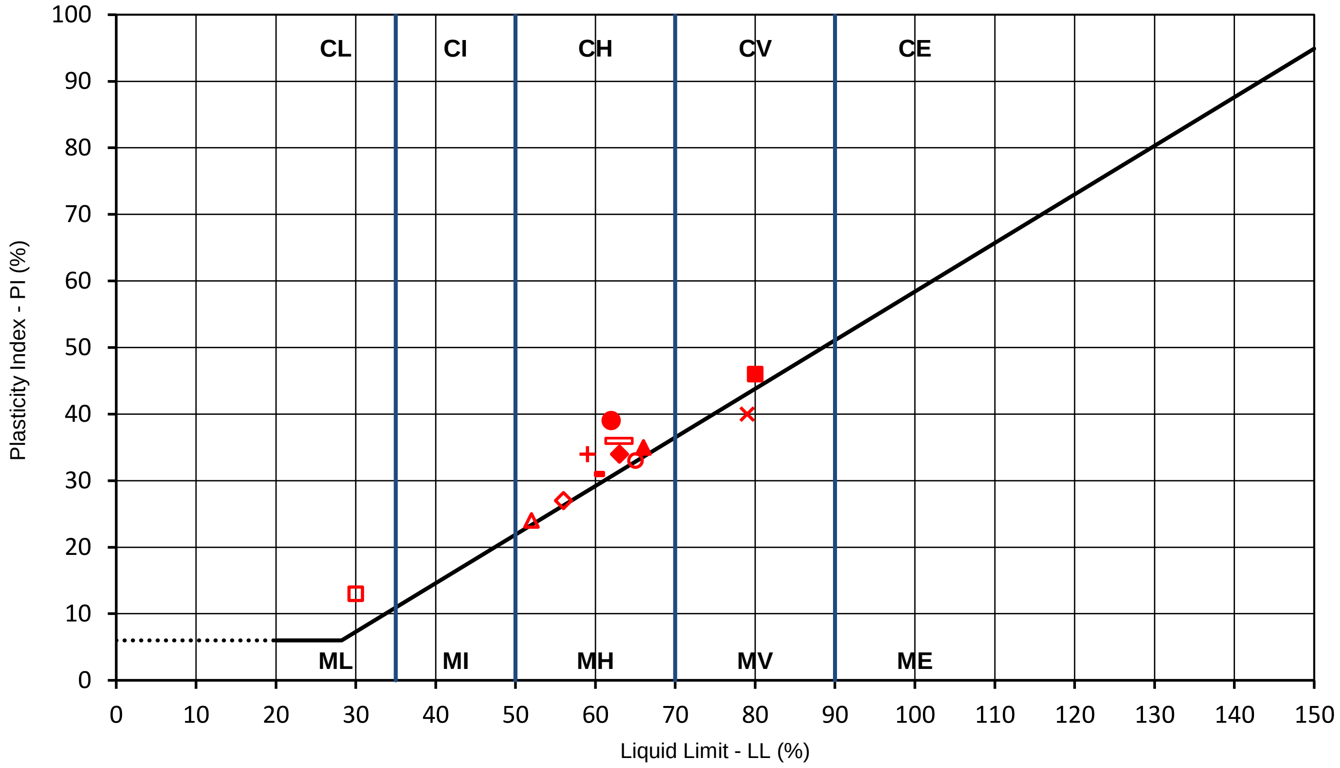
specimen preparation		test method	CONTRACT	CHECKED
A - as received	D - oven dried (60oC)	X - cone penetrometer (test 4.3)	**32642**	**SR**
B - washed on 0.425mm sieve	E - oven dried (105oC)	Y - cone penetrometer (test 4.4)		
C - air dried	F - not known	Z - casagrande apparatus (test 4.5)		

Geotechnical Engineering Limited

ATTERBERG LINE PLOT

CLIENT HYDROCK

SITE WYKHAM PARK FARM



	BH/TP No.	depth (m)	LL	PL	PI	remarks
□	TP01	1.50	30	17	13	
◇	TP03	0.50	56	29	27	
△	TP05	0.80	52	28	24	
×	TP08	1.00	79	39	40	
+	TP116	0.50	59	25	34	
○	TP117	1.00	65	32	33	
■	TP121	1.00	80	34	46	
◆	TP22	1.00	63	29	34	
▲	TP27	1.00	66	31	35	
●	TP38	0.50	62	23	39	
▭	TP41	1.00	63	27	36	
▪	TP45	0.50	60	29	31	

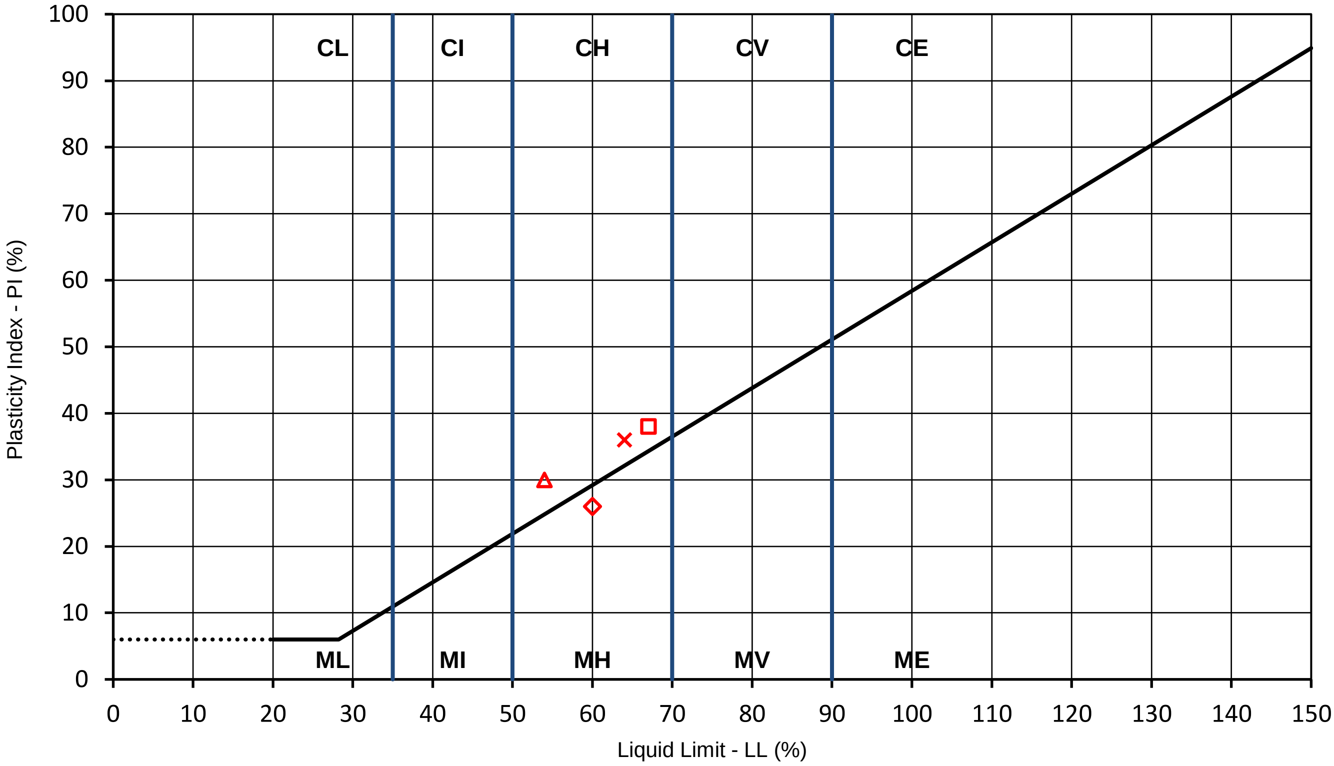
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

ATTERBERG LINE PLOT

CLIENT HYDROCK

SITE WYKHAM PARK FARM



	BH/TP No.	depth (m)	LL	PL	PI	remarks
☐	TP66	1.00	67	29	38	
◇	TP69	0.50	60	34	26	
△	TP94	1.00	54	24	30	
×	TP97	0.50	64	28	36	

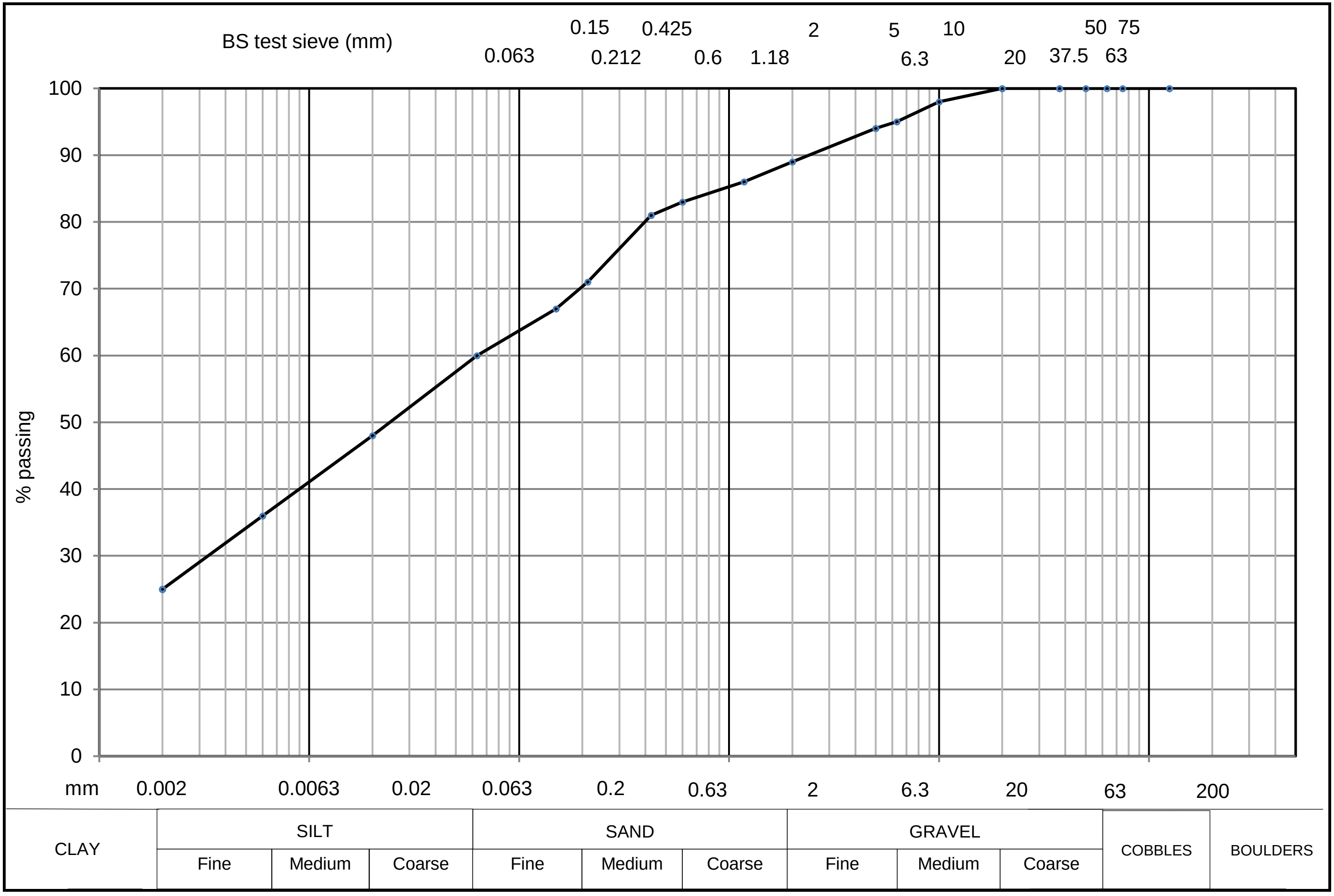
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP02
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Brown slightly sandy slightly gravelly silty CLAY	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	25
SILT	35
SILT & CLAY	60
SAND	29
GRAVEL	11
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing
150		5	94
75		2	89
63		1.18	86
50		0.6	83
37.5		0.425	81
20	100	0.212	71
10	98	0.15	67
6.3	95	0.063	60

BS test sieve (µm)	% finer
20	48
6	36
2	25

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

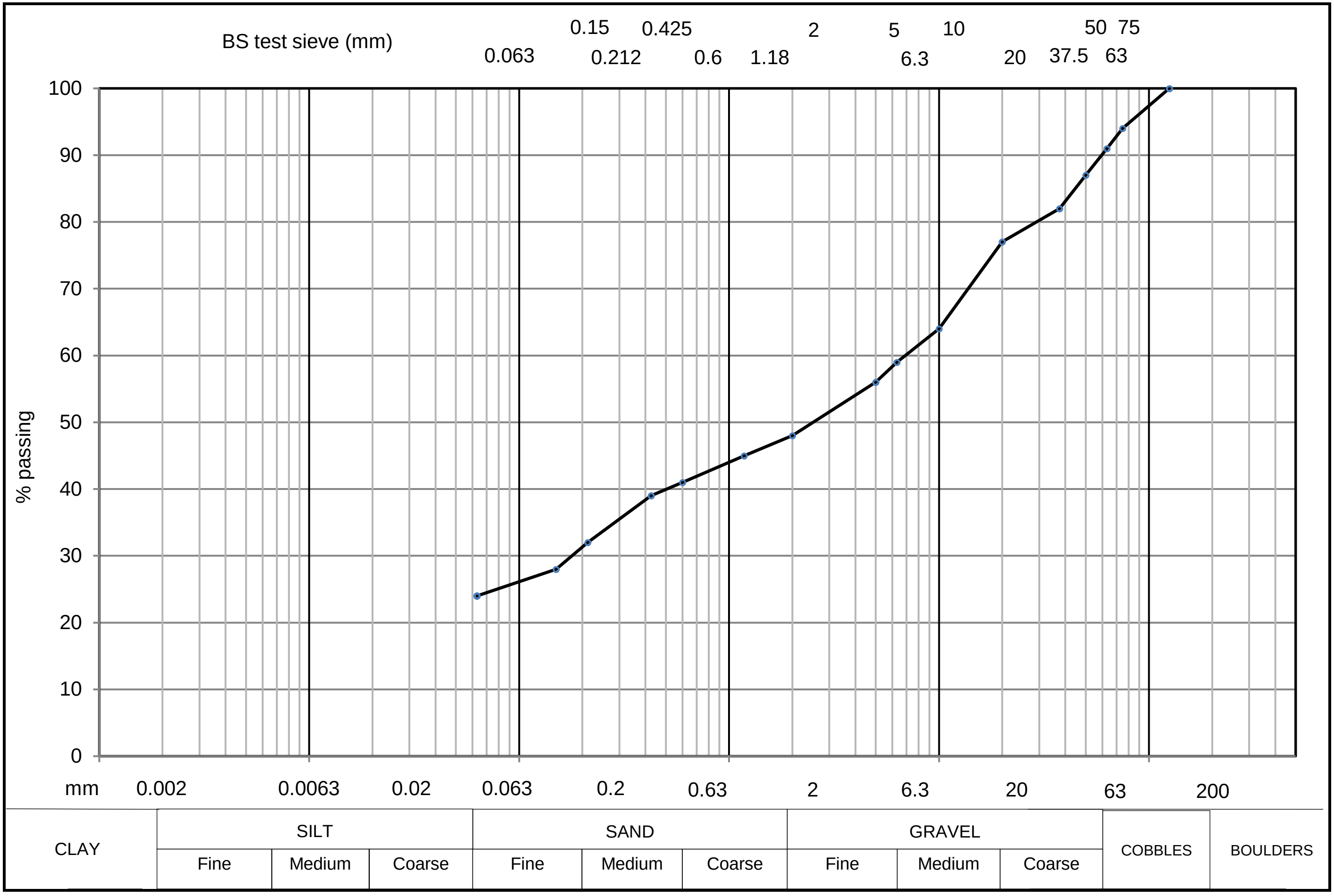
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP10
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Brown very clayey very sandy GRAVEL with medium cobble content	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	24
SAND	24
GRAVEL	43
COBBLE & BOULDER	9
test method(s)	9.2

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (μm)	% finer
150	100	5	56	20	
75	94	2	48	6	
63	91	1.18	45	2	
50	87	0.6	41		
37.5	82	0.425	39		
20	77	0.212	32		
10	64	0.15	28		
6.3	59	0.063	24		

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

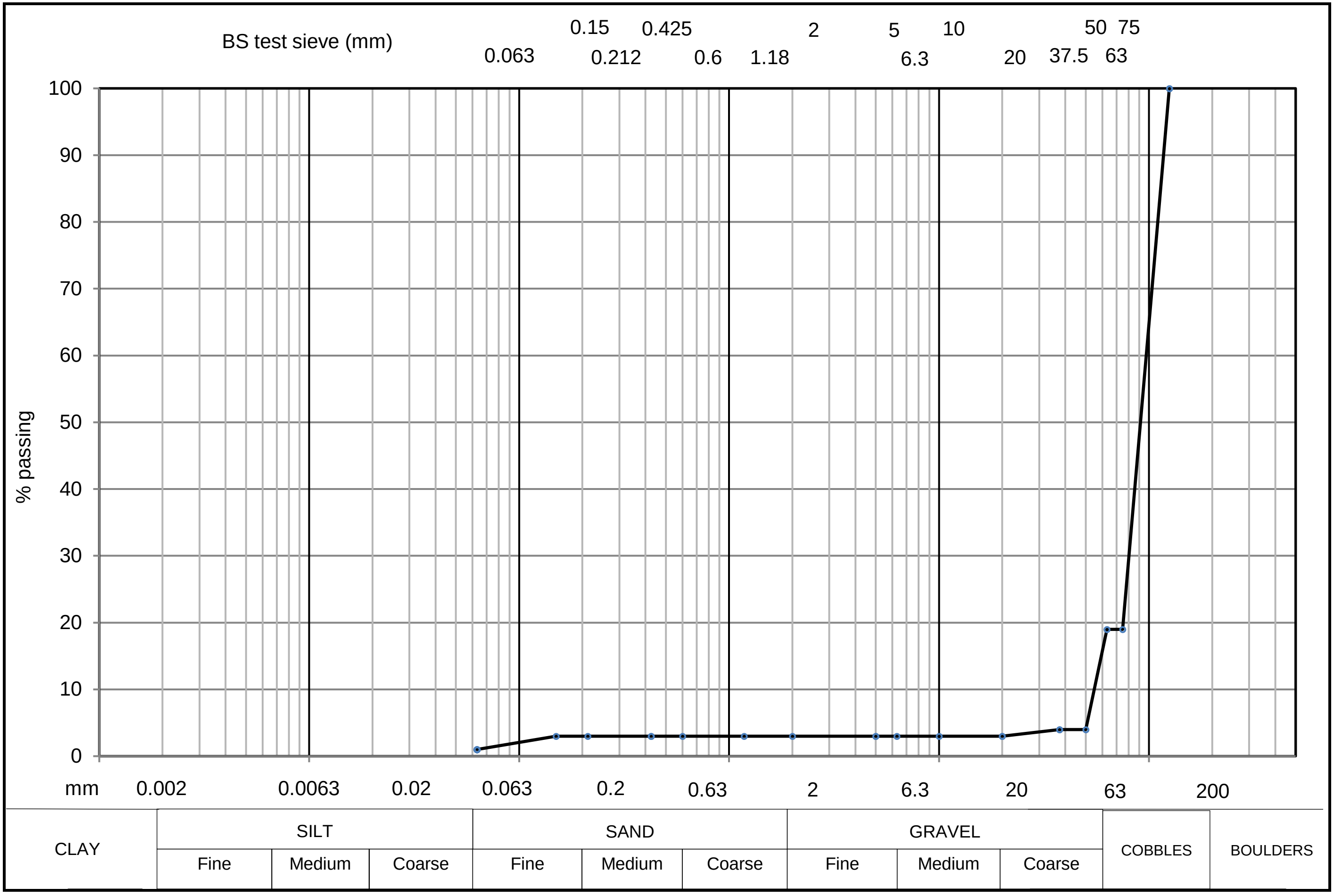
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP102
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.50
DESCRIPTION	Orangish brown slightly sandy gravelly COBBLES	SPECIMEN TOP (m)	1.50
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	1
SAND	2
GRAVEL	16
COBBLE & BOULDER	81
test method(s)	9.2#

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing
150	100	5	3
75	19	2	3
63	19	1.18	3
50	4	0.6	3
37.5	4	0.425	3
20	3	0.212	3
10	3	0.15	3
6.3	3	0.063	1

BS test sieve (µm)	% finer
20	
6	
2	

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

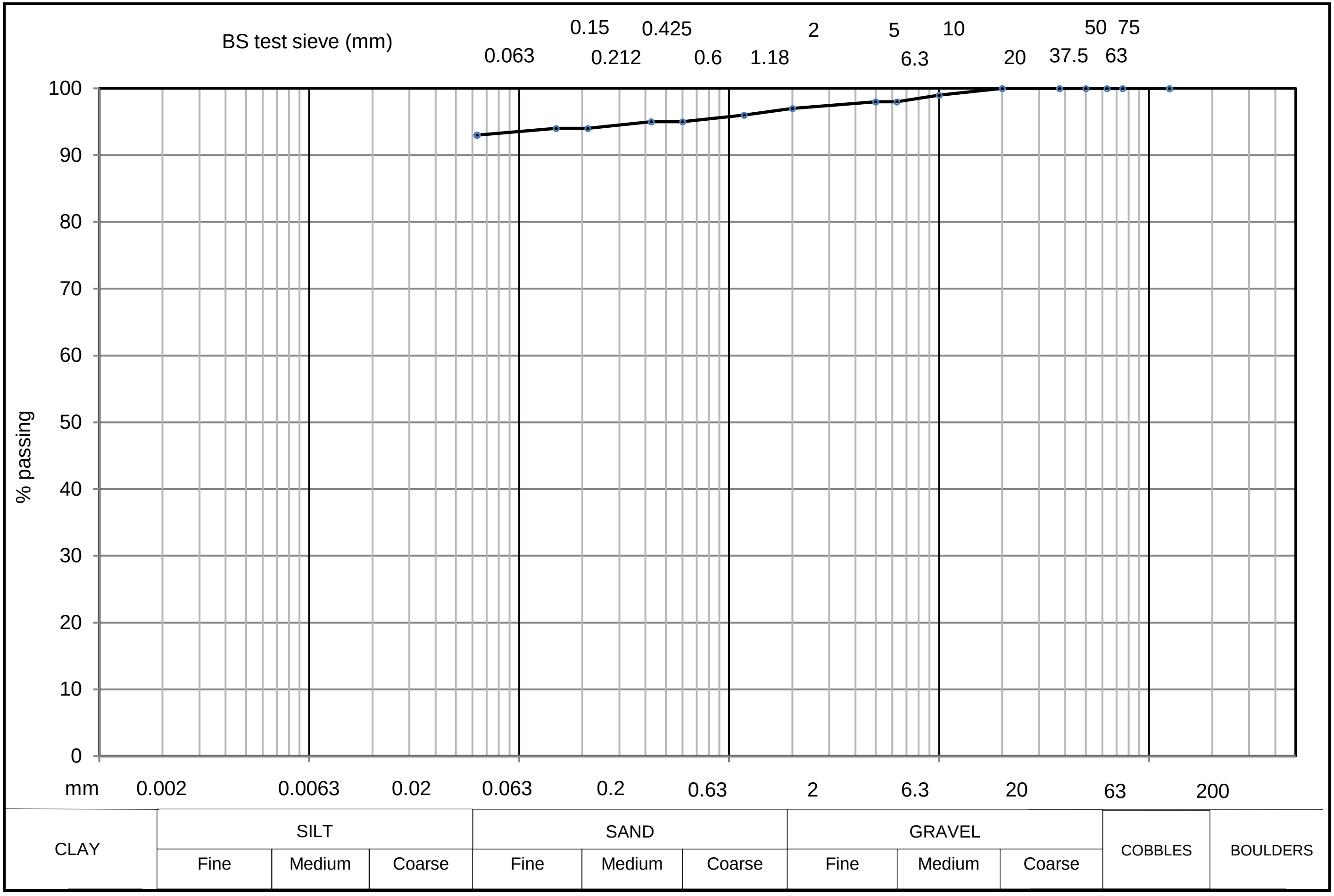
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP110
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Orangish brown slightly sandy slightly gravelly silty CLAY	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY							
SILT		150		5	98	20	
SILT & CLAY	93						
SAND	4	75		2	97	6	
GRAVEL	3						
COBBLE & BOULDER	0	63		1.18	96	2	
test method(s)	9.2	50		0.6	95		
test method		37.5		0.425	95		
9.2 - wet sieving		20	100	0.212	94		
9.3 - dry sieving		10	99	0.15	94		
9.4 - sedimentation by pipette		6.3	98	0.063	93		
9.5 - sedimentation by hydrometer							

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

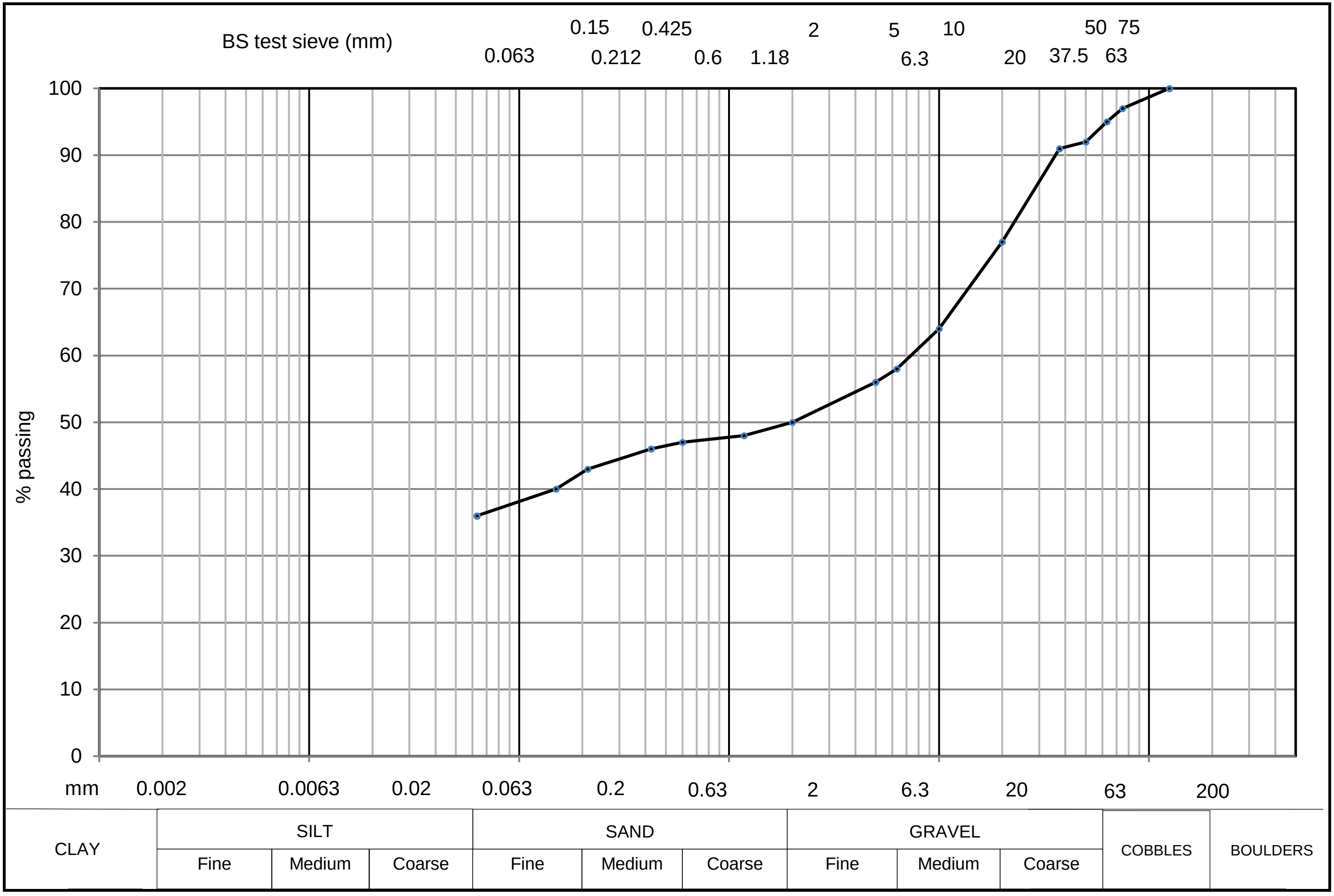
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP123
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.50
DESCRIPTION	Orangish brown slightly sandy gravelly CLAY with medium cobble content	SPECIMEN TOP (m)	1.50
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	36
SAND	14
GRAVEL	45
COBBLE & BOULDER	5
test method(s)	9.2#

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	100	5	56	20	
75	97	2	50	6	
63	95	1.18	48	2	
50	92	0.6	47		
37.5	91	0.425	46		
20	77	0.212	43		
10	64	0.15	40		
6.3	58	0.063	36		

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

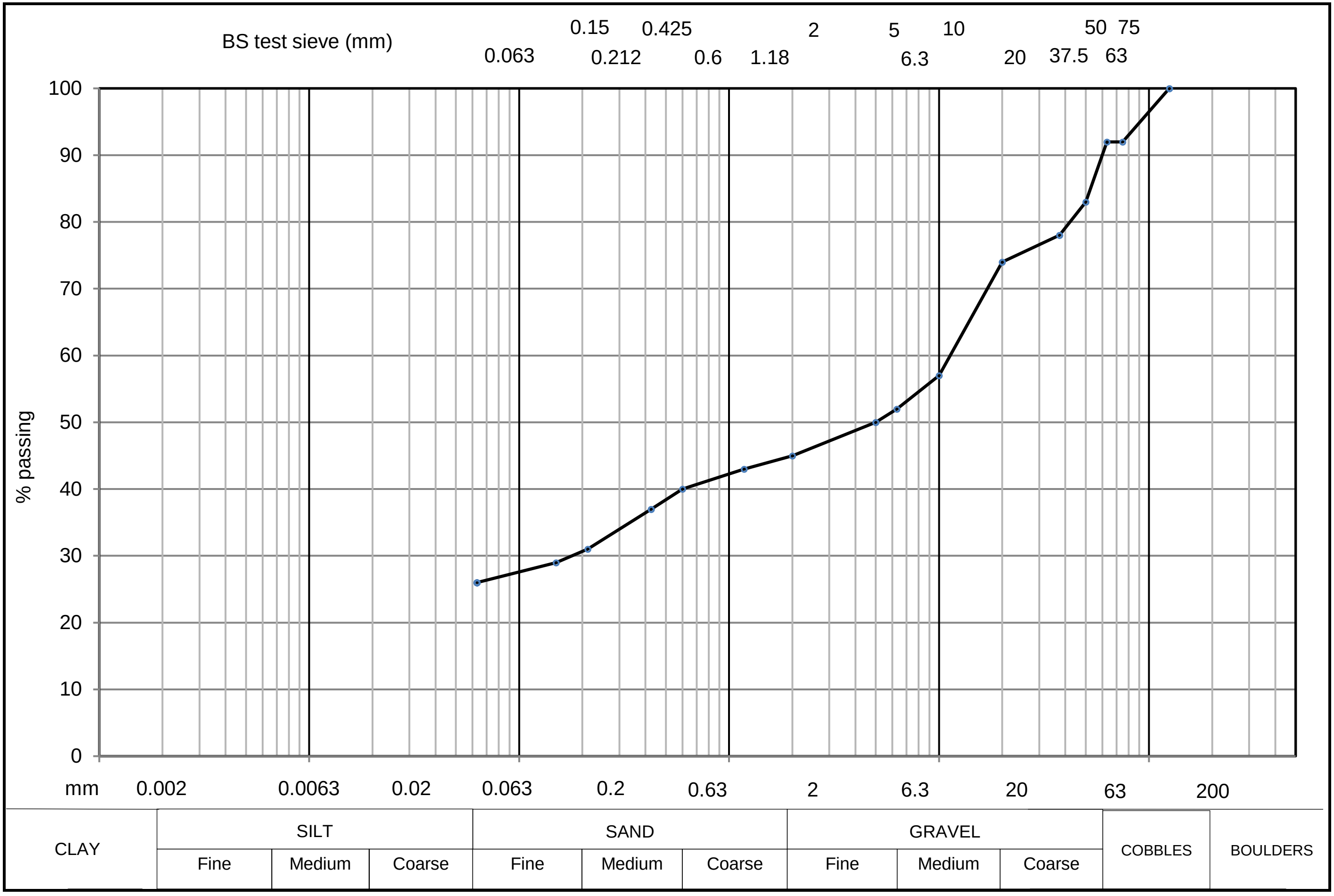
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP125
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Brown sandy very clayey GRAVEL with medium cobble content	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	26
SAND	19
GRAVEL	47
COBBLE & BOULDER	8
test method(s)	9.2

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing
150	100	5	50
75	92	2	45
63	92	1.18	43
50	83	0.6	40
37.5	78	0.425	37
20	74	0.212	31
10	57	0.15	29
6.3	52	0.063	26

BS test sieve (µm)	% finer
20	
6	
2	

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

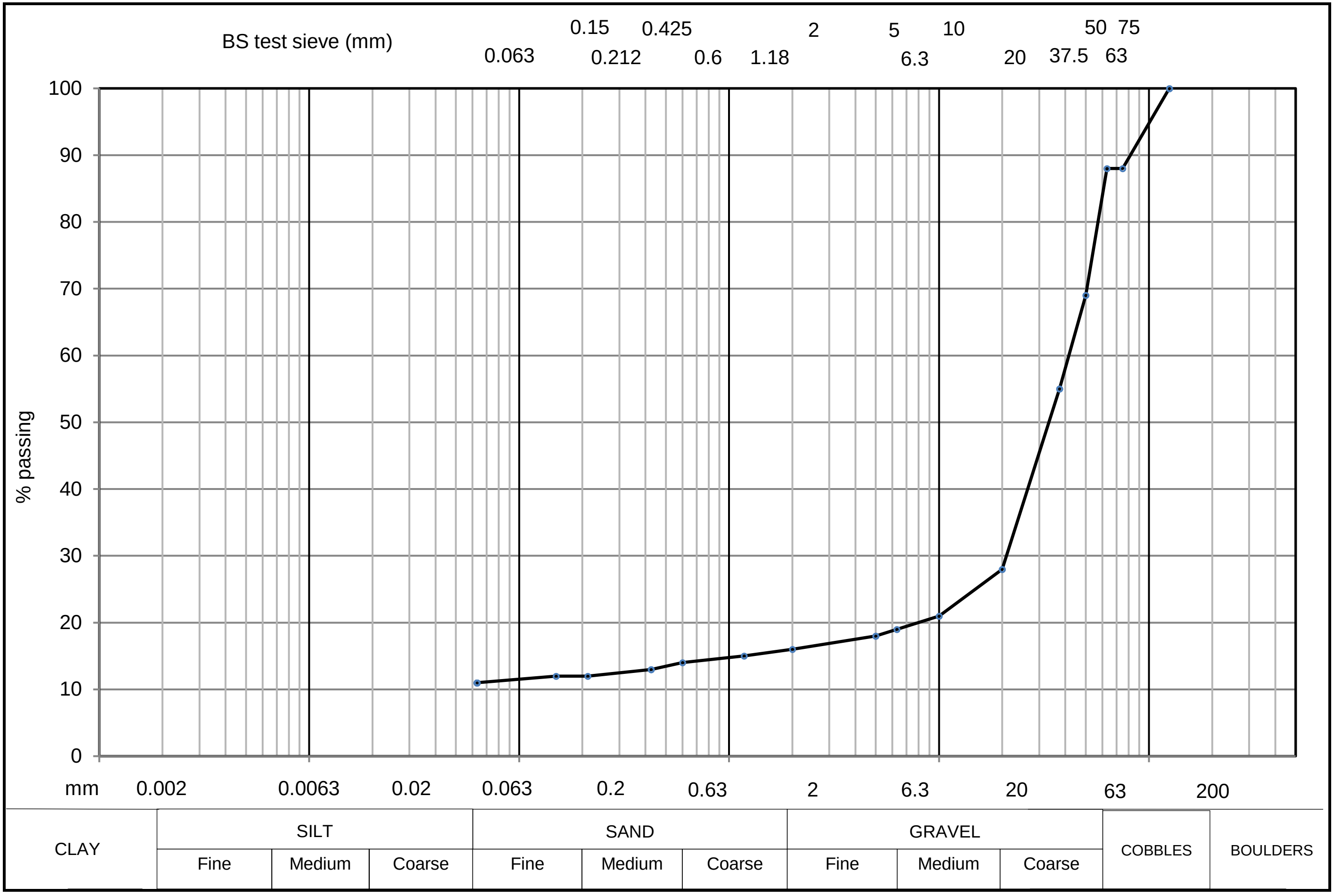
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP17
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	0.80
DESCRIPTION	Orangish brown slightly very clayey GRAVEL with medium cobble content	SPECIMEN TOP (m)	0.80
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	11
SAND	5
GRAVEL	72
COBBLE & BOULDER	12
test method(s)	9.2#

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing
150	100	5	18
75	88	2	16
63	88	1.18	15
50	69	0.6	14
37.5	55	0.425	13
20	28	0.212	12
10	21	0.15	12
6.3	19	0.063	11

BS test sieve (µm)	% finer
20	
6	
2	

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

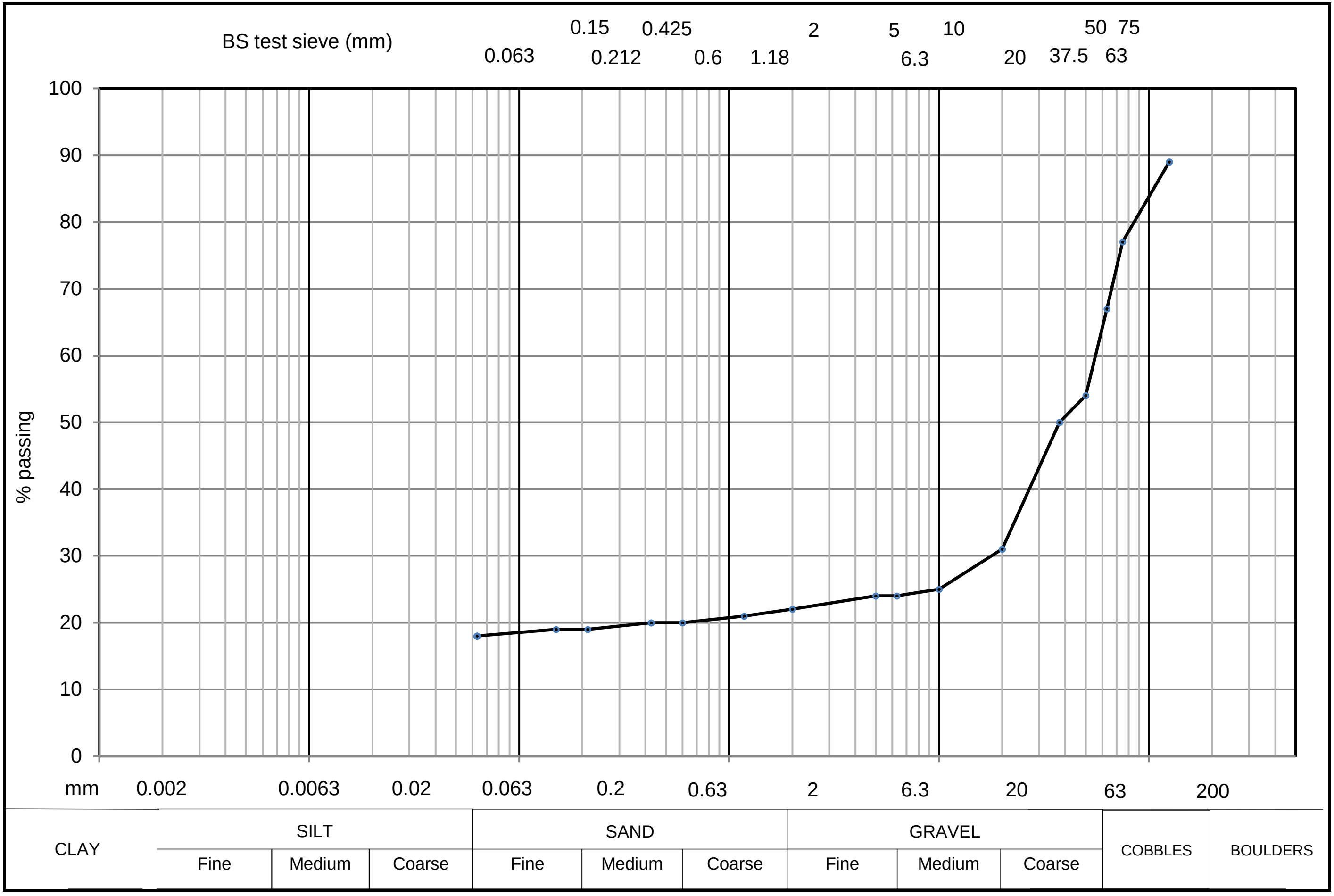
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP31
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Brown slightly sandy clayey GRAVEL with high cobble content	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	18
SAND	4
GRAVEL	45
COBBLE & BOULDER	33
test method(s)	9.2

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150	89	5	24	20	
75	77	2	22	6	
63	67	1.18	21	2	
50	54	0.6	20		
37.5	50	0.425	20		
20	31	0.212	19		
10	25	0.15	19		
6.3	24	0.063	18		

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

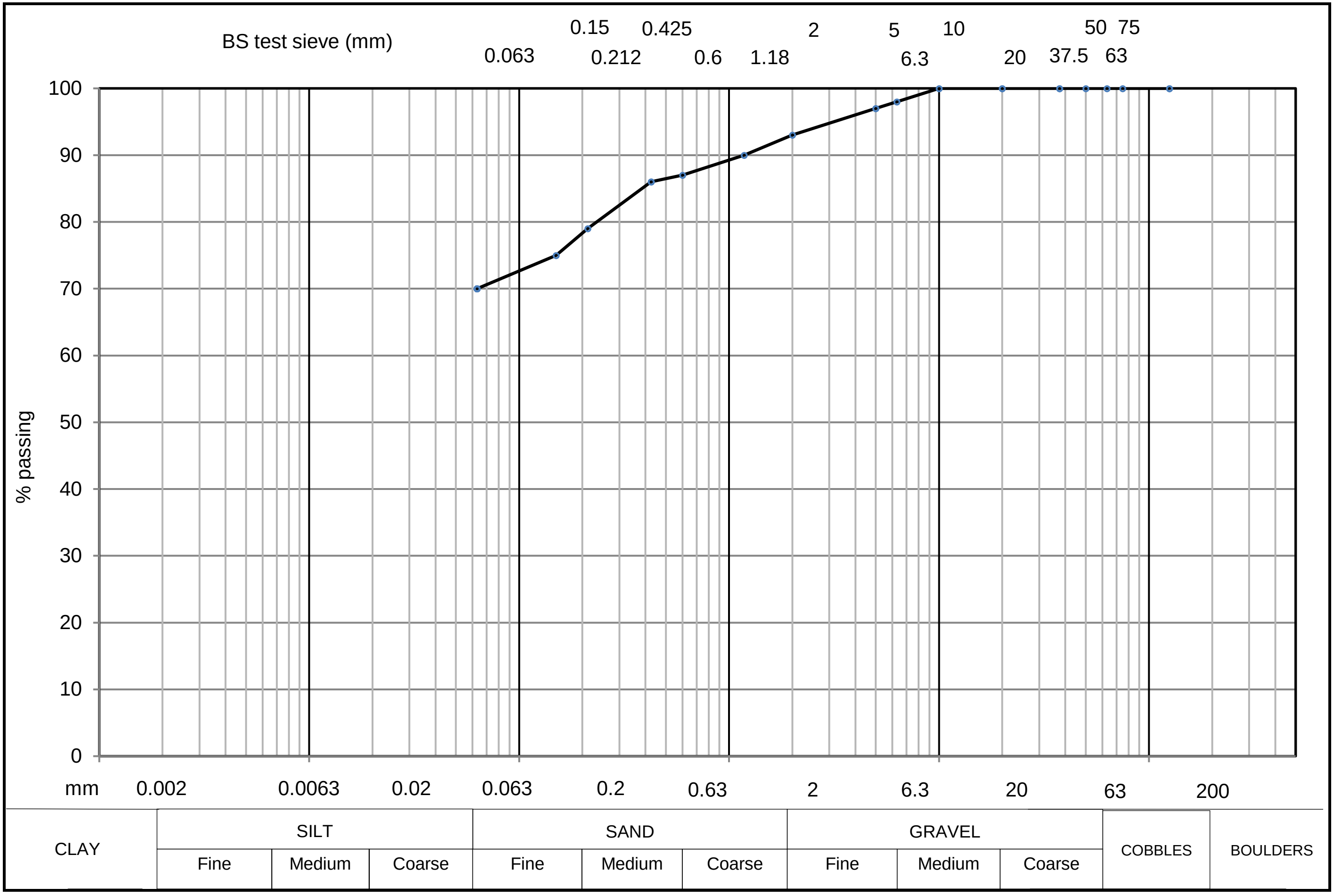
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP31
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	D
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Orangish brown slightly sandy slightly gravelly CLAY	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (μm)	% finer
CLAY							
SILT		150		5	97	20	
SILT & CLAY	70						
SAND	23	75		2	93	6	
GRAVEL	7						
COBBLE & BOULDER	0	63		1.18	90	2	
test method(s)	9.2	50		0.6	87		
		37.5		0.425	86		
		20		0.212	79		
		10	100	0.15	75		
		6.3	98	0.063	70		

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

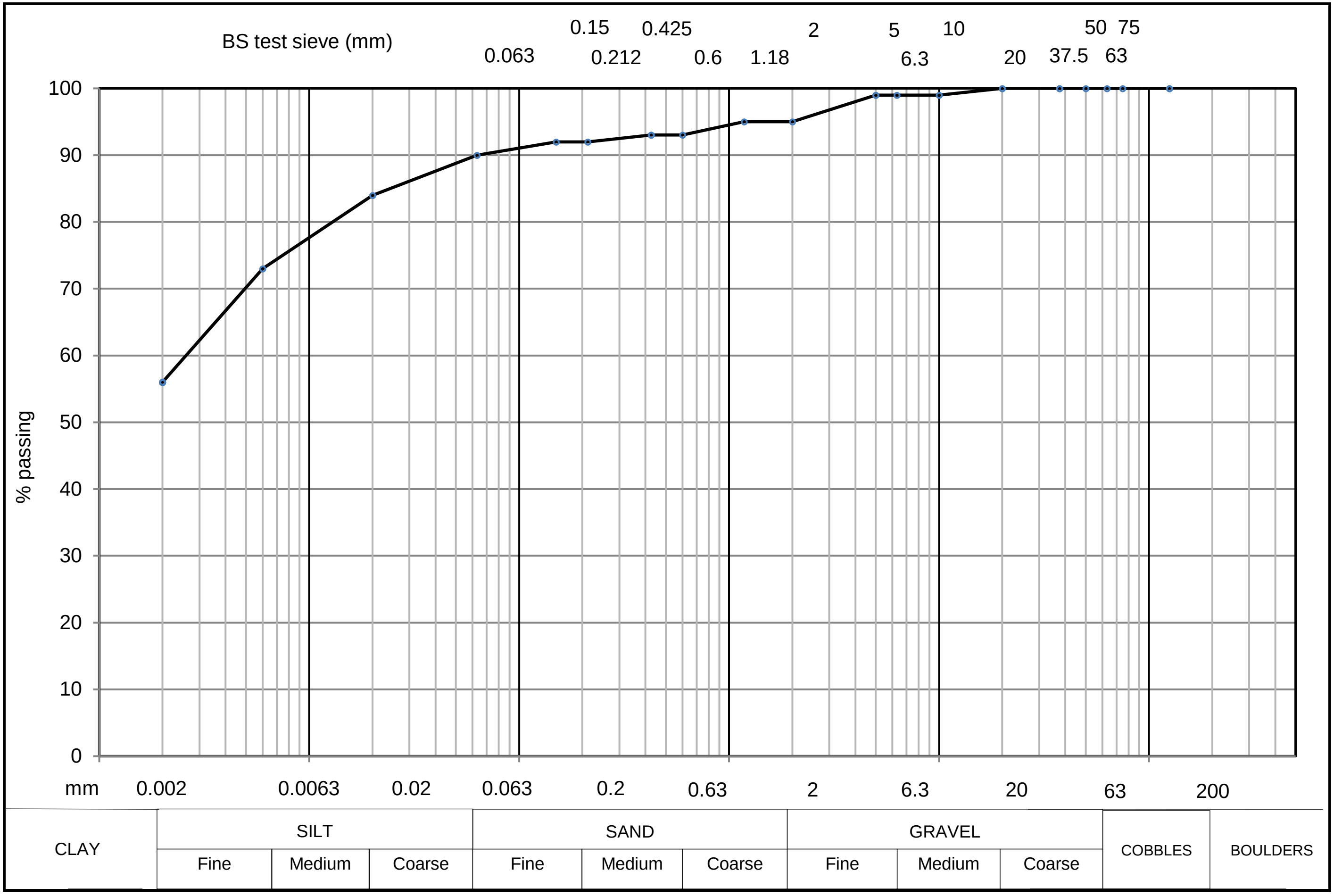
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP38
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	D
		SAMPLE DEPTH (m)	0.50
DESCRIPTION	Greyish brown slightly sandy slightly gravelly silty CLAY	SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	56						
SILT	34	150		5	99	20	84
SILT & CLAY	90						
SAND	5	75		2	95	6	73
GRAVEL	5						
COBBLE & BOULDER	0	63		1.18	95	2	56
test method(s)	9.2 & 9.4	50		0.6	93		
test method		37.5		0.425	93		
9.2 - wet sieving		20	100	0.212	92		
9.3 - dry sieving		10	99	0.15	92		
9.4 - sedimentation by pipette		6.3	99	0.063	90		
9.5 - sedimentation by hydrometer							

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

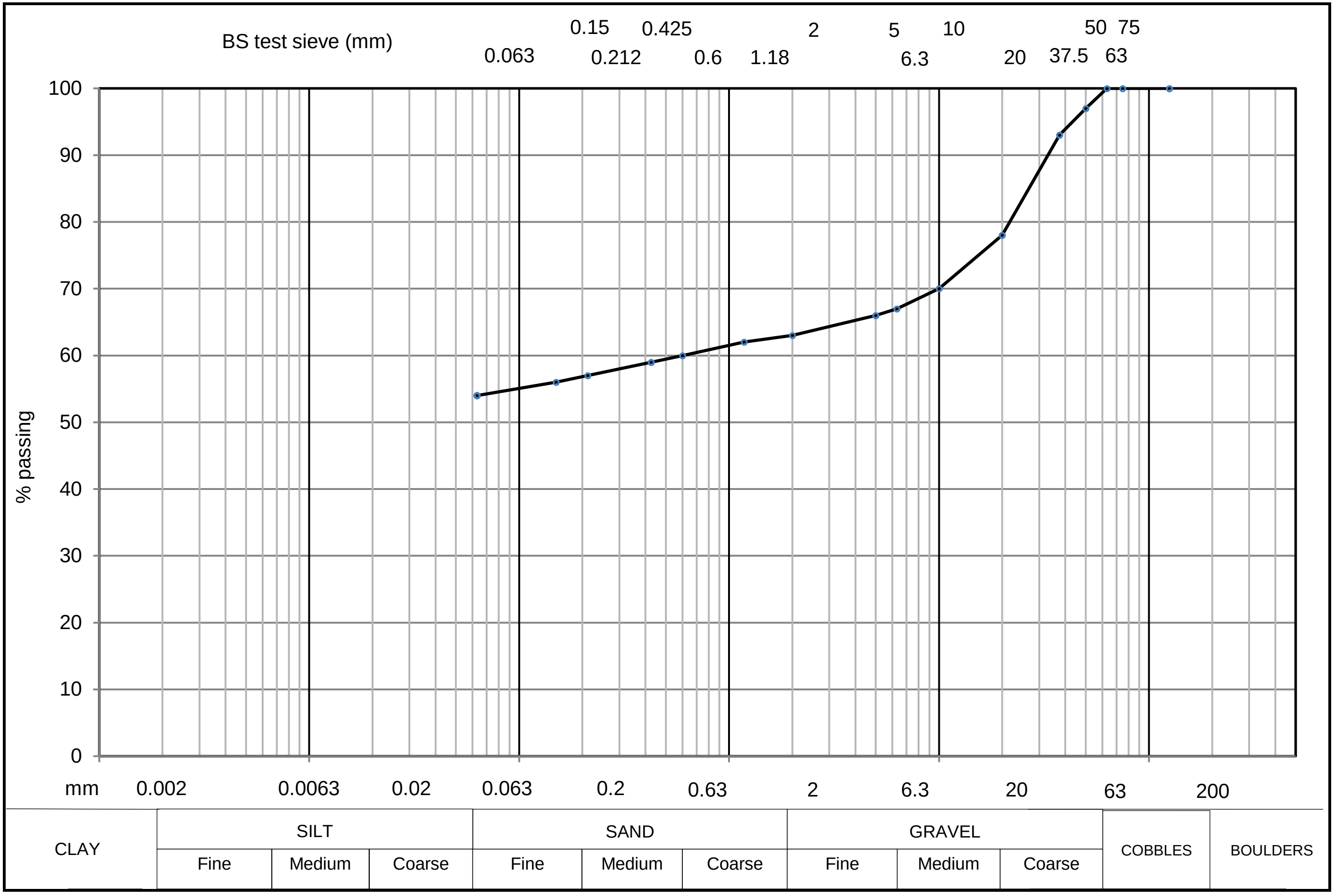
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP53
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	0.60
DESCRIPTION	Orangish brown slightly sandy gravelly CLAY	SPECIMEN TOP (m)	0.60
		SPECIMEN BASE (m)	N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (μm)	% finer
CLAY							
SILT		150		5	66	20	
SILT & CLAY	54						
SAND	9	75		2	63	6	
GRAVEL	37						
COBBLE & BOULDER	0	63	100	1.18	62	2	
test method(s)	9.2	50	97	0.6	60		
		37.5	93	0.425	59		
		20	78	0.212	57		
		10	70	0.15	56		
		6.3	67	0.063	54		

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

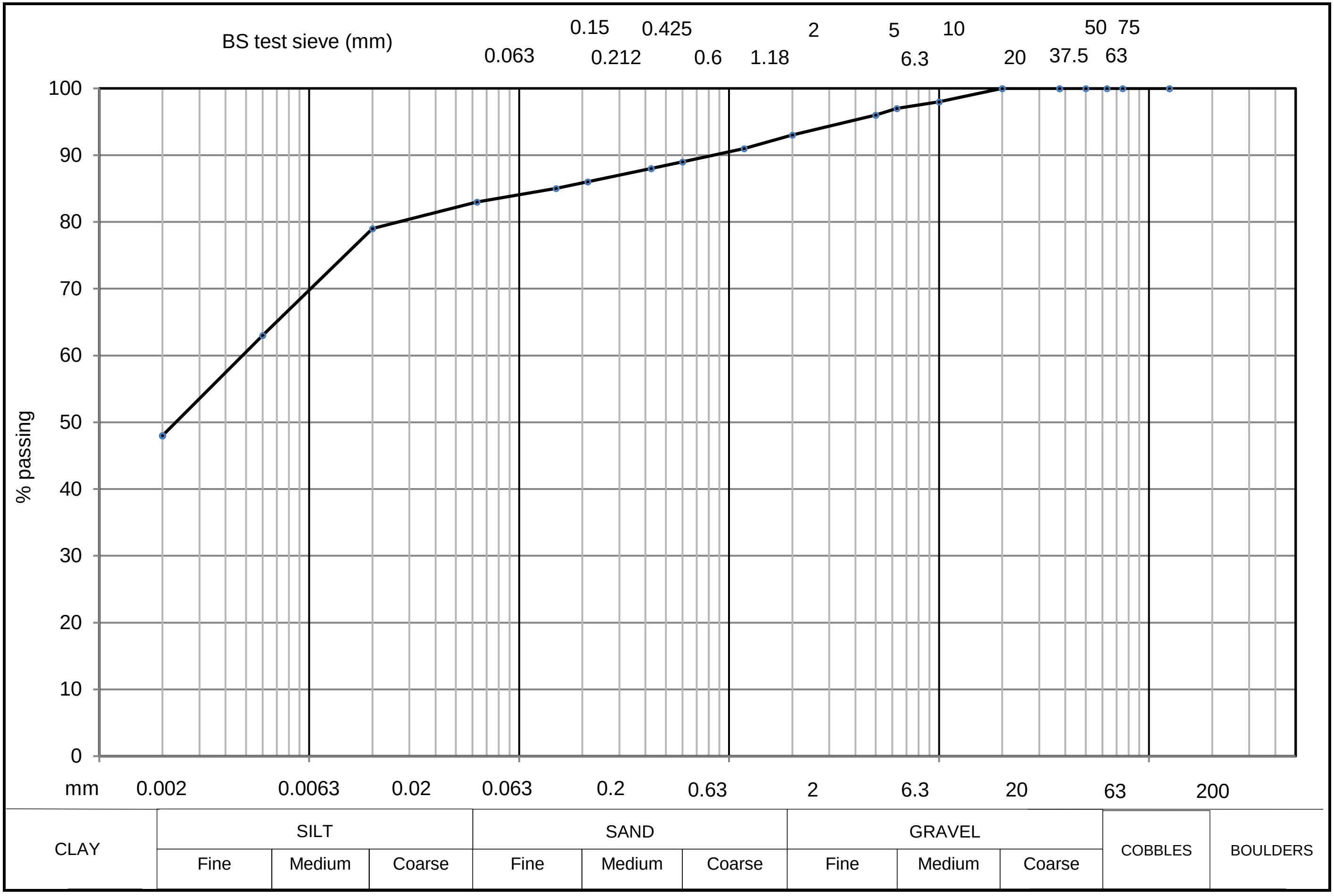
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP66
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	D
		SAMPLE DEPTH (m)	1.00
DESCRIPTION	Brown slightly sandy slightly gravelly silty CLAY	SPECIMEN TOP (m)	1.00
		SPECIMEN BASE (m)	N/A



soil type	% fraction	BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
CLAY	48						
SILT	35	150		5	96	20	79
SILT & CLAY	83						
SAND	10	75		2	93	6	63
GRAVEL	7						
COBBLE & BOULDER	0	63		1.18	91	2	48
test method(s)	9.2 & 9.4	50		0.6	89		
test method		37.5		0.425	88		
9.2 - wet sieving		20	100	0.212	86		
9.3 - dry sieving		10	98	0.15	85		
9.4 - sedimentation by pipette		6.3	97	0.063	83		
9.5 - sedimentation by hydrometer							

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

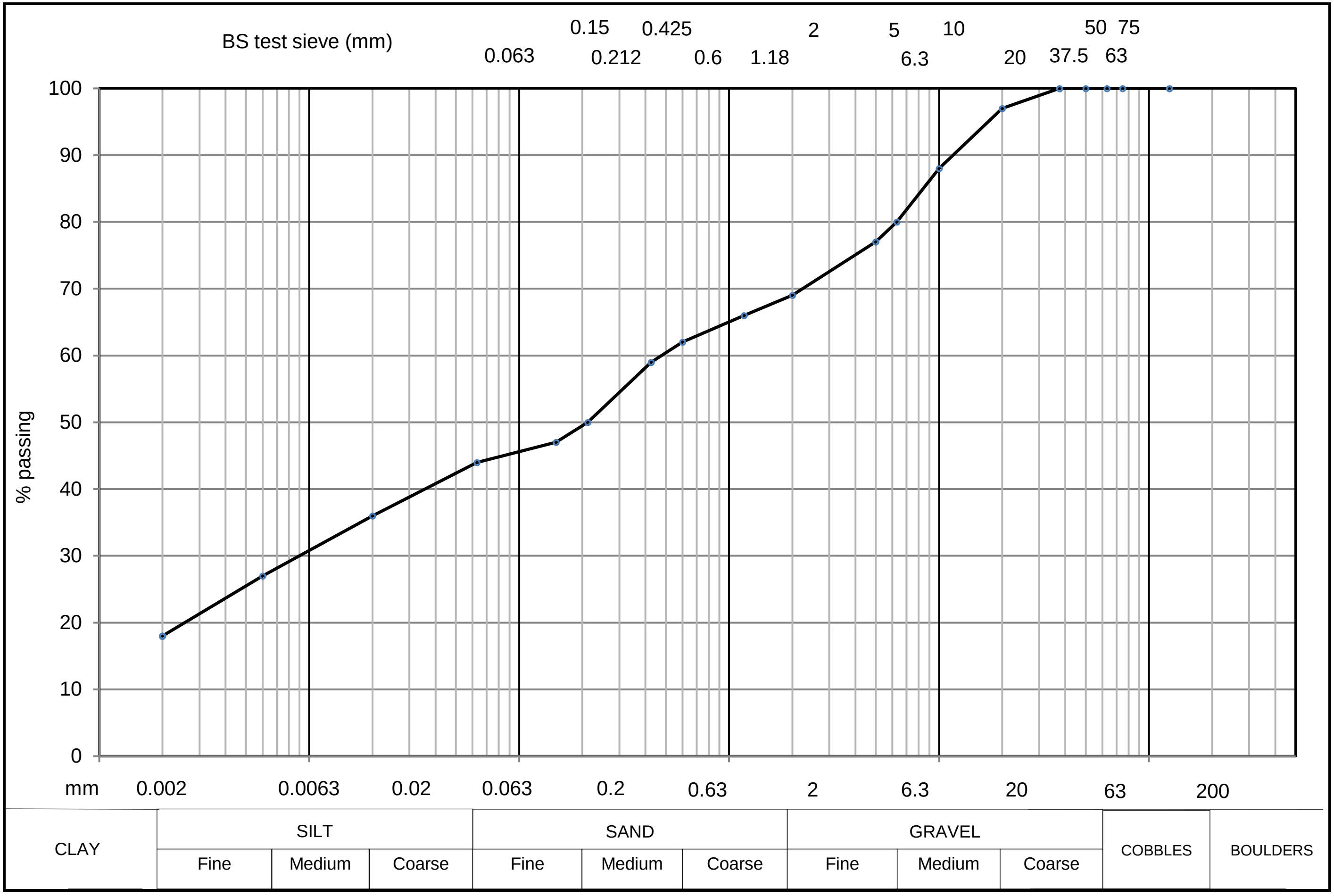
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP69
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	0.50
DESCRIPTION	Brown slightly sandy slightly gravelly silty CLAY	SPECIMEN TOP (m)	0.50
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	18
SILT	26
SILT & CLAY	44
SAND	25
GRAVEL	31
COBBLE & BOULDER	0
test method(s)	9.2 & 9.4

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing
150		5	77
75		2	69
63		1.18	66
50		0.6	62
37.5	100	0.425	59
20	97	0.212	50
10	88	0.15	47
6.3	80	0.063	44

BS test sieve (µm)	% finer
20	36
6	27
2	18

remarks

# denotes sample tested is smaller than that which is recommended in accordance with BS1377

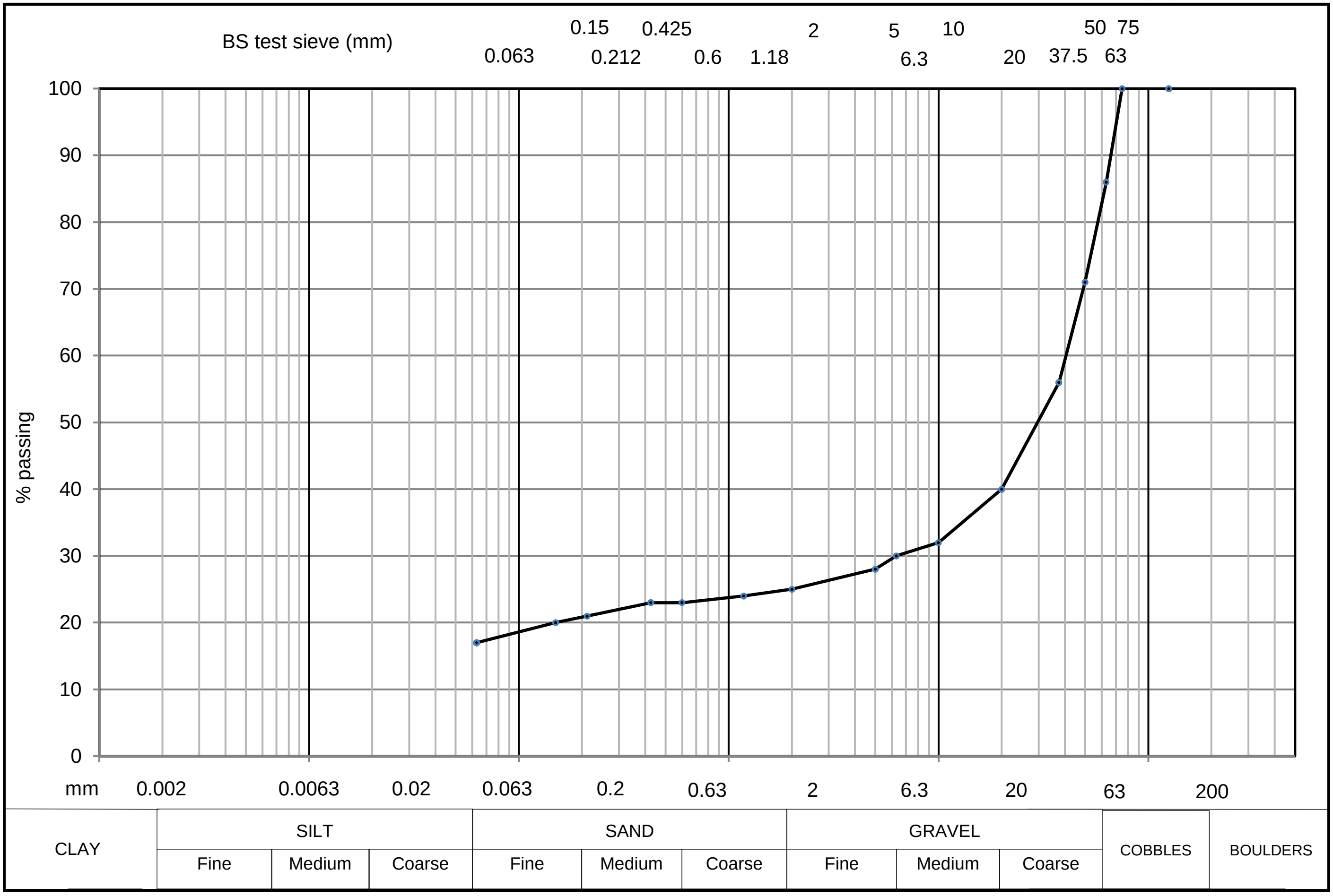
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

PARTICLE SIZE DISTRIBUTION

BS. 1377 : Part 2 : 1990 : 9

CLIENT	HYDROCK	BH/TP No.	TP79
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
		SAMPLE DEPTH (m)	0.90
DESCRIPTION	Orangish brown slightly sandy clayey GRAVEL with medium cobble content	SPECIMEN TOP (m)	0.90
		SPECIMEN BASE (m)	N/A



soil type	% fraction
CLAY	
SILT	
SILT & CLAY	17
SAND	8
GRAVEL	61
COBBLE & BOULDER	14
test method(s)	9.2#

test method

9.2 - wet sieving

9.3 - dry sieving

9.4 - sedimentation by pipette

9.5 - sedimentation by hydrometer

BS test sieve (mm)	% passing	BS test sieve (mm)	% passing	BS test sieve (µm)	% finer
150		5	28	20	
75	100	2	25	6	
63	86	1.18	24	2	
50	71	0.6	23		
37.5	56	0.425	23		
20	40	0.212	21		
10	32	0.15	20		
6.3	30	0.063	17		

remarks

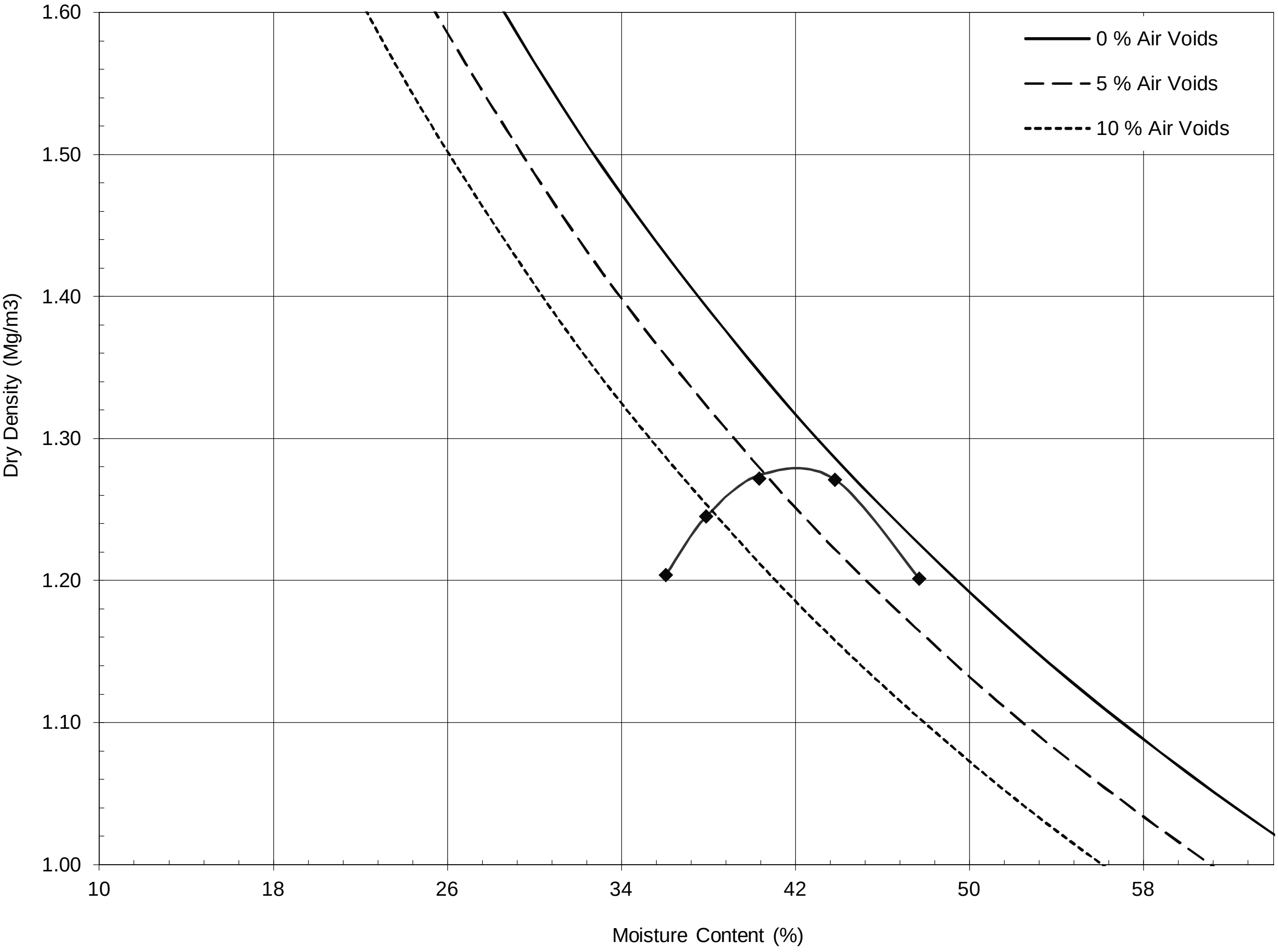
# denotes sample tested is smaller than that which is recommended in accordance with BS1377

CONTRACT	CHECKED
32642	**SR**

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

BS. 1377 : Part 4 : 1990 : 3

CLIENT	HYDROCK	BH/TP No.	TP07
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
DESCRIPTION	Brown slightly sandy slightly gravelly organic CLAY	SAMPLE DEPTH (m)	1.20
		SPECIMEN DEPTH (m)	1.20



test method		3.4.4.1 2.5kg dynamic compaction - CBR mould			
preparation procedure		3.2.5.3 (grading zone 5)			
sample preparation		C R			
proportion retained on 37.5mm sieve	%	7	initial moisture content	%	48
proportion retained on 20mm sieve	%	6	maximum dry density	(Mg/m3)	1.28
particle density	(Mg/m^3)	#2.95	optimum moisture content	%	42

remarks

# denotes particle density has been assigned an assumed value

C denotes sample has been chopped to pass 20mm sieve

S denotes sample has been shredded to pass 20mm sieve

R denotes sample material has been recycled between/for points

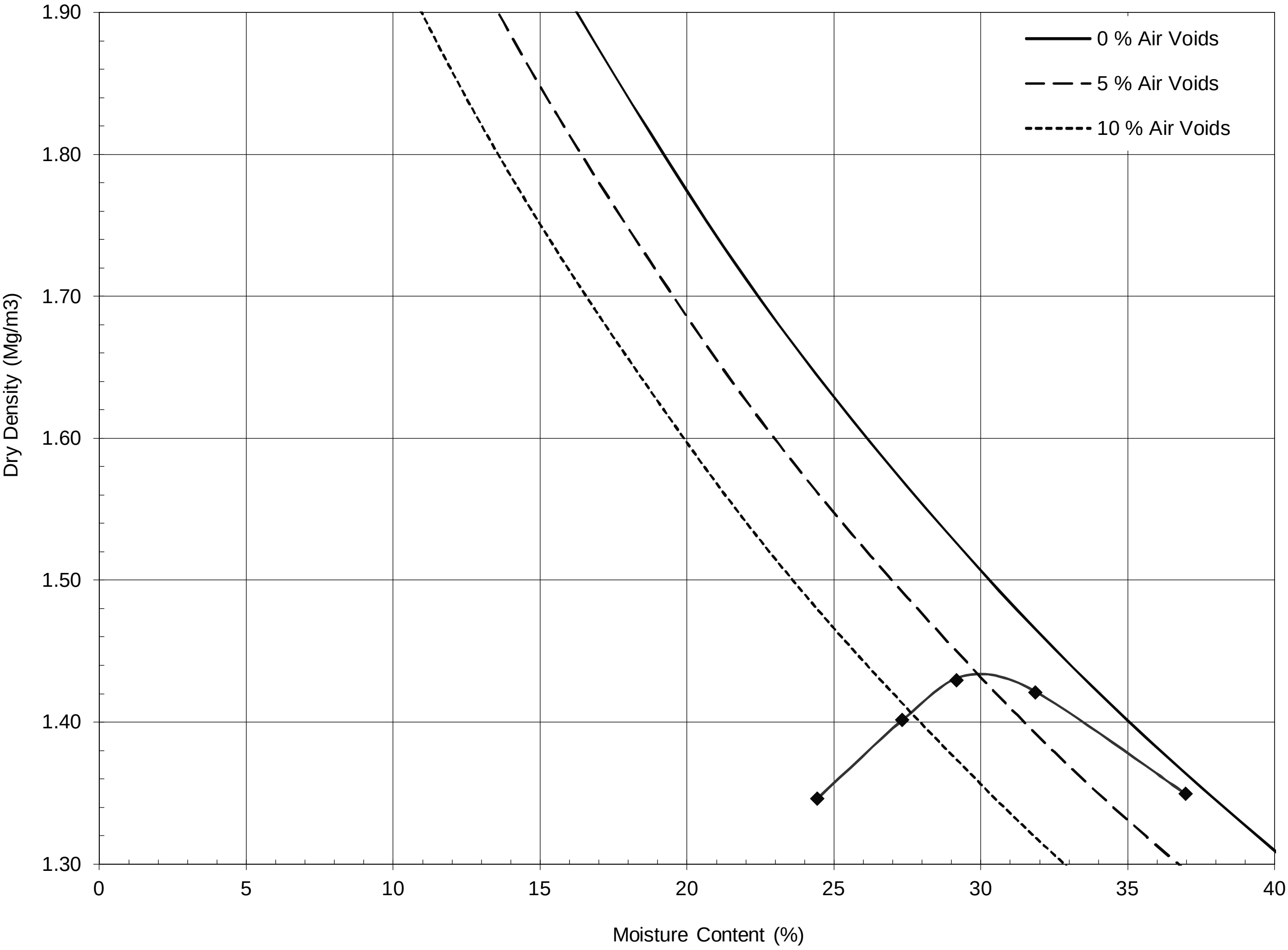
CONTRACT	CHECKED
32642	**SR**

Geotechnical Engineering Limited

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

BS. 1377 : Part 4 : 1990 : 3

CLIENT	HYDROCK	BH/TP No.	TP110
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
DESCRIPTION	Orangish brown slightly sandy slightly gravelly CLAY	SAMPLE DEPTH (m)	1.00
		SPECIMEN DEPTH (m)	1.00



test method	3.3.4.1 2.5kg dynamic compaction - 1L mould			
preparation procedure	3.2.4.1 (grading zone 1)			
sample preparation	C R			
proportion retained on 37.5mm sieve %	0	initial moisture content %	32	
proportion retained on 20mm sieve %	0	maximum dry density (Mg/m3)	1.43	
particle density (Mg/m^3)	#2.75	optimum moisture content %	30	

remarks

# denotes particle density has been assigned an assumed value

C denotes sample has been chopped to pass 20mm sieve

S denotes sample has been shredded to pass 20mm sieve

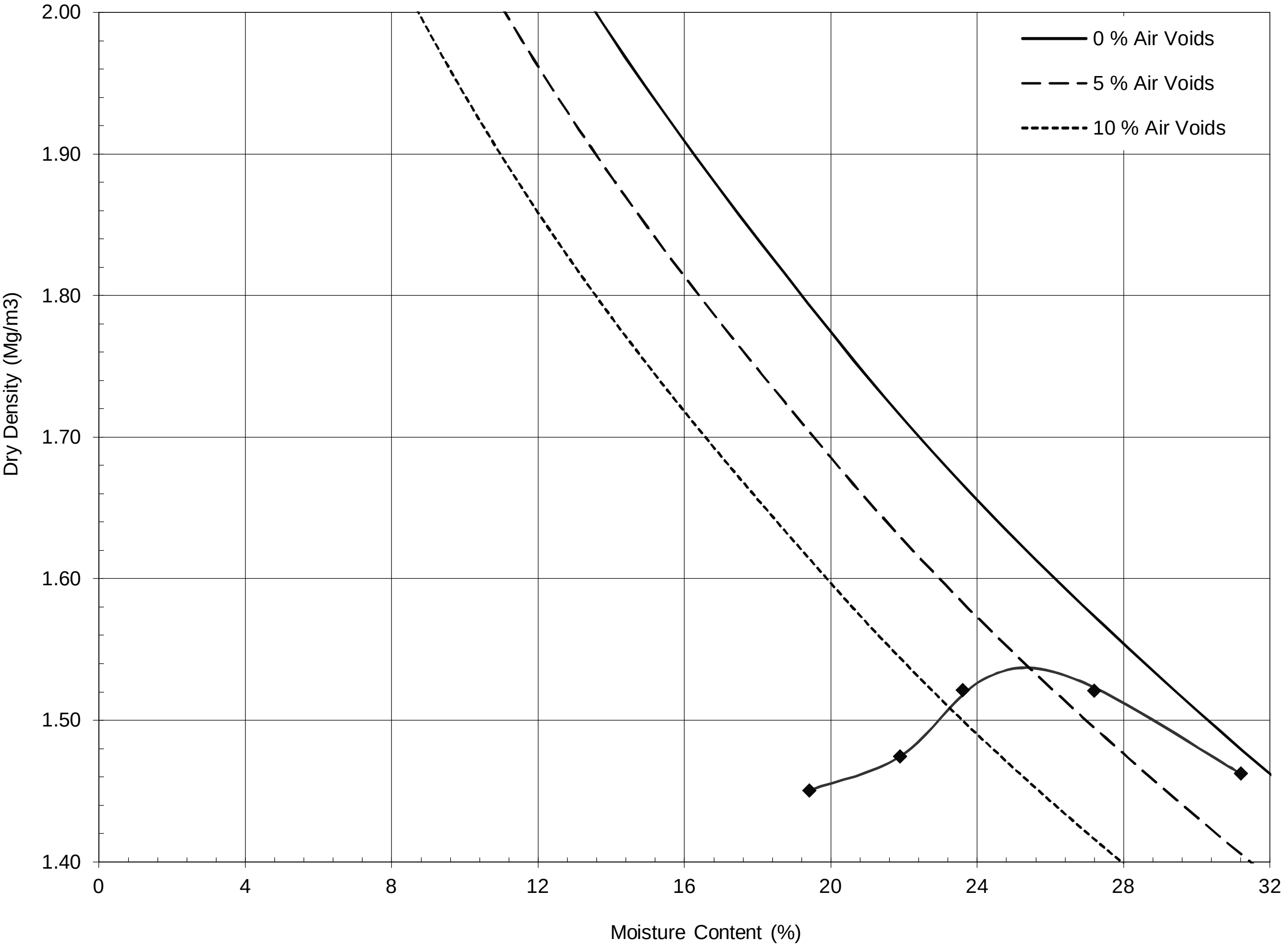
R denotes sample material has been recycled between/for points

CONTRACT	CHECKED
32642	**SR**

DRY DENSITY/MOISTURE CONTENT RELATIONSHIP

BS. 1377 : Part 4 : 1990 : 3

CLIENT	HYDROCK	BH/TP No.	TP44
SITE	WYKHAM PARK FARM	SAMPLE No./TYPE	B
DESCRIPTION	Orangish brown slightly sandy slightly gravelly CLAY	SAMPLE DEPTH (m)	1.00
		SPECIMEN DEPTH (m)	1.00



test method	3.3.4.1 2.5kg dynamic compaction - 1L mould			
preparation procedure	3.2.4.1 (grading zone 1)			
sample preparation	C R			
proportion retained on 37.5mm sieve %	0	initial moisture content	%	27
proportion retained on 20mm sieve %	0	maximum dry density	(Mg/m3)	1.53
particle density (Mg/m^3)	#2.75	optimum moisture content	%	25

remarks

# denotes particle density has been assigned an assumed value

C denotes sample has been chopped to pass 20mm sieve

S denotes sample has been shredded to pass 20mm sieve

R denotes sample material has been recycled between/for points

CONTRACT	CHECKED
32642	**SR**

Appendix F

Site Monitoring Data

Hydrock

Site: Wykham Park Farm, Banbury
Job number: C-04841-C
Client: Gallagher Estates

Gas analyser: GA2000 No. 12369
Equipment check OK: Y
Service in date: Y
Calibration check OK: Y
Name of person monitoring: WD

Notes on site conditions:
23/01/17 - Ground frozen, weather dry. Farmer advised to use farm tracks outside our site plan for access rather than crossing fields with crops.
02/02/17 - Low pressure system: windy and occasional showers. Ground waterlogged.

Notes: LEL = lower explosive limit = 5%v/v. * where the flow is less than the limit of detection of the instrument, the detection limit is reported. GSVs are rounded to 3 places.

Monitoring round		**Borehole details**						**Pressure and flow**													**GSV**		**Local conditions**
Date	**Time**	**Borehole**	**Single or dual gas tap**	**Response zone depth (m)**	**Depth to water or depth of hole if dry (m)**	**D denotes dry hole**	**Volume of headspace in BH (well pipie & filter pack) (m^3)**	**Atmospheric pressure (hPa)**	**Atm pressure falling / rising / steady**	**Relative BH pressure (hPa)**	**Gas flow* (l/hr)**	**Gas flow* (absolute value) (l/hr)**	**CH_4 (%v/v)**		**CH_4 (%LEL)**		**CO_2 (%v/v)**		**O_2 (%v/v)**		**Gas Screening Value (CH_4) (l/hr)**	**Gas Screening Value (CO_2) (l/hr)**	**Notes on condition of borehole and surrounding ground**
													Initial	**Steady**	**Initial**	**Steady**	**Initial**	**Steady**	**Initial**	**Steady**			
								Max. individual values:				**0.3**		**0.2**		**3.0**		**1.6**		**20.9**	**0.0006**	**0.0048**	**Summary statistics for this monitoring period.**
								Min. individual values:				0.3		0.1		0.1		0.4		13.8	0.0003	0.0012	
								Worst-case GSVs based on max. individual flow and max. individual conc. over the duration of this table:													**0.0006**	**0.0048**	
23/01/17		BH03	S		5.05	D	0	1011	S	1	0.3	0.3	0.1	0.1	1	1	1.1	1.1	20.7	20.7	0.0003	0.0033	
02/02/17		BH03	S		5.05	D	0.00000	976	F	1	0.3	0.3	0.1	0.1	2	2	1.2	1.1	20.9	20.9	0.0003	0.0033	
21/02/17		BH03	S		5.05	D	0.00000	1000	F	1	0.3	0.3	0.2	0.2	3	3	1.1	1	20.6	20.9	0.0006	0.003	
		BH03	S				0.00000																
		BH03	S				0.00000																
		BH03	S				0.00000																
23/01/2017		BH02	S		2.04		0.00000	1011	S	1	0.3	0.3	0.1	0.1	2	2	1.1	1.1	19.3	19.4	0.0003	0.0033	
02/02/17		BH02	S		1.37		0.00000	976	F	1	0.3	0.3	0.2	0.1	0.2	0.1	0.5	0.4	13.8	13.8	0.0003	0.0012	CO @ 1ppm
21/02/17		BH02	S		2.05		0.00000	999	F	0	0.3	0.3	0.2	0.2	3	3	0.9	1.2	13.9	16	0.0006	0.0036	
		BH02	S				0.00000																
		BH02	S				0.00000																
		BH02	S				0.00000																
23/01/2017		BH01	S		2.8		0.00000	1010	S	1	0.3	0.3	0.1	0.1	2	2	1.3	1.2	19.8	19.9	0.0003	0.0036	Initial flow +1.3l/hr CO steady @ 6ppm
02/02/17		BH01	S		2.6		0.00000	977	F	1	0.3	0.3	0.1	0.1	2	2	1.7	1.6	19.7	19.6	0.0003	0.0048	
21/02/17		BH01	S		2.54		0.00000	999	F	1	0.3	0.3	0.2	0.2	3	3	1.4	1.5	19.8	19.9	0.0006	0.0045	
		BH01	S				0.00000																
		BH01	S				0.00000																
		BH01	S				0.00000																

Appendix G

Hydrock Methodology

Hydrock Report Appendix on Hydrock Methodology, version 27 updated 25-01-16 applies to this report.

1.0 HYDROCK REPORT APPENDIX ON HYDROCK METHODOLOGY

This appendix provides additional background information on certain approaches and methods used by Hydrock Consultants Ltd in the preparation of this report.

Throughout the report the term ‘geotechnical’ is used to describe aspects relating to the physical nature of the site (such as foundation requirements) and the term ‘geo-environmental’ is used to describe aspects relating to ground-related environmental issues (such as potential contamination). However, it should be appreciated that this is an integrated investigation and these two main aspects are inter-related. The geo-environmental sections are written in broad agreement with BS 10175:2011+A1:2013.

The **first stage** of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011+A1:2013), often referred to as the Phase 1 Study[1], comprising desk study and walk-over survey, which culminates in the Preliminary Risk Assessment. A preliminary conceptual site model (CSM) is developed. From this are identified any geotechnical and geo-environmental hazards and the qualitative degree of risk associated with them. From the geo-environmental perspective, the Hazard Identification process uses professional judgement to evaluate all the hazards in terms of **possible contaminant linkages** (of source-pathway-receptor). Possible contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and generic risk assessment.

The **second stage** is the Ground Investigation, Generic Risk Assessment and Geotechnical Interpretation. This represents the further assessment mentioned above. The Ground Investigation comprises field work and laboratory testing based on the findings of the Preliminary Risk Assessment, to reduce uncertainty in the geotechnical and geo-environmental hazard identification. This may include the Exploratory, Main and Supplementary Investigations described in BS 10175:2011+A1:2013.

For the geotechnical aspects of the report, the general requirements of Eurocode 7 (BS EN 1997-2:2007) are to produce a Ground Investigation Report (GIR) which shall form part of the Geotechnical Design Report (GDR). The geotechnical section of this report is intended to fulfil the general requirements of the GIR as outlined in BS EN 1997-2, Section 6.

The GIR contains the factual information including geological features and relevant data, and a geotechnical evaluation of the information stating the assumptions made in the interpretation of the test results.

---

[1] Please note that it does not refer to a site development phase.

2.0 SITE INVESTIGATION INFORMATION

2.1 Unexploded Ordnance

Clients have a legal duty under the CDM 2015 Regulations to provide designers and contractors with project-specific health and safety information needed to identify hazards and risks. This includes the possibility of unexploded ordnance (UXO) being encountered on the site. Further details are given in CIRIA report C681 (Stone *et al* 2009).

A non-specialist UXO screening exercise has been carried out for the site by considering (a) any evidence of UK defence activities on or near the site evident from the gathered desk study information and (b) the unexploded aerial delivered bomb (UXB) regional risk maps produced by Zetica. Other data sources are available, but as a first stage screening exercise the freely available Zetica maps have been used. The level of risk stated is that determined by Zetica, a company experience in the desk study, field investigation and clearance of UX0/UXB.

2.2 Hydrogeology

Under the Water Framework Directive the designations of principal and secondary aquifers is based on the Environment Agency interactive aquifer designation map. Where aquifers have been mapped, and they are capable of sustaining a yield of 10 m^3/day or supplying 50 people on a continuous basis, the Environment Agency has designated a number of Groundwater Bodies to help manage water quality under the River Basin Management Plans. Groundwater Bodies are defined based on their support for ecosystems as well as their capacity to supply drinking water. Note that some localised small aquifers capable of supporting the above supply may be too small to map and can be identified only by investigation.

Where an aquifer exists and it contains groundwater but is incapable of sustaining the above supply, the groundwater is not part of a Groundwater Body and may not be considered a strategic resource. In which case the groundwater is not a receptor, but can be a pathway to other receptors by virtue of its ability to transport contaminants.

2.3 Geotechnical Testing

Derived values of geotechnical parameters and/or coefficients are obtained from test results, by theory, correlation or empiricism in line with BS EN 1997-2:2007, Section 1.6.

Where derived geotechnical parameters are to be used in designs in accordance with EC7, there are two further stages of interpretation that will be carried out by the geotechnical designer. The first of these is the selection of **characteristic values** for geotechnical parameters using the derived values and complemented by well-established experience as per EN BS 1997-1:2004, Section 2.4.5.2. The characteristic value is a cautious estimate of the value affecting the occurrence of the limit state. Consequently, any particular material type may have more than one characteristic value for each parameter because there may be more than one limit state depending what is being designed.

The second stage is the selection of **design values** as per EN BS 1997-1:2004, Section 2.4.6.2. The design values is either derived from the characteristic value by applying the relevant partial factor or is assessed directly. Similarly, there can be several design values for the same material type.

In the event that geotechnical designs are included in this report, selection of the characteristic and design values is included. Otherwise, it is the duty of the geotechnical designer to determine these within a separate design report.

3.0 RISK ASSESSMENT RATIONALE

The work presented in this report has been carried out in accordance with recognised best practice as detailed in guidance documents such as in the CLR 11 Model Procedures (Environment Agency 2004a), GP3 (Environment Agency August 2013), BS 5930:2015 and BS 10175:2011+A1:2013. Important aspects of the risk assessment process are transparency and justification. The particular rationale behind the risk assessments presented is given in this appendix.

A preliminary risk assessment is made of both geotechnical and geo-environmental hazards identified at the desk study stage and confirmed (or amended) at the ground investigation stage. In the case of geo-environmental hazards this is based on a simple matrix of probability of occurrence versus the consequence, as explained below, and is referred to as the **exposure model**. In the case of the geotechnical hazard identification, this is referred to as the **ground model**.

The geo-environmental risk assessment process proceeds to the next level, the generic risk assessment, in which actual contaminant concentrations are considered.

3.1 Preliminary Risk Assessment

In line with the CLR 11 Model Procedures (Environment Agency 2004a), the Preliminary Risk Assessment includes a geo-environmental Hazard Identification, which seeks to list all the suspected contaminant **sources**, the **receptors** that might be harmed by those sources and the **pathways** via which the sources might reach the receptors to cause the harm. The source-pathway-receptor concept is known as a contaminant linkage (formerly a pollutant linkage) and only when a linkage is complete is there any possibility of risk of harm arising.

The Hazard Identification process uses professional judgement to evaluate all the hazards in terms of **possible contaminant linkages**. Possible contaminant linkages are potentially unacceptable risks in terms of the current contaminated land regime legal framework and require either remediation or further assessment. These are normally addressed via intrusive ground investigation and the chemical analysis of soil and water samples.

Where no ground investigation has been carried out (i.e. in a desk study only report) there is greater uncertainty in the information available and so a geoenvironmental consequences and probability assessment is undertaken.

Some linkages may be identified which constitute a theoretical connection between a source and a receptor, but professional judgement shows them not to be possible for some reason. These are labelled ‘no linkage’ in the summary table and no further action is required. If a linkage is possible, a comparison is made of consequence against probability in accordance with the guidance given in CIRIA Report C552 (Rudland *et al* 2001), but is modified as mentioned below.

Classification of consequences and probability are given in CIRIA Report C552 Tables 6.3 and 6.4, respectively, but there are a number of inconsistencies in the original Table 6.3, in particular relating to ‘significant harm or significant possibility of significant harm’ (SH/SPOSH). Consequently, the table has been updated by Hydrock in line with current practice and the revision presented in R&D Publication 66, Annex 4 (NHBC and Environment Agency. 2008, and is given in Table 3.1 below.

The basis of the classification is that 'severe' and 'medium' are likely to result in SH/SPOSH as defined by the EPA 1990, Part 2A, with 'severe' resulting in acute harm. 'Mild' lies below the level of SH/SPOSH but above the level of 'no harm' as implied by the relevant Generic assessment criterion (GAC, see below). Minor lies below the 'no harm' level.

Table 3.1: Classification of Consequences of Geo-environmental Risks

Classification of Consequences for Geo-environmental Risks		
Classification	**Definition**	**Examples**
Severe	Concentration of contaminants is likely to (or is known from previous data to) exceed that indicative of unacceptable intake or contact. Highly elevated concentrations **likely** to result in "significant harm" to human health as defined by the EPA 1990, Part 2A, if exposure occurs. I.e. >>SH/SPOSH, concentrations are high enough to cause acute (short-term) effects. Equivalent to EA **Category 1** pollution incident including persistent and/or extensive effects on water quality; leading to closure of a potable abstraction point; major impact on amenity value or major damage to agriculture or commerce. Major damage to aquatic or other ecosystems, which is likely to result in a substantial adverse change in its functioning or harm to a species of special interest that endangers the long-term maintenance of the population. Catastrophic damage to crops, buildings or property.	Human health: short-term (acute) effects likely to result in significant harm. E.g. high conc. of cyanide on the surface of an informal recreational area. Significant harm to humans is defined as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Planting: complete and rapid die-back of landscaped areas. Controlled waters: short-term pollution, e.g. major spillage into controlled water. Major fish kill in surface water from large spillage of contaminants from site. Highly elevated concentrations of List I and II substances present in groundwater close to small potable abstraction (high sensitivity). Buildings etc.: catastrophic damage, e.g. explosion causing collapse. (can also equate to immediate human health risk if buildings are occupied). Ecosystems: acute risk to a particular ecosystem or organism forming part of that ecosystem in a designated protected area, e.g. by contamination spillage. Damage to a protected area of international significance (e.g. Ramsar site). Site workers: risk assessment required to determine PPE and this may involve USEPA Level A, B or C protection.

Classification of Consequences for Geo-environmental Risks		
Classification	**Definition**	**Examples**
Medium	Concentration of contaminants is likely to (or is known from previous data to) exceed that indicative of unacceptable intake or contact. Elevated concentrations which could result in "significant harm" to human health as defined by the EPA 1990, Part 2A if exposure occurs. I.e. >SH/SPOSH. Equivalent to **EA Category 2** pollution incident including significant effect on water quality; notification required to abstractors; reduction in amenity value or significant damage to agriculture or commerce. Significant damage to aquatic or other ecosystems, which may result in a substantial adverse change in its functioning or harm to a species of special interest that may endanger the long-term maintenance of the population. Significant damage to crops, buildings or property.	Human health: long-term (chronic) effects likely to result in significant harm. E.g. high conc. of contaminants close to the surface of a development site. Significant harm to humans is defined as death, disease*, serious injury, genetic mutation, birth defects or the impairment of reproductive functions. Planting: stressed or dead plants in landscaped areas. Controlled waters: pollution of sensitive water resources, e.g. leaching into principal or secondary aquifers or rivers. Buildings etc.: damage renders unsafe to occupy e.g. foundation damage resulting in instability. Ingress of contaminants through plastic potable water pipes. Ecosystems: chronic death of species in a particular ecosystem in a designated protected area, e.g. by contamination spillage. Damage to a protected area of national significance (e.g. Site of Special Scientific Interest). Site workers: risk assessment required to determine PPE and this may involve USEPA Level B, C or D protection.
Mild	Concentration of contaminants is likely to (or is known from previous data to) exceed that indicative of no harm but not unacceptable intake or contact. Exposure to human health **unlikely** to lead to "significant harm". I.e. >SVG/GAC but <SH/SPOSH. Equivalent to **EA Category 3** pollution incident including minimal or short lived effect on water quality; marginal effect on amenity value, agriculture or commerce. Minor or short lived damage to aquatic or other ecosystems, which is unlikely to result in a substantial adverse change in its functioning or harm to a species of special interest that would endanger the long-term maintenance of the population. Minor damage to crops, buildings or property.	Human health: harm but probably not significant harm unless particularly sensitive individual within the receptor group. May be aesthetic/olfactory impacts. Exposure could lead to slight short-term effects (e.g. mild skin rash). Planting: damage to plants in landscaped areas, e.g. stunted growth, discoloration. Controlled waters: pollution of non-sensitive water bodies e.g. leaching into non-classified groundwater or minor ditches. Buildings etc.: damage to sensitive buildings etc. Surface spalling of concrete. Ecosystems: minor change in a particular ecosystem in a designated protected area, but not significant harm. Damage to a locally important area. Site workers: risk assessment required to determine PPE and this may involve USEPA Level C or D protection.

Classification of Consequences for Geo-environmental Risks		
Classification	**Definition**	**Examples**
Minor	Concentration of contaminants is likely to (or is known from previous data to) be less than that indicative of no harm. No measurable effects on humans. I.e. <SGV/GAC. Equivalent to insubstantial pollution incident with no observed effect on water quality or ecosystems. Repairable effects of damage to buildings, structures and services.	No measurable effects, but simple PPE required (USEPA Level D protection, i.e. overalls, boots, goggles, hard hat). The loss of plants in a landscaping scheme. Discoloration of concrete.

CIRIA Report C552 Table 6.4 is reproduced as Table 3.2 below. This provides an estimate of the probability that the event described by the contaminant linkage will occur. For example, the likelihood that pollution of groundwater will occur by leaching of metals into the aquifer.

Table 3.2: Classification of Probability of Geo-environmental Risks

Classification of Probability of Geo-environmental Risks	
Classification	**Definition**
High Likelihood	There is a contaminant linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a contaminant linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event in not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a contaminant linkage and circumstances are possible under which an event could occur. However, it is no means certain that even over a longer period such event could take place, and is less likely in the shorter term.
Unlikely	There is a contaminant linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

The perceived level of risk for each pathway is then derived from the probability versus consequences matrix, modified after CIRIA Report C552 Table 6.5, given in Table 3.3 below. Note that by definition, no contaminant linkage equates to no risk.

Table 3.3: Qualitative Risk Level from Consequence and Probability

		Consequence			
Probability	*product*	**Severe**	**Medium**	**Mild**	**Minor**
	High Likelihood	Very high risk	High risk	Moderate risk	Low risk
	Likely	High risk	Moderate risk	Low risk	Very low risk
	Low Likelihood	Moderate risk	Low risk	Low risk	Very low risk
	Unlikely	Low risk	Very low risk	Very low risk	Very low risk
	No Linkage	No risk			

This approach assumes an equivalence between probability and consequences and ignores the difficulty that can arise where to probability of occurrence appears to be almost negligible but the consequences are very severe. In such conditions there is a degree of subjectivity in assessing the level of risk and it could be low, moderate or high. Such risks may require specialist consideration beyond the scope of this standard report.

Finally, a description of the classified risks and the likely action required can be determined from Table 3.4 below.

Table 3.4: Description of the Classified Risks and Likely Action Required

Description of Classified Risks and Likely Action Required	
Very High Risk	A significant contaminant linkage, including actual evidence of significant harm or significant possibility and significant harm, is clearly identifiable at the site (e.g. from visual or documentary evidence) under current conditions, with potential for legal and/or financial consequences for the site owner or other Responsible Person. Remediation advisable based on acute impacts being likely. Immediate action should be considered.
High Risk	A contaminant linkage is identifiable at the site under current and future use conditions. Although likely, there is no obvious actual evidence of significant harm or significant possibility and significant harm under current conditions. Extent of risk is therefore subject to confirmation by investigation and risk assessment and most likely to be deemed significant. Realisation of the risk is likely to present a substantial liability to the site owner or other Responsible Person. Remediation required for redevelopment and may also be required under Part 2A for existing receptors.
Moderate Risk	A contaminant linkage is identifiable at the site under current and future use conditions. However, it is not likely to be a significant linkage under current conditions. It is either relatively unlikely that any such harm would be severe, and if any harm were to occur it is more likely, that the harm would be relatively mild. Actual extent of risk subject to confirmation by additional investigation and risk assessment and most likely to lie between no possibility of harm (under current conditions) and significant possibility of significant harm (under conditions created by new use). Remediation may be required for redevelopment.
Low risk	Potential pathways and receptors exist but history of contaminative use or site conditions indicates that contamination is likely to be of limited extent and below the level of no possibility of harm. It is unlikely that the site owner or other Responsible Person would face substantial liabilities from suck a risk. Precautionary investigations and risk assessment advisable on change of use. Any subsequent remedial works are likely to be relatively limited.
Very Low Risk	No contaminant linkage likely to exist under current or future conditions, but this cannot be completely discounted. If harm is realised, it is likely at worst to be mild or minor. Site not capable of being determined under Part 2A where the local authority inspects the site. No further action recommended.
No Risk	No contaminant linkage exists.

3.2 Contaminant Analysis of Samples

The Model Procedures of CLR 11 provide guidance on key information sources with respect to potential contamination arising from past land uses of a site. In particular, the now withdrawn CLR 8 (Environment Agency 2002b), the DoE Industry Profile documents and ISO10381-5 provide good summaries of priority pollutants for UK sites. Additionally, the Environment Agency (2004b) has produced a list of priority pollutants for ecological risk assessment. These documents have been used, with the findings of the Phase 1 investigation, to scope the analyses of chemicals of potential concern. It should be noted that whilst CLR 8 was withdrawn in August 2008 it was not replaced and its findings are still considered useful.

Hydrock considers there to be a minimum requirement for soil chemical analysis, even for greenfield sites, in order to satisfy the ‘suitable for use’ criterion of the planning regime. This is represented by the ‘Hydrock default list of determinands for solids’. The default list is derived from the above guidance, particularly Tables 2.1 and 2.2 of CLR 8, listing potential inorganic and organic contaminants on typical former **industrial** land in the UK.

Since not all redevelopment sites have former industrial land uses, the default list designed to screen for unacceptable risks to property development and future occupiers comprises those substances with human, vegetation and construction materials receptors. The list includes common metals, metalloids and inorganic species, pH, asbestos fibres and screening tests for common organic compound groups which are deemed chemicals of potential concern. Sulfate is a contaminant whose principal receptor is concrete in the ground and is not considered toxic except in extreme conditions. Sulfate analysis is included in the list of geotechnical tests. Some common determinands such as elemental sulfur and sulfide are not included because there is insufficient information available to calculate meaningful assessment criteria.

The Hydrock default list of determinands for water or soil leaching samples is based on the prevailing UK drinking water standards and the environmental quality standards (EQS) values under the UK's obligations under the European Water Framework Directive (WFD). It includes the most common contaminants for use as a screening exercise but does not represent a complete list.

The two Hydrock default lists of determinands are used as a minimum requirement whatever the findings of the Phase 1 investigation. Added to this may be other suites of determinands based on the findings and review of the aforementioned documents.

Assessment is made of all chemicals of potential concern recorded on the site above the laboratory reporting limit. The reporting limits are less than the generic assessment criteria where this is possible. There are two main reasons why this may not be the case.

Firstly, low-level detection may be available using a more detailed analysis method, but this would be disproportionally expensive for routine screening purposes. More detailed testing may be recommended in some instances as an additional phase of investigation once the results of the screening exercise are known.

Secondly, there may be no suitable laboratory method available. In which case it is impossible to give a definitive opinion.

3.3 Generic Risk Assessment Criteria for Human Health

3.3.1 Policy

Generic assessment criteria (GAC) are criteria derived using largely generic assumptions about the characteristics and behaviour of sources, pathways and receptors. These assumptions will be conservative in a defined range of conditions. The Contaminated Land Exposure Assessment (CLEA) framework uses Soil Guideline Values (SGV) in assessing risks to human health from exposure to soils contaminated with selected contaminants. It has been assumed in this report that the exposure conditions are within the generic conditions used to derive the SGVs.

It should be noted that exceedance of GACs does not automatically mean that the soil is "contaminated". The derivation of GACs includes a number of precautionary assumptions such that non-exceedance will indicate that risk to human health is acceptable and that the land is suitable for use, with regard to the contaminant in question. SGVs are not binding standards, but may be used to inform judgments about the need for action and the selection of remediation standards or target values for individual sites.

However, the legal test for land contamination under the statutory guidance of Part 2A of the Environment Protection Act 1990 (i.e. “significant harm or significant possibility of significant harm”) is **unacceptable** intake or direct bodily contact. Defra (September 2005 and July 2008) has made it clear that exceedance of a GAC does not necessarily meet this legal test, i.e. exceedance of a GAC does not necessarily equate to unacceptable risk. Consequently, the GACs must be considered as screening values only. The situation was clarified by Defra (July 2008) in its guidance on the legal definition of contaminated land and in 2012 by the publication of revised contaminated land statutory guidance. One of the key policy aspects of this revision is to clarify that GACs are only one tool in the decision-making process and that background concentrations and a number of other relevant factors should also be taken into account. The aim is to prevent over-cautious determination of land as being contaminated.

The Environment Agency (2009a) has stated that the Health Criteria Values (HCV) used to derive GACs represent minimal or tolerable risk for long-term human exposure to chemicals in the soil. “Science alone cannot answer the question of whether or not a given *possibility of significant harm* is *significant*, since what is either *significant* or *unacceptable* is a matter of socio-political judgement, and the law entrusts decisions on this to the enforcing authorities (Defra July 2008).”

The former Health Protection Agency (2009) (now Public Health England) also described how HCVs do not represent unacceptable intake and that unacceptable intake is not a toxicological parameter. It further asserts that “unacceptable intake is a policy decision which can only be taken by the local authority.” Pointers provided to local authorities in this regard are provided by the following: “The HCVs, and GACs based upon them represent trigger values above which there might be a possibility of significant harm. Whether there is a significant possibility will be linked to factors such as the margin of exceedance, the duration and frequency of exposure, and other site-specific factors.”

The 2012 National Planning Policy Framework states that the standard of remediation to be achieved through the grant of planning permission for new development, including permission for land remediation activities, is the removal of unacceptable risk and making sure the site is suitable for its new use. As a minimum, after carrying out the development and commencement of its use, the land should not be capable of being determined as contaminated under Part 2A. The requirements for planning are, therefore, the same as for Part 2A.

The 2012 contaminated land statutory guidance says that GAC 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. They may be used to indicate when land is very unlikely to pose a significant possibility of significant harm to human health. They should not:

- be used as direct indicators of whether a significant possibility of significant harm to human health may exist. Also, the local authority should not view the degree by which GACs are exceeded (in itself) as being particularly relevant to this consideration, given that the degree of risk posed by land would normally depend on many factors other than simply the amount of contaminants in soil.

- be seen as screening levels which describe the boundary between Categories 3 and 4 (see below);
- be viewed as indicators of levels of contamination above which detailed risk assessment would automatically be required under Part 2A or, under the planning system, in relation to ensuring that land affected by contamination does not meet the Part 2A definition of contaminated land after it has been developed; nor
- be used as generic remediation targets under the Part 2A regime.

Where it is judged that significant uncertainties remain following assessment against generic criteria, there are two options for the developer: either the implementation of an agreed remedial strategy, or to undertake additional testing and/or a detailed quantifiable risk assessment to determine whether remediation is indeed necessary.

Category 4 Screening Levels (C4SL) are criteria developed to screen out land affected by contamination under Part 2A of the EPA 1990 (see Section 3.12 below). They represent a low level of risk, whilst still being protective of human health. The Defra policy document (March 2014) states that “it is anticipated that, where they exist, C4SLs will be used as generic screening criteria that can be used within a GQRA, albeit describing a higher level of risk than the currently or previously available SGVs.”

Defra also states that “the Part 2A regime and the planning regime are inter-linked such that the National Planning Policy Framework states that “after development, as a minimum, land should not be capable of being determined as contaminated land under Part 2A of the Environmental Protection Act 1990” and that “Where a site is affected by contamination or land stability issues, responsibility for securing a safe development rests with the developer and/or landowner.” The Part 2A Statutory Guidance and accompanying Impact Assessment were developed on the basis that Category 4 Screening Levels could be used under the planning regime, as they would be in Part 2A investigations directly. The estimated benefits that were expected to accrue from the changes to the Part 2A Statutory Guidance and specifically from the use of the new Category 4 Screening Levels were based on this assumption. However, policy responsibility for the National Planning Policy Framework and associated Planning Practice Guidance falls to the Department for Communities and Local Government.”

DCLG’s Planning Policy Guidance (Reference ID: 33-007-20140612 Land affected by contamination, dated 12 June 2014) states that “if there is a reason to believe contamination could be an issue, developers should provide proportionate but sufficient site investigation information (a risk assessment) to determine the existence or otherwise of contamination, its nature and extent, the risks it may pose and to whom/what (the ‘receptors’) so that these risks can be assessed and satisfactorily reduced to an acceptable level. Defra has published a policy companion document considering the use of ‘Category 4 Screening Levels’ in providing a simple test for deciding when land is suitable for use and definitely not contaminated land.”

In a letter to Local Authorities dated 3 September 2014, Defra Parliamentary Under Secretary Lord de Mauley confirmed that the Impact Assessment agreed during the revision of the Part 2A Statutory Guidance was developed on the basis that C4SLs could be used under the planning regime, and noted this intent is reflected in the above-mentioned revision of the Planning Policy Guidance. He highlighted that C4SLs provide a simple test for deciding when land is suitable for use. He concluded that the introduction of C4SLs has an important part to play in the assessment of potentially contaminated land and encouraged Local Authority officials to read Defra's Policy Companion Document.

The NHBC (October 2014) has endorsed the use of C4SLs in the planning framework. "NHBC considers that:

- C4SLs may be used for schemes in England and Wales as generic screening levels for contaminants in soils, as long as they are justifiable and defensible in the conceptual site model for the site. Where representative contaminant concentrations exceed C4SLs, remediation or further detailed assessment will normally be required.
- Developers should, however, check that the use of C4SLs would be accepted by regulators under the relevant planning regime.
- Where a land use scenario covered by a C4SL applies in England and Wales, that use of C4SLs will satisfy NHBC Standards – Chapter 4.1 requirements. For lead, the C4SL value should be adopted as the screening level, though normal background concentrations can be considered when appropriate."

Public Health England has also communicated with Hydrock on a site-specific basis, confirming (in this instance) that the soil benzo(a)pyrene levels below C4SL not to be of particular concern as long as the Local Authority as the regulator is also satisfied.

On this basis, Hydrock considers the C4SLs to be more pragmatic assessment criteria for use in the planning regime. However, it is recommended that the opinion be sought of the Local Authority in question.

3.3.2 Methodology

The sample analyses are divided into representative data sets for the assessment, based on the conceptual model and taking into account such characteristics as variation in soil properties or historical, existing or proposed land uses. The 'averaging area' is the area of soil to which a receptor is exposed or which otherwise contributes to the creation of hazardous conditions.

The determination of averaging areas is clarified in the CLEA Frequently Asked Questions (30 January 2006) document available from the Agency CLEA web pages. In applying statistical tests, the risk assessor is asking the question "are mean (95 percentile upper confidence limit) soil concentrations within the averaging area equal to, or greater than, the SGV/GAC?" If a garden lies within a larger averaging area, but that averaging area is representative of conditions within the garden, then this is the average concentration a receptor using the garden will be exposed to. An averaging area can, therefore, be larger than a single garden and part of a larger zoned area if:

- contaminant concentrations are within the same statistical population, the sample data being representative of the averaging area and the mean concentration of the averaging area;
- hot spots are treated as separate zones or averaging areas; and
- the sampling strategy takes into account uncertainty (spatial heterogeneity) in contaminant concentration.

The approach taken in this report is to characterize the materials that are likely to form the ground cover in garden areas by zoning the site. Each averaging area has been chosen to describe the area(s) of the site, zoned according to material type and existing conditions, within which assessment against GACs has taken place. As pointed out in P5-066/TR (Environment Agency 2000) and by Nathanail (2004), this is a logical way of investigating a large plot of land that is intended for residential use, particularly if the development layout may not have been finalised.

The original Soil Guideline Values were all withdrawn in August 2008 and the Agency started a programme of publishing replacements using its 'new approach', which involves a number of changes to the way exposure is assessed. This was started using the CLEA 1.04 software. The current version is CLEA 1.07. This programme was put in abeyance when Defra started to re-draft the Part 2A statutory guidance and was never re-started.

This new approach included SGVs only at 6% soil organic matter (SOM) content and none for the residential without plant uptake land use. The contaminated land community has addressed this deficiency by publishing other lists of GACs (EIC/AGS/CL:AIRE 2009 and LQM/CIEH (Nathanail *et al* 2009)) and these have been given equal status to the SGVs in the 2012 revised statutory guidance. Hydrock adopted all these SGVs and GACs and where none are published has derived in-house values using generic assumptions about the characteristics and behaviour of sources, pathways and receptors, the CLEA 1.07 software and research of the recommended data sources.

Since the publication of these lists, CL:AIRE (December 2013) has highlighted that several of the original USEPA data sets used as default input parameters in CLEA have been revised based on a better understanding of the science. These are the outdoor soil-to-skin adherence factor, the exposure frequency for dermal contact, the indoor soil vapour inhalation rates and the produce consumption rates. The first three of these changes are based on updated research in a USEPA 2011 document cited by CL:AIRE. These supersede a draft 2006 USEPA document that was used in the default CLEA model and represent new science. The produce consumption rates used by CL:AIRE are from the most recent National Diet and Nutrition Survey (NSDS) (2008/2009 to 2010/11).

In November 2014 Hydrock used these revised parameters to update all the previously published GACs using modifications to CLEA 1.06. These changes are now built into CLEA 1.07 when the C4SL land uses are selected.

The mean and 90th percentile consumption rates from SP1010 Table 3.4 are used. In the derivation of the C4SLs, CL:AIRE used the 90th percentile consumption rates for the "top two" produce types for each substance and mean consumption rates are used for the remaining produce types (SP1010 Table 3.3). This approach has been followed by Hydrock for the C4SL substances. However, the procedure for determining which are the "top two" is time consuming and has not been replicated by Hydrock for all the other chemicals. The 90th percentile values have been taken for all produce types (and is slightly more conservative).

The GACs adopted by Hydrock for the standard CLEA land uses are given in Table 3.5 together with the source of the GAC. The table also lists GACs for open space (see below).

Please note also that CLEA 1.07 allows for other variations, most notably of soil type (9 options) and building type (5 residential options). The defaults are a sandy loam soil, a small terraced house in the residential setting and a pre-1970s office block in the commercial setting. These are generally conservative and the resultant SGV/GAC are protective of other combinations (unlike the default SOM mentioned above). It is not practical to include all permutations in Table 3.5 and in the cases where specific GACs have been derived, this is referred to in the text of the report and the relevant values included in the assessment tables.

Lead is a special case as the former SGV was not based on the CLEA model, but equations utilising blood lead concentrations. There is currently no guidance on how to risk assess lead in order to produce a GAC. The provisional C4SL for lead was derived using a number approaches, again based on blood lead concentrations, but for three different toxicological effects. The use of biokinetic modelling allows conversion to units suitable for use in the CLEA model. The final C4SLs for residential (with home-ground produce) stipulated in the Defra policy document is less than the withdrawn SGV although the SGV was supposed to represent a lower level of risk. It is clear from the work undertaken to develop the C4SLs why the SGVs were withdrawn. Consequently, and in view of the Defra policy document, Hydrock has adopted the C4SLs for lead *in lieu* of the withdrawn SGV or any specifically derived GAC (which would require a thorough review of lead toxicology). The lead C4SLs are, therefore, included under the term "GACs" in this report.

Further details including data sources can be obtained on request. It is Hydrock's policy to continually review GACs and updates are made in response to the latest Government guidance or as more data on the substances becomes available. The date of the last update of the table is indicated.

Table 3.5: Soil GACs Adopted by Hydrock (mg/kg) - on following pages

Updated 18/11/15		Human Health Generic Assessment Criteria (mg/kg)											
Contaminant	**Source of GAC**	**Human health - residential without plant uptake (1%SOM)**	**Human health - residential without plant uptake (2.5%SOM)**	**Human health - residential without plant uptake (6%SOM)**	**Human health - residential with plant uptake (1%SOM)**	**Human health - residential with plant uptake (2.5%SOM)**	**Human health - residential with plant uptake (6%SOM)**	**Human health - allotments (1%SOM)**	**Human health - allotments (2.5%SOM)**	**Human health - allotments (6%SOM)**	**Human health - commercial (1%SOM)**	**Human health - commercial (2.5%SOM)**	**Human health - commercial (6%SOM)**
							Default for SGV			Default for SGV			Default for SGV
Hydrock Default Suite													
Arsenic	SGV report + CLEA 1.07	40	40	40	37	37	37	49	49	49	640	640	640
Beryllium	LQM/CIEH + CLEA 1.07	73	73	73	73	73	73	56	56	56	390	390	390
Boron	LQM/CIEH + CLEA 1.07	11000	11000	11000	300	300	300	47	47	47	190000	190000	190000
Cadmium	SGV report + CLEA 1.07	87	87	87	14	14	14	2.4	2.4	2.4	220	220	220
Chromium (III)	LQM/CIEH + CLEA 1.07	890	890	890	890	890	890	15000	15000	15000	8400	8400	8400
Chromium (VI)	LQM/CIEH + CLEA 1.07	6.1	6.1	6.1	6.1	6.1	6.1	2.3	2.3	2.3	33	33	33
Copper	LQM/CIEH + CLEA 1.07	7300	7300	7300	2500	2500	2500	540	540	540	69000	69000	69000
Lead	C4SL (NB not minimal risk)	310	310	310	200	200	200	80	80	80	2300	2300	2300
Mercury, inorganic	SGV report + CLEA 1.07	240	240	240	170	170	170	81	81	81	3600	3600	3600
Nickel	Hydrock + CLEA 1.07	180	180	180	130	130	130	55	55	55	1700	1700	1700
Selenium	SGV report + CLEA 1.07	600	600	600	360	360	360	130	130	130	13000	13000	13000
Vanadium	LQM/CIEH + CLEA 1.07	1200	1200	1200	410	410	410	94	94	94	9000	9000	9000
Zinc	LQM/CIEH + CLEA 1.07	40000	40000	40000	3900	3900	3900	640	640	640	670000	670000	670000
Cyanide (free)	Hydrock + CLEA 1.07	800	800	800	790	790	790	2300	2300	2300	16000	16000	16000
Phenol	SGV report + CLEA 1.07	750	1300	2300	290	560	1100	69	140	290	760	1500	3200
Acenaphthene	LQM/CIEH + CLEA 1.07	3000	4700	6000	220	520	1100	35	95	210	84000	97000	100000
Acenaphthylene	LQM/CIEH + CLEA 1.07	2900	4600	6000	180	430	940	29	71	170	83000	97000	100000
Anthracene	LQM/CIEH + CLEA 1.07	31000	35000	37000	2400	5500	11000	390	940	2300	520000	540000	540000
Benz(a)anthracene	LQM/CIEH + CLEA 1.07	5.5	7.8	9.4	4.2	6.7	8.6	2.5	5.4	10	86	91	94
Benzo(a)pyrene	LQM/CIEH + CLEA 1.07	1.5	1.6	1.6	1.50	1.50	1.5	2.10	2.2	2.4	14	14	14
Benzo(b)fluoranthene	LQM/CIEH + CLEA 1.07	11.0	11.0	11.0	7.6	9.4	10.0	3.5	7.3	13	97	98	99
Benzo(ghi)perylene	LQM/CIEH + CLEA 1.07	71	72	72	64	69	71	69	110	150	630	640	640
Benzo(k)fluoranthene	LQM/CIEH + CLEA 1.07	15	16	16	12.0	14.0	15	6.7	13	23	140	140	140
Chrysene	LQM/CIEH + CLEA 1.07	13.0	16.0	15	7.7	11.0	13.0	2.6	5.8	12	140	140	140
Dibenz(ah)anthracene	LQM/CIEH + CLEA 1.07	1.30	1.40	1.40	1.10	1.30	1.40	0.75	1.4	2.3	12	12	13
Fluoranthene	LQM/CIEH + CLEA 1.07	1500	1600	1600	290	560	900	52	130	290	23000	23000	23000
Fluorene	LQM/CIEH + CLEA 1.07	2800	3800	4500	170	410	880	28	68	160	63000	68000	71000
Indeno(123cd)pyrene	LQM/CIEH + CLEA 1.07	6.3	6.6	6.7	4.3	5.5	6.2	1.8	3.8	7.1	58	59	60
Naphthalene	LQM/CIEH + CLEA 1.07	2.3	5.6	13.0	2.2	5.2	12.0	4.2	10	24	190	460	1100
Phenanthrene	LQM/CIEH + CLEA 1.07	1300	1500	1500	97	220	440	16	39	92	22000	22000	23000
Pyrene	LQM/CIEH + CLEA 1.07	3700	3800	3800	620	1200	2000	110	270	620	54000	54000	55000
TPH fractions													
TPH ali EC05-EC06	LQM/CIEH + CLEA 1.07	42	78	160	42	78	160	760	1800	4000	300	560	1200
TPH ali >EC06-EC08	LQM/CIEH + CLEA 1.07	100	230	530	100	230	530	2400	5700	13000	140	320	740
TPH ali >EC08-EC10	LQM/CIEH + CLEA 1.07	27	65	160	27	65	150	320	760	1700	78	190	450
TPH ali >EC10-EC12	LQM/CIEH + CLEA 1.07	48	120	280	48	120	280	2100	4200	7000	48	120	280
TPH ali >EC12-EC16	LQM/CIEH + CLEA 1.07	24	59	140	24	59	140	11000	13000	13000	24	59	140
TPH ali >EC16-EC35	LQM/CIEH + CLEA 1.07	65000	93000	110000	65000	92000	110000	260000	270000	270000	1000000	1000000	1000000
TPH ali >EC35-EC44	LQM/CIEH + CLEA 1.07	65000	93000	110000	65000	92000	110000	260000	270000	270000	1000000	1000000	1000000
TPH aro EC05-EC07	LQM/CIEH + CLEA 1.07	370	690	1400	73	150	310	14	28	60	1200	2300	4700
TPH aro >EC07-EC08	LQM/CIEH + CLEA 1.07	860	1800	3900	130	300	680	23	53	120	870	1900	4400
TPH aro >EC08-EC10	LQM/CIEH + CLEA 1.07	47	120	270	35	84	190	8.9	22	52	610	1500	3600
TPH aro >EC10-EC12	LQM/CIEH + CLEA 1.07	250	590	1200	75	180	390	13	32	76	360	900	2200
TPH aro >EC12-EC16	LQM/CIEH + CLEA 1.07	1800	2300	2500	150	330	670	23	58	140	36000	37000	38000
TPH aro >EC16-EC21	LQM/CIEH + CLEA 1.07	1900	1900	1900	260	550	930	46	110	260	28000	28000	28000
TPH aro >EC21-EC35	LQM/CIEH + CLEA 1.07	1900	1900	1900	1100	1500	1700	360	790	1500	28000	28000	28000
TPH aro >EC35-EC44	LQM/CIEH + CLEA 1.07	1900	1900	1900	1100	1500	1700	360	790	1500	28000	28000	28000
TPH >EC44-EC70	LQM/CIEH + CLEA 1.07	1900	1900	1900	1600	1800	1900	1100	2000	2900	28000	28000	28000
VOCs - BTEX & MTBE													
Benzene	SGV report + CLEA 1.07	0.38	0.70	1.4	0.099	0.2	0.42	0.02	0.041	0.09	27	48	90
Toluene	SGV report + CLEA 1.07	860	1800	3900	130	300	680	23	53	120	870	1900	4400
Ethylbenzene	SGV report + CLEA 1.07	240	540	1200	76	180	410	17	40	94	520	1200	2800
Xylene, o-	SGV report + CLEA 1.07	85	200	460	59	140	320	29	70	160	480	1100	2600
Xylene, m-	SGV report + CLEA 1.07	79	190	430	58	140	320	32	77	180	630	1500	3500
Xylene, p- (use this for combined m & p)	SGV report + CLEA 1.07	76	180	410	55	130	300	30	72	170	580	1400	3200
MTBE	EIC/AGS/CL:AIRE + CLEA 1.07	100	170	320	62	110	210	23	45	92	7500	12000	27000
VOCs - other benzenes													
Iso-propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	17	40	95	15	38	89	33	81	190	390	950	2300
Propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	57	140	320	46	110	260	35	86	200	400	980	2300
1,2,4-Trimethylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	0.58	1.4	3.3	0.47	1.2	2.7	0.39	0.96	2.3	39	94	210

Updated 18/11/15		Human Health Generic Assessment Criteria (mg/kg)											
Contaminant	**Source of GAC**	**Human health - residential without plant uptake (1%SOM)**	**Human health - residential without plant uptake (2.5%SOM)**	**Human health - residential without plant uptake (6%SOM)**	**Human health - residential with plant uptake (1%SOM)**	**Human health - residential with plant uptake (2.5%SOM)**	**Human health - residential with plant uptake (6%SOM)**	**Human health - allotments (1%SOM)**	**Human health - allotments (2.5%SOM)**	**Human health - allotments (6%SOM)**	**Human health - commercial (1%SOM)**	**Human health - commercial (2.5%SOM)**	**Human health - commercial (6%SOM)**
VOCs - chlorobenzenes													
Bromobenzene	EIC/AGS/CL:AIRE + CLEA 1.07	1.3	3	7	1.2	2.8	6.6	3.3	7.9	18	92	210	490
Chlorobenzene	LQM/CIEH + CLEA 1.07	0.47	1.1	2.4	0.46	1.0	2.4	6.1	14	33	56	130	290
1,2-Dichlorobenzene	LQM/CIEH + CLEA 1.07	24	57	130	23	55	130	97	240	560	570	1400	3200
1,3-Dichlorobenzene	LQM/CIEH + CLEA 1.07	0.44	1.1	2.5	0.41	0.98	2.3	0.26	0.63	1.5	30	73	170
1,4-Dichlorobenzene	LQM/CIEH + CLEA 1.07	60	140	330	38	92	220	16	38	91	230	540	1300
Hexachlorobenzene	LQM/CIEH + CLEA 1.07	0.20	0.50	2.5	0.20	0.50	1.9	0.17	0.42	0.91	0.2	53	55
Pentachlorobenzene	LQM/CIEH + CLEA 1.07	20	30	38	5.9	12	22	1.3	3.1	7.1	640	770	830
1,2,3-trichlorobenzene	LQM/CIEH + CLEA 1.07	1.5	3.7	8.8	1.5	3.6	8.6	4.8	12	28	100	250	590
1,2,4-trichlorobenzene	LQM/CIEH + CLEA 1.07	2.6	3.4	15	2.6	6.4	15	31	77	180	220	530	1300
1,3,5-trichlorobenzene	LQM/CIEH + CLEA 1.07	0.33	0.81	1.9	0.33	0.81	1.9	4.9	12	28	23	55	130
1,2,3,4-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	24	56	120	15	36	78	4.5	11	26	120	300	730
1,2,3,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	0.75	1.9	4.3	0.67	1.6	3.7	0.39	0.95	2.2	39	98	240
1,2,4,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	0.73	1.7	3.5	0.34	0.78	1.6	0.065	0.16	0.38	20	49	96
VOCs - chloroalkanes & alkanes													
Bromodichloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	0.027	0.049	0.10	0.022	0.040	0.082	0.017	0.033	0.070	2.0	3.5	7.1
Bromoform	EIC/AGS/CL:AIRE + CLEA 1.07	7.4	15	32	3.5	7.3	16	0.98	2.1	4.8	710	1400	3000
Chloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	12	16	26	12	16	26	120	210	390	900	1200	2000
Chloroethene (aka vinyl chloride)	LQM/CIEH + CLEA 1.07	0.00077	0.0010	0.0015	0.00064	0.00087	0.0014	0.00057	0.0010	0.0019	0.059	0.077	0.12
Chloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	0.012	0.014	0.019	0.012	0.014	0.019	0.068	0.13	0.24	1.0	1.1	1.5
1,1-Dichloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	3.6	5.8	11	3.4	5.5	11	9.6	18	37	260	430	800
1,2-Dichloroethane	LQM/CIEH + CLEA 1.07	0.0092	0.013	0.023	0.0071	0.011	0.019	0.0048	0.0086	0.016	0.67	0.97	1.7
1,1-Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	0.33	0.58	1.2	0.32	0.57	1.2	2.9	5.8	12	24	43	87
Cis 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	0.17	0.29	0.56	0.16	0.27	0.52	0.27	0.52	1.1	14	23	44
Trans 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	0.28	0.50	1.0	0.27	0.48	0.98	0.97	1.9	4.2	21	37	76
Dichloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	3.0	4.0	6.4	0.62	1.1	1.9	0.11	0.19	0.35	260	340	530
1,2-Dichloropropane	EIC/AGS/CL:AIRE + CLEA 1.07	0.034	0.06	0.12	0.034	0.060	0.12	0.64	1.3	2.7	3.1	5.5	11
Hexachloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	0.31	0.77	1.8	0.27	0.66	1.6	0.28	0.069	1.6	8.2	20	48
Tetrachloroethene	LQM/CIEH + CLEA 1.07	1.5	3.3	7.5	1.3	2.9	6.7	1.7	3.9	9.0	120	280	620
1,1,1,2-Tetrachloroethane	LQM/CIEH + CLEA 1.07	1.5	3.6	8.2	1.2	2.8	6.5	0.82	1.9	4.6	110	250	560
1,1,2,2-Tetrachloroethane	LQM/CIEH + CLEA 1.07	4.1	8.3	18	1.7	3.5	7.8	0.42	0.92	2.1	280	560	1200
Tetrachloromethane	LQM/CIEH + CLEA 1.07	0.026	0.056	0.13	0.026	0.056	0.13	0.17	0.38	0.88	2.9	6.3	14
Trichloroethene	LQM/CIEH + CLEA 1.07	0.16	0.33	0.73	0.15	0.31	0.69	0.44	0.99	2.2	11	24	52
1,1,1-Trichloroethane	LQM/CIEH + CLEA 1.07	9.0	18	40	8.8	18	39	50	110	250	660	1400	3000
1,1,2 Trichloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	1.3	2.5	5.5	0.76	1.6	3.5	0.29	0.64	1.4	89	180	380
Trichloromethane	LQM/CIEH + CLEA 1.07	1.3	2.3	4.6	0.98	1.8	3.6	0.37	0.73	1.5	100	180	350
Other phenols & chlorophenols													
2-Chlorophenol	LQM/CIEH + CLEA 1.07	110	170	220	3.9	9.1	20	0.60	1.4	3.4	3600	4000	4300
2,4-Dichlorophenol	LQM/CIEH + CLEA 1.07	94	150	200	0.91	2.1	4.7	0.14	0.31	0.72	3500	3900	4200
2,4-Dimethylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	300	590	1000	20	46	100	3.2	7.4	17	1400	3100	7200
2-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	5300	7700	9900	85	190	430	13	29	67	160000	180000	180000
3-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	6800	9100	11000	85	190	420	13	29	65	170000	180000	190000
4-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	5400	7900	10000	84	190	420	13	29	65	160000	180000	180000
Pentachlorophenol	LQM/CIEH + CLEA 1.07	37	56	69	0.56	1.3	3.1	0.085	0.21	0.49	1200	1300	1400
2,3,4,6-Tetrachlorophenol	LQM/CIEH + CLEA 1.07	140	200	240	0.89	2.1	4.8	0.14	0.32	0.74	3900	4200	4300
2,4,6-Trichlorophenol	LQM/CIEH + CLEA 1.07	140	200	250	1.5	3.5	7.8	0.22	0.53	1.2	3900	4200	4400
Phthalates													
Bis (2-ethylhexyl) phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	3900	4000	4100	290	660	1300	48	120	280	85000	86000	86000
Butyl benzyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	61000	63000	64000	1500	3500	7800	230	560	1300	940000	940000	950000
Diethyl Phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	14	29	65	120	270	610	19	43	98	14	29	65
Di-n-butyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	650	650	650	13	32	72	2.1	5.1	12	15000	15000	15000
Di-n-octyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	4900	4900	4900	2800	3800	4300	920	2000	3900	89000	89000	89000
Pesticides													
Aldrin	LQM/CIEH + CLEA 1.07	3.0	3.1	3.1	2.3	2.7	2.9	1.3	2.5	4.0	54	54	54
Atrazine	LQM/CIEH + CLEA 1.07	45	46	46	0.25	0.58	1.3	0.038	0.089	0.21	870	880	880
DDD	Hydrock + CLEA 1.07	1300	1300	1300	910	1100	1200	400	780	1200	22000	22000	22000
DDE	Hydrock + CLEA 1.07	1300	1300	1300	870	1100	1200	360	740	1300	22000	22000	22000
DDT	Hydrock + CLEA 1.07	1300	1300	1300	830	1000	1200	320	650	1100	21000	21000	21000
Dichlorvos	LQM/CIEH + CLEA 1.07	36	45	53	0.30	0.62	1.3	0.046	0.094	0.20	840	870	890
Dieldrin	LQM/CIEH + CLEA 1.07	5.0	5.4	5.6	0.74	1.5	2.7	0.13	0.32	0.74	90	91	92
Endosulfan - alpha	LQM/CIEH + CLEA 1.07	62	110	160	3.1	7.4	17	0.49	1.2	2.8	2300	3000	3400
Endosulfan - beta	LQM/CIEH + CLEA 1.07	76	130	180	2.9	7.0	16	0.46	1.1	2.6	2500	3100	3500
Hexachlorocyclohexanes - alpha (inc. Lindane)	LQM/CIEH + CLEA 1.07	660	840	940	20	48	110	3.1	7.7	18	14000	15000	15000
Hexachlorocyclohexanes - beta (inc. Lindane)	LQM/CIEH + CLEA 1.07	73	75	76	1.7	4.1	9.2	0.27	0.66	1.6	1100	1100	1100
Hexachlorocyclohexanes - gamma (inc. Lindane)	LQM/CIEH + CLEA 1.07	27	31	33	0.60	1.4	3.3	0.092	0.23	0.54	530	550	550

Updated 18/11/15		Human Health Generic Assessment Criteria (mg/kg)											
Contaminant	**Source of GAC**	**Human health - residential without plant uptake (1%SOM)**	**Human health - residential without plant uptake (2.5%SOM)**	**Human health - residential without plant uptake (6%SOM)**	**Human health - residential with plant uptake (1%SOM)**	**Human health - residential with plant uptake (2.5%SOM)**	**Human health - residential with plant uptake (6%SOM)**	**Human health - allotments (1%SOM)**	**Human health - allotments (2.5%SOM)**	**Human health - allotments (6%SOM)**	**Human health - commercial (1%SOM)**	**Human health - commercial (2.5%SOM)**	**Human health - commercial (6%SOM)**
Dioxins, furans & dioxin-like-PCBs													
Total dioxins, furans & DL-PCB (aerial dep.)	SGV report + CLEA 1.07	0.012	0.012	0.012	0.0099	0.010	0.010	0.0075	0.0083	0.0086	0.24	0.24	0.24
Non-dioxin-like PCBs													
PCB-28	Hydrock + CLEA 1.07	0.63	0.63	0.63	0.24	0.37	0.47	0.056	0.12	0.22	9.0	9.0	9.0
PCB-52	Hydrock + CLEA 1.07	0.63	0.63	0.63	0.24	0.38	0.49	0.058	0.13	0.26	9.0	9.0	9.0
PCB-101	Hydrock + CLEA 1.07	0.63	0.63	0.63	0.50	0.57	0.60	0.290	0.52	0.74	9.0	9.0	9.0
PCB-138	Hydrock + CLEA 1.07	0.63	0.63	0.63	0.54	0.59	0.61	0.39	0.65	0.88	9.0	9.0	9.0
PCB-153	Hydrock + CLEA 1.07	0.63	0.63	0.63	0.56	0.60	0.61	0.49	0.75	0.95	9.0	9.0	9.0
PCB-180	Hydrock + CLEA 1.07	0.63	0.63	0.63	0.58	0.61	0.62	0.58	0.85	1.0	9.0	9.0	9.0
Explosives													
HMX	LQM/CIEH + CLEA 1.07	6700	6700	6700	5.9	13	27	0.89	2.0	4.0	110000	110000	110000
RDX	LQM/CIEH + CLEA 1.07	400	400	400	3.5	7.6	17	0.54	1.2	2.6	6400	6400	6400
2,4,6-Trinitrotoluene	LQM/CIEH + CLEA 1.07	65	65	66	1.6	3.8	8.4	0.25	0.61	1.4	1000	1000	1100
Other inorganics													
Antimony	EIC/AGS/CL:AIRE + CLEA 1.07	380	380	380	190	190	190	54	54	54	6600	6600	6600
Barium	EIC/AGS/CL:AIRE + CLEA 1.07	1400	1400	1400	790	790	790	270	270	270	22000	22000	22000
Mercury, elemental	SGV report + CLEA 1.07	0.24	0.60	1.5	0.24	0.60	1.5	4.3	11	26	4.3	11	26
Molybdenum	EIC/AGS/CL:AIRE + CLEA 1.07	670	670	670	250	250	250	59	59	59	18000	18000	18000
Thiocyanate	Hydrock + CLEA 1.07	13	13	13	13	13	13	28	28	28	190	190	190
Other organics													
Biphenyl	EIC/AGS/CL:AIRE + CLEA 1.07	34	84	200	34	84	200	15	36	86	34	84	200
Carbon disulphide	LQM/CIEH + CLEA 1.07	0.14	0.29	0.62	0.14	0.29	0.62	5.0	11	24	11	22	47
2,4-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.07	240	250	250	1.5	3.4	7.6	0.23	0.51	1.2	3700	3800	3800
2,6-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.07	110	120	130	0.82	1.8	4.1	0.12	0.28	0.63	1900	1900	1900
Hexachloro-1,3-butadiene	LQM/CIEH + CLEA 1.07	0.32	0.78	1.8	0.29	0.70	1.6	0.25	0.62	1.4	31	66	120
Mercury, methyl	SGV report + CLEA 1.07	12	16	20	10	13	15	8.0	8.0	8.0	370	390	410
Styrene	EIC/AGS/CL:AIRE + CLEA 1.07	52	120	280	11	25	58	1.6	3.9	9.1	630	1400	3400
Tributyl tin oxide	EIC/AGS/CL:AIRE + CLEA 1.07	12	14	15	0.28	0.67	1.5	0.040	0.11	0.25	230	230	240
2-Chloronaphthalene	EIC/AGS/CL:AIRE + CLEA 1.07	5.4	13	32	5.3	13	31	42	100	230	370	900	2100
Insufficient data to derive GAC													
n butylbenzene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
sec butylbenzene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
Carbazole	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
Dimethyl phthalate	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
Isopropyltoluene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
1-Methylnaphthalene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
2-Methylnaphthalene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
Sulfur (elemental)	Insufficient data (Hydrock)	-	-	-	-	-	-	-	-	-	-	-	-
1,3,5-Trimethylbenzene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
tert butylbenzene	Insufficient data (EIC)	-	-	-	-	-	-	-	-	-	-	-	-
NOTES													
If >1,000,000 is calculated, 1,000,000 is adopted.													
Red text - liquid at ambient temperature, calculated GAC exceeds saturation value and highlighed in red in CLEA - saturation value adopted for GAC													
Orange text - solid at ambient temperature, calculated GAC exceeds saturation value and highlighted red in CLEA - manual calculation not possible as only one HCV - saturated vapour concentration exceed, so saturation value adopted for GAC.													
Blue text - solid at ambient temperature, calculated GAC exceeds saturation value and highlighted red in CLEA - manual calculation not possible as only one HCV - aqueous solubility exceed, so original red-highlighted value adopted for GAC.													
Green text - solid at ambient temperature, calculated GAC exceeds saturation value and highlighted red in CLEA - manual calculation undertaken but result is greater than original red-highlighted value, so original red-highlighted value adopted for GAC.													

Updated 18/11/15							
Contaminant	**Source of GAC**	**Human health - POSresi (1%SOM)**	**Human health - POSresi (2.5%SOM)**	**Human health - POSresi (6%SOM)**	**Human health - POSpark (1%SOM)**	**Human health - POSpark (2.5%SOM)**	**Human health - POSpark (6%SOM)**
Hydrock Default Suite							
Arsenic	SGV report + CLEA 1.07	79	79	79	170	170	170
Beryllium	LQM/CIEH + CLEA 1.07	92	92	92	670	670	670
Boron	LQM/CIEH + CLEA 1.07	21000	21000	21000	46000	46000	46000
Cadmium	SGV report + CLEA 1.07	120	120	120	560	560	560
Chromium (III)	LQM/CIEH + CLEA 1.07	1500	1500	1500	27000	27000	27000
Chromium (VI)	LQM/CIEH + CLEA 1.07	7.7	7.7	7.7	220	220	220
Copper	LQM/CIEH + CLEA 1.07	12000	12000	12000	44000	44000	44000
Lead	C4SL (NB not minimal risk)	630	630	630	1300	1300	1300
Mercury, inorganic	SGV report + CLEA 1.07	470	470	470	1100	1100	1100
Nickel	Hydrock + CLEA 1.07	290	290	290	800	800	800
Selenium	SGV report + CLEA 1.07	1400	1400	1400	2600	2600	2600
Vanadium	LQM/CIEH + CLEA 1.07	2000	2000	2000	5000	5000	5000
Zinc	LQM/CIEH + CLEA 1.07	81000	81000	81000	170000	170000	170000
Cyanide (free)	Hydrock + CLEA 1.07	1600	1600	1600	3400	3400	3400
Phenol	SGV report + CLEA 1.07	760	1500	3200	760	1500	3200
Acenaphthene	LQM/CIEH + CLEA 1.07	15000	15000	15000	29000	30000	30000
Acenaphthylene	LQM/CIEH + CLEA 1.07	15000	15000	15000	29000	30000	30000
Anthracene	LQM/CIEH + CLEA 1.07	74000	74000	74000	150000	150000	150000
Benz(a)anthracene	LQM/CIEH + CLEA 1.07	17	18	18	26	33	40
Benzo(a)pyrene	LQM/CIEH + CLEA 1.07	2.6	2.6	2.6	4.5	5.6	6.5
Benzo(b)fluoranthene	LQM/CIEH + CLEA 1.07	18	18	18	30	38	45
Benzo(ghi)perylene	LQM/CIEH + CLEA 1.07	120	120	120	270	310	350
Benzo(k)fluoranthene	LQM/CIEH + CLEA 1.07	26	26	26	46	57	67
Chrysene	LQM/CIEH + CLEA 1.07	25	26	26	34	45	55
Dibenz(ah)anthracene	LQM/CIEH + CLEA 1.07	2.3	2.3	2.3	4.5	5.5	6.3
Fluoranthene	LQM/CIEH + CLEA 1.07	3100	3100	3100	6300	6300	6400
Fluorene	LQM/CIEH + CLEA 1.07	9900	9900	9900	20000	20000	20000
Indeno(123cd)pyrene	LQM/CIEH + CLEA 1.07	11	11	11	17	22	26
Naphthalene	LQM/CIEH + CLEA 1.07	3900	4100	4200	1100	1600	2300
Phenanthrene	LQM/CIEH + CLEA 1.07	3100	3100	3100	6200	6300	6300
Pyrene	LQM/CIEH + CLEA 1.07	7400	7400	7400	15000	15000	15000
TPH fractions							
TPH ali EC05-EC06	LQM/CIEH + CLEA 1.07	300	590000	600000	300	560	1200
TPH ali >EC06-EC08	LQM/CIEH + CLEA 1.07	600000	610000	620000	140	320	740
TPH ali >EC08-EC10	LQM/CIEH + CLEA 1.07	13000	13000	13000	77	190	450
TPH ali >EC10-EC12	LQM/CIEH + CLEA 1.07	13000	13000	13000	48	120	280
TPH ali >EC12-EC16	LQM/CIEH + CLEA 1.07	13000	13000	13000	24	59	140
TPH ali >EC16-EC35	LQM/CIEH + CLEA 1.07	250000	250000	250000	460000	480000	490000
TPH ali >EC35-EC44	LQM/CIEH + CLEA 1.07	250000	250000	250000	460000	480000	490000
TPH aro EC05-EC07	LQM/CIEH + CLEA 1.07	56000	56000	56000	1200	2300	4700
TPH aro >EC07-EC08	LQM/CIEH + CLEA 1.07	56000	56000	56000	870	1900	4400
TPH aro >EC08-EC10	LQM/CIEH + CLEA 1.07	5000	5000	5000	610	1500	3600
TPH aro >EC10-EC12	LQM/CIEH + CLEA 1.07	5000	5000	5000	360	900	10000
TPH aro >EC12-EC16	LQM/CIEH + CLEA 1.07	5000	5000	5000	10000	10000	10000
TPH aro >EC16-EC21	LQM/CIEH + CLEA 1.07	3800	3800	3800	7600	7700	7800
TPH aro >EC21-EC35	LQM/CIEH + CLEA 1.07	3800	3800	3800	7800	7800	7900
TPH aro >EC35-EC44	LQM/CIEH + CLEA 1.07	3800	3800	3800	7800	7800	7900
TPH >EC44-EC70	LQM/CIEH + CLEA 1.07	3800	3800	3800	7800	7800	7900
VOCs - BTEX & MTBE							
Benzene	SGV report + CLEA 1.07	72	72	73	90	100	110
Toluene	SGV report + CLEA 1.07	56000	56000	56000	870	1900	4400
Ethylbenzene	SGV report + CLEA 1.07	25000	25000	25000	520	1200	2800
Xylene, o-	SGV report + CLEA 1.07	41000	42000	43000	480	1100	2600
Xylene, m-	SGV report + CLEA 1.07	41000	42000	43000	630	1500	3500
Xylene, p- (use this for combined m & p)	SGV report + CLEA 1.07	41000	42000	43000	580	1400	3200
MTBE	EIC/AGS/CL:AIRE + CLEA 1.07	75000	75000	75000	20000	33000	63000
VOCs - other benzenes							
Iso-propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	25000	25000	25000	390	950	2300
Propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	25000	25000	25000	400	980	2300
1,2,4-Trimethylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	250	250	250	310	360	410

Updated 18/11/15							
Contaminant	**Source of GAC**	**Human health - POSresi (1%SOM)**	**Human health - POSresi (2.5%SOM)**	**Human health - POSresi (6%SOM)**	**Human health - POSpark (1%SOM)**	**Human health - POSpark (2.5%SOM)**	**Human health - POSpark (6%SOM)**
VOCs - chlorobenzenes							
Bromobenzene	EIC/AGS/CL:AIRE + CLEA 1.07	5200	5400	5600	850	2000	3500
Chlorobenzene	LQM/CIEH + CLEA 1.07	12000	13000	14000	680	1500	2900
1,2-Dichlorobenzene	LQM/CIEH + CLEA 1.07	95000	100000	100000	570	1400	3300
1,3-Dichlorobenzene	LQM/CIEH + CLEA 1.07	300	300	300	390	440	470
1,4-Dichlorobenzene	LQM/CIEH + CLEA 1.07	17000	17000	17000	220	540	1300
Hexachlorobenzene	LQM/CIEH + CLEA 1.07	6.5	6.5	6.5	11	11	11
Pentachlorobenzene	LQM/CIEH + CLEA 1.07	110	110	110	190	190	190
1,2,3-trichlorobenzene	LQM/CIEH + CLEA 1.07	1700	1800	1800	130	330	1600
1,2,4-trichlorobenzene	LQM/CIEH + CLEA 1.07	10000	11000	12000	320	790	1900
1,3,5-trichlorobenzene	LQM/CIEH + CLEA 1.07	1600	1700	1800	37	91	220
1,2,3,4-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	830	830	830	120	1600	1600
1,2,3,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	79	79	79	39	120	130
1,2,4,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	13	13	13	25	26	26
VOCs - chloroalkanes & alkanes							
Bromodichloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	73	73	74	56	67	81
Bromoform	EIC/AGS/CL:AIRE + CLEA 1.07	3900	3900	4000	2700	4700	5200
Chloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	2600	3500	5700	2600	3500	5700
Chloroethene (aka vinyl chloride)	LQM/CIEH + CLEA 1.07	3.5	3.5	3.5	4.8	5	5.4
Chloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	540	550	560	140	150	170
1,1-Dichloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	46000	47000	48000	1800	3000	5600
1,2-Dichloroethane	LQM/CIEH + CLEA 1.07	29	29	29	21	24	28
1,1-Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	2200	3900	11000	2200	3900	5900
Cis 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	1300	1300	1400	690	840	1000
Trans 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	3800	4000	4000	1700	2100	2700
Dichloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	760	760	760	1500	1500	1500
1,2-Dichloropropane	EIC/AGS/CL:AIRE + CLEA 1.07	1700	1900	2200	160	210	290
Hexachloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	120	130	130	8.2	20	48
Tetrachloroethene	LQM/CIEH + CLEA 1.07	3400	3400	3400	420	950	2200
1,1,1,2-Tetrachloroethane	LQM/CIEH + CLEA 1.07	1400	1400	1400	1500	1800	2100
1,1,2,2-Tetrachloroethane	LQM/CIEH + CLEA 1.07	1400	1400	1400	1800	2100	2300
Tetrachloromethane	LQM/CIEH + CLEA 1.07	340	350	350	170	240	320
Trichloroethene	LQM/CIEH + CLEA 1.07	1200	1300	1300	660	860	1100
1,1,1-Trichloroethane	LQM/CIEH + CLEA 1.07	140000	140000	140000	1400	2900	6400
1,1,2 Trichloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	990	990	1000	1100	1300	1500
Trichloromethane	LQM/CIEH + CLEA 1.07	1700	1700	1700	2700	2900	3100
Other phenols & chlorophenols							
2-Chlorophenol	LQM/CIEH + CLEA 1.07	610	610	610	1100	1100	1100
2,4-Dichlorophenol	LQM/CIEH + CLEA 1.07	610	610	610	1000	1100	1100
2,4-Dimethylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	5000	5000	5000	1400	9600	9900
2-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	25000	25000	25000	15000	48000	49000
3-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	25000	25000	25000	27000	48000	49000
4-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.07	25000	25000	25000	27000	48000	49000
Pentachlorophenol	LQM/CIEH + CLEA 1.07	180	180	180	220	250	270
2,3,4,6-Tetrachlorophenol	LQM/CIEH + CLEA 1.07	610	610	610	1000	1100	1100
2,4,6-Trichlorophenol	LQM/CIEH + CLEA 1.07	610	610	610	1100	1100	1100
Phthalates							
Bis (2-ethylhexyl) phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	9700	9700	9700	17000	17000	17000
Butyl benzyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	130000	130000	130000	250000	260000	260000
Diethyl Phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	49000	50000	50000	14	93000	96000
Di-n-butyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	1300	1300	1300	2600	2700	2600
Di-n-octyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.07	11000	11000	11000	20000	20000	20000
Pesticides							
Aldrin	LQM/CIEH + CLEA 1.07	6.6	6.6	6.6	13	13	13
Atrazine	LQM/CIEH + CLEA 1.07	100	100	100	180	180	180
DDD	Hydrock + CLEA 1.07	2700	2700	2700	5700	5700	5700
DDE	Hydrock + CLEA 1.07	2700	2700	2700	5700	5700	5700
DDT	Hydrock + CLEA 1.07	2600	2600	2600	5500	5500	5500
Dichlorvos	LQM/CIEH + CLEA 1.07	120	120	120	140	160	180
Dieldrin	LQM/CIEH + CLEA 1.07	12	12	12	23	23	23
Endosulfan - alpha	LQM/CIEH + CLEA 1.07	490	490	490	940	970	990
Endosulfan - beta	LQM/CIEH + CLEA 1.07	490	490	490	950	980	990
Hexachlorocyclohexanes - alpha (inc. Lindane)	LQM/CIEH + CLEA 1.07	2000	2000	2000	4000	4100	4100
Hexachlorocyclohexanes - beta (inc. Lindane)	LQM/CIEH + CLEA 1.07	150	150	150	300	300	310
Hexachlorocyclohexanes - gamma (inc. Lindane)	LQM/CIEH + CLEA 1.07	71	71	71	140	140	140

Updated 18/11/15							
Contaminant	**Source of GAC**	**Human health - POSresi (1%SOM)**	**Human health - POSresi (2.5%SOM)**	**Human health - POSresi (6%SOM)**	**Human health - POSpark (1%SOM)**	**Human health - POSpark (2.5%SOM)**	**Human health - POSpark (6%SOM)**
Dioxins, furans & dioxin-like-PCBs							
Total dioxins, furans & DL-PCB (aerial dep.)	SGV report + CLEA 1.07	0.023	0.023	0.023	0.049	0.049	0.049
Non-dioxin-like PCBs							
PCB-28	Hydrock + CLEA 1.07	1.2	1.2	1.2	2.5	2.5	2.5
PCB-52	Hydrock + CLEA 1.07	1.2	1.2	1.2	2.5	2.5	2.5
PCB-101	Hydrock + CLEA 1.07	1.2	1.2	1.2	2.5	2.5	2.5
PCB-138	Hydrock + CLEA 1.07	1.2	1.2	1.2	2.5	2.5	2.5
PCB-153	Hydrock + CLEA 1.07	1.2	1.2	1.2	2.5	2.5	2.5
PCB-180	Hydrock + CLEA 1.07	1.2	1.2	1.2	2.5	2.5	2.5
Explosives							
HMX	LQM/CIEH + CLEA 1.07	13000	13000	13000	23000	23000	24000
RDX	LQM/CIEH + CLEA 1.07	790	790	800	19	1500	1600
2,4,6-Trinitrotoluene	LQM/CIEH + CLEA 1.07	130	130	130	260	270	270
Other inorganics							
Antimony	EIC/AGS/CL:AIRE + CLEA 1.07	740	740	740	1700	1700	1700
Barium	EIC/AGS/CL:AIRE + CLEA 1.07	2700	2700	2700	5800	5800	5800
Mercury, elemental	SGV report + CLEA 1.07	4.3	11	26	4.3	11	26
Molybdenum	EIC/AGS/CL:AIRE + CLEA 1.07	1400	1400	1400	2900	2900	2900
Thiocyanate	Hydrock + CLEA 1.07	25	25	25	53	53	53
Other organics							
Biphenyl	EIC/AGS/CL:AIRE + CLEA 1.07	9500	9500	9500	34	84	19000
Carbon disulphide	LQM/CIEH + CLEA 1.07	11000	11000	12000	1300	1900	2700
2,4-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.07	500	500	500	140	960	990
2,6-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.07	250	250	250	290	490	500
Hexachloro-1,3-butadiene	LQM/CIEH + CLEA 1.07	25	25	25	48	50	51
Mercury, methyl	SGV report + CLEA 1.07	53	53	53	73	93	97
Styrene	EIC/AGS/CL:AIRE + CLEA 1.07	3000	3000	3000	630	1400	3400
Tributyl tin oxide	EIC/AGS/CL:AIRE + CLEA 1.07	31	31	31	63	64	65
2-Chloronaphthalene	EIC/AGS/CL:AIRE + CLEA 1.07	7500	8400	9000	110	1800	2800
Insufficient data to derive GAC							
n butylbenzene	Insufficient data (EIC)	-	-	-	-	-	-
sec butylbenzene	Insufficient data (EIC)	-	-	-	-	-	-
Carbazole	Insufficient data (EIC)	-	-	-	-	-	-
Dimethyl phthalate	Insufficient data (EIC)	-	-	-	-	-	-
Isopropyltoluene	Insufficient data (EIC)	-	-	-	-	-	-
1-Methylnaphthalene	Insufficient data (EIC)	-	-	-	-	-	-
2-Methylnaphthalene	Insufficient data (EIC)	-	-	-	-	-	-
Sulfur (elemental)	Insufficient data (Hydrock)	-	-	-	-	-	-
1,3,5-Trimethylbenzene	Insufficient data (EIC)	-	-	-	-	-	-
tert butylbenzene	Insufficient data (EIC)	-	-	-	-	-	-
NOTES							
If >1,000,000 is calculated, 1,000,000 is adopted.							
Red text - liquid at ambient temperature, calculated GAC exceeds saturation value an							
Orange text - solid at ambient temperature, calculated GAC exceeds saturation value							
Blue text - solid at ambient temperature, calculated GAC exceeds saturation value an							
Green text - solid at ambient temperature, calculated GAC exceeds saturation value a							

3.3.3 Exceedance of Saturation Limits

In some instances the CLEA 1.07 model produces GACs with a warning that the value exceeds the saturation value, which is either the solubility of the substance in water or the vapour saturation limit. Limited guidance is given in SR4 (Section 4.12) on how to assess the GAC in these circumstances. Precedence is also set in a number of SGV reports, to date those dealing with the BTEX compounds. These two sets of documentation are contradictory. The original issue of SR4 (CLEA 1.04) (Environment Agency 2009b) gives an example of how to carry out a manual calculation using data for ethylbenzene, whereas the BTEX SGV reports (e.g. Environment Agency March 2009) state that the GAC should be limited to the saturation level. The revised version of SR4 (CLEA 1.05/6) (Environment Agency 2009c) retains the example, but the name ethylbenzene has been removed.

There are three options: to adopt the value as calculated, to limit the GAC to the saturation value, or to undertake a manual calculation as per Section 4.12 of SR4. Again, the guidance is confusing. SR3 (Environment Agency 2009b) cautions against adopting the saturation limit, which is the most conservative, saying that it may be over-conservative. However, this is the approach taken in the BTEX SGV reports.

Clearly, the adoption of a GAC under conditions where the saturation level is exceeded is subjective and professional judgement is involved. With this in mind, the protocol adopted by Hydrock is as follows, and has been derived at by considering the possible values from the three methods given above.

1. For substances where the GAC is highlighted in amber in CLEA, this is adopted as the GAC. For substances where the GAC is highlighted in red, the following apply.

2. For VOCs including BTEX and the volatile TPH Fractions (less than EC10), the saturation value is adopted in line with the latest recommendations in the BTEX SGV reports.

3. For substances which are liquid at ambient temperature, the saturation value is adopted.

4. For substances which are solid at ambient temperature, the manual calculation is undertaken provided there are both oral and inhalation HCVs. The result is compared with the red-highlighted GAC and the lower of the two adopted as the GAC. If there is only one HCV and the calculation cannot be performed, the red-highlighted value is adopted as the GAC where the saturation limit exceed the aqueous solubility, but the saturation value is adopted where the saturation limit exceed the saturated vapour concentration.

5. In some instances the GACs shows a large difference between different SOM where the saturation value has been taken for, say, 1% SOM and the calculated values for 2.5% and 6% SOM. Whilst this may appear inconsistent on first inspection, the results have been adopted as they are and the difference must be attributed to the physico-chemical influence of organic matter in the soil as modelled by CLEA.

3.3.4 GACs for Public Open Space

The first UK methodology for assessing public open space (POS) was published for the C4SLs (CL:AIRE December 2013) based on two land use scenarios:

- Public open space near residential housing (POS_{resi}) includes the predominantly grassed areas adjacent to high density housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It also includes the smaller areas commonly incorporated in new developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a predominantly grassed area up to 0.05 ha and a considerable portion of this (up to 50%) may be bare soil. The site is regularly used by children for playing and may be used for informal sports activities such as a football "kickabout".
- Public park (POS_{park}) is an area of open space provided for recreational use and usually owned and maintained by the Local Authority and could be used for a wide range of activities such as family visits and picnics, children's play area, sporting activities such as football on an informal basis (although this POS is not considered as a dedicated sports pitch) and dog walking. It is considered to be a relatively large are (>0.5 ha) of predominantly grassed open space with no more than 25% of exposed soil.

Hydrock has calculated GACs for these two standard land uses using the land use scenarios given in Tables 3.6 and 3.7 of the CL:AIRE report, but with the following modifications:

- POS_{resi} (Table 3.6), items omitted from the published table in error: building = small terraced house; occupancy period for lifetime averaging (for Cd) AC10-12 = 19, AC13-16 = 15 & AC17-18 = 16; and indoor inhalation rates updated according to a USEPA 2011 publication that supersedes the draft 2006 version used in the CLEA model previously.
- POS_{park} (Table 3.7), typographic errors in the published table: soil ingestion rate for AC1-12 = 50 mg/day and for AC13-18 = 20 mg/day.

Note that these corrections are included in the revised CLEA 1.07 when the C4SL land uses are selected. The calculated GACs are presented in Table 3.5 and are based on a sandy loam soil of pH 7 su.

3.4 Note on Petroleum Hydrocarbons

Petroleum hydrocarbon contamination is complex. The type of crude oil, its distillation, processing and blending, and the subsequent weathering in the environment all result in the development of petroleum residues of extreme chemical complexity (Environment Agency, 2003). The laboratory analysis of petroleum hydrocarbons is highly method dependent. In addition to contaminants such as fuels and lubricating oils, the analyses also pick up a range of other chemicals such as PAHs and phenols, together with naturally occurring substances like humic and fulvic matter in organic soils. For example, TPH determination on dried oak leaves can give a result of 18,000 mg/kg of TPH.

TPH can only be used as a surrogate for estimating the petroleum load of a soil if a spill is well defined but is generally not a sound basis for risk management and regulatory control. International approaches for assessing risks from petroleum hydrocarbons focus on dividing the components into groups and assigning toxicologically potency and fate-transport to each group.

Approaches have been developed internationally, one such proposal is discussed by the Dutch National Institute of Public Health and the Environment (RIVM) (Franken *et al* 1999). The approach is broadly to sub-divide the TPH into fractions based on equivalent carbon length for aliphatic (straight chain) and aromatic (cyclic) compounds. The choice of the fractions is based on work carried out by, amongst others, the Total Petroleum Hydrocarbon Criteria Working Group (TPHCWG). The Working Group is guided by a steering committee consisting of representatives from industry, government and academia, with the remit *to develop scientifically defensible information for establishing soil cleanup levels that are protective of human health at petroleum contaminated sites.*

Generic assessment criteria can be developed for each TPH fraction in the same way as they can be for named substances, providing certain assumptions are made regarding the applicability of the data to all the compounds in each fraction. A significant part of the TPHCWG activity has been in determining fraction boundaries to maximize confidence in the eventual criteria.

A modified TPHCWG approach has been adopted in a framework developed by the Environment Agency (2005) for use within the UK. The 13 original TPHCWG fractions have been adopted, with the addition of >EC35-EC44. An undifferentiated (i.e. without aliphatic – aromatic split) fraction of >EC44-EC70 has also been suggested but the Agency says it will be reviewing the need for this in due course, once research has been carried out into the toxicity of these heavy-end products like resins and asphaltenes.

The UK suggested approach to petroleum hydrocarbon risk assessment is summarised as follows:

- Measure indicator chemicals and compare with their GAC – these are chemicals which are considered as key risk drivers at petroleum hydrocarbon contaminated sites. The chemicals of potential concern depend on the type of hydrocarbon product, but a (non-exhaustive) list has been suggested by the Environment Agency (2005):

  Non-threshold: benzene, benzo(a)pyrene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, indeno(1,2,3,cd)pyrene.

  Threshold: toluene, ethylbenzene, xylene, naphthalene, fluoranthene, phenanthrene, pyrene.

- Measure TPH fractions and compare with their GAC, based on threshold toxicity only.

  Aliphatic fractions: >EC5-EC6, >EC6-EC8, >EC8-EC10, >EC10-EC12, >EC12-EC16, >EC16-EC35, >EC35-EC44.

  Undifferentiated: >EC44-EC77 (subject to review and confirmation by Agency).

  Aromatic fractions: >EC5-EC7, >EC7-EC8, >EC8-EC10, >EC10-EC12, >EC12-EC16, >EC16-EC21, >EC21-EC35, >EC35-EC44.

- Carry out an additivity check on the TPH fractions if none of the individual fractions exceed their GAC. A Hazard Quotient is calculated for each fraction by dividing the measured concentration by the GAC and these are summed to give the Hazard Index. Where the Hazard Index exceeds unity, this can indicate a potentially significant risk to human health and consideration should proceed to the next stage (remediation or further assessment). Including all the fractions in a Hazard Index is conservative as it assumes all fractions add together in acting on the same target organ within the critical receptor. The Environment Agency (2005) has stated that fractions exhibiting different toxicological properties might be excluded from this process in due course, once research has been completed and further guidance published. The Louisiana Department of Environmental Quality (LDEQ) (2003) has published more detailed guidance, suggesting the following fractions be grouped: (a) aliphatic >EC8-EC10, >EC10-EC12 & >EC12-EC16, (b) aromatic >EC8-EC10, >EC10-EC12 & >EC12-EC16 and (c) aromatic >EC16-EC21 & >EC21-EC35.

Hydrock has adopted the first two points from above approach and has developed generic assessment criteria for the TPH fractions up to EC35. These are used for assessment where an appropriate level of sampling and laboratory analysis has been carried out, but cannot be used where more generalised TPH analysis has been scheduled (such as DRO/GRO only).

There is, however, some uncertainty concerning the validity of the additivity check. The Environment Agency (2002a) stated in the now withdrawn CLR 9, Section 4.4, “that it is not valid to simply calculate the sum of the fractions ‘soil concentration divided by SGV’, and compare this with 1.”, because total intake, not just intake from soil, needs to be included. It is assumed that the 2005 document takes this into account and that it is erring on the side of conservatism. Until this is formally resolved, Hydrock will report the additivity check for information, using the LDEQ groupings, but will caution against its use in setting remedial goals without further study or publication of definitive guidance. It is more realistic to carry out the additivity test on individual samples rather than on US_{95} values for the whole population, because it is unlikely that the TPH profile of the averaging area will be represented by the US_{95}s of every fraction. More likely, a sample high in one fraction will be low in another, particularly where a mixture of products is present in the ground.

The analysis required for the above methodology, using the aliphatic / aromatic split of TPH fractions, is referred to by Hydrock its “**TPH Level 2 suite**” of determinands. In instances where a full numerical risk assessment is not required, Hydrock carries out a screening analysis known as its “**TPH Level 1 suite**” of determinands. The TPH is divided into fractions, but without the aliphatic / aromatic split. This allows a semi-quantitative risk assessment on the basis of taking a worst case condition. The fraction split with the lowest GAC is deemed to apply to the whole fraction. For example, if the Level 1 analysis indicates the presence of >EC8-EC10, the result is compared to the GACs for the aliphatic >C8-C10 and the aromatic >EC8-EC10 fractions. The worst case would be to assume the whole fraction is aliphatic because this is the lower of the two GACs. This is a conservative approach, and if the test is passed, there is no need to proceed further. However, if the test is failed this does not necessarily indicate unacceptable risks and a more detailed risk assessment is required, with the full TPH Level 2 analysis suite.

3.5 Note on PAHs

A number of authors have used to concept of PAH double ratio plots to investigate the possible source of PAHs in environmental samples.

NAVFAC (Appendix A, April 2003) defines three major source type: petrogenic - generated from organic matter in ancient sediments by geologic conditions (i.e. including petroleum hydrocarbons and refined products); pyrogenic – generated by combustion of organic matter (wood, coal, petroleum, wastes etc.); and biogenic – generated by modern biological processes or by diagenetic processes (e.g. oxidation of organic matter). The following broad trends in the data were recognised:

- a ratio of fluoranthene to pyrene (Fl/Py) of <1 is indicative petrogenic sources, and of >1 is indicative of pyrogenic sources; and

- a ratio of anthracene to phenanthrene (An/Ph) of <0.2 is indicative of pyrogenic sources and of >0.2 is indicative of petrogenic sources.

Yunker *et al* (2002) carried out a literature study of published PAH ratios for a number of petroleum sources, combustion sources and environmental sources. They identified the following broad trends in the data:

- a ratio of fluoranthene to fluoranthene plus pyrene (Fl/(Fl+Py)) of <0.4 is indicative of petroleum hydrocarbon sources; of 0.4-0.5 is indicative of liquid fossil fuel combustion products; and of >0.5 is indicative of grass, wood and coal combustion products;

- a ratio of benzo(a)anthracene to benzo(a)anthracene plus chyrsene (BaA/(BaA+Ch)) of <0.2 is indicative of petroleum hydrocarbon sources; of 0.2-0.35 is indicative of either petroleum hydrocarbon sources or combustion and of >0.35 is indicative of combustion products;

- a ratio of anthracene to anthracene plus phenanthrene (An/(An+Ph)) of <0.1 is indicative petroleum hydrocarbon sources, but can be emissions from lignite, diesel or oil combustion, and of >0.1 is indicative of combustion sources, but can be diesel, coal or some crude oil hydrocarbons;

- a ratio of indeno(1,2,3)pyrene to indeno(1,2,3)pyrene plus benzo(ghi)perylene (IP/(IP+Bghi)) of <0.2 is indicative of petroleum hydrocarbon sources; of 0.2-0.5 is indicative of petroleum hydrocarbon combustion; and >0.5 is indicative of grass, wood or coal combustion products.

Note that in these authors’ study of these and a number of other ratios they cautioned there are exceptions to these generalisations on account of the variability and complexity of, for example, different crude oil sources.

Costa *et al* (2004) and Costa and Sauer (2005) used plots of fluoranthene to pyrene (Fl/Py) against benzo(a)anthracene to chrysene (BaA/Ch), benzo(a)anthracene to benzo(a)pyrene (BaA/BaP) and chrysene to benzo(a)pyrene (Ch/BaP) to distinguish coal tar and creosote contaminants from combustion products they referred to as urban background. They report distinctive areas on the plots relating to the sites being studied. Litton (2006) has also used these ratios to similar effect on other sites.

ALcontrol Laboratories (2006) also uses plots of fluoranthene to pyrene (Fl/Py) against benzo(a)anthracene to chrysene (BaA/Ch). Jones (2008) confirms that the following broad trends are derived from unpublished work at the laboratory:

- a ratio of Fl/Py of <0.65 is indicative of used engine oil when the ratio of BaA/Ch is higher (approaching 1.40) or other petroleum products when the ratio of BaA/Ch is lower (above about 0.35);

- a ratio of F/Py of 0.65-1 is indicative of petroleum combustion products; and

- a ratio of Fl/Py of <1 is indicative of coal when the ratio of BaA/Ch is higher (approaching 1.40) or other combustion soots when the ratio of BaA/Ch is lower (above about 0.35).

Stogiannidis and Laane (2015) undertook a review of published literature and produced a summary (their Table 4 plus supporting text) of a number of PAH ratios and threshold values for the initial screening or identification of pyrogenic or petrogenic PAHs.

It is evident from the literature that if a cross plot is made of two ratios it is often possible to see a separation in samples from different sources and, together with other supporting information, gain a better understanding of the likely source of the PAHs. Different ratios may give differing degrees of separation and so trying several plots is often useful. The work of Stogiannidis and Laane can help distinguish between oil-spill related PAHs and those produced by combustion.

3.6 Note on Cyanide

Cyanide toxicity is complicated but it is generally accepted that cyanide species exist in ‘free’ and ‘complex’ forms. Free cyanide species are toxic and it is generally agreed that free cyanide provides a more scientifically correct basis for the establishment of generic criteria. This approach has been followed in this report.

Metal-cyanide complexes (complex cyanide) are generally not considered toxic but in certain environmental fate reactions it is possible that dissociation may release toxic free cyanide into the water environment. This might occur where complex cyanides are exposed to direct sunlight and photolysis takes place. Such circumstances are considered very rare.

There is no published approach to assessing acute toxicity, but this can be a concern on gas works sites where spent oxide or, more particularly foul lime (aka “blue billy”) from the older processes, may contain significant concentrations of free cyanide. This is a particular problem because young children may be attracted to the bright blue deposits.

A methodology was presented by Macklin *et al* (December 2012): an acute oral LOAEL dose was identified by the then Health Protection Agency as 0.4 mg/kg bw/day; a dose of 5 g of soil was selected based on USEPA studies, eaten by a 10 kg weight child. This equates to a trigger level of 800 mg/kg free cyanide in soil. Above this concentration, there is a plausible hazard of ingestion of a harmful or fatal dose.

3.7 Note on Polychlorinated Biphenyls

PCBs fall into two groups, the dioxin-like (DL) and the non-dioxin-like (NDL), by virtue of their toxicity.

The Environment Agency methodology for DL-PCBs is included with dioxins and furans in the published dioxins SGV report (Science Report SC050021 / Dioxins SGV). The basis of this report is that because of the additive nature of these substances it is inappropriate to produce individual SGVs. The approach is to obtain speciated analyses of 12 DL-PCBs and, using an Agency spreadsheet, calculate a Hazard Index for a prescribed mixture of substances. SGVs can only be produced for atmospheric fall-out sites where the proportions of the individual substances are assumed to be uniform across the UK according to a table listed in the document.

For potentially industrially contaminated sites (such as where PCBs have escaped from transformers) only a Hazard Index can be produced. This can be converted into a GAC by calculation, but such a GAC is only applicable to conditions where the mixture of substances is unchanged. In effect, Hazard Indices will be calculated for each soil sample and provided these are all less than unity, the site poses no significant risk.

There is not Agency guidance with respect to NDL-PCBs. Hydrock has produced individual GACs for a number of these. A precautionary approach has been taken, in that the NDL-PCBs are assumed to have additive effects and the same approach is taken as with Hydrock's assessment of contamination by TPH fractions. Namely, each substance is compared with its GAC, but there is an additional stage in which a Hazard Index is also calculated. This is similar to the Agency's approach for DL-PCBs, but the Hazard Index calculation is performed at a different stage in the process.

Currently, these two approaches are separate. That is to say, there is no assumption of additvity of effect between DL- and NDL-PCBs. The logic for this is the fact that these two groups where established in the first place on account of their different effects.

The toxicity of the DL-PCBs is far greater than that of the NDL-PCBs. For example, the residential SGV for the full list of dioxins, furans and DL-PCBs under atmospheric fall-out conditions is 0.0087 mg/kg (NB: using only the 12 DL-PCBs in this list gives a GAC of 0.051 mg/kg), whist the lowest GAC for the NDL-PCBs is 0.32 mg/kg under the same exposure conditions. Analyses for DL-PCBs must be undertaken with very low laboratory reporting limits (typically 1ng/kg).

In real life examples, it is almost certain that both forms of PCBs will be present at a site. This is because the marketed products (known as Aroclors) were mixtures of many PCB congeners and they all appear to contain members from both groups (according to literature researched by Hydrock). Perhaps this is why the Agency has only issued guidance on the DL-PCBs.

Logically, if a site contains any PCBs (for example as a 'total' analysis) it is likely to contain DL-PCBs. In which case, the safe concentrations will be very low and can only be confirmed by re-analysing using low detection methods and following the Agency methodology on a sample-by-sample basis. This is effect means that GACs for NDL-PCBs are redundant. The implications of the Agency methodology have yet to be fully understood by the contaminated land community. For example, it would appear that standard laboratory tests for NDL-PCBs are irrelevant. Furthermore, standard reporting limits are far too high, typically 1ug/kg. The only instance where NDL-PCBs become the risk driver at a PCB contaminated site would be if for some reason the DL-PCBs had preferentially degraded.

The Hydrock methodology for PCB risk assessment is to carry out analyses for the 12 DL-PCBs (commonly referred to as the WHO-12) and the 7 most persistent NDL-PCBs (commonly referred to as the ICES-7) at a detection limit of 1 ng/kg (Table 3.6). This is considered conservative because it covers both groups even though the risk driver is most likely to be the DL-PCB group.

The WHO-12 are assessed using the Environment Agency SGV report methodology, to produce a Hazard Index, and the ICES-7 are compared to Hydrock-derived GACs with additivity check. Note that PCB118 appears in both lists and so in assessed under the Environment Agency methodology as a DL-PCB.

Table 3.6: PCB Suites

WHO-12 (dioxin-like)	ICES-7 (most persistent)
PCB-77 PCB-81 PCB-126 PCB-169 PCB-105 PCB-114 PCB-118 PCB-123 PCB-156 PCB-157 PCB-167 PCB-189	PCB-28 PCB-52 PCB-101 PCB-118 PCB-138 PCB-153 PCB-180 (Non-dioxin-like apart from PCB-118)

3.8 Note on Pesticides and Herbicides

Unless there is evidence to suggest that a certain pesticide or herbicide has been used on the land, the standard approach adopted by Hydrock is to screen for the presence of common pesticides in the organochlorine, organophosphorous and organonitrogen groups (OCP, OPP & OPN), for example on agricultural land. Note that the only available GACs are for pesticides in these groups (and then only a sub-set of the whole).

3.9 Note on Radon

Advice on radon protection in England is provided by Public Health England (www.ukradon.org), formerly the Health Protection Agency (*The Indicative Atlas of Radon in England and Wales,* HPA-RPD-033 (Miles *et al* 2007) and RCE-15 (2010)), and by the BRE (BRE Report BR 211 (Scivyer 2015)). An area of the country can be categorised according to the percentage of existing homes where radon is present above the Action Level: 0-1% lower probability, 1-3% and 3-10% intermediate probability and >10% higher probability. It is important to understand that the database on which these numbers are based is incomplete and contains more data points in areas of the country that have traditionally been known for high radon concentrations. As more properties are monitored, the categorisation may change.

The areas where >1% of homes exceed the Action Level are known as Radon Affected Areas.

The Building Regulations cite BR 211 and require basic radon protection measures in new buildings in areas of England and Wales where 3-10% of properties exceed the Action Level and full radon protection measures where >10% exceed the Action Level.

Landlords and employers have a legal duty to keep radon levels as low as practicable and to install remedial measures if levels are too high. Commercial new build includes protection measures similar to those for new homes, but once occupied they are subject to the HSW Act and the Ionising Radiations Regulations 1999.

Private residents are advised to have a radon test where their property is in a Radon Affected Area, and to fit remedial measures if levels are too high.

The Law Society's advice to conveyancing solicitors is to ask the vendor standard questions concerning whether the property is in a radon affected area, whether it was constructed with radon protection measures and whether a radon test has been carried out by the vendor. Hydrock understands that PHE is discussing with the Law Society the adoption of stronger wording to these questions.

In 2009 the then Health Protection Agency recommended that Building Regulations and supporting documents should be amended to ensure that *all* new buildings, extensions, conversions and refurbished buildings in the UK include basic radon protective measures as a minimum. This recommendation was rejected by the Government. Consequently, the current situation is that a developer is *required* only to install protective measures in buildings where >3% of existing properties are above the Action Level, but is not required to install them in Radon Affected Areas where 1-3% of existing properties exceed the Action Level (even though there may be future implications for occupiers of these buildings).

Note that whilst membranes intended to protect against radon *may* also protect against methane and carbon dioxide, this will only be the case if they have also been specifically designed (and installed) to protect against those gases (BS 8485:2015, Annex G).

3.10 Note on the Use of Non-UK Assessment Criteria

In rare instances reference to assessment criteria or other trigger values published by other authoritative bodies (other than those concerned with the UK contaminated land regime) may provide background information on the likely degree of contamination of a substance. Trigger levels indicative of naturally occurring concentrations or risk-based guidance from other countries often help place site analysis results into context. It must be remembered that use of non-UK assessment criteria is not in compliance with the UK contaminated land assessment regime given in the Model Procedures. However, these criteria can be of use as an aid to professional judgement and can help in determining a cost-effective and sustainable remedial strategy for a site, in consultation with the regulatory authorities.

3.11 Site-specific Assessment Criteria for Volatile Substances

The CLEA methodology includes the inhalation of indoor vapours where there are occupied buildings in the standard land use scenarios. For volatile substances such as those listed in Table 3.7 the percentage contribution of the indoor vapour pathway to the average daily exposure (ADE) can be seen to be significant (up to 100%). Consequently, if this pathway can be severed by the installation of a suitably designed and installed organic vapour barrier in the buildings only the remaining CLEA exposure pathways need to be considered for the site. Assessment criteria can be calculated for the remaining exposure pathways.

Site Specific Assessment Criteria (SSAC) have been calculated using CLEA UK using the same input parameters etc. as for the Hydrock GACs but with the indoor vapour pathway turned off in the model. The resulting SSACs can be used to inform on risk from these contaminants in the same way as GACs are used, but apply only if suitable membranes are provided and verified.

Table 3.7: Derivation of Site Specific Assessment Criteria for Volatile Substances for CLEA Standard Land Uses *Excluding the Indoor Vapour Pathway* (mg/kg) – on following page(s).

Updated 18/11/15		**Human Health Generic Assessment Criteria (no indoor vapour pathway) (mg/kg)**								
Contaminant	**Source of GAC**	**Human health - residential without plant uptake, no indoor vapour (1%SOM)**	**Human health - residential without plant uptake, no indoor vapour (2.5%SOM)**	**Human health - residential without plant uptake, no indoor vapour (6%SOM)**	**Human health - residential with plant uptake, no indoor vapour (1%SOM)**	**Human health - residential with plant uptake, no indoor vapour (2.5%SOM)**	**Human health - residential with plant uptake, no indoor vapour (6%SOM)**	**Human health - commercial, no indoor vapour (1%SOM)**	**Human health - commercial, no indoor vapour (2.5%SOM)**	**Human health - commercial, no indoor vapour (6%SOM)**
TPH fractions										
TPH ali EC05-EC06	LQM/CIEH + CLEA 1.07	320000	320000	320000	5000	11000	25000	300	560	1200
TPH ali >EC06-EC08	LQM/CIEH + CLEA 1.07	320000	320000	320000	15000	34000	71000	140	320	740
TPH ali >EC08-EC10	LQM/CIEH + CLEA 1.07	6400	6400	6400	1600	2900	4300	78	94000	94000
TPH ali >EC10-EC12	LQM/CIEH + CLEA 1.07	6500	6500	6500	4600	5500	6000	94000	95000	95000
TPH ali >EC12-EC16	LQM/CIEH + CLEA 1.07	6500	6500	6500	6300	6300	6400	95000	95000	95000
TPH ali >EC16-EC35	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
TPH ali >EC35-EC44	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
TPH aro EC05-EC07	LQM/CIEH + CLEA 1.07	29000	29000	29000	90	180	390	1200	2300	4700
TPH aro >EC07-EC08	LQM/CIEH + CLEA 1.07	29000	29000	29000	150	350	800	870	420000	420000
TPH aro >EC08-EC10	LQM/CIEH + CLEA 1.07	2600	2600	2600	58	140	310	38000	38000	38000
TPH aro >EC10-EC12	LQM/CIEH + CLEA 1.07	1800	1800	1800	83	200	430	38000	38000	38000
TPH aro >EC12-EC16	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
TPH aro >EC16-EC21	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
TPH aro >EC21-EC35	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
TPH aro >EC35-EC44	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
TPH >EC44-EC70	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
VOCs - BTEX & MTBE										
Benzene	SGV report + CLEA 1.07	37	37	37	0.13	0.27	0.59	530	530	540
Toluene	SGV report + CLEA 1.07	29000	29000	29000	150	350	800	870	420000	420000
Ethylbenzene	SGV report + CLEA 1.07	13000	13000	13000	110	260	600	180000	180000	190000
Xylene, o-	SGV report + CLEA 1.07	22000	22000	22000	190	460	1100	260000	280000	300000
Xylene, m-	SGV report + CLEA 1.07	22000	22000	22000	210	500	1200	260000	280000	300000
Xylene, p- (use this for combined m & p)	SGV report + CLEA 1.07	22000	22000	22000	200	470	1100	260000	280000	300000
MTBE	EIC/AGS/CL:AIRE + CLEA 1.07	39000	39000	39000	150	300	600	550000	550000	560000
VOCs - other benzenes										
Iso-propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	13000	13000	13000	220	520	1200	180000	180000	180000
Propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	13000	13000	13000	230	550	1200	180000	190000	190000
1,2,4-Trimethylbenzene	EIC/AGS/CL:AIRE + CLEA 1.07	130	130	130	2.5	6.1	14	1800	1800	1900
VOCs - chlorobenzenes										
Bromobenzene	EIC/AGS/CL:AIRE + CLEA 1.07	2900	3000	3000	22	52	120	31000	34000	37000
Chlorobenzene	LQM/CIEH + CLEA 1.07	6200	6300	6400	40	94	210	63000	77000	91000
1,2-Dichlorobenzene	LQM/CIEH + CLEA 1.07	54000	55000	56000	640	1500	3500	580000	670000	730000
1,3-Dichlorobenzene	LQM/CIEH + CLEA 1.07	130	130	130	1.7	4.1	9.3	3000	3100	3100
1,4-Dichlorobenzene	LQM/CIEH + CLEA 1.07	8800	8900	8900	100	250	570	130000	130000	130000
Hexachlorobenzene	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
Pentachlorobenzene	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
1,2,3-trichlorobenzene	LQM/CIEH + CLEA 1.07	950	960	960	31	74	160	12000	13000	13000
1,2,4-trichlorobenzene	LQM/CIEH + CLEA 1.07	6300	6500	6600	200	480	1100	49000	60000	69000
1,3,5-trichlorobenzene	LQM/CIEH + CLEA 1.07	920	940	940	31	74	160	9300	11000	12000
1,2,3,4-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
1,2,3,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	34	34	34	2.4	5.4	11.0	690	700	700
1,2,4,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.07	-	-	-	-	-	-	-	-	-
VOCs - chloroalkanes & alkanes										
Bromodichloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	38	38	38	0.11	0.22	0.46	500	520	530
Bromoform	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
Chloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	350000	350000	350000	780	1400	2600	2600	3500	5700
Chloroethene (aka vinyl chloride)	LQM/CIEH + CLEA 1.07	1.8	1.8	1.8	0.0038	0.0069	0.013	26	26	26
Chloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	310	310	310	0.45	0.88	1.6	1900	2200	3000
1,1-Dichloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	25000	25000	25000	64	120	240	1800	3000	5600
1,2-Dichloroethane	LQM/CIEH + CLEA 1.07	15	15	15	0.032	0.057	0.11	200	200	210
1,1-Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	5700	5700	5700	19	39	82	2200	3900	8000
Cis 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	680	690	690	1.8	3.5	7.1	3900	6600	9900
Trans 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.07	2100	2100	2100	6.5	13	27	3400	6200	13000
Dichloromethane	EIC/AGS/CL:AIRE + CLEA 1.07	390	390	390	0.70	1.3	2.3	7300	9000	9000
1,2-Dichloropropane	EIC/AGS/CL:AIRE + CLEA 1.07	1200	1300	1400	4.3	8.4	18	1200	2100	11000
Hexachloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	64	64	64	1.8	4.3	9.3	900	920	930
Tetrachloroethene	LQM/CIEH + CLEA 1.07	1700	1700	1700	11	26	58	420	950	26000
1,1,1,2-Tetrachloroethane	LQM/CIEH + CLEA 1.07	730	730	730	5.4	13	29	10000	10000	11000
1,1,2,2-Tetrachloroethane	LQM/CIEH + CLEA 1.07	730	730	730	2.8	6.1	14	11000	11000	11000
Tetrachloromethane	LQM/CIEH + CLEA 1.07	180	180	180	1.1	2.5	5.7	1500	2500	2500
Trichloroethene	LQM/CIEH + CLEA 1.07	660	660	660	3.0	6.5	15	1500	3200	9000
1,1,1-Trichloroethane	LQM/CIEH + CLEA 1.07	75000	76000	76000	330	730	1600	1400	2900	6400
1,1,2 Trichloroethane	EIC/AGS/CL:AIRE + CLEA 1.07	510	510	510	2.0	4.2	9.4	7100	7300	7400
Trichloromethane	LQM/CIEH + CLEA 1.07	880	880	880	2.5	4.8	10	5200	9100	20000
Other inorganics										
Antimony	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
Barium	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-

Updated 18/11/15		Human Health Generic Assessment Criteria (no indoor vapour pathway) (mg/kg)								
Contaminant	**Source of GAC**	**Human health - residential without plant uptake, no indoor vapour (1%SOM)**	**Human health - residential without plant uptake, no indoor vapour (2.5%SOM)**	**Human health - residential without plant uptake, no indoor vapour (6%SOM)**	**Human health - residential with plant uptake, no indoor vapour (1%SOM)**	**Human health - residential with plant uptake, no indoor vapour (2.5%SOM)**	**Human health - residential with plant uptake, no indoor vapour (6%SOM)**	**Human health - commercial, no indoor vapour (1%SOM)**	**Human health - commercial, no indoor vapour (2.5%SOM)**	**Human health - commercial, no indoor vapour (6%SOM)**
Mercury, elemental	SGV report + CLEA 1.07	4.3	11	26	4.3	11	26	4.3	11	26
Molybdenum	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
Thiocyanate	Hydrock + CLEA 1.07									
Other organics										
Biphenyl	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
Carbon disulphide	LQM/CIEH + CLEA 1.07	6200	6300	6300	33	70	150	2100	4200	75000
2,4-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
2,6-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
Hexachloro-1,3-butadiene	LQM/CIEH + CLEA 1.07	13	13	13	1.5	3.1	5.6	290	290	290
Mercury, methyl	SGV report + CLEA 1.07	-	-	-	-	-	-	-	-	-
Styrene	EIC/AGS/CL:AIRE + CLEA 1.07	1500	1500	1500	11	25	58	23000	23000	23000
Tributyl tin oxide	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
2-Chloronaphthalene	EIC/AGS/CL:AIRE + CLEA 1.07	-	-	-	-	-	-	-	-	-
NOTES										
If >1,000,000 is calculated, 1,000,000 is adopted.										
Red text - liquid at ambient temperature, calculated GAC exceeds saturation value and highlighed in red in CLEA - saturation value adopted for GAC										
Orange text - solid at ambient temperature, calculated GAC exceeds saturation value and highlighted red in CLEA - manual calculation not possible as only one HCV - saturated vapour concentration exceed, so saturation valu										
Blue text - solid at ambient temperature, calculated GAC exceeds saturation value and highlighted red in CLEA - manual calculation not possible as only one HCV - aqueous solubility exceed, so original red-highlighted value a										
Green text - solid at ambient temperature, calculated GAC exceeds saturation value and highlighted red in CLEA - manual calculation undertaken but result is greater than original red-highlighted value, so original red-highlighte										

3.12 Determination of Contaminated Land Under Part 2A of the Environmental Protection Act 1990

The legal test for land contamination under the statutory guidance of Part 2A of the Environment Protection Act 1990 (i.e. “significant harm or significant possibility of significant harm”) is **unacceptable** intake or direct bodily contact.

The situation was clarified by Defra (July 2008) in its guidance on the legal definition of contaminated land.

Part 2A does not prescribe number-based thresholds because it would be very difficult to produce numbers which are meaningful and proportionate, given the lack of scientific information about many substances and the site specific nature of risks. Instead, it relies on local authorities to assess risks posed on individual sites, then decide whether (in their view) the risks represent SPOSH, and thus whether land qualifies as **contaminated**.

The intention of the approach is that local authorities can use their judgement to ensure that Part 2A focuses on the SPOSH it was designed to address, whilst avoiding unnecessary burdens on land where contaminants may be present but there is no SPOSH.

In making Part 2A decisions, local authorities are likely to face some difficult decisions caused by uncertainty on the nature of risks. But they should be confident in exercising their judgement on the basis of available information. Part 2A clearly leaves judgements about what constitutes a SPOSH to local authorities, and it is up to them to make decisions.

GACs are not proxy thresholds for SPOSH, and should not be used as such. They describe levels (based on cautious estimates and assumptions in hypothetical example situations) at which concentrations of contaminants in soil may cease to pose **no appreciable/ minimal** risk. They do not seek to describe levels at which there might be a SPOSH.

Thus, if a GAC is exceeded, the assessor will usually need to conduct a detailed quantitative risk assessment to discover whether there is a **possibility of significant harm** and, if so, the nature of that risk. Whether or not SPOSH exists will depend on the results of risk assessment, the existence and nature of any pollutant linkages, and (ultimately) the judgement of the local authority.

As a general guide:

(i) For substances where there is a GAC, the more the GAC is exceeded, the more likely it is that an authority should consider the risks to be SPOSH.

(ii) Generally, the cautious nature of GACs means that local authorities may conclude that SPOSH is unlikely to exist at concentrations close to GACs.

(iii) In some cases, land with concentrations of contaminants which marginally exceed a GAC (say, up to a few times the GAC) might give rise to SPOSH if, for example, the receptor is particularly sensitive; or if further assessment finds that exposure is higher than that estimated in the GAC; or if there is little uncertainty in the underlying toxicology and HCV.

(iv) In other cases a GAC may be exceeded by tens of times and there might be no SPOSH (e.g. if further assessment found that exposure was much lower than that estimated using the GAC).

In view of the above, Hydrock has not to attempted to derive numerical SPOSH concentrations, but to use GACs as screening values. Where GACs are exceeded, it is recommended that the linkages and the uncertainties in the data are reviewed in consultation the regulatory authority to aid its judgment on determination.

A possible next phase would be to refine the generic risk assessment with a detailed risk assessment. This would involve using site-specific input parameters relevant to the particular site, in the CLEA model.

Revised contaminated land statutory guidance was published by Defra in 2012 with respect to Part 2A. The Act itself is unchanged. A new four category test (and associated classifications) has been introduced to ensure a high standard without being excessive. The aims are to make the regime target higher risk sites more efficiently, remove excessive cost burdens and facilitate the development of technical tools to increase consistency over time. This includes supporting non-technical guidance including a possible framework to aid in deciding into which of the proposed four new Categories of land a site should be placed.

Conversely, the regime is not intended to intervene where there is only a low level of risk, particularly in cases where it is difficult to demonstrate anything other than a very small hypothetical risk, as might be the case with vast swathes of land.

Defra states that there is a need for a more pragmatic approach. In practice, deciding when regulatory intervention is justified involves making decisions about when to act on a wide spectrum of risk, with varying levels of uncertainty over the precise nature of the risks. A number of the changes are intended to clarify when land is “contaminated land”. These are most likely to affect the assessment and remediation of contaminated land and are listed below.

1. Statutory explanation of broad objectives of the regime to explain that regulators should seek a reasonable balance between dealing with unacceptable risks whilst ensuring that burdens on businesses and society are manageable and sustainable. The regime should be seen as an option of last resort; that land is in effect “innocent until proven guilty”. This should give greater clarity for all concerned on what the regime seeks to achieve, and what it seeks to avoid.

2. Local Authorities to produce risk summaries before land may be determined as “contaminated”. Summaries must be understandable to non-experts to provide greater transparency and accountability. Easier for all involved to understand what local authority considers risks to be. It should be easier for Local Authorities managers, lawyers and councillors to be involved in decision making, particularly more difficult sites where wider socio-economic effects need to be take into account. Easier to share experience between Local Authorities leading to greater consistency in decision making.

3. Clarification of the legal test of significant harm to human health to mean serious unhealthy conditions of the body or part of it, and not minor/trivial complaints. This is unlikely to have a major effect because, to date, no site in England and Wales has been determined on

grounds that significant harm to human health has actually been caused. However, greater clarity on the meaning of significant harm is likely to help clarify the related legal test of significant possibility of significant harm.

4. Explanation of how to decide when land is (and is not) “contaminated land”. A new four category test which recognises the spectrum of risk encountered by assessors, and the reality that some sites are clearly contaminated land (Category 1), some clearly are not (Category 4), and others need more detailed consideration before a decision can be taken (Categories 2 and 3). Greater clarity that decision making is a two stage process in which the regulator must first understand the risk before deciding whether the risk is sufficiently high to justify regulatory intervention. The aim is to create legal certainty around what definitely is, and is not, contaminated land, whilst leaving Local Authorities with discretion to exercise local judgement on less straightforward land.

5. Category 4 will include normal background levels of contamination unless there is some exceptional reason to consider otherwise. Clarification that land at SGV/GAC levels is likely to be well into Category 4. Statutory backing for the sector to develop new tests to describe the top of Category 4 (including the production of Category 4 Screening Levels). This should provide clarity on when land will not be caught, reduced uncertainty and costs for landowners and businesses and faster decision making on non-problematic land.

6. Clarify the status of GACs and how they should (and should not) be used including a legal backing for the use of robust GACs produced by reputable, non-governmental, organisations within the sector (LQM/CIEH, EIC/AGS/CL:AIRE). Backing the development of new GACs (or similar tools) as might be developed by the sector to help implement the new Guidance. Specific legal backing for the current set of SGVs/GACs, and clarity on how they can (and cannot) be used.

7. Category 1 land is clearly caught by the regime when there is clear evidence of an unacceptable risk (e.g. similar land is known to have caused significant harm). This should give clarity on when land is definitely “contaminated land”, and help frame the spectrum of risk raised by land contamination.

8. New category of land under which Local Authorities would decide whether a site is in Category 2 (contaminated land) or Category 3 (not contaminated land). The new test would rest on whether or not the local authority believes there is a strong case for regulatory action, taking account of the scientific evidence, the objectives of the regime, and other factors. The local authority would start by considering health risks alone, and if they clearly tend towards the Category 4 or the Category 1 the decision could be taken at this point. However, if this does not lead to a decision, the local authority would consider wider socio-economic factors (e.g. cost, views of local people, etc) before deciding. If the local authority still cannot decide, the default decision is that the site is not contaminated land.

9. Reduce “regulatory creep” (excessive remediation of land forced by regulatory uncertainty) with greater clarity on what the enforcing authority can “reasonably” require by way of remediation. Clarity that SGVs/GACs must not be used as “one size fits all” remediation requirements; and that Part 2A can only be used to force remediation to a level where land

is no longer contaminated land (i.e. to a point where land is in Category 3), but it should not be used to force remediation beyond this point.

10. Guidance on the process of risk assessment: the need to take a strategic approach; the aim of dismissing low risk sites as soon as possible in order to focus on finding higher risk sites; and the general need to ensure that risk assessment is conducted in a timely and efficient manner. Clarify that in considering possible future risks the local authority should consider likely future situations (e.g. rather than hypothetical worst possible case situations). Recognise that in practice there is often a need for authorities to bring in external experts and act in accordance with their advice. Recognise that scientific and technical uncertainty is an inevitable part of contaminated land risk assessment, and set out broadly how regulators should deal with it. It is important that this is recognised in the Guidance to support the regulators who have to make decisions in the face of uncertainty.

In deciding whether or not a significant possibility of significant harm to human health exists, the local authority should first understand the possibility of significant harm from the relevant contaminant linkage(s) and the levels of uncertainty attached to that understanding, before it goes on to decide whether or not the possibility of significant harm is significant.

The term “possibility of significant harm” means the risk posed by one or more relevant contaminant linkage(s) relating to the land. It comprises:

- the estimated likelihood that significant harm might occur to an identified receptor, taking account of the current use of the land in question; and
- the estimated impact if the significant harm did occur i.e. the nature of the harm, the seriousness of the harm to any person who might suffer it, and (where relevant) the extent of the harm in terms of how many people might suffer it.

Having completed its estimation of the possibility of significant harm, the local authority should produce a risk summary.

The decision on whether the possibility of significant harm being caused is significant (SPOSH) is a regulatory decision to be taken by the relevant local authority. In deciding whether the possibility of significant harm being caused is significant, the authority is deciding whether the possibility of significant harm posed by contamination in, on or under the land is sufficiently high that regulatory action should be taken to reduce it, with all that would entail.

In deciding whether or not land is contaminated land on grounds of significant possibility of significant harm to human health, the local authority should use the four categorisations.

The decision between Categories 2 and 3 is a positive legal test, which means that the starting assumption should be that land does not pose a significant possibility of significant harm unless there is reason to consider otherwise. Category 3 may include land where the risks are not low, but nonetheless the authority considers that regulatory intervention under Part 2A is not warranted.

The local authority should first consider its assessment of the possibility of significant harm to human health, including the estimated likelihood of such harm, the estimated impact if it did occur, the timescale over which it might occur, and the levels of certainty attached to these estimates. If the authority considers, on the basis of this consideration alone, that the strong case does or does not exist, the authority should make its decision on whether the land falls into Category 2 or Category 3 on this basis regardless of any other factors.

However, if the authority considers that it cannot make a decision, it should consider other factors which it considers are relevant, including:

- The likely direct and indirect health benefits and impacts of regulatory intervention including benefits of reducing or removing the risk posed by contamination, any risks from contaminants being mobilised during remediation and any indirect impacts such as stress-related health effects that may be experienced by affected people, particularly local residents. If it is not clear to the authority that the health benefits of remediation would outweigh the health impacts, the authority should presume the land falls into Category 3 unless there is strong reason to consider otherwise.
- The authority's initial estimate of what remediation would involve; how long it would take; what benefit it would be likely to bring; whether the benefits would outweigh the financial and economic costs; and any impacts on local society or the environment from taking action that the authority considers to be relevant.

Deregulatory Change to Definition of Contaminated Land as it Relates to Water Pollution.

Defra will commence Section 86 of the Water Act 2003 so that in future this would only be the case if there is significant pollution of controlled waters or significant possibility of such pollution. To explain how to decide whether or not “significant” pollution is being caused, the Statutory Guidance introduced new Category 1-4 tests similar to those for deciding when there is a significant risk to human health as described above. There will be new technical guidance produced by the Environment Agency. In practice, this change is likely to have little effect on the practical implementation of the Part 2A regime because the Environment Agency has already been prioritising sites likely to meet the new “significance” test.

The ‘pollution of Controlled Waters’ means the entry into controlled Waters of any poisonous, noxious or polluting matter or any solid waste matter. Given that the Part 2A regime seeks to identify and deal with significant pollution (rather than lesser levels of pollution), the local authority should seek to focus on pollution which: (i) may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems; (ii) which may result in damage to material property; or (iii) which may impair or interfere with amenities and other legitimate uses of the environment.

In deciding whether significant pollution of Controlled Waters is being caused, the local authority should consider that this test is only met where it is satisfied that the substances in question are continuing to enter controlled Waters; or that they have already entered the waters and are likely to do so again in such a manner that past and likely future entry in effect constitutes on-going pollution.

3.13 Generic Risk Assessment Criteria for Risk to Plants

Soil contaminants, if present at sufficient concentrations, can have an adverse effect on the plant population. Phytotoxic effects can be manifested by a variety of responses, such as growth inhibition, interference with plant processes, contaminant-induced nutrient deficiencies and chlorosis (yellowing of leaves). All chemicals are probably capable of causing phytotoxic effects. Thus the phytotoxic potential of substances is dependent on the concentrations capable of having adverse effects on plants and the concentrations likely to be found at contaminated sites. Phytotoxicity is a difficult parameter to quantify given that experimental techniques vary widely and variations exist in plant tolerances, soil effects and synergistic/antagonistic reactions between chemicals.

Contaminants may be taken up and accumulated by plants through a range of mechanisms. The principal pathways are active and/or passive uptake through the plant root, adsorption to root surfaces and volatilisation from the soil surface followed by foliar uptake. After plant uptake, contaminants may be metabolised or excreted, or they may be bioaccumulated.

Many of the substances capable of adversely affecting vegetation exert this effect because of their water solubility, a characteristic that could result in their transport from contaminated sites into adjacent locations where the chemical may generate a phytotoxic response. This could be important if, for example, the adjacent site has important conservation status.

Whilst many contaminants may be phytotoxic, data are limited. Some heavy metals are essential as trace elements for plant growth but may become toxic at higher concentrations. Toxicity may be displayed in many forms, including signs of stress such as reduction in growth or yellowing of the tissue. The concentration in soil at which substances become phytotoxic depend on a range of factors including plant type, soil type, pH, the form and availability of the contaminant and other vegetation stress factors that may be present (such as drought).

Hydrock has carried out a review of a number of current and former guidance documents and other texts on phytotoxicity. It is not possible to produce a definitive list of phytotoxic substances on account of the variables mentioned above. However, a number of metals are repeatedly cited as commonly occurring priority pollutants. As a result, the following list is adopted as Hydrock's indicators of the potential for phytotoxicity: As, B, Cr, Cu, Ni and Zn.

As the CLEA framework is a risk based approach, applied to humans, an alternative strategy is required to assess the risk to plants from substances that are phytotoxic. Reference to published criteria and background concentrations can help put site data into context.

Published assessment criteria for the protection of plant life from a number of countries are given in Table 3.8. Also included in the table are some measures of natural background concentrations in typical soils.

The most authoritative source is the British Standard for topsoil, but this only lists three elements. CLR 11 states that the ICRCL Guidance Note 70/90 can be used for initial screening criteria. This approach has been adopted by Hydrock where BS 3882 is lacking, but where an ICRCL 70/90 criterion is lacking, the lowest criterion in Table 3.8 from, firstly MAFF, and, secondly, another country has been adopted. The adopted criteria are highlighted in Table 3.8. The MAFF value of 250 mg/kg has been chosen for As over the ICRCL value of 50 mg/kg as MAFF explains the 50 is applicable to vegetables and human health, whereas 250 is applicable to the plants themselves.

Table 3.8: Published Assessment Criteria and Natural Background Concentrations for Phytotoxic Elements (mg/kg)

Reference	As	B	Cr (total)	Cr (III)	Cr (VI)	Cu	Ni	Zn
Published assessment criteria (mg/kg)								
British Standard for topsoil (BS 3882:2015)						200 (pH>7) 135 (pH 6-7) 100 (pH 5.5-6.0)	110 (pH>7) 75 (pH 6-7) 60 (pH 5.5-6.0)	300 (pH>7) 200 (pH 6-7) 200 (pH 5.5-6.0)
MAFF Code of Good Agricultural Practice for the Protection of Soil (1998)	250			unlikely to be toxic except in v low pH. 400 for sites containing sewage sludge		500 (grass) but may fall to 250 for clover and sensitive species (at pH≥6)	110 (pH>7) 75 (pH 6-7) 60 (pH 5.5-6.0)	1000 (clover & grass at pH 6), may fall to 300 for sensitive species (at pH 6-7)
Australian Guideline B(1) (1999), Interim Urban Ecological Investigation Level (EIL). Soils not generally considered phytotoxic below these EILs.	20			400	1	100	60	200
Considered toxic to plants - Ponnamperuma *et al* (1979)		5 (hot water soluble)						
Dutch ecotoxicological intervention value (Swartjes 1993 & 1994) *	40	7	230			190		
Alberta Environment (1990) Tier 1 (draft) *	10 acid sandy soils			600 acid sandy soils	25 acid sandy soils	130 acid sandy soils		
Ontario MoE (1989) *	20 acid sandy soils 25 clay soils							
ICRCL 59/83 (1987) now withdrawn for human health assessment		3 (hot water soluble)				130	70	300
ICRCL 70/90 (1990) threshold trigger value	50				25	250		1000
New Zealand guidelines for timber treatment sites (1997), estimated based on Cu bioavailability *						500-1000 clay soils		
New Zealand guidelines for timber treatment sites (1997), soil criteria for protection of plant life (residential/agricultural setting)	10-20	3 (soluble)		600	25	130		

Reference	As	B	Cr (total)	Cr (III)	Cr (VI)	Cu	Ni	Zn
Natural Background Concentrations (mg/kg)								
Dutch background level (target value) (VROM 2000)	29		100			36	35	140
UK ICRCL 42/80 (2nd ed. 1983) - Normal conc. In agricultural soil	0.1-40	2-100	5-500			2-100	5-500	10-300
UK ICRCL 70/90 (1st ed. 1990) - Typical range (and mean) in agricultural soils	2.3 - 53 (11.0)					5.8-62 (19) [1.2-19 4.9) extractable]		29-210 (78.1) [1.5-21 (5.6) extractable]
Canadian assessment criteria (i.e. background) (CCME 1991)	5	1(hot water soluble)	20		2.5	30		60
New Zealand timber sites (1997) – background	2-30							
Australian Guideline B(1) (1999), typical background levels	1-50		5-1000			2-100	5-500	10-300
* cited in New Zealand Ministry for the Environment (1997) timber treatment chemicals guidelines.								

3.14 Generic Risk Assessment Criteria for Controlled Waters

The following aquifer definitions are adopted.

- **Principal aquifers** - These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer.
- **Secondary aquifers** - These include a wide range of rock layers or drift deposits with an equally wide range of water permeability and storage. Secondary aquifers are subdivided into two types:
- **Secondary A** - permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers; and
- **Secondary B** - predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
- **Secondary undifferentiated** - has been assigned in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type
- **Unproductive strata** - These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

The Environment Agency (August 2013) Groundwater Protection Policy (known as GP3) contains the legal framework, detailed policies, technical background and the tools to be used in the protection of groundwater.

The European Water Framework Directive (2000/60/EC) (WFD) and its daughter Directives establish a consolidated way of controlling water quality of the whole water environment. The UK Government has revised its guidance to the Environment Agency and Natural Resources Wales (the Agencies) to remain relevant to the second and subsequent planning cycles. *River basin planning guidance* (Defra and Welsh Government July 2014) is a point of reference for other regulators, bodies and individuals affected by or contributing to the river basin planning process. Parts of this guidance are transposed into The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015, which support The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2015 (Statutory Instrument 2015 No. 1623) which came into force on 14 September 2015. This updates the 2003 Regulations to include the revised EQS Directive (2013/39/EU) which has been amended to cover the second planning cycle, starting on 22 December 2015.

Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment (Defra and Welsh Government May 2014) informs interested parties of the new and updated environmental standards. There are a number of support documents produced by the UK Technical Advisory Group on the Water Framework Directive (UKTAG), including *Updated Recommendations on Environmental Standards* for the 2015-21 river basin management programme.

A groundwater body is defined as groundwater in an aquifer capable of supporting an abstraction of 10 m^3/day or 50 people over a sustained period under the WFD. Groundwater bodies are a strategic resource, even if there is no current abstraction. Lesser amounts of groundwater in an aquifer may not be considered as receptors in their own right, but may still be pathways to other receptors such as surface water bodies or aquatic ecosystems. However, if the conceptual site model indicates a potable supply of less than 10 m^3/day, this source will be included in the risk assessment.

One of the main objectives of the Agencies is to ‘prevent or limit’ inputs of substances. Substances are defined as either ‘hazardous substances’ or ‘non-hazardous pollutants’. Directive 2006/118/EC include the objective of preventing the input of hazardous substances into groundwater and limiting inputs of other (non-hazardous) pollutants so as to avoid deterioration of the groundwater body. The revised EQS Directive 2013/39/EU Annex I contains a list of ‘priority substances’ in the field of water policy and includes those identified as ‘priority hazardous substances’.

For practical purposes, the Agency interprets prevention of inputs of hazardous substances and any other substances which meet the criteria for persistence, toxicity and bioaccumulation taking into account those substances listed in WFD (2000/60/EC) Annex VIII.

The ‘prevent’ objective applies to active inputs such as industrial discharges and *de minimus* concentrations are set as a series of minimum reporting values (MRV). Inputs to Controlled Waters from contaminated land sites are classed as passive inputs under the WFD and, as such, were regulated under the Agency’s ‘limit’ objective. However, paragraph 9.3 of the revised *River* *basin planning guidance* (Defra and Welsh Government July 2014) states that the governments will issue revised Directions to take into account the recommendations of UKTAG (November 2013, amended January 2014) as well as Directive 2013/39/EU. These recommendations provide approached for hazardous and non-hazardous substances as follows.

- Hazardous substances – standards in groundwater help to assess whether or not measures to prevent inputs from identified sources have been successful and are based on 'limits of quantification' achieved routinely by competent laboratories (also known as minimum reporting values, MRV). Recommended standards are given in Table 13 of the UKTAG document. These standards are recommended for use in assessing risks posed by new developments (such as landfills) and whether or not existing activities and contaminated land with the potential to cause inputs are doing so.

  This is potentially more onerous than the previous 'limit' objective and the UKTAG document states that actions currently taken with respect to contaminated land are not always sufficient to prevent inputs of hazardous substances and additional remediation may be required. However, it also states that exemptions are available where measures would be disproportionately costly.
- Non-hazardous pollutants – standards in groundwater help to assess the extent to which inputs need to be limited to ensure they do not cause deterioration. Standards vary depending on the receptor at risk. Acceptable water quality targets are defined for protection of human health (based on drinking water standards (DWS)) and for protection of aquatic ecosystems (environmental quality standards (EQS)).

In the event, when the revised Directions were issued (namely, The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015) there was no mention of the use of MRVs with respect to inputs from land subjected to contamination. Consequently, MRVs are not used by Hydrock in this report.

All substances which are not determined to be hazardous are potentially non-hazardous pollutants. The final say lies with the Agencies as to which chemicals they consider to be of potential concern and whilst the indicator substances analysed for by Hydrock in this report may be indicative of the likely risk of pollution of Controlled Waters, this report may not be definitive and the relevant Agency may require additional work.

The definition of pollution is "the direct or indirect introduction, as a result of human activity, of substances or heat into the air water or land which may be harmful to human health or the quality of aquatic ecosystems or terrestrial ecosystems directly depending on aquatic ecosystems, which result in damage to material property, or which impair or interfere with amenities and other legitimate uses of the environment."

Pollution equates to harm. In order to protect receptors there is a regulatory regime. This involves setting an environmental standard at the receptor (i.e. minimum acceptable water quality). In recognition that pollutants may degrade *en route* to the receptor it is possible to set a limit value at the source of the pollution and compliance values at locations along the pathway, such that water reaching the receptor does not exceed the environmental standard. By definition, the target value is greater than or equal to the compliance value, which in turn is greater than or equal to the environmental standard, depending on the amount of degradation expected. This concept is used in the Remedial Targets Methodology (Environment Agency 2006a) to determine how land contamination impacts on groundwater and surface water quality.

The applied environmental standards vary with the hydrogeological conditions and the perceived value of the water resource, and are subject to local assessment by the relevant Agency. Note that protection of Controlled Waters may involve work over and above that required for 'suitable use' of a site for the proposed development.

Note also that Article 6.3(e)(ii) of the WFD enables the regulatory authorities to exempt measures from the prevent and limit requirements where it would be disproportionately costly to remove or control the further movement of pollutants that are already in the ground. Where a continuing source that has given rise in the past to land contamination this must be brought under control to prevent further unacceptable inputs to groundwater, but it is clear that the extent is limited by what is considered to be 'reasonableness'.

This report provides an initial assessment of the risks of pollution of Controlled Waters using water quality targets (WQT) as screening values. These are the drinking water standards (DWS) and the environmental quality standards (EQS), the latter designed to protect the surface water ecosystems. EQS are available for inland surface waters (freshwater) and other surface waters (transitional and marine). In addition, the recommended standards for hazardous substances in groundwater (UKTAG November 2013, amended January 2014, Table 13, Column 2) are also used where appropriate.

DWS are given in the Water Supply Regulations 2010 (which amends to Water Quality (Water Supply) Regulations 2000, Schedule 1, Table B, Part 1 (Directive requirements) and Part 2 (national requirements)). Where no UK or EU drinking water standard exists, reference is made to the World Health Organization (2011).

The list of EQS for priority substances is published in Directive 2013/39/EU. In addition, each Member State has to define country-specific substances and their EQS (river basin specific pollutants). Those adopted by the UK listed by Defra and Welsh Government (May 2014) and the 2015 Directions. These documents form the basis for the DWS and EQS used in this report.

It is noted that the EQS for iron in *Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment* is given in Table 5.2a as 1 µg/l. The 'standard status' in that table is listed as an existing standard. However, the existing standard was 1 mg/l (i.e. 1000 µg/l) and the tabulated value appears to be an error. This has been carried forward to the 2015 Directions. Consequently, Hydrock continues to use 1000 µg/l in its assessments.

Several EQS are based on bioavailable metal proportions (i.e. copper, lead, manganese, nickel and zinc). For zinc, this is the concentration in excess of the ambient background concentration (ABC). A software tool (M-BAT) is available from the Water Framework Directive - UK TAG web site for calculating the bioavailable fraction of Cu, Mn, Ni and Zn, but not Pb, and it also lists regional ABC values (WFD-UKTAG July 2014). Use of the tool requires knowledge of certain determinants of the receiving waters. Consequently, unless otherwise stated in the report text, this modelling has not been used in Hydrock's initial screening exercise and so an assessment based on the total dissolved metal concentrations will be conservative and a further level of risk assessment may be required.

Where this tool has been used, the bioavailability has been taken into account by calculating site-specific $\text{PNEC}_{\text{dissolved}}$ (Predicted No Effect Concentration) values. These enable the dissolved concentration data to be compared with the PNEC as if it were an EQS.

The WFD imposes a duty on the Agencies to classify surface water and groundwater bodies and to ensure long-term improvement (where necessary) to achieve acceptable standards. Threshold Values (TV) for individual groundwater bodies (GWB) are published. Each GWB has been identified by the Agencies and specific TVs calculated based on the perceived risks to that GWB. Failure of a TV is an indicator of potential adverse impact in specific circumstances. These TVs are not intended to be applied to meet the 'prevent or limit' objective of the Agencies (UKTAG September 2008) and are not to be used as part of specific site investigations (The Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015) and they are not used by Hydrock in this report.

Generic criteria for contaminated soils which might result in groundwater contamination can be derived from generic assumptions using the Environment Agency (2006) Remedial Targets Methodology. A tiered approach is detailed in this document. In accordance with CLR 11, EQS and DWS can be used as generic water quality targets with respect to contamination of controlled waters.

It is clearly not cost-effective to analyse every water sample for all determinands. Hydrock has produced a default *de minimus* suite which includes a number of common water quality indicators plus a selection of the more common chemicals of potential concern, drawn from the lists of Specific Pollutants and Priority Substances / Priority Hazardous Substances plus additional common contaminants listed in the EPA-H1 Part 2 document, as being indicators of Good water quality under the terms of the Directive.

In addition to this, Hydrock will add to this list any chemicals identified as potential risks by reference to the conceptual site model.

Using the WQTs discussed above, the risks to groundwater and surface water from contaminants on site have been assessed according to the remedial targets methodology (RTM) prescribed by the Environment Agency (2006a).

The Level 1 soil zone assessment considers whether the contaminant concentrations in the soil moisture are sufficient to impact the water receptor(s). It is a conservative model and compares soil pore water concentrations with the above criteria, taking no account of dilution, dispersion or attenuation. Pore water concentrations can be estimated by analysis of perched water samples, analysis of eluates produced in the laboratory by standard leaching of soil samples, or by calculation from physico-chemical properties of the substances. Calculation may be more appropriate for poorly soluble substances where retention times may not be long enough during the standard leaching tests to reach equilibrium. However, the Environment Agency (2009d) cautions that the use of published k_d values to calculate pore water concentrations "can lead to a conservative estimate of risk" and suggest that leaching tests may be designed for non-volatile organics using BS 18772:2008.

The Level 2 groundwater assessment is applicable where groundwater quality data are available and compares these with the above criteria, again taking no account of dilution, dispersion or attenuation.

The remedial targets methodology also allows for more detailed assessment (soil Level 2, 3 or 4, or groundwater Level 3 or 4) for substances which fail the above-mentioned assessments. These are progressively more complex assessments and do take into account attenuation and/or dilution, as applicable to the conceptual exposure model. Such assessment is beyond the scope of this report.

Where more than one water quality target is available it is important to apply the one relevant to the critical receptor. The DWS apply to groundwater or to surface water used for abstraction and the EQS apply to surface water where the aquatic ecosystem is the receptor. EQS are available for *inland* surface waters (freshwater) and *other* surface waters (transitional and marine). Where the most appropriate water quality target cannot be determined with certainty, the lowest one is adopted in line with the precautionary principle.

For the purposes of this report, the site data are compared with the various targets as set out in Table 3.9

Table 3.9: Summary of Water Quality Risk Assessment Protocol

Scenario	**Water body Receptors**	**Secondary Receptors**	**Example Contaminant Linkages**	**RTM Level and Samples Used (if Available)**	**Water Quality Targets**
A	Groundwater.	Human health (abstraction).	Contaminants from site leach or seep into groundwater body and this is a (potential/actual) source of human consumption or a strategic resource.	RTM Level 2 - Groundwater. RTM Level 1 - Soil leachate (including any calculated pore water concentrations) or pore water.	DWS
A	Groundwater. Surface water.	Human health (abstraction).	Contaminants from site leach or seep into groundwater body and this feeds surface water by base flow. The surface water may be used for human consumption.		DWS
B	Groundwater. Surface water.	Aquatic ecosystem.	Contaminants from site leach or seep into groundwater body and this feeds surface water by base flow. The surface water may be an aquatic ecosystem.		EQS (inland)
C	Groundwater. Surface water.	Aquatic ecosystem.	Contaminants from site leach or seep into groundwater body and this feeds surface water by base flow. The surface water may be an aquatic ecosystem.		EQS (other)
D	Groundwater. Surface water.	Human health (abstraction). Aquatic ecosystem.	Contaminants from site leach or seep into groundwater body and this feeds surface water by base flow. The surface water may be used for human consumption and is an aquatic ecosystem.		DWS EQS (inland)

Scenario	Water body Receptors	Secondary Receptors	Example Contaminant Linkages	RTM Level and Samples Used (if Available)	Water Quality Targets
E	Surface water.	Human health (abstraction).	Contaminants from site leach or seep into surface water which may be used for human consumption.	RTM Level 1 - Soil leachate (including any calculated pore water concentrations) or pore water. Although not part of the RTM, these scenarios are used to compare surface water data to the water quality targets.	DWS
F	Surface water.	Aquatic ecosystem.	Contaminants from site leach or seep into surface water which may be an aquatic ecosystem.		EQS (inland)
G	Surface water.	Aquatic ecosystem.	Contaminants from site leach or seep into surface water which may be an aquatic ecosystem.		EQS (other)
H	Surface water.	Human health (abstraction). Aquatic ecosystem.	Contaminants from site leach or seep into surface water which may be used for human consumption and is an aquatic ecosystem.		DWS EQS (inland)

Notes:
Some EQS are water hardness dependent. This is measured either in the receiving water or in groundwater (if it is part of the pathway), or is estimated from national maps.
Inland waters EQS applicable to freshwater, other waters EQS applicable to marine or transitional waters.
Where both DWS and EQS are applicable, it is assumed that the EQS is for inland waters.
This table and the results of the assessment are considered as a first screening for potential risks of pollution of Controlled Waters. More specific requirements may be stipulated by the Environment Agency.

Note that in some instances the reporting limit (or detection limit) quoted by the laboratory may be greater than the water quality target that it is being assessed against. Where this is the case it is noted in the table. The current exercise is an initial screening assessment.

There are three main possible reasons for this. Firstly, it may be that the ‘standard’ method gives a relatively higher reporting limit, but that a lower one could be obtained using a more specialised technique. However, it would be disproportionately expensive to adopt the more costly specialist technique for this initial screening exercise. Secondly, it may be that the sample in question was not ‘clean’ because the matrix was contaminated by other substances which interfere with the analysis and so a less sensitive method has been used to protect the laboratory equipment. Thirdly, it may be that no method exists that can reach the required limit. Hydrock has contacted the Environment Agency’s own National Laboratory Service and even they cannot reach low enough limits for several of the substances in the Hydrock default suite (Cr(VI), total cyanide, phenols and certain PAHs). Consequently, and depending on the particular chemicals, it may be possible with additional effort to refine the assessment, or it may be the case that it is not possible to say for certainty because suitable techniques are not available. Methods are being continually updated and new ones may become available.

The problem is compounded when EQS are revised downwards (eg the PAHs in 2013/39/EU Annex II) on the basis of toxicology, but laboratory techniques have yet to catch up. Indeed, the Directive acknowledges this in the revised Article 3b and where it states “... measurement, when carried out using the best available technique not entailing excessive costs, is referred to as “less than limit of quantification”, and the limit of quantification of that technique is above the EQS, the result for the substance being measured shall not be considered for the purposes of assessing the overall chemical status of that water body.”

In some cases all samples are below the detection limit but above the water quality target. It is not possible to make any judgement about these. However, in other cases, even though the detection limit is greater than the water quality target, some sample results do exceed the target.

3.14.1 Petroleum Hydrocarbons in Water

With respect to hydrocarbons in water, the Water Supply (Water Quality) Regulations 1989 (as amended 1999) contained a prescribed concentration of 10 µg/l for “dissolved or emulsified hydrocarbons (after extraction with petroleum ether); mineral oils”. This was removed from the 2000 (consolidated 2007) Regulations. It was confirmed by email from the Drinking Water Inspectorate to Hydrock (1 November 2005) that dissolved hydrocarbons are no longer a prescribed substance under the Regulations. However, the 10 µg/l limit did remain in the Private Drinking Water Regulations 1991 until their revision at the end of 2009.

In the absence of a prescribed concentration for drinking water, many Environment Agency officers continue to use the superseded value. This is perhaps because petroleum hydrocarbons are a hazardous substance (former List 1) under the WFD. There is, however, no clear UK policy on hydrocarbon contamination of controlled waters. This is partly because analyses for ‘petroleum hydrocarbons’ are fraught with complications concerning false positives, the results being method dependent and not restricted to petroleum products.

Guidance written by the Environment Agency on risk assessment of hydrocarbons in groundwater is dated 2009 but has never been officially released through the Agency’s website, although the dissemination status of the document is given as publicly available. This gives a table of water quality targets for hydrocarbons and lists “TPH (dissolved or emulsified hydrocarbons)”. No minimum reporting value (MRV) is quoted, the value that would equate to a *de minimus* concentration under the prevention objective. The target of 10 µg/l is given and this is described as coming from the “Private Water Supply Regulations 1991 No. 2790 (due to be updated in 2009)”. As mentioned above, the 2009 Regulations no longer list dissolved hydrocarbons.

Furthermore, the guidance also states that in cases where petroleum hydrocarbons have already entered the water, the Agency will regulate under its limit objective, rather than the prevention objective. This means that EQS or DWS will be appropriate. However, none exist.

In the absence of definitive guidance on petroleum hydrocarbons in water Hydrock recognises that it is not possible to provide EQS and so regulation with respect to aquatic ecosystems is impossible. However, it is possible to extend the use of DWS by calculating screening criteria for the speciated TPH fractions. This provides a rational, transparent and risk-based approach using established scientific principles, rather than simply adopting a withdrawn standard.

Whilst not strictly applicable to aquatic ecosystems, at least this approach can help inform the judgement as to the degree of degradation of a water body.

Accordingly Hydrock has calculated guidelines for drinking water quality based on the methodology proposed by the World Health Organisation (WHO, 2005). This is based on an adult consuming 2 litres of water per day. Whereas the WHO document assumes a body weight of 60kg, Hydrock has assumed 70kg in keeping with the UK Contaminated Land CLEA methodology.

A conservative allocation of 10% of the oral Tolerable Daily Intake (TDI) has been attributed to intake from drinking water. It is noted by the WHO (2005) that exposure from other sources would be expected to be very small and that it would be possible to allocate a greater percentage to drinking water if required. In other words, this approach is very conservative and is appropriate as an initial screening value and allows for potential additive toxicity and simultaneous exposure from other sources.

The TDIs used are the same as those used in the derivation of soil GACs and are listed in Table 3.10 along with the calculated health-based water quality targets for drinking water. Note, however, that the Environment Agency (2009d) states that when considering carbon bands, one does not know the range of toxicities and health effects of the individual chemicals, and it is precautionary to assume that the toxicological effects are additive when setting water quality targets even though the toxic endpoints and modes of action might in reality be quite different. The recommendation is to adopt a precautionary approach whereby the water quality target for each band is divided by the number of bands with detected concentrations.

Table 3.10: Calculated Water Quality Targets for Petroleum Hydrocarbons in Drinking Water

Determinand	**TDI** (µg/kg/day)	**Solubility** (µg/l)	**Water Quality Target (see Note 1)** (µg/l)	**Notes**
Ali EC5-EC6	5000	35900	**17500**[1]	
Ali >EC6-EC8	5000	5370	**17500**[1]	This concentration would be significantly above the solubility in water.
Ali >EC8-EC10	100	427	**350**[1]	
Ali >EC10-EC12	100	33.9	**350**[1]	This concentration would be significantly above the solubility in water.
Ali >EC12-EC16	100	0.759	**350**[1]	This concentration would be significantly above the solubility in water.
Ali >EC16-EC44	2000	0.00254	**7000**[1]	This concentration would be significantly above the solubility in water.
Aro EC5-EC7	223	1780000	**1**[1]	Based on the TDI for toluene as recommended by Environment Agency (2005) P5-080/TR3 gives 780. In reality the UK DWS for benzene = **1** takes precedence.
Aro >EC7-EC8	223	590000	**700**[1]	Calculated as 780, WHO DWS = **700** takes precedence.
Aro >EC8-EC10	40	64600	**140**[1]	
Aro >EC10-EC12	40	24500	**140**[1]	
Aro > EC12-EC16	40	5750	**140**[1]	
Aro >EC16-EC21	30	653	**105**[1]	
Aro >EC21-EC44	30	6.61	**105**[1]	This concentration would be significantly above the solubility in water.
Benzene	n/a	1780000	**1**	Calculation not possible as non-threshold substance, UK DWS = **1** takes precedence.
Toluene	223	590000	**700**	Calculated as 780, WHO DWS = **700** takes precedence.
Ethylbenzene	100	180000	**300**	Calculated as 350, WHO DWS = **300** takes precedence.
Xylene	180	200000	**500**	Calculated as 630, WHO DWS = **500** takes precedence.
MTBE	300	48000000	**15**	Calculated as 1050 so the odour threshold = **15** is adopted.

Determinand	TDI (μg/kg/day)	Solubility (μg/l)	Water Quality Target (see Note 1) (μg/l)	Notes
Note 1: The value to be used in a risk assessment (for carbon bands) is the value in the table divided by the number of bands with detected concentrations. Last updated 29/06/10				

In instances where a simple 'total' TPH is reported for water samples this should be considered indicative only. This is particularly the case if groundwater or surface water samples were not available and an indication of pore water quality has been derived by subjecting soil samples to a standard leaching procedure or calculation.

Where petroleum hydrocarbon contamination of Controlled Waters is suspected, Hydrock recommends that discussion with the Environment Agency is entered into at the earliest opportunity.

3.15 Statistical Tests of Soil Contamination Results

As discussed above, the sample analyses are divided into representative data sets for the assessment, based on the conceptual site model, and are referred to as 'averaging areas'. In this case it has been chosen to characterize materials that are likely to form the ground cover in critical receptor areas (e.g. gardens), on a material by material basis. The critical part of the soil column is the upper metre in terms of contact with end users of a development site.

Under the **land use planning system** where the aim is to demonstrate 'suitability for use' the key question will usually be "can we say confidently that the level of contamination of this land is low relative to some appropriate measure of risk, sometimes referred to as the critical concentration?" The critical concentration can be, for example, the relevant GAC.

It is necessary to demonstrate that (for each contaminant) the mean concentration on the site is **below** the critical concentration. The true mean concentration of a contaminant is not known because all the site soil has not been tested. An estimation of the true mean can be obtained from the samples tested during the investigation. The greater the number of samples tested, the closer the mean of these values is to the true mean.

In practice, this involves calculation of a quantity known as the 95th Upper Confidence Limit (UCL) of the true population mean, also known as the US_{95}. This is the estimate of the true mean at a 95% level of confidence (i.e. there is a 95% probability that the true mean will not be greater than this, given the values obtained from the investigation sample testing).

The statistical test that is carried out, therefore, is used to demonstrate that there is a 95% probability that the true mean falls below critical concentration (typically the GAC in a screening exercise).

In statistical language, a **null hypothesis** is stated; that the level of contamination is the same as, or higher than, the critical concentration. The **alternative hypothesis** is that the level of contamination is lower than the critical concentration. The statistical test is used to decide whether or not the null hypothesis is rejected.

If it is rejected, the assessor can conclude that the alternative hypothesis is more likely to be true, i.e. that contaminant concentrations are low relative to the critical concentration and that, potentially, the land is suitable for use. Conversely, if the null hypothesis is not rejected, the assessor should conclude that contaminant concentrations may be the same as, or higher than, the critical concentration and further measures may be needed.

A useful summary of the methodology is provided by CIEH & CL:AIRE (May 2008), which forms the basis for the approach adopted by Hydrock, and is described below. Appendix I of the C4SL report SP1010 (CL:AIRE, December 2013) contains a review of this methodology.

Firstly, the data set is assessed for outliers and normality. This is mainly a visual exercise rather than following a particular statistical method. Two graphs are considered, the data frequency histogram with a normal ‘bell curve’ for comparison and a quantlie-quantile (q-q) plot. The closer the data points lie to the 45° line, the closer they are to a normal distribution. Kinks in the q-q plot are indicative of more than one data set. Individual points away from the 45° line are indicative of outliers.

Additional evidence of outliers is obtained through a simple method of robust statistics advocated by the Royal Society of Chemistry (2001) and others. The measure of the mean is taken to be the median value because this is less susceptible to outliers and non-normal data sets. A value known as the mean absolute deviation (MAD) is calculated and from this can be calculated a robust standard deviation estimate by multiplying by 1.483.

A z-score can then be calculated, which is the absolute value of the data value minus the median, divided by the robust standard deviation. This is then compared with a critical value which, if exceeded, suggests a possible outlier. The critical value represents the number of standard deviations from the mean (or in this case the median). A critical value of 3 to 3.5 is generally considered appropriate. The attraction of this approach is that it is a robust, non-parametric method suitable for all data sets. It is not considered as definitive, but merely a tool to aid decision making.

If a potential outlier is identified it could be a laboratory or typographic error. If this is not the case it could be representative of a different contaminative incident and, therefore, be a hot-spot. However, it could also be simply the result of heterogeneous ground conditions and a relatively low number of sampling points. The initial review of the data is then coupled to a knowledge of the conceptual site model before an outlier is removed from the data set. A good reason is required to justify the removal of outliers and this will be reported in the text.

The second stage of the assessment is to carry out the statistical test as described previously. Two alternative methods are highlighted in the CIEH/CL:AIRE document. The one-sample t-test is said to be appropriate for normally distributed data (it is a parametric test) but is not sensitive to moderate departures from normality. The Chebychev Theorem is a non-parametric test which is said to be suitable for all data distributions. It is a less powerful test (statistically) and gives a more cautious result than the t-test because there is less certainty about the shape of the distribution.

The CL:AIRE review of 2013 considers the use of the t-test in more detail and states that if enough samples have been taken the distribution that describes the uncertainty about the mean depends only on the mean concentration and the size of between-location variation (as measured by the observed standard deviation, not the shape of the variation. The review goes on to say that in certain circumstances, the use of the Chebychev Theorem may be unsound and suggests the use of statistical tests not based on the null hypothesis test.

The method of determining when there are enough samples to be able to use the t-test is based on the condition that the relative standard error (RSE) is less than 0.25. The RSE is calculated from the relative standard deviation (RSD) by dividing my the square root of the number of samples. The RSD is the standard deviation divided by the mean. The number of samples required for an unbiased estimate of the average concentration are listed in Table 2 of Appendix I of SP1010, for various values of RSD and based on RSE of 0.25. The number of samples required and the RSE are calculated for each chemical on the Hydrock statistics spreadsheet and a note appears as to whether or not the t-test is applicable on this basis.

The risk assessor ultimately decides, based on all the evidence, whether to use the t-test (by selecting the data as being treated as normally distributed) or the Chebychev Theorem (data treated as non-normal). The chosen method is applied and the outcome recorded with respect to whether or not the null hypothesis is rejected and the site is potentially suitable for use.

Please note that under certain circumstances a ‘divided by 0’ error can occur in the spreadsheets used in the statistical analyses. This happens when all the data points are the same integer value, for example where all results are <3 mg/kg and they have been assumed to be 3 mg/kg. To prevent this error, one of the results can be altered by a small amount (e.g. 3 becomes 2.99999). This allows the statistical tests to be carried out but makes no difference to the outcome. However, it does mean that the q-q and histogram plots show a spurious point, which should be ignored.

It should be noted that a similar, but opposite, set of propositions applies in the case of a potential Part 2A determination where the level of contamination must be higher than some appropriate level of risk (critical concentration) (e.g. that indicative of SPOSH). In this case, however, a lower standard of proof may be accepted and the guidance suggests that if the statistical test of significance at the 95% confidence level does not indicate rejection of the null hypothesis, then the test should be repeated at the 51% level to see if there is evidence to suggest the null hypothesis be rejected on the balance of probabilities. Where no SPOSH concentrations are available and, say C4SLs, are being used as a low-level screen under Part 2A, the same approach as for the planning regime is appropriate.

When considering potential Part 2A sites, updated guidance published by Barnes *et al* (2010) recommends the t-test for all data sets where exceedance of a critical concentration is being tested (unless the data are negatively skewed, something these authors have never seen in contaminated land data sets).

3.15.1 Note on Clustered Data Sets

The assumption behind the statistical tests is that each sample represents an equal fraction of the averaging area (Nathanail, 2004). If the data are clustered, i.e. the sampling points are not equally spaced, the calculated US_{95} would be too high if targeted sampling has taken place around suspected high concentration areas to determine the extent of the high contamination. Conversely, the calculated US_{95} would be too low if there is a high density of sampling in an area of low contaminant concentration.

The sampling pattern used in this report has been reviewed to determine if clustering of data points is likely to affect the statistical tests significantly. In cases where the area represented by each sample is judged to be similar, the tests have been carried out without modification. The error in this approach is likely to be conservative to human health because the Hydrock approach to targeted sampling is more likely to produce more closely spaced higher concentrations than more closely spaced lower concentrations.

Erring on the conservative side is, however, counter-productive when it would indicate unnecessary remediation, i.e. remediation triggered by a US_{95} which is skewed by clustered data. This is taken into consideration in the risk evaluation part of the risk assessment exercise and can take the form of professional judgement, the modification of the averaging area datasets to decluster them, or the weighting of sample results to decluster the data set. The latter method involves weighting the measured concentrations according the proportion of the area they represent, giving greater weight to samples representative of a larger area.

3.15.2 Statistical Tests and Risk to Controlled Waters

Where only a few water quality tests are available, the maximum concentrations are compared with the standards because the 95 percentile will be close to the maximum value. However, where a larger population is available, the 95 percentile is compared with the standards, as recommended by the Environment Agency.

3.16 Ground Gas Risk Assessment

The permanent ground gases methane (CH_4) and carbon dioxide (CO_2) are monitored in accordance with the principles of BS 8576:2013 and the site records are reported in an appendix. Instrument calibration records are kept in accordance with Hydrock's in-house protocol for ground gas monitoring.

The risks associated with the methane and carbon dioxide are assessed using BS 8485:2015 and guidelines from CIRIA (Wilson *et al* 2007), the NHBC (Boyle and Witherington 2007) and CL:AIRE RB17 (Card *et al* 2012).

In the above guidance, 'Situation B' is defined as the specific development of low-rise (1 or 2 storey) housing with beam and block floors, vented sub-floor void and gardens. Initial risk classification can be made according to NHBC Table 8.1. This determines the appropriate risk strategy for protection, including the need to progress to generic quantitative risk assessment (GQRA). Even where no risk assessment is recommended by this table, one may be carried out if so desired. The GQRA is known as the 'NHBC traffic light classification' as it uses red, amber and green designations to portray levels of risk.

'Situation A' covers all other forms of development. This uses a modified version of the Wilson and Card (1999) methodology.

The idealised frequency of monitoring is suggested in CIRIA Tables 5.5a and 5.5b. These tables are adapted from Wilson and Haines (2005) Table 3 which gives examples of ground conditions with the various gas generation potentials, ranging from inert Made Ground (very low potential) to post 1960s domestic landfill (very high potential).

The report does not constitute a design for gas protection measures, but lists the recommendations given by the above-mentioned guidance for the particular "Situation" considered relevant. Reference should be made to BS 8485:2015 which provides guidance for the design, based on a system of scoring depending on the type of building, the type of structural barrier, ventilation protection measures and the gas membrane. The design of gas protection measures according to BS 8485:2015 requires the building(s), or different parts thereof, to be categorized into one of four building types: Type A, Type B, Type C or Type D. This is because the construction and use of the building, together with the control of future structural changes to the building and its maintenance (the building's management) should be assessed, since potential risks posed by ground gases are strongly influenced by these factors. Note that if a membrane is installed it must be verified in accordance with CIRIA C735 (Mallet *et al* 2014) or it will score zero points and will not be deemed to afford any protection.

CL:AIRE RB17 (Card *et al* 2012) is a pragmatic approach to ground gas risk assessment and was developed because gas concentration, pressure and flow rate measured in a well headspace may not be representative of the conditions in the surrounding formation. This approach is endorsed in BS 8485:2015. This is particularly the case where landfill or mine gases are not present, but there is scope for gas generation from Made Ground or naturally occurring organic matter in the soil. If generation rates are low, relatively high concentrations may be present in the soil pores but there is no driving force to expel gases at sufficiently high fluxes so as to represent a risk by entering enclosed living spaces.

In these low risk situations, the approach is to use the conceptual site model and the estimation of the likely gas generation from a source to identify:

- where gas monitoring is required to better define the risks;
- where it may be appropriate to reduce the period of monitoring required (or avoid extra monitoring in response to anomalous results); or
- gas protection measures where the total organic content (TOC) is not greater than 6%.

In summary:

Natural soils only with no credible methane source:

- no action required (monitoring or gas protection measures) as this represents Characteristic Situation 1 (CS1).

Natural soils with peat/organic alluvium or Made Ground with low organic content and a radon barrier is being provided:

- no action required (monitoring or gas protection measures).

Natural soils with peat/organic alluvium or Made Ground with low organic content and a radon barrier is *not* being provided:

- no gas monitoring required;
- if peat/organic alluvium is present this represents CS2 (note Table A1 in RB17 reads CS3 and this is an error according to Wilson (pers. Comm.);

- if Made Ground is present, is less than 1 m thick and is inert material such as sub-base of mineral soils no gas protection is required as this represents CS1;
- if Made Ground is present, is less than 5 m (maximum) and less than 3 m (average) thick determine TOC and forensic description (Table 3.11) and Characteristic Situation (and hence gas protection measures) (Table 3.12);
- if Made Ground is present, is greater than 5 m thick (for example and 'old refuse tip' on the Ordnance Survey map) determine Characteristic Situation (and hence gas protection measures) from TOC with forensic description plus gas generation modelling and gas monitoring to provide a lines of evidence approach. The findings of the TOC and gas modelling may mean gas monitoring for a period shorter than recommended by CIRIA.

Table 3.11: TOC and Forensic Description

Made Ground Fraction	TOC (%)
Fine soil <10mm organic	Laboratory test for TOC
Fine soil <10mm inorganic	Zero (inert) or confirm TOC with lab test
Coarse inert – clinker, gravel, concrete, brick etc.	Zero (inert)
Wood, trees, branches etc.	57 (=IPCC (2006) DOC of 43% x 1.33 according to Hesse (1971))
Vegetable matter	27 (=IPCC (2006) DOC of 20% x 1.33 according to Hesse (1971))
Metal, glass, ceramic and other inert matter	Zero (inert)
Paper and card	53 (=IPCC (2006) DOC of 40% x 1.33 according to Hesse (1971))
Other degradable matter	Food: 20 (=IPCC (2006) DOC of 15% x 1.33 according to Hesse (1971) Nappies: 32 (=IPCC (2006) DOC of 24% x 1.33 according to Hesse (1971) Construction / demolition waste: 5 (=IPCC (2006) DOC of 4% x 1.33 according to Hesse (1971)
Cloth and leather	32 (=IPCC (2006) DOC of 24% x 1.33 according to Hesse (1971))
Total TOC for the sample	**Weighted average of above based on mass of fractions**

Table 3.12: Characteristic Situation Based on TOC of Made Ground Maximum 5 m Thick, Average 3 m Thick

Maximum TOC (%) Made Ground in Place for 20 years or Less	Maximum TOC (%) Made Ground in Place for More Than 20 years	Characteristic Situation (CIRIA C665)
≤ 1.0	≤ 1.0	CS1
≤ 1.5	≤ 3.0	CS2
≤ 4.0	≤ 6.0	CS3
Not applicable for >CS3. Gas monitoring required if TOC > 4% (or 6% in old Made Ground)		

In a scenario where Made Ground is greater than 5 m thick the gas generation potential can be calculated according to the equation on page 10 of RB17, but ignoring the summation as no iteration is required if no new Made Ground is placed every year (Wilson, pers. comm.). The equation comes from LTGN03 (Environment Agency 2004c) and was originally developed to calculate the gas generation potential of landfill sites based on iterations representing the amount of waste deposited year by year. The rate constants (half-life) Hydrock uses as default are the fast, medium and slow degradation waste types from LTGN03 (viz 0.185/yr, 0.1/yr and 0.03/yr, respectively).

The result of the above calculation is assumed to represent the surface emission rate from a given area and mass of degradable Made Ground. This can be converted into a borehole emission rate (rounded up to the nearest 0.5%) for comparison with CIRIA C665 by assuming one borehole is equivalent to 10 m^2 of ground surface (Pecksen 1986).

Furthermore, the above calculated surface emission rate can be used with the equations from the NHBC Appendix F (Boyle and Witherington 2007) to estimate gas content in as house and compare this with the permissible concentrations.

4.0 WATER SUPPLY PIPES

The current guidance on selection of materials for potable water supply pipes to be laid in contaminated land is contained in a document published jointly by Water UK and the Home Builders Federation (Water UK HBF 2014). The protocols in that document are for guidance and are not subject to enforcement by Water UK or any agency, but have been adopted by Water UK and by HBF as best practice for their members. It has been produced to replace the guidance published by UK Water Industry Research (UKWIR) (Report 10/WM/03/02 and reissued in 2010), which came under criticism from contaminated land specialists. Accordingly this guidance is used in the following assessment.

The contaminants are divided into a number of 'parameter groups'. Threshold values for a selection of organic contaminants that may have a detrimental effect on pipes and fittings, together with threshold values for certain parameters that could cause corrosion of metal pipes, are presented.

It is generally accepted that the UKWIR document contains a number of technical errors and inconsistencies and was not universally accepted (AGS June 2014). The Water UK guidance document states that UKWIR Tables 3.1 and G1 are "not considered a definitive guide" and replaces these with its own Table 1 which clarifies the guidance. This is reproduced as within Table 4.1 below and although not stated in the document, it is assumed the units are mg/kg.

With respect to VOCs it is not clear whether or not BTEX and MTBE are to be included within the total VOC category. They appear in the USEPA method 8260C list of priority pollutants, but the text does not say to exclude them from the VOC total even though there is a separate group for BTEX and MTBE. The text does specifically exclude certain sub-sets of the SVOC list and so Hydrock has taken the guidance at face value and includes BTEX and MTBE in the VOC total.

Table 4.1: Water UK Threshold Values for Water Pipes

Parameter Group	Testing Required?	PE Pipe Threshold (mg/kg)	Metal or Barrier Pipe Threshold
Total VOC Sum of all USEPA 8260C VOC >10ug/kg and TIC >20ug/kg	Where preliminary risk assessment has identified land potentially affected by contamination	0.5	No limit
Total BTEX and MTBE		0.1	No limit
Total SVOC Sum of all USEPA 8270D SVOC >10ug/kg and TIC >20ug/kg but excluding PAH and those substances marked with an asterisk below.		2	No limit
TPH >EC5-EC10		2	No limit

Parameter Group	Testing Required?	PE Pipe Threshold (mg/kg)	Metal or Barrier Pipe Threshold
TPH >EC10-EC16		10	No limit
TPH >EC16-EC40		500	No limit
Phenols* from SVOC analysis		2	No limit
Cresols* and chlorinated phenols* from SVOC analysis		2	No limit
Ethers*	Only where identified from former land use	0.5	No limit
Nitrobenzene*		0.5	No limit
Ketones*		0.5	No limit
Aldehydes*		0.5	No limit
Amines*		Nothing >LoD	No limit
Corrosive indicators, pH, conductivity EC and redox potential Eh	Where metal pipes are contemplated	No limit	Wrapped steel: corrosive if pH<7 and EC>400uS/cm. Wrapped ductile iron corrosive if pH<5, Eh not neutral and EC>400uS/cm. Copper: corrosive if pH<5 or >* and Eh positive.
Presence of liquid free phase hydrocarbons	Observation	None allowed	None allowed

Within the guidance the soil tested must be representative of that in which the pipes will be laid, be it existing ground, remediated ground or imported soil, and should be sampled to at least 0.5 m below the underside of the pipe and along the pipe runs with sufficient number of samples to satisfy sampling strategies set out in CLR 4, CRL 11 and P5-066/TR. Following this, the data are to be incorporated into a specified risk assessment methodology.

Note that, unless stated otherwise, the Hydrock report does not constitute a formal water pipe risk assessment. Rather, the findings of the standard site investigation are screened against the threshold values in Table 4.1 insofar as is practicable given the data availability to give an indication of the possible restrictions to the use of plastic water pipes.

Note that the use of barrier pipe (PE-Al-PE) is applicable for all brownfield sites according to the guidelines, unless there are liquid free phase hydrocarbons present.

Note also that the Water UK guidance also includes greenfield sites where the preliminary risk assessment indicates there is a potential for contamination to be present.

The Water UK guidance above concentrates on direct contact of pipes with contaminated soil. It also refers to contact with excessive vapour phase and contaminated groundwater, but does not define either of these nor give any threshold concentrations.

The guidance also cautions against the creation of new pathways during construction, mainly the ability of contaminated groundwater to flow into granular pipe bedding.

It is **strongly recommended** that site-specific approval of the materials for underground pipes to be used for water supply be obtained from the water company that will be supplying this site and/or adopting the pipe work.

5.0 FLOOD RISK

The following additional information concerns the background to flood risk mentioned in the report. Guidance is given in the document *Technical Guidance to the National Planning Policy Framework* (DCLG March 2012) which retains key elements from the withdrawn Planning Policy Statement 25.

The Environment Agency flood maps are divided into Flood Zones, as follows.

- Flood Zone 1 is land outside the extent of extreme flooding and the annual risk is less than 1:1000, low probability (depicted as white on the web-based map).
- Flood Zone 2 is land unlikely to flood except in extreme conditions if no defences are present and the annual risk is between 1:100 and 1:1000 (for rivers) or 1:200 and 1:1000 (for the sea), medium probability (depicted as light blue on the web-based map).
- Flood Zone 3 is land within the floodplain at risk of flooding if no defences are present and the annual risk is greater than or equal to 1:100 (for rivers) or 1:200 (for the sea), high probability (depicted as dark blue on the web-based map).

The Agency flood maps also define the risk of flooding: as ‘low’ (≤1:200), ‘moderate’ (>1:200 to ≤1:75) or ‘significant’ (>1:75), which are not the same divisions as those in the guidance mentioned above. Note that the published flood map only relates to flooding from rivers, estuaries and the sea and does not include other potential sources such as surface water, groundwater, sewers, canals and reservoirs. Note also that the presence on the map of flood defences, or areas benefiting from flood defences, should not be taken to imply that a proposed development in these areas is acceptable.

The **Environment Agency in England** has issued Flood Risk Standing Advice. However, this is to be reviewed following the publication of the NPPF (see http://www.environment-agency.gov.uk/research/planning/33098.aspx for updates and details).

The flood map mentioned above can be accessed at the Agency’s website.

The Technical Guidance states:

- Within Flood Zone 1 all uses of land are appropriate. For development proposals on sites comprising one hectare or above, the vulnerability to flooding from other sources as well as from river and sea flooding; and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment (FRA) to accompany the planning application. This need only be brief unless the factors above or other local considerations require particular attention. For development proposals less than one hectare no flood risk assessment (FRA) is required.
- Within Flood Zone 2, water-compatible, less vulnerable and more vulnerable uses of land and essential infrastructure (as defined in Technical Guidance, Table 2) are appropriate in this zone. The Sequential Test is required and must be passed and for highly vulnerable uses in Table 2 the Exception Test must be applied and passed also. All

development proposals in this zone should be accompanied by a flood risk assessment (FRA).

- Flood Zone 3 is sub-divided into 3a and 3b, but these are not distinguished on the published maps. Flood Zone 3a is land having an annual probability of flooding of >1:100 (from rivers) or >1:200 (from the sea). The water-compatible and less vulnerable uses of land (as defined in Technical Guidance, Table 2) are appropriate in this zone. The highly vulnerable uses in Table 2 should not be permitted in this zone. The Sequential Test is required and must be passed and for the more vulnerable and essential infrastructure uses in Table 2 the Exception Test must be applied and passed also. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood. All development proposals in this zone should be accompanied by a flood risk assessment (FRA).

  Flood Zone 3b is known as the 'functional floodplain' and comprises land where water has to flow or be stored in times of flood and should be identified on Strategic Flood Risk Assessments (SFRA) undertaken by the Local Planning Authority. Such land is defined as land which would flood with an annual probability of 1:20 or greater, or is *designed* to flood in an extreme (1:1000) flood, or at another probability to be agreed between the Local Planning Authority and the Environment Agency, including water conveyance routes). Only the water-compatible uses and the essential infrastructure (as defined in Technical Guidance, Table 2) that has to be there should be permitted in this zone. It should be designed and constructed to: remain operational and safe for users in times of flood; result in no net loss of floodplain storage; not impede water flows; and not increase flood risk elsewhere. The Sequential Test is required and must be passed and for essential infrastructure the Exception Test must be applied and passed also. All development proposals in this zone should be accompanied by a FRA.

Natural Resources Wales points users to the Environment Agency flood map, but it is not used for planning purposes (only to provide information on flood risk and to raise awareness). Development advice with respect to flooding is provided by the Welsh Assembly Government (July 2004) Technical Advice Note 15 (TAN15) and the accompanying development advice maps. An interactive map is available from the WAG web site.

The development advice map containing three zones (A, B and C with subdivision into C1 and C2) should be used to trigger the appropriate planning tests.

- Zone A is considered to be at little or no risk of fluvial or tidal/coastal flooding. The justification test (TAN15, Section 6) is not applicable and there is no need to consider flood risk further. This equates to Flood Zone 1 on the Agency maps.

- Zone B is land known to have been flooded in the past evidenced by sedimentary deposits. As part of a precautionary approach site levels should be checked against the extreme (1:1000) flood level. If site levels are greater than the flood levels used to define adjacent extreme flood outline there is no need to consider flood risk further. This land within Flood Zone 1 of the Agency maps but close to Flood Zone 2 or 3.

- Zone C is based on the Environment Agency extreme flood outline, equal to or greater than 1:1000 (river, tidal or coastal) and equates to Flood Zones 2 and 3 on the Agency map. Flooding issues should be considered as an integral part of decision making by the application of the justification test (TAN15, Section 6) including assessment of consequences (TAN15, Section 7) is required. Sub-division C1 is land in the floodplain which are developed and served by significant infrastructure, including flood defences. Development can take place subject to application of the justification test, including acceptability of consequences. Sub-division C2 is land in the floodplain without significant flood defence infrastructure. Only less vulnerable development should be considered subject to application of the justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered. The categories of land use are defined in TAN15, Figure 2.

6.0 WASTE MANAGEMENT

6.1 Introduction

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose.

One of the ways this can be achieved is set out in the Development Industry Code of Practice (CoP) (CL:AIRE, March 2011). This builds on the Environment Agency guidance document Definition of waste: developing greenfield and brownfield sites (2006b).

The handling, re-use or disposal of waste is regulated by the Environment Agency. The Agency will take into account the use of the CoP in deciding whether to regulate materials as waste. If materials are dealt with in accordance with the CoP, the Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development. This may be because the materials were never discarded in the first place, or because they have been submitted to a recovery operation and have been completely recovered so that they have ceased to be waste.

Further details are provided in the CoP.

The chemical analyses in this report were scheduled for the purposes of risk assessment with respect to human health, plant life and controlled waters as discussed in the report. Whilst the results may be useful in applying the Hazardous Waste Assessment Methodology given in Environment Agency Technical Guidance WM3, they are not primarily intended for that purpose and additional analysis may be required should waste classification be required for consideration of off-site disposal of contaminated soils. As part of the report, Hydrock may have undertaken a preliminary exercise to characterise the soils encountered in the investigation in order to inform the waste characterisation process. This has been undertaken using a proprietary web-based tool and in not necessarily identical to the assessment that could be made by a particular landfill operator.

Separate analyses are required to meet the Waste Acceptance Criteria for specific landfill sites.

6.2 Classification of Materials for Off-Site Disposal Purposes

With respect to the possible waste streams from a site, it is recommended that a phased approach is implemented. This phased approach comprises Waste Characterisation and Waste Acceptance Criteria.

6.2.1 Waste Characterisation

Background

All wastes going to landfill must be classified as ‘inert’, ‘non-hazardous’ or ‘hazardous’, with a sub-category of hazardous waste known as ‘stable non-reactive hazardous waste’. Individual landfill sites must operate in accordance with their Environmental Permits.

Basic Characterisation

The first step is to determine if a waste is hazardous or non-hazardous.

Contaminated soil is a ‘mirror entry’ in the Consolidated European Waste Catalogue, and is not necessarily a hazardous waste. It is only classified as hazardous if it contains dangerous substances above certain threshold concentrations. The Environment Agency document *Waste Sampling and Testing for Disposal to Landfill* (March 2013) suggests that waste holders should use the information collected as part of the contaminated land risk assessment to inform decisions as to the concentrations that might reasonably be expected to be present in the contaminated soil, given the past and current uses of the site.

The waste must be assessed against all the appropriate hazards in accordance with the Environment Agency Technical Guidance WM3. This makes certain worst case assumptions about the chemical composition if specific compounds are not analysed for.

The classification of the soils as waste in England and Wales is undertaken in accordance with the revised Waste Framework Directive (WFD) (2008/98/EC).

Defining the class of waste is carried out on the actual waste being disposed of and the destination landfill site will have the final decision on acceptability of the waste. Therefore, it is recommended that if soils are to be removed from the site, the appointed contractor should approach a landfill site with the available chemical data and seek a formal waste characterisation.

The waste characterisation in this report is for information purposes only and should be considered in the light of the final decision made by the landfill site.

6.2.2 Waste Acceptance Criteria

If the waste is destined for landfill, the second step is Waste Acceptance Criteria (WAC) testing to determine if the receiving landfill can accept the waste. Further sampling and testing may be required.

WAC testing must be carried out on waste classified as non-hazardous to check if it can be disposed of at an inert landfill. Otherwise, it can be disposed of at a non-hazardous landfill without WAC testing.

WAC testing must be carried out on waste classified as hazardous to check if it can be disposed of at a hazardous landfill (or in a special stable non-reactive hazardous waste landfill site/cell).

The WAC are a list of limit values for certain parameters obtained from total content tests and standard leaching tests. If the limit values are exceeded, the waste is not suitable for disposal at that class of landfill site and alternative disposal methods have to be found.

Maximum permissible limit values are determined by the EU (part of what is known as ‘full waste acceptance criteria’) but individual landfills may have more stringent values to take into account the environmental setting, liner system or additional nature of specific waste streams.

WAC tests should be performed on the soils leaving the site and is not normally part of a site investigation exercise.

6.3 Materials Management

Any material excavated on site may be classified as waste and it is the responsibility of the holder of a material to form their own view on whether or not it is waste. This includes determining when waste that has been treated in some way can cease to be classed as waste for a particular purpose. One of the ways this can be achieved is set out in the Development Industry Code of Practice (CoP) (CL:AIRE, March 2011).

The handling, re-use or disposal of waste is regulated by the Environment Agency. The Agency will take into account the use of the CoP in deciding whether to regulate materials as waste. If materials are dealt with in accordance with the CoP, the Agency considers that those materials are unlikely to be waste at the point when they are to be used for the purpose of land development. The MMP must be signed off by a Qualified Person as defined in the CoP.

7.0 REFERENCES

AGS. June 2014. AGS Position Paper. Potable water supply pipes in land potentially affected by contamination. Association of Geotechnical and Geoenvironmental Specialists. <<ags.og.uk>>.

ALBERTA ENVIRONMENT. 1990. Alberta Tier 1 Criteria for Contaminated Soil Assessment and Remediation. Waste Management and Chemicals Division, Soil Protection Branch. Draft.

ALCONTROL LABORATORIES. 2006. Land Division – Information Sheet: *Where have my PAHs come from??*

BARNES, B., GLENNIE, E., DAVEY, A,. and THOMAS, J. 2010. Cheby or not Cheby? Is that the question? L*and Contamination and Reclamation,* **18(2)**, 121-33.

BOYLE, R. and WITHERINGTON, P. JANUARY 2007. Guidance on evaluation of development proposals on sites where methane and carbon dioxide are present. Report No. 10627-R01(04). NHBC, Milton Keynes. 93pp + apps.

BRITISH STANDARDS INSTITUTION. 2004. Eurocode 7 – Geotechnical design - Part 1: General rules. *BS EN 1997-1. Incorporating Corrigendum No.1.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2007. Eurocode 7 – Geotechnical design - Part 2: Geotechnical investigation and testing. *BS EN 1997-2.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2011. Code of Practice for Investigation of Potentially Contaminated sites. *BS 10175 Incorporating Amendment No.1:2013.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2014. Soil quality. Guidance on leaching procedures for subsequent chemical and ecotoxicological testing of soils and soil materials. *BS EN ISO 18772.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Specification of topsoil and requirements for use. *BS 3882.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings. *BS 8485.* BSI, London.

BRITISH STANDARDS INSTITUTION. 2015. Code of practice for ground investigations. *BS 5930.* BSI, London.

CANADIAN COUNCIL OF MINISTERS OF THE ENVIRONMENT (CCME). 1991. Review and recommendations for Canadian Interim Environmental Quality Criteria for contaminated sites. Environment Canada.

CARD, G., WILSON, s. and MORTIMER, S. 2012. *A pragmatic approach to ground gas risk assessment*. CL:AIRE Research Bulletin RB17. CL:AIRE, London.

CIEH and CL:AIRE. May 2008. Guidance on comparing soil contamination data with a critical concentration. The Chartered Institute of Environmental Health and Contaminated Land: Applications in Real Environments. 66pp.

CL:AIRE. March 2011. The Definition of Waste: Development Industry Code of Practice, Version 2. Contaminated Land: Applications in the Real Environment (CL:AIRE), London.

CL:AIRE. December 2013. Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination. *Final Project Report SP1010,* 20 December 2013, Contaminated Land: Applications in Real Environments (CL:AIRE), London.

COSTA, H. J. and SAUER, T. C. 2005. Forensic approaches and considerations in identifying PAH background. *Environmental Forensics,* **6,** 9-16.

COSTA, H. J., WHITE, K. A. and RUSPANTINI, J. J. 2004. Distinguishing PAH background and MGP residues in sediments of a freshwater creek. *Environmental Forensics,* **5,** 171-182.

DCLG. March 2012. National Planning Policy Framework. DCLG, London.

DCLG. March 2012. Technical Guidance to the National Planning Policy Framework. DCLG, London.

DEPARTMENT OF THE ENVIRONMENT. 1994. Sampling strategies for contaminated land. DoE *Contaminated Land Research Report CLR Report No. 4.* DETR, Rotherham.

DEFRA. 1 September 2005. Soil Guideline Values and the Determination of Land as Contaminated Land under Part 2A. *Guidance Note CLAN 2/05*. Defra/LEQ, London.

DEFRA. July 2008. Guidance on the legal definition of contaminated land. Defra, London.

DEFRA. April 2012. Contaminated Land Statutory Guidance. Defra, London.

DEFRA. March 2014. SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination – Policy Companion Document. Defra, London.

DEFRA and WELSH GOVERNMENT. May 2014. *Water Framework Directive implementation in England and Wales: new and updated standards to protect the water environment.*

DEFRA and WELSH GOVERNMENT. July 2014. *River basin planning guidance.*

EIC, AGS and CL:AIRE. 2009. The EIC/AGS/CL:AIRE Soil Generic Assessment Criteria for Human Health Risk Assessment. Environmental Industries Commission, Association of Geotechnical and Geoenvironmental Specialists and Contaminated Land: Applications in Real Environments. Available from <www.claire.co.uk>.

ENVIRONMENT AGENCY. 2000. Secondary Model Procedure for the Development of Appropriate Soil Sampling Strategies for Land Contamination. *R&D Technical Report P5-066/TR1*. The Environment Agency.

ENVIRONMENT AGENCY. 2002a. Contaminants in soils: collation of toxicological data and intake values for humans. *Contaminated Land Report 9.* The Environment Agency.

ENVIRONMENT AGENCY. 2002b. Possible contaminants for the assessment of land. *Contaminated Land Report 8.* The Environment Agency.

ENVIRONMENT AGENCY. 2003. Principles for Evaluation the Human Health Risks from Petroleum Hydrocarbons in Soils: A Consultation paper*. R&D Technical Report P5-080/TR1*. The Environment Agency.

ENVIRONMENT AGENCY. 2004a. Model procedures for the management of land contamination. *Contaminated Land Report 11.* The Environment Agency.

ENVIRONMENT AGENCY. 2004b. Soil screening values for use in UK ecological risk assessment. *R&D Technical Report P5-091/TR1*. The Environment Agency.

ENVIRONMENT AGENCY. 2004c. *Guidance on the management of landfill gas*. Landfill Technical Guidance Note 3 (LTGN03).

ENVIRONMENT AGENCY. 2005. The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils*. Science Report P5-080/TR3*. The Environment Agency.

ENVIRONMENT AGENCY. 2006a. Remedial Targets Methodology. Hydrogeological Risk Assessment for Land Contamination. The Environment Agency, Bristol, 123pp.

ENVIRONMENT AGENCY. 2006b. Definition of waste: developing greenfield and brownfield sites. The Environment Agency, Bristol.

ENVIRONMENT AGENCY. 2009a. Updated technical background to the CLEA model. *Science Report – SC050021/SR3.* The Environment Agency, Bristol, 164pp.

ENVIRONMENT AGENCY. 2009b. CLEA Software (Version 1.04) Handbook. *Science Report – SC050021/SR4.* The Environment Agency, Bristol, 121pp.

ENVIRONMENT AGENCY. 2009c. CLEA Software (Version 1.05) Handbook. *Science Report – SC050021/SR4.* The Environment Agency, Bristol, 129pp.

ENVIRONMENT AGENCY. 2009d. Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for Hydrogeological Risk Assessment. The Environment Agency, Bristol, 48pp.

ENVIRONMENT AGENCY. March 2009. S*cience Report – SC050021/benzene SGV.* The Environment Agency, Bristol, 10pp.

ENVIRONMENT AGENCY. June 2009. S*cience Report – SC050021/Cd SGV.* The Environment Agency, Bristol, 11pp.

ENVIRONMENT AGENCY. September 2009. S*cience Report – SC050021/Dioxins SGV.* The Environment Agency, Bristol.

ENVIRONMENT AGENCY. March 2013. Waste sampling and Testing for Disposal to Landfill. Report EBPRI 11507B. The Environment Agency, Bristol, 36pp.

ENVIRONMENT AGENCY. August 2013. *Groundwater protection: Principles and practice (GP3).* Version 1.1. The Environment Agency, Bristol, 207pp.

ENVIRONMENT AGENCY. 2015. Waste classification. Guidance on the classification and assessment of waste (1st Ed.) *Technical Guidance WM3.* The Environment Agency.

FRANKEN, R.O.G., BAARS, A.J., CROMMENTUIJN, G.H. & OTTE, P. 1999. A proposal for revised Intervention Values for petroleum hydrocarbons ('minerale olie') on base of fractions of petroleum hydrocarbons. *RIVM Report 711701015*. (Dutch) National Institute of Public Health and the Environment. P.O. Box 1, 3720 BA Bilthoven.

HARTLESS, R. 1991. Construction of new buildings on gas-contaminated land. Building Research Establishment Report BR 212. BRE, Garston.

HEALTH PROTECTION AGENCY. 2009. An introduction to land contamination for public health professionals, Ver 1.2. HPA, Cardiff.

HEALTH PROTECTION AGENCY. 2010. Limitation of human exposure to radon. Advice from the Health Protection Agency. *Report RCE-15*. HPA, Cardiff.

HESSE, P. R. 1971*. A textbook of soil chemical analysis.* John Murray (Publishers) Ltd, London.

INTERDEPARTMENTAL COMMITTEE ON THE REDEVELOPMENT OF CONTAMINATED LAND. 1983. Notes on the Redevelopment of Scrap Yards and Similar Sites. *ICRCL 42/80 (2nd Ed).* DETR, Rotherham.

INTERDEPARTMENTAL COMMITTEE ON THE REDEVELOPMENT OF CONTAMINATED LAND. 1987. Guidance on the assessment of contaminated land. *ICRCL 59/83 (2nd Ed).* DETR, Rotherham.

INTERDEPARTMENTAL COMMITTEE ON THE REDEVELOPMENT OF CONTAMINATED LAND. 1990. Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing. *ICRCL 70/90.* DETR, Rotherham.

INTERNATIONAL ORGANIZATION FOR STANDARDIZATION. 2005. Soil quality - Sampling - Part 5: Guidance on the procedure for the investigation of urban and industrial sites with regard to soil contamination. ISO 10381-5:2005.

IPCC. 2006 *2006 IPCC Guidelines for National Greenhouse Gas Inventories.* Volume 5, Waste. Prepared by the National Greenhouse Gas Inventories Programme, Eggleston H.S., Buendia L., Miwa K., Ngara T. and Tanabe K. (eds). Published: IGES, Japan.

JONES, J. 2008. Personal Communication.

LITTON, P. J. 2006. Personal Communication. Determining the source of hydrocarbon sheen using chromatogram fingerprinting and dual-ratio scatter plot analysis. Poster produced by BBL Inc, Tampa, Florida.

LOUISIANA DEPARTMENT OF ENVIRONMENTAL QUALITY. 2003. Risk Evaluation / Corrective Action Program. Appendix D. Louisiana Department of Environmental Quality Corrective Action Group, 20 October 2003.

MALLETT, H., COX, L., WILSON, S., and CORBAN, M. 2014. Good practice on the testing and verification of protection systems for buildings against hazardous ground gases. CIRIA Report C735. CIRIA, London.

MAKLIN, Y., KOWALCZYK, G., McCANN, R., WELFARE, W. and BROWN, M. December 2012. *Acute risks from soil contaminants: "Blue Billy".* SoBRA & RSC Toxicology Group Conference: Current Issues in Contaminated Land Risk Assessment, London, December 2012.

MILES, J. C. H., APPLETON, J. D., REES, D. M., GREEN, B. M. R., ADLAM. K. A. M. and MYRES. A. H. 2007. Indicative Atlas of Radon in England and Wales. Health Protection Agency and British Geological Survey. Report HPA-RPD-033.

MINISTRY OF AGRICULTURE FISHERIES AND FOOD. October 1998. Code of Good Agricultural Practice for the Protection of Soil.

MINISTRY OF HOUSING, SPATIAL PLANNING AND ENVIRONMENT. February 2000. Circular on Target Values and Intervention Values for Soil Remediation. DBO/1999226863. VROM, The Hague.

NATHANAIL, C. P. 2004. The use and misuse of CLR 7 acceptance tests for assessment of risks to human health from contaminated land. *Quarterly Journal of Engineering Geology and Hydrogeology*, **37**, 361-367.

NATHANAIL, P., McCAFFREY, C., ASHMORE, M., CHENG, Y., GILLETT, A., OGDEN, R. and SCOTT, D. 2009. The LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment (2nd ed.). Land Quality Press, Nottingham.

NATIONAL ENVIRONMENTAL PROTECTION COUNCIL. 1999. National Environmental Protection (Assessment of Site Contamination) Measure 1999. Schedule B(1) – Guideline on Investigation Levels for Soil and Groundwater. National Environmental Protection Council Service Corporation, Adelaide, Australia.

NAVFAC. April 2003. Guidance for Environmental Background Analysis, Vol. II: Sediment. *NFESC User's Guide UG-2054-ENV.* Naval Facilities Engineering Command, Washington DC, USA.

NEW ZEALAND MINISTRY FOR THE ENVIRONMENT. June 1997. Health and Environmental Guidelines for Selected Timber Treatment Chemicals. NZ Ministry for the Environment, Wellington.

NHBC. October 2014. Publication of Category 4 Screening Levels for land affected by contamination. *Technical Extra*, **15**, 14-17.

NHBC and ENVIRONMENT AGENCY. 2008. Guidance for the safe development of housing on land affected by contamination. R&D Publication 66, 2 Volumes.

ONTARIO MINISTRY OF THE ENVIRONMENT. 1990. Guidelines for the decommissioning and clean-up of contaminated sites in Ontario.

PECKSEN, G. N. 1986. Methane and the development of derelict land. London Environmental Supplement, Summer 1985, No. 13. London Scientific Services, Land Pollution Group.

PONNAMPERUMA, F. N., LANTIN, R. S. and CLAYTON, M. T. C. 1979. Boron toxicity in rice soils. *Int. Rice Res. Newsletter,* **4, 8.**

ROYAL SOCIETY OF CHEMISTRY. 2001. Robust statistics: a method of coping with outliers. AMC Technical Brief No. 6.. Analytical Methods Committee, Royal Society of Chemistry.

RUDLAND, D. J., LANCEFIELD, R. M. and MAYELL, P. N. 2001. Contaminated land risk assessment. A guide to good practice. *CIRIA Report C552*. CIRIA, London. 158 pp.

SCIVYER, C. 2015. Radon: Guidance on protective measures for new buildings. Building Research Establishment Report BR 211. BRE, Garston.

STOGIANNIDIS, E. and LAANE, R. 2015. Source characterization of polycyclic aromatic hydrocarbons by using their molecular indices: an overview of possibilities. *In: WHITACRE, D. M. (ed.), Reviews of Environmental Contamination and Toxicology.* **234,** 49-133.

STONE, K., MURRAY, A., COOKE, S., FORAN, J. and GOODERHAM, L. 2009. Unexploded ordnance (UXO), a guide to the construction industry. *CIRIA Report C681*. CIRIA, London. 141 pp.

SWARTJES, F. and van den Berg, R. 1993. Remediation of contaminated soil and groundwater: proposals for criteria and priority setting. *Proc. Workshop on Contaminated Soils*, *October 1993*, Stockholm.

UKTAG. November 2013 (updated January 2014). *Updated recommendations on environmental standards. River Basin Management (2015-21)*. UK Technical Advisory Group on the Water Framework Directive.

UK WATER INDUSTRY RESEARCH (UKWIR). 2010 re-issued. Guidance for the Selection of Water Supply Pipes to be used in Brownfield Sites. *Report 10/WM/03/21*.

WATER UK HBF. January 2014. Contaminated Land Assessment Guidance. Water UK and the Home Builders Federation. 12pp.

WELSH ASSEMBLY GOVERNMENT. July 2004. Development and flood risk. Planning Policy Wales, Technical Advice Note 15.

WFD-UKTAG. July 2014. UKTAG River & Lake Assessment Method, Specific Pollutants (Metals), Metal Bioavailability Assessment Tool (M-BAT). Water Framework Directive – United Kingdom Technical Advisory Group. Stirling.WILSON, S.A. and CARD, G.B. 1999. Reliability and risk in gas protection design. *Ground Engineering,* February 1999, 33-36, plus letters in March 1999.

WILSON, S. and HAINES, S. 2005. Site investigation and monitoring for ground gas assessment – back to basics. *Land Contamination and Reclamation* **13(3),** 211-222.

WILSON, S., OLIVER, S., MALLETT, H., HUTCHINGS, H. and CARD, G. 2007. Assessing risks posed by hazardous ground gases to buildings. *CIRIA Report C665*. CIRIA, London. 182pp.

WORLD HEALTH ORGANIZATION. 2011. Guidelines for drinking-water quality (4th Edition). WHO, Geneva.

WORLD HEALTH ORGANIZATION. 2005. Petroleum products in drinking-water. Background documentation for development of WHO guidelines for Drinking-water Quality. *Report WHO/SDE/WSH/05.08/123*. WHO, Geneva.

YUNKER, M.B., MACDONALD, R.W., VINGARZAN, R., MITCHELL, R.H., GOYETTE, D AND SYLVESTRE, S. 2002. PAHs in the Fraser River basin: a critical appraisal of PAH ratios as indicators of PAH source and composition. *Organic Geochemistry*, **33,** 489-515.

Appendix H

Contamination Test Results and Statistical Analysis

Assessment of Chemicals of Potential Concern to Human Health

								Soil Type	WHI	WHI	WHI	WHI	WHI	WHI	TS/WHI	WHI	MG/WHI	TS/WHI	WHI	TS/WHI	WHI	WHI	WHI	TS/WHI	WHI
All values in mg/kg unless otherwise stated								Location & Depth	TP21	TP19	TP20	TP45	TP39	TP49	TP21	TP16	TP14	TP14	TP42	TP53	TP30	TP47	TP23	TP66	TP63
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US$_{95}$**	**Result of Significance Test**	**0.50**	**0.20**	**0.50**	**0.30**	**0.50**	**0.50**	**0.20**	**0.60**	**0.40**	**0.20**	**0.50**	**0.20**	**1.00**	**0.30**	**0.50**	**0.20**	**0.50**
Arsenic	1	38	47	270	38	37	144.7217	FURTHER ASSESSMENT REQUIRED	78	82	47	98	75	58	120	63	89	100	98	120	78	120	140	100	93
Beryllium	0.06	33	1.4	6.3	0	73	3.85763	POTENTIALLY SUITABLE FOR USE	2.8	2.8	2.2	2.9	2.4	2.2	4.2	2.1	2.6	3	2.8	3.2	2	2.7	3.1	2.5	2.4
Boron	0.2	33	0.5	4.2	0	300	2.384595	POTENTIALLY SUITABLE FOR USE	2	2.5	1.2	2.4	1.4	1.5	1.5	2.5	2.1	2.4	1.7	1.7	0.7	2.2	2.3	1.9	1.8
Cadmium	0.2	33	0.2	0.2	0	14	0.2	POTENTIALLY SUITABLE FOR USE	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	0.2	0.2
Chromium (III)	1	33	36	330	0	890	174.7111	POTENTIALLY SUITABLE FOR USE	86	87	52	96	90	51	220	140	84	100	81	110	36	84	120	82	76
Chromium (VI)	1.2	33	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Copper	1	33	7.5	35	0	2500	29.82714	POTENTIALLY SUITABLE FOR USE	28	25	27	25	22	30	17	23	27	31	27	35	33	23	25	28	27
Lead	1	33	16	130	0	200	51.27812	POTENTIALLY SUITABLE FOR USE	33	34	17	44	24	19	34	22	33	43	31	46	20	38	130	40	31
Mercury, inorganic	0.3	33	0.3	0.4	0	170	0.337276	POTENTIALLY SUITABLE FOR USE	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.4	0.3	0.3	0.3
Nickel	1	33	25	120	0	130	85.51079	POTENTIALLY SUITABLE FOR USE	56	54	46	51	52	55	83	110	66	64	74	86	95	56	66	58	72
Selenium	1	33	1	1	0	360	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Vanadium	1	33	41	430	2	410	254.3043	POTENTIALLY SUITABLE FOR USE	110	120	57	140	110	70	340	100	120	150	120	170	74	130	180	120	120
Zinc	1	33	55	310	0	3900	172.5924	POTENTIALLY SUITABLE FOR USE	100	110	65	100	92	90	170	310	100	130	130	210	55	100	140	120	88
Cyanide (free)	1	33	1	1	0	790	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Phenol (total)	1	33	1	1	0	560	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Acenaphthene	0.1	33	0.1	0.1	0	520	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Acenaphthylene	0.1	33	0.1	0.1	0	430	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Anthracene	0.1	33	0.1	0.1	0	5500	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Benz(a)anthracene	0.1	33	0.1	0.1	0	6.7	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Benzo(a)pyrene	0.1	33	0.1	0.1	0	1.5	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Benzo(b)fluoranthene	0.1	33	0.1	0.1	0	9.4	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Benzo(ghi)perylene	0.05	33	0.05	0.05	0	69	0.05	POTENTIALLY SUITABLE FOR USE	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	0.05	0.05
Benzo(k)fluoranthene	0.1	33	0.1	0.1	0	14	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Chrysene	0.05	33	0.05	0.05	0	11	0.05	POTENTIALLY SUITABLE FOR USE	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	0.05	0.05
Dibenz(a,h)anthracene	0.1	33	0.1	0.1	0	1.3	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Fluoranthene	0.1	33	0.1	0.1	0	560	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Fluorene	0.1	33	0.1	0.1	0	410	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Indeno(1,2,3,cd)pyrene	0.1	33	0.1	0.1	0	5.5	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Naphthalene	0.05	33	0.05	0.05	0	5.2	0.05	POTENTIALLY SUITABLE FOR USE	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	0.05	0.05
Phenanthrene	0.1	33	0.1	0.1	0	220	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Pyrene	0.1	33	0.1	0.1	0	1200	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	0.1
Asbestos identified	Y/N								N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N
FOC (dimensionless)	0.01305	**(mean)**							0.015	0.021	0.0047	0.025	0.0049	0.0044	0.019	0.0049	0.017	0.025	0.0089	0.02	0.0019	0.025	0.019	0.0049	0.022
SOM (calculated)	2.25%	**(mean)**							2.59%	3.62%	0.81%	4.31%	0.84%	0.76%	3.28%	0.84%	2.93%	4.31%	1.53%	3.45%	0.33%	4.31%	3.28%	0.84%	3.79%
pH (su)	7.7	**(mean)**							8.1	8	8.3	7	8.3	8.2	7.4	8.2	7.9	7.7	7.3	7.1	8.4	7.1	7.4	7.4	8

Risk parameter: **Human health - residential with plant uptake (2.5%SOM)**
Data set: Whitby Formation
Client: Gallagher Estates
Site: Wykham Park Farm
Job no.: C-04582
Lab. report no(s).: 16-36329-1

Legend: Values in blue are at or below the laboratory reporting limit (where a single value is indicated) and are
considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
Values in red are equal to, or greater than, the generic assessment criterion (GAC) or +ve asbestos ID.
MG denotes Made Ground
NAT denotes natural ground

Assessment of Chemicals of Potential Concern to Human Health

								Soil Type	TS/WHI	WHI	WHI	WHI	WHI	WHI	WHI	WHI	WHI	WHI	WHI	TS/WHI	WHI	WHI	WHI	WHI	WHI
All values in mg/kg unless otherwise stated								Location & Depth	TP59	TP78	TP87	TP96	TP94	TP105	TP108	TP111	TP114	TP60	TP119	TP129	TP120	TP128	TP102	TP130	TP22
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US_{95}**	**Result of Significance Test**	**0.20**	**0.40**	**0.50**	**0.50**	**0.50**	**0.50**	**0.30**	**0.50**	**0.30**	**0.50**	**0.50**	**0.30**	**0.30**	**0.50**	**1.00**	**1.00**	**0.3**
Arsenic	1	38	47	270	38	37	144.7217	FURTHER ASSESSMENT REQUIRED	47	87	73	73	97	88	89	230	190	57	140	210	170	94	89	58	99
Beryllium	0.06	33	1.4	6.3	0	73	3.85763	POTENTIALLY SUITABLE FOR USE	1.4	2.8	1.9	2.2	2.5	2.4	2.6	6.3	5.4	2.6	4.7	5.3	4.8	3.7	2.4	1.9	
Boron	0.2	33	0.5	4.2	0	300	2.384595	POTENTIALLY SUITABLE FOR USE	1.5	1.7	1.1	1.7	1.7	1.3	2.5	1.5	2.8	1.4	2.4	2.3	4.2	1.9	0.5	1.2	
Cadmium	0.2	33	0.2	0.2	0	14	0.2	POTENTIALLY SUITABLE FOR USE	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	0.2	
Chromium (III)	1	33	36	330	0	890	174.7111	POTENTIALLY SUITABLE FOR USE	49	97	40	59	82	79	90	330	260	98	250	240	230	240	53	41	
Chromium (VI)	1.2	33	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	1.2	
Copper	1	33	7.5	35	0	2500	29.82714	POTENTIALLY SUITABLE FOR USE	33	19	27	24	26	29	32	12	16	15	14	25	24	7.5	34	29	
Lead	1	33	16	130	0	200	51.27812	POTENTIALLY SUITABLE FOR USE	67	26	16	20	33	36	44	29	38	22	25	56	54	16	28	19	
Mercury, inorganic	0.3	33	0.3	0.4	0	170	0.337276	POTENTIALLY SUITABLE FOR USE	0.3	0.3	0.4	0.4	0.4	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	
Nickel	1	33	25	120	0	130	85.51079	POTENTIALLY SUITABLE FOR USE	25	49	46	51	51	59	71	120	93	53	96	96	91	88	93	48	
Selenium	1	33	1	1	0	360	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Vanadium	1	33	41	430	2	410	254.3043	POTENTIALLY SUITABLE FOR USE	72	120	45	71	120	120	140	430	370	120	410	360	330	400	82	41	
Zinc	1	33	55	310	0	3900	172.5924	POTENTIALLY SUITABLE FOR USE	81	69	82	86	100	110	140	210	190	60	180	220	220	88	190	64	
Cyanide (free)	1	33	1	1	0	790	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Phenol (total)	1	33	1	1	0	560	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	
Acenaphthene	0.1	33	0.1	0.1	0	520	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Acenaphthylene	0.1	33	0.1	0.1	0	430	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Anthracene	0.1	33	0.1	0.1	0	5500	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Benz(a)anthracene	0.1	33	0.1	0.1	0	6.7	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Benzo(a)pyrene	0.1	33	0.1	0.1	0	1.5	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Benzo(b)fluoranthene	0.1	33	0.1	0.1	0	9.4	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Benzo(ghi)perylene	0.05	33	0.05	0.05	0	69	0.05	POTENTIALLY SUITABLE FOR USE	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	0.05	
Benzo(k)fluoranthene	0.1	33	0.1	0.1	0	14	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Chrysene	0.05	33	0.05	0.05	0	11	0.05	POTENTIALLY SUITABLE FOR USE	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	0.05	
Dibenz(a,h)anthracene	0.1	33	0.1	0.1	0	1.3	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Fluoranthene	0.1	33	0.1	0.1	0	560	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Fluorene	0.1	33	0.1	0.1	0	410	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Indeno(1,2,3,cd)pyrene	0.1	33	0.1	0.1	0	5.5	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Naphthalene	0.05	33	0.05	0.05	0	5.2	0.05	POTENTIALLY SUITABLE FOR USE	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	0.05	
Phenanthrene	0.1	33	0.1	0.1	0	220	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Pyrene	0.1	33	0.1	0.1	0	1200	0.1	POTENTIALLY SUITABLE FOR USE	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	0.1	
Asbestos identified	Y/N								N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	
FOC (dimensionless)	0.01305	**(mean)**							0.02	0.0091	0.0044	0.0069	0.0093	0.014	0.024	0.005	0.024	0.0046	0.0081	0.022	0.021	0.007	0.0036	0.0052	
SOM (calculated)	2.25%	**(mean)**							3.45%	1.57%	0.76%	1.19%	1.60%	2.41%	4.14%	0.86%	4.14%	0.79%	1.40%	3.79%	3.62%	1.21%	0.62%	0.90%	
pH (su)	7.7	**(mean)**							7.2	7.3	8.3	8	7.2	7.8	7.8	7.5	7.2	7.8	7.7	6.9	7.7	8.1	8.3	8.2	

Risk parameter: **Human health - residential with plant uptake (2.5%SOM)**
Data set: Whitby Formation
Client: Gallagher Estates
Site: Wykham Park Farm
Job no.: C-04582
Lab. report no(s).: 16-36329-1

Assessment of Chemicals of Potential Concern to Human Health

								Soil Type	WHI	WHI	WHI	WHI
All values in mg/kg unless otherwise stated								Location & Depth	TP78	TP111	TP105	TP118
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US_{95}**	**Result of Significance Test**	**0.4**	**0.5**	**0.3**	**0.3**
Arsenic	1	38	47	270	38	37	144.7217	FURTHER ASSESSMENT REQUIRED	170	270	86	150
Beryllium	0.06	33	1.4	6.3	0	73	3.85763	POTENTIALLY SUITABLE FOR USE				
Boron	0.2	33	0.5	4.2	0	300	2.384595	POTENTIALLY SUITABLE FOR USE				
Cadmium	0.2	33	0.2	0.2	0	14	0.2	POTENTIALLY SUITABLE FOR USE				
Chromium (III)	1	33	36	330	0	890	174.7111	POTENTIALLY SUITABLE FOR USE				
Chromium (VI)	1.2	33	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE				
Copper	1	33	7.5	35	0	2500	29.82714	POTENTIALLY SUITABLE FOR USE				
Lead	1	33	16	130	0	200	51.27812	POTENTIALLY SUITABLE FOR USE				
Mercury, inorganic	0.3	33	0.3	0.4	0	170	0.337276	POTENTIALLY SUITABLE FOR USE				
Nickel	1	33	25	120	0	130	85.51079	POTENTIALLY SUITABLE FOR USE				
Selenium	1	33	1	1	0	360	1	POTENTIALLY SUITABLE FOR USE				
Vanadium	1	33	41	430	2	410	254.3043	POTENTIALLY SUITABLE FOR USE				
Zinc	1	33	55	310	0	3900	172.5924	POTENTIALLY SUITABLE FOR USE				
Cyanide (free)	1	33	1	1	0	790	1	POTENTIALLY SUITABLE FOR USE				
Phenol (total)	1	33	1	1	0	560	1	POTENTIALLY SUITABLE FOR USE				
Acenaphthene	0.1	33	0.1	0.1	0	520	0.1	POTENTIALLY SUITABLE FOR USE				
Acenaphthylene	0.1	33	0.1	0.1	0	430	0.1	POTENTIALLY SUITABLE FOR USE				
Anthracene	0.1	33	0.1	0.1	0	5500	0.1	POTENTIALLY SUITABLE FOR USE				
Benz(a)anthracene	0.1	33	0.1	0.1	0	6.7	0.1	POTENTIALLY SUITABLE FOR USE				
Benzo(a)pyrene	0.1	33	0.1	0.1	0	1.5	0.1	POTENTIALLY SUITABLE FOR USE				
Benzo(b)fluoranthene	0.1	33	0.1	0.1	0	9.4	0.1	POTENTIALLY SUITABLE FOR USE				
Benzo(ghi)perylene	0.05	33	0.05	0.05	0	69	0.05	POTENTIALLY SUITABLE FOR USE				
Benzo(k)fluoranthene	0.1	33	0.1	0.1	0	14	0.1	POTENTIALLY SUITABLE FOR USE				
Chrysene	0.05	33	0.05	0.05	0	11	0.05	POTENTIALLY SUITABLE FOR USE				
Dibenz(a,h)anthracene	0.1	33	0.1	0.1	0	1.3	0.1	POTENTIALLY SUITABLE FOR USE				
Fluoranthene	0.1	33	0.1	0.1	0	560	0.1	POTENTIALLY SUITABLE FOR USE				
Fluorene	0.1	33	0.1	0.1	0	410	0.1	POTENTIALLY SUITABLE FOR USE				
Indeno(1,2,3,cd)pyrene	0.1	33	0.1	0.1	0	5.5	0.1	POTENTIALLY SUITABLE FOR USE				
Naphthalene	0.05	33	0.05	0.05	0	5.2	0.05	POTENTIALLY SUITABLE FOR USE				
Phenanthrene	0.1	33	0.1	0.1	0	220	0.1	POTENTIALLY SUITABLE FOR USE				
Pyrene	0.1	33	0.1	0.1	0	1200	0.1	POTENTIALLY SUITABLE FOR USE				
Asbestos identified	Y/N											
FOC (dimensionless)	0.01305	**(mean)**										
SOM (calculated)	2.25%	**(mean)**										
pH (su)	7.7	**(mean)**										

Risk parameter: **Human health - residential with plant uptake (2.5%SOM)**
Data set: Whitby Formation
Client: Gallagher Estates
Site: Wykham Park Farm
Job no.: C-04582
Lab. report no(s).: 16-36329-1

Assessment of Chemicals of Potential Concern to Human Health

								Soil Type	**MAR**	**MAR**	**MAR**	**MAR**	**MAR**	**MAR**	**MAR**	**MAR**	**MAR**	**MAR**
All values in mg/kg unless otherwise stated								**Location & Depth**	**TP37**	**TP18**	**TP25**	**TP58**	**TP101**	**TP124**	**TP126**	**TP18**	**TP25**	**TP124**
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US$_{95}$**	**Result of Significance Test**	**1.00**	**1.00**	**0.50**	**0.80**	**1.00**	**0.50**	**0.50**	**1**	**0.5**	**0.5**
Arsenic	1	10	72	920	10	37	821.24466	FURTHER ASSESSMENT REQUIRED	210	920	920	100	72	260	130	490	480	290
Beryllium	0.06	7	1.6	7	0	73	7.8678495	POTENTIALLY SUITABLE FOR USE	3.9	6.2	7	4.3	1.6	6	5.2			
Boron	0.2	7	0.8	1.9	0	300	1.9311073	POTENTIALLY SUITABLE FOR USE	1.3	1.2	0.9	1.4	0.8	1.6	1.9			
Cadmium	0.2	7	0.2	0.2	0	14	0.2	POTENTIALLY SUITABLE FOR USE	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
Chromium (III)	1	7	28	350	0	890	434.43978	POTENTIALLY SUITABLE FOR USE	200	280	320	220	28	340	350			
Chromium (VI)	1.2	7	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE	1.2	1.2	1.2	1.2	1.2	1.2	1.2			
Copper	1	7	6.8	38	0	2500	35.94763	POTENTIALLY SUITABLE FOR USE	26	12	14	20	38	12	6.8			
Lead	1	7	18	51	0	200	47.894925	POTENTIALLY SUITABLE FOR USE	51	28	36	21	28	27	18			
Mercury, inorganic	0.3	7	0.3	0.3	0	170	0.3	POTENTIALLY SUITABLE FOR USE	0.3	0.3	0.3	0.3	0.3	0.3	0.3			
Nickel	1	7	67	130	1	130	145.95945	FURTHER ASSESSMENT REQUIRED	110	120	130	79	67	120	120			
Selenium	1	7	1	1	0	360	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1			
Vanadium	1	7	50	550	3	410	622.78277	FURTHER ASSESSMENT REQUIRED	260	410	400	310	50	480	550			
Zinc	1	7	98	380	0	3900	377.15251	POTENTIALLY SUITABLE FOR USE	290	240	380	220	98	180	140			
Cyanide (free)	1	7	1	1	0	790	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1			
Phenol (total)	1	7	1	1	0	560	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1			
Acenaphthene	0.1	7	0.1	0.1	0	520	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Acenaphthylene	0.1	7	0.1	0.1	0	430	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Anthracene	0.1	7	0.1	0.1	0	5500	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benz(a)anthracene	0.1	7	0.1	0.1	0	6.7	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benzo(a)pyrene	0.1	7	0.1	0.1	0	1.5	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benzo(b)fluoranthene	0.1	7	0.1	0.1	0	9.4	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benzo(ghi)perylene	0.05	7	0.05	0.05	0	69	0.05	POTENTIALLY SUITABLE FOR USE	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Benzo(k)fluoranthene	0.1	7	0.1	0.1	0	14	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Chrysene	0.05	7	0.05	0.05	0	11	0.05	POTENTIALLY SUITABLE FOR USE	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Dibenz(a,h)anthracene	0.1	7	0.1	0.1	0	1.3	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Fluoranthene	0.1	7	0.1	0.1	0	560	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Fluorene	0.1	7	0.1	0.1	0	410	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Indeno(1,2,3,cd)pyrene	0.1	7	0.1	0.1	0	5.5	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Naphthalene	0.05	7	0.05	0.05	0	5.2	0.05	POTENTIALLY SUITABLE FOR USE	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Phenanthrene	0.1	7	0.1	0.1	0	220	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Pyrene	0.1	7	0.1	0.1	0	1200	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Asbestos identified	Y/N								N	N	N	N	N	N	N			
FOC (dimensionless)	0.006371	**(mean)**							0.014	0.0067	0.0048	0.0076	0.0012	0.0045	0.0058			
SOM (calculated)	1.10%	**(mean)**							2.41%	1.16%	0.83%	1.31%	0.21%	0.78%	1.00%			
pH (su)	7.9	**(mean)**							7.7	7.9	7.7	8.1	8.4	7.8	7.7			

Risk parameter: **Human health - residential with plant uptake (2.5%SOM)**
Data set: Marlstone Formation
Client: Gallagher Estates
Site: Wykham Park Farm
Job no.: C-04582
Lab. report no(s).: 16-36329-1

Legend: Values in blue are at or below the laboratory reporting limit (where a single value is indicated) and are considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
Values in red are equal to, or greater than, the generic assessment criterion (GAC) or +ve asbestos ID.
MG denotes Made Ground
NAT denotes natural ground

Assessment of Chemicals of Potential Concern to Plant Life

Hydrock

								Soil Type	MAR	MAR	MAR	MAR	MAR	MAR	MAR	MAR	MAR	MAR					
All values in mg/kg unless otherwise stated								Location & Depth	TP37	TP18	TP25	TP58	TP101	TP124	TP126	TP18	TP25	TP124					
Chemical of Potential Concern	Lab. RL	No. Samples	Min. Value	Max. Value	No. Samples > or = GAC	GAC	US_{95}	Result of Significance Test	1.00	1.00	0.50	0.80	1.00	0.50	0.50	1	0.5	0.5					
Arsenic	1	10	72	920	6	250	821.2447	FURTHER ASSESSMENT REQUIRED	210	920	920	100	72	260	130	490	480	290					
Boron	0.2	7	0.8	1.9	0	3	1.931107	POTENTIALLY SUITABLE FOR USE	1.3	1.2	0.9	1.4	0.8	1.6	1.9								
Chromium (III)	1	7	28	350	0	400	434.4398	FURTHER ASSESSMENT REQUIRED	200	280	320	220	28	340	350								
Chromium (VI)	1.2	7	1.2	1.2	0	25	1.2	POTENTIALLY SUITABLE FOR USE	1.2	1.2	1.2	1.2	1.2	1.2	1.2								
Copper	1	7	6.8	38	0	135	35.94763	POTENTIALLY SUITABLE FOR USE	26	12	14	20	38	12	6.8								
Nickel	1	7	67	130	6	75	145.9594	FURTHER ASSESSMENT REQUIRED	110	120	130	79	67	120	120								
Zinc	1	7	98	380	1	300	377.1525	FURTHER ASSESSMENT REQUIRED	290	240	380	220	98	180	140								
	Mean																						
pH (su)	7.9								7.7	7.9	7.7	8.1	8.4	7.8	7.7								

Risk parameter: Plant life pH 7
Data set: Marlstone Formation
Client: Gallagher Estates
Site: Wykham Park Farm
Job no.: C-04582
Lab. report no(s).: 16-36329-1

Legend: Values in blue are at or below the laboratory reporting limit (where a single value is indicated) and are considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
Values in red are equal to, or greater than, the generic assessment criterion (GAC).
MG denotes Made Ground
NAT denotes natural ground

Assessment of Chemicals of Potential Concern to Human Health

Hydrock

								Soil Type	DYR	TS/DYR	DYR	DYR	DYR	DYR	DYR	DYR	DYR	DYR
All values in mg/kg unless otherwise stated								Location & Depth	TP05	TP03	TP02	TP10	TP07	TP06	TP08	TP02	TP03	TP07
Chemical of Potential Concern	**Lab. RL**	**No. Samples**	**Min. Value**	**Max. Value**	**No. Samples > or = GAC**	**GAC**	**US$_{95}$**	**Result of Significance Test**	0.70	0.20	0.50	0.50	0.50	0.20	0.50	0.2	0.2	0.5
Arsenic	1	10	81	270	10	37	247.78549	FURTHER ASSESSMENT REQUIRED	240	220	140	270	140	130	160	150	160	81
Beryllium	0.06	7	4.6	6.9	0	73	6.5468965	POTENTIALLY SUITABLE FOR USE	5.5	5.1	4.8	6.9	5.1	4.6	4.7			
Boron	0.2	7	0.7	2.3	0	300	2.5229109	POTENTIALLY SUITABLE FOR USE	1.8	2.3	2	1.9	0.7	1.6	1.5			
Cadmium	0.2	7	0.2	0.2	0	14	0.2	POTENTIALLY SUITABLE FOR USE	0.2	0.2	0.2	0.2	0.2	0.2	0.2			
Chromium (III)	1	7	220	340	0	890	319.94091	POTENTIALLY SUITABLE FOR USE	260	240	230	340	250	220	230			
Chromium (VI)	1.2	7	1.2	1.2	0	6.1	1.2	POTENTIALLY SUITABLE FOR USE	1.2	1.2	1.2	1.2	1.2	1.2	1.2			
Copper	1	7	9.6	21	0	2500	21.94466	POTENTIALLY SUITABLE FOR USE	19	17	13	9.6	21	13	10			
Lead	1	7	21	40	0	200	41.7059	POTENTIALLY SUITABLE FOR USE	40	40	22	21	21	24	23			
Mercury, inorganic	0.3	7	0.3	0.3	0	170	0.3	POTENTIALLY SUITABLE FOR USE	0.3	0.3	0.3	0.3	0.3	0.3	0.3			
Nickel	1	7	84	110	0	130	110.07988	POTENTIALLY SUITABLE FOR USE	100	97	89	100	110	84	92			
Selenium	1	7	1	1	0	360	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1			
Vanadium	1	7	360	540	1	410	506.33994	FURTHER ASSESSMENT REQUIRED	400	400	390	540	370	360	380			
Zinc	1	7	140	240	0	3900	253.40046	POTENTIALLY SUITABLE FOR USE	240	240	200	170	170	140	160			
Cyanide (free)	1	7	1	1	0	790	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1			
Phenol (total)	1	7	1	1	0	560	1	POTENTIALLY SUITABLE FOR USE	1	1	1	1	1	1	1			
Acenaphthene	0.1	7	0.1	0.1	0	520	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Acenaphthylene	0.1	7	0.1	0.1	0	430	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Anthracene	0.1	7	0.1	0.1	0	5500	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benz(a)anthracene	0.1	7	0.1	0.1	0	6.7	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benzo(a)pyrene	0.1	7	0.1	0.1	0	1.5	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benzo(b)fluoranthene	0.1	7	0.1	0.1	0	9.4	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Benzo(ghi)perylene	0.05	7	0.05	0.05	0	69	0.05	POTENTIALLY SUITABLE FOR USE	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Benzo(k)fluoranthene	0.1	7	0.1	0.1	0	14	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Chrysene	0.05	7	0.05	0.05	0	11	0.05	POTENTIALLY SUITABLE FOR USE	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Dibenz(a,h)anthracene	0.1	7	0.1	0.1	0	1.3	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Fluoranthene	0.1	7	0.1	0.1	0	560	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Fluorene	0.1	7	0.1	0.1	0	410	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Indeno(1,2,3,cd)pyrene	0.1	7	0.1	0.1	0	5.5	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Naphthalene	0.05	7	0.05	0.05	0	5.2	0.05	POTENTIALLY SUITABLE FOR USE	0.05	0.05	0.05	0.05	0.05	0.05	0.05			
Phenanthrene	0.1	7	0.1	0.1	0	220	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Pyrene	0.1	7	0.1	0.1	0	1200	0.1	POTENTIALLY SUITABLE FOR USE	0.1	0.1	0.1	0.1	0.1	0.1	0.1			
Asbestos identified	Y/N								N	N	N	N	N	N	N			
FOC (dimensionless)	0.012271	**(mean)**							0.028	0.016	0.0076	0.0064	0.0043	0.017	0.0066			
SOM (calculated)	2.12%	**(mean)**							4.83%	2.76%	1.31%	1.10%	0.74%	2.93%	1.14%			
pH (su)	7.7	**(mean)**							7.6	6.8	7.7	8	8.1	7.9	8			

Risk parameter: **Human health - residential with plant uptake (2.5%SOM)**
Data set: Dyrham Formation
Client: Gallagher Estates
Site: Wykham Park Farm
Job no.: C-04582
Lab. report no(s).: 16-36329-1

Legend: Values in blue are at or below the laboratory reporting limit (where a single value is indicated) and are considered as being at the detection limit for the purposes of statistical analysis, as a conservative estimate.
Values in red are equal to, or greater than, the generic assessment criterion (GAC) or +ve asbestos ID.
MG denotes Made Ground
NAT denotes natural ground

CLEA Software Version 1.071

Report generated	06-Mar-17
Report title	Wykham Park Farm - As bioaccessibility in Whitby Formation
Created by	Alexandra Edwards at Hydrock

RESULTS

Environment Agency

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (C4SL adult)	2.34E+02	2.30E+02	NR	0.98	1.00	NR	NR	No	No	Yes	Yes	No	No	No	No	Yes
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (C4SL adult)	99.9	0.1	0.0	100.0	2.30E+02	NR	1.15E+02	9.78E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.88E-02	9.19E-02	5.29E-02	7.59E-02	4.60E-02	2.53E-01
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (C4SL adult)	1.53E-04	1.19E-04	2.28E-05	3.80E-06	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

		Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (C4SL adult)	ID	0.3	ID	0.0038	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.09**	1
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

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

		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (C4SL adult)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

	Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

CLEA Software Version 1.071

Report generated	06-Mar-17
Report title	Wykham Park Farm - As bioaccessibility in Marlstone Rock Formation
Created by	Alexandra Edwards at Hydrock

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (C4SL adult)	3.59E+02	2.30E+02	NR	0.64	1.00	NR	NR	No	No	Yes	Yes	No	No	No	No	Yes
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

Environment Agency

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (C4SL adult)	99.9	0.1	0.0	100.0	2.30E+02	NR	1.15E+02	9.78E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.88E-02	9.19E-02	5.29E-02	7.59E-02	4.60E-02	2.53E-01
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (C4SL adult)	5.11E-05	1.18E-04	2.28E-05	3.80E-06	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

		Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (C4SL adult)	ID	0.3	ID	0.0038	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.03**	1
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

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

Environment Agency

		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (C4SL adult)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Environment Agency

	Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

CLEA Software Version 1.071

Report generated 07-Mar-17

Report title Wykham Park Farm - As bioaccessibility in Marlstone Rock Formation

Created by Alexandra Edwards at Hydrock

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (C4SL adult)	1.62E+03	2.93E+02	NR	0.18	1.00	NR	NR	No	No	Yes	Yes	No	No	No	No	Yes
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (C4SL adult)	99.9	0.1	0.0	100.0	2.93E+02	NR	1.46E+02	1.20E-06	2.99E-07	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (C4SL adult)	3.26E-05	0.00E+00	2.14E-05	3.80E-06	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

		Oral Health Criteria Value (μg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (μg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (μg day^{-1})	Inhalation Mean Daily Intake (μg day^{-1})	Air-water partition coefficient (K$_{aw}$) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K$_{oc}$ (cm^3 g^{-1})	log K$_{ow}$ (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (C4SL adult)	ID	0.3	ID	0.0038	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.03**	1
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

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

		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (C4SL adult)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

	Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

CLEA Software Version 1.071

Report generated	06-Mar-17
Report title	Wykham Park Farm - As bioaccessibility in Marlstone Rock Formation
Created by	Alexandra Edwards at Hydrock

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (C4SL adult)	2.09E+02	2.30E+02	NR	1.00	0.91	NR	NR	No	No	Yes	Yes	No	No	No	No	Yes
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (C4SL adult)	99.9	0.1	0.0	100.0	2.09E+02	NR	1.05E+02	8.91E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	9.00E-02	8.37E-02	4.81E-02	6.91E-02	4.19E-02	2.30E-01
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (C4SL adult)	1.71E-04	1.08E-04	2.08E-05	3.46E-06	0.00E+00	0.00E+00	0.00E+00	56.92	36.16	6.92	0.00	0.00	0.00	0.00	0.00
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

			Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})	Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (C4SL adult)	ID	0.3	ID	0.0038	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.11**	1
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

Environment Agency		Oral Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Inhalation Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})	Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (C4SL adult)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Environment Agency

	Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

CLEA Software Version 1.071

Report generated	06-Mar-17
Report title	Wykham Park Farm - As bioaccessibility in Marlstone Rock Formation
Created by	Alexandra Edwards at Hydrock

RESULTS

		Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
		oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
1	Arsenic (C4SL adult)	6.22E+02	2.93E+02	NR	0.47	1.00	NR	NR	No	No	Yes	Yes	No	No	No	No	Yes
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

Environment Agency

	Assessment Criterion (mg kg^{-1})			Ratio of ADE to HCV			Saturation Limit (mg kg^{-1})	50% rule?		Top Two applied?	Apply Top 2 Approach to Produce Group					
	oral	inhalation	combined	oral	inhalation	combined		Oral	Inhal		Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

		Soil Distribution				Media Concentrations													
		Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
		%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
1	Arsenic (C4SL adult)	99.9	0.1	0.0	100.0	2.93E+02	NR	1.46E+02	1.20E-06	2.99E-07	NA	0.00E+00	0.00E+00	NA	NA	NA	NA	NA	NA
2																			
3																			
4																			
5																			
6																			
7																			
8																			
9																			
10																			
11																			
12																			
13																			
14																			
15																			
16																			
17																			
18																			
19																			
20																			

Environment Agency

	Soil Distribution				Media Concentrations													
	Sorbed	Dissolved	Vapour	Total	Soil	Soil gas	Indoor Dust	Outdoor dust at 0.8m	Outdoor dust at 1.6m	Indoor Vapour	Outdoor vapour at 0.8m	Outdoor vapour at 1.6m	Green vegetables	Root vegetables	Tuber vegetables	Herbaceous fruit	Shrub fruit	Tree fruit
	%	%	%	%	mg kg^{-1}	mg m^{-3}	mg kg^{-1}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg m^{-3}	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW	mg kg^{-1} FW
21																		
22																		
23																		
24																		
25																		
26																		
27																		
28																		
29																		
30																		

Environment Agency

		Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
		Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
1	Arsenic (C4SL adult)	1.20E-04	0.00E+00	2.14E-05	3.80E-06	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00	100.00	0.00	0.00	0.00	0.00
2																
3																
4																
5																
6																
7																
8																
9																
10																
11																
12																
13																
14																
15																
16																
17																
18																
19																
20																

	Average Daily Exposure (mg kg^{-1} bw day^{-1})							Distribution by Pathway (%)							
	Direct soil ingestion	Consumption of homegrown produce and attached soil	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour	Background (oral)	Background (inhalation)	Direct soil ingestion	Consumption of homegrown produce	Dermal contact with soil and dust	Inhalation of dust	Inhalation of vapour (indoor)	Inhalation of vapour (outdoor)	Background (oral)	Background (inhalation)
21															
22															
23															
24															
25															
26															
27															
28															
29															
30															

		Oral Health Criteria Value (µg kg^{-1} BW day^{-1})		Inhalation Health Criteria Value (µg kg^{-1} BW day^{-1})		Oral Mean Daily Intake (µg day^{-1})	Inhalation Mean Daily Intake (µg day^{-1})	Air-water partition coefficient (K_{aw}) (cm^3 cm^{-3})	Coefficient of Diffusion in Air (m^2 s^{-1})	Coefficient of Diffusion in Water (m^2 s^{-1})	log K_{oc} (cm^3 g^{-1})	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor (g g^{-1} DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
1	Arsenic (C4SL adult)	ID	0.3	ID	0.0038	NR	NR	NR	NR	NR	NR	NR	0.03	0.5	1	**0.11**	1
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20																	

		Oral Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})		Inhalation Health Criteria Value ($\mu g\ kg^{-1}$ BW day^{-1})	Oral Mean Daily Intake ($\mu g\ day^{-1}$)	Inhalation Mean Daily Intake ($\mu g\ day^{-1}$)	Air-water partition coefficient (K_{aw}) ($cm^3\ cm^{-3}$)	Coefficient of Diffusion in Air ($m^2\ s^{-1}$)	Coefficient of Diffusion in Water ($m^2\ s^{-1}$)	log K_{oc} ($cm^3\ g^{-1}$)	log K_{ow} (dimensionless)	Dermal Absorption Fraction (dimensionless)	Soil-to-dust transport factor ($g\ g^{-1}$ DW)	Sub-surface soil to indoor air correction factor (dimensionless)	Relative bioavailability via soil ingestion (unitless)	Relative bioavailability via dust inhalation (unitless)
21																
22																
23																
24																
25																
26																
27																
28																
29																
30																

Environment Agency

		Soil-to-water partition coefficient (cm^3 g^{-1})	Vapour pressure (Pa)	Water solubility (mg L^{-1})	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
1	Arsenic (C4SL adult)	5.00E+02	NR	1.25E+06	0.00043 fw	0.0004 fw	0.00023 fw	0.00033 fw	0.0002 fw	0.0011 fw
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										
16										
17										
18										
19										
20										

Environment Agency

	Soil-to-water partition coefficient ($cm^3 g^{-1}$)	Vapour pressure (Pa)	Water solubility ($mg L^{-1}$)	Soil-to-plant concentration factor for green vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for root vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tuber vegetables (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for herbaceous fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for shrub fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)	Soil-to-plant concentration factor for tree fruit (mg g^{-1} plant DW or FW basis over mg g^{-1} DW soil)
21									
22									
23									
24									
25									
26									
27									
28									
29									
30									

Richard Coward
Hydrock Consultants Ltd
Over Court Barns
Over Lane
Bristol
BS32 4DF

t: 01454 619533
f: 01454 614125
e: richardcoward@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 17-40120

Project / Site name: Wykham Park Farm

Samples received on: 15/02/2017

Your job number: C-04841

Samples instructed on: 15/02/2017

Your order number:

Analysis completed by: 02/03/2017

Report Issue Number: 1

Report issued on: 02/03/2017

Samples Analysed: 7 soil samples

Signed: [redacted]

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed: [redacted]

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 17-40120

Project / Site name: Wykham Park Farm

Lab Sample Number				702870	702871	702872	702873	702874
Sample Reference				TP02	TP22	TP105	TP118	TP03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.30	0.30	0.30	0.20
Date Sampled				Deviating	Deviating	Deviating	Deviating	Deviating
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	42	37	37	31	23
Moisture Content	%	N/A	NONE	25	23	23	18	20
Total mass of sample received	kg	0.001	NONE	1.2	1.1	0.91	1.0	0.51
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	150	99	86	150	160
PBET Results (Bioaccessibile Fraction)								
Arsenic (Stomach)	%	1	NONE	2.7	**6.3**	8.1	4.5	1.5
Arsenic (Intestine 1)	%	1	NONE	**3.9**	3.1	**9.3**	**5.1**	**3.5**
Arsenic (Intestine 2)	%	1	NONE	2.9	4.0	7.3	4.1	3.4
Bioaccessible Fraction %	Maximum % BAF			**3.9 % (I1)**	**6.3 % (S)**	**9.3 % (I1)**	**5.1 % (I1)**	**3.5 % (I1)**

Analytical Report Number: 17-40120

Project / Site name: Wykham Park Farm

Lab Sample Number				702875	702876			
Sample Reference				TP05	TP111			
Sample Number				None Supplied	None Supplied			
Depth (m)				0.70	0.50			
Date Sampled				Deviating	Deviating			
Time Taken				None Supplied	None Supplied			
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	28	33			
Moisture Content	%	N/A	NONE	24	22			
Total mass of sample received	kg	0.001	NONE	0.49	0.39			
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	230	270			
PBET Results (Bioaccessibile Fraction)								
Arsenic (Stomach)	%	1	NONE	1.2	1.4			
Arsenic (Intestine 1)	%	1	NONE	**4.4**	2.4			
Arsenic (Intestine 2)	%	1	NONE	3.7	**2.5**			
Bioaccessible Fraction %	Maximum % BAF			**4.4 % (I1)**	**2.5 % (I2)**			

Analytical Report Number : 17-40120

Project / Site name: Wykham Park Farm

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
702870	TP02	None Supplied	0.20	Light brown loam and clay with vegetation.
702871	TP22	None Supplied	0.30	Light brown loam and clay with vegetation.
702872	TP105	None Supplied	0.30	Light brown loam and clay with vegetation.
702873	TP118	None Supplied	0.30	Light brown loam and clay with vegetation.
702874	TP03	None Supplied	0.20	Light brown loam and clay with vegetation.
702875	TP05	None Supplied	0.70	Light brown loam and clay with vegetation.
702876	TP111	None Supplied	0.50	Light brown loam and clay with vegetation.

Analytical Report Number : 17-40120

Project / Site name: Wykham Park Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	**Analytical Method Description**	**Analytical Method Reference**	**Method number**	**Wet / Dry Analysis**	**Accreditation Status**
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 2, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PBET	In House Method	In house method based on Ruby et.al.		D	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Sample ID	Other_ID	Sample Type	Job	Sample Number	Sample Deviation Code	test_name	test_ref	Test Deviation code
TP02		S	17-40120	702870	a			
TP03		S	17-40120	702874	a			
TP05		S	17-40120	702875	a			
TP105		S	17-40120	702872	a			
TP111		S	17-40120	702876	a			
TP118		S	17-40120	702873	a			
TP22		S	17-40120	702871	a			

Key: a - No sampling date b - Incorrect container
c - Holding time d - Headspace e - Temperature

Richard Coward
Hydrock Consultants Ltd
Over Court Barns
Over Lane
Bristol
BS32 4DF

t: 01454 619533
f: 01454 614125
e: richardcoward@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 17-37789

Project / Site name: Wykham Park Farm

Your job number: C-04841

Your order number:

Report Issue Number: 1

Samples Analysed: 6 soil samples

Samples received on: 23/12/2016

Samples instructed on: 19/01/2017

Analysis completed by: 26/01/2017

Report issued on: 27/01/2017

Signed: [redacted]

Dr Claire Stone
Quality Manager
For & on behalf of i2 Analytical Ltd.

Signed: [redacted]

Dr Irma Doyle
Senior Account Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 17-37789

Project / Site name: Wykham Park Farm

Lab Sample Number				688555	688556	688557	688558	688559
Sample Reference				TP07	TP10	TP18	TP25	TP78
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	0.40
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	27	21	19	23	23
Total mass of sample received	kg	0.001	NONE	0.45	0.48	0.45	0.49	0.48

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	81	260	490	480	170

PBET Results (Bioaccessibile Fraction)

Arsenic (Stomach)	%	1	NONE	3.3	0.9	0.7	1.0	2.2
Arsenic (Intestine 1)	%	1	NONE	9.4	**3.7**	1.4	**2.3**	5.1
Arsenic (Intestine 2)	%	1	NONE	**10.8**	3.2	**1.9**	1.4	**6.0**

Bioaccessible Fraction %	Maximum % BAF	**10.8 % (I2)**	**3.7 % (I1)**	**1.9 % (I2)**	**2.3 % (I1)**	**6.0 % (I2)**

Analytical Report Number: 17-37789

Project / Site name: Wykham Park Farm

Lab Sample Number				688560				
Sample Reference				TP124				
Sample Number				None Supplied				
Depth (m)				0.50				
Date Sampled				19/12/2016				
Time Taken				None Supplied				
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1				
Moisture Content	%	N/A	NONE	25				
Total mass of sample received	kg	0.001	NONE	0.53				

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	290				

PBET Results (Bioaccessibile Fraction)

Arsenic (Stomach)	%	1	NONE	1.3				
Arsenic (Intestine 1)	%	1	NONE	2.3				
Arsenic (Intestine 2)	%	1	NONE	**3.1**				

Bioaccessible Fraction %	Maximum % BAF	**3.1 % (I2)**				

Analytical Report Number : 17-37789

Project / Site name: Wykham Park Farm

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
688555	TP07	None Supplied	0.50	Light brown loam and clay with vegetation.
688556	TP10	None Supplied	0.50	Light brown loam and clay with vegetation.
688557	TP18	None Supplied	1.00	Light brown loam and clay with gravel.
688558	TP25	None Supplied	0.50	Light brown loam and clay with vegetation.
688559	TP78	None Supplied	0.40	Light brown loam and clay with vegetation.
688560	TP124	None Supplied	0.50	Light brown loam and clay with vegetation.

Analytical Report Number : 17-37789

Project / Site name: Wykham Park Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	**Analytical Method Description**	**Analytical Method Reference**	**Method number**	**Wet / Dry Analysis**	**Accreditation Status**
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
PBET	In House Method	In house method based on Ruby et.al.	UK		NONE

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.

Testing was carried out in accordance with the Ruby et al PBET protocol. The model used was the fasted model, in accordance with recommended protocol.

Bioaccessibile Fraction (%) is calculated as follows: $\frac{\text{Element (bioaccessible)}}{\text{Element (total aqua regia extractable)}}$ x 100

Richard Coward
Hydrock Consultants Ltd
Over Court Barns
Over Lane
Bristol
BS32 4DF

t: 01454 619533
f: 01454 614125
e: richardcoward@hydrock.com

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404
f: 01923 237404
e: reception@i2analytical.com

Analytical Report Number : 16-36329

Project / Site name:	Wykham Park Farm	**Samples received on:**	23/12/2016
Your job number:	C-04582-C	**Samples instructed on:**	23/12/2016
Your order number:		**Analysis completed by:**	03/01/2017
Report Issue Number:	1	**Report issued on:**	03/01/2017
Samples Analysed:	3 leachate samples - 48 soil samples		

Signed: [redacted]

Dr Irma Doyle
Senior Account Manager
For & on behalf of i2 Analytical Ltd.

Signed: [redacted]

Emma Winter
Assistant Reporting Manager
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41 -711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils	- 4 weeks from reporting
leachates	- 2 weeks from reporting
waters	- 2 weeks from reporting
asbestos	- 6 months from reporting

Excel copies of reports are only valid when accompanied by this PDF certificate.

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679354	679355	679356	679357	679358
Sample Reference				TP21	TP19	TP20	TP45	TP39
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.50	0.30	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	21	23	20	22	20
Total mass of sample received	kg	0.001	NONE	0.48	0.47	0.46	0.37	0.46
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.1	8.0	8.3	7.0	8.3
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	640	-	400	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	0.064	-	0.040	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.040	-	0.0061	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	39.9	-	6.1	-	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	11	-	2.7	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	5.4	-	1.4	-	-
Total Sulphur	mg/kg	50	MCERTS	310	-	170	-	-
Total Sulphur	%	0.005	MCERTS	0.031	-	0.017	-	-
Ammonium as NH_4	mg/kg	0.5	MCERTS	< 0.5	-	< 0.5	-	-
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	< 0.1	-	< 0.1	-	-
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.015	0.021	0.0047	0.025	0.0049
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	17	-	12	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	8.5	-	5.8	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679354	679355	679356	679357	679358
Sample Reference				TP21	TP19	TP20	TP45	TP39
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.50	0.30	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	78	82	47	98	75
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.8	2.8	2.2	2.9	2.4
Boron (water soluble)	mg/kg	0.2	MCERTS	2.0	2.5	1.2	2.4	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	86	87	52	96	90
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	87	87	52	97	90
Copper (aqua regia extractable)	mg/kg	1	MCERTS	28	25	27	25	22
Lead (aqua regia extractable)	mg/kg	1	MCERTS	33	34	17	44	24
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	56	54	46	51	52
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	110	120	57	140	110
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	100	110	65	100	92
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	-	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	-	< 2.5	-	-
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	Absent	-

Lab Sample Number				679359	679360	679361	679362	679363
Sample Reference				TP49	TP21	TP05	TP05	TP03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.70	0.20	0.20
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	19	28	24	22	20
Total mass of sample received	kg	0.001	NONE	0.53	0.49	0.40	0.51	0.51

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	-	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.2	7.4	7.6	-	6.8
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	-	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	890	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	-	-	0.089	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.012	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	11.5	-	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	-	6.8	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	3.4	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	430	-	-
Total Sulphur	%	0.005	MCERTS	-	-	0.043	-	-
Ammonium as NH_4	mg/kg	0.5	MCERTS	-	-	< 0.5	-	-
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.1	-	-
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0044	0.019	0.028	-	0.016
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	-	-	19	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	-	-	9.4	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	-	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	-	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	-	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679359	679360	679361	679362	679363
Sample Reference				TP49	TP21	TP05	TP05	TP03
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	0.70	0.20	0.20
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	58	120	240	-	220
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.2	4.2	5.5	-	5.1
Boron (water soluble)	mg/kg	0.2	MCERTS	1.5	1.5	1.8	-	2.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	-	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	1.2	< 1.2	-	< 1.2
Chromium (III)	mg/kg	1	NONE	51	220	260	-	240
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	51	220	260	-	240
Copper (aqua regia extractable)	mg/kg	1	MCERTS	30	17	19	-	17
Lead (aqua regia extractable)	mg/kg	1	MCERTS	19	34	40	-	40
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	55	83	100	-	97
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	-	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	70	340	400	-	400
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	90	170	240	-	240

Magnesium (water soluble)	mg/kg	5	NONE	-	-	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	< 2.5	-	-

Pesticide and Herbicide Screen

Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	Absent	-

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679364	679365	679366	679367	679368
Sample Reference				TP02	TP10	TP37	TP07	TP06
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	0.20
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	20	21	23	27	23
Total mass of sample received	kg	0.001	NONE	0.47	0.48	0.45	0.45	0.45
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.7	8.0	7.7	8.1	7.9
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	580	-	720
Total Sulphate as SO_4	%	0.005	MCERTS	-	-	0.058	-	0.072
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.014	-	0.012
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	13.5	-	12.2
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	-	7.7	-	5.5
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	3.8	-	2.8
Total Sulphur	mg/kg	50	MCERTS	-	-	300	-	300
Total Sulphur	%	0.005	MCERTS	-	-	0.030	-	0.030
Ammonium as NH_4	mg/kg	0.5	MCERTS	-	-	< 0.5	-	< 0.5
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.1	-	< 0.1
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0076	0.0064	0.014	0.0043	0.017
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	-	-	27	-	30
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	-	-	13	-	15
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679364	679365	679366	679367	679368
Sample Reference				TP02	TP10	TP37	TP07	TP06
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	1.00	0.50	0.20
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	140	270	210	140	130
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	4.8	6.9	3.9	5.1	4.6
Boron (water soluble)	mg/kg	0.2	MCERTS	2.0	1.9	1.3	0.7	1.6
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	230	340	200	250	220
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	230	340	200	250	220
Copper (aqua regia extractable)	mg/kg	1	MCERTS	13	9.6	26	21	13
Lead (aqua regia extractable)	mg/kg	1	MCERTS	22	21	51	21	24
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	89	100	110	110	84
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	390	540	260	370	360
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	200	170	290	170	140
Magnesium (water soluble)	mg/kg	5	NONE	-	-	< 5.0	-	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	< 2.5	-	< 2.5
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	-	-

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679369	679370	679371	679372	679373
Sample Reference				TP18	TP16	TP14	TP14	TP25
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	0.60	0.40	0.20	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	19	19	21	23	23
Total mass of sample received	kg	0.001	NONE	0.45	0.45	0.45	0.47	0.49
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.9	8.2	7.9	7.7	7.7
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	-	-	690
Total Sulphate as SO_4	%	0.005	MCERTS	-	-	-	-	0.069
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	-	0.050
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-	50.1
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	-	-	-	4.2
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	-	2.1
Total Sulphur	mg/kg	50	MCERTS	-	-	-	-	1200
Total Sulphur	%	0.005	MCERTS	-	-	-	-	0.119
Ammonium as NH_4	mg/kg	0.5	MCERTS	-	-	-	-	< 0.5
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	-	-	-	-	< 0.1
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0067	0.0049	0.017	0.025	0.0048
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	-	-	-	-	40
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	-	-	-	-	20
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679369	679370	679371	679372	679373
Sample Reference				TP18	TP16	TP14	TP14	TP25
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				1.00	0.60	0.40	0.20	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	920	63	89	100	920
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	6.2	2.1	2.6	3.0	7.0
Boron (water soluble)	mg/kg	0.2	MCERTS	1.2	2.5	2.1	2.4	0.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	280	140	84	100	320
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	280	140	84	100	320
Copper (aqua regia extractable)	mg/kg	1	MCERTS	12	23	27	31	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	28	22	33	43	36
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	120	110	66	64	130
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	410	100	120	150	400
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	240	310	100	130	380
Magnesium (water soluble)	mg/kg	5	NONE	-	-	-	-	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	-	< 2.5
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	Absent	-

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679374	679375	679376	679377	679378
Sample Reference				TP42	TP53	TP30	TP47	TP23
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	1.00	0.30	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	21	23	20	22	24
Total mass of sample received	kg	0.001	NONE	0.48	0.50	0.39	0.44	0.45

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.3	7.1	8.4	7.1	7.4
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	450	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	-	-	0.045	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.0084	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	8.4	-	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	-	12	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	6.2	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	210	-	-
Total Sulphur	%	0.005	MCERTS	-	-	0.021	-	-
Ammonium as NH_4	mg/kg	0.5	MCERTS	-	-	< 0.5	-	-
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.1	-	-
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0089	0.020	0.0019	0.025	0.019
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	-	-	7.1	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	-	-	< 5.0	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679374	679375	679376	679377	679378
Sample Reference				TP42	TP53	TP30	TP47	TP23
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.20	1.00	0.30	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	98	120	78	120	140
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.8	3.2	2.0	2.7	3.1
Boron (water soluble)	mg/kg	0.2	MCERTS	1.7	1.7	0.7	2.2	2.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	81	110	36	84	120
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	82	110	36	84	120
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	35	33	23	25
Lead (aqua regia extractable)	mg/kg	1	MCERTS	31	46	20	38	130
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	0.4	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	74	86	95	56	66
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	120	170	74	130	180
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	130	210	55	100	140
Magnesium (water soluble)	mg/kg	5	NONE	-	-	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	< 2.5	-	-
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	-	-

Lab Sample Number				679379	679380	679381	679382	679383
Sample Reference				TP66	TP58	TP63	TP59	TP78
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.80	0.50	0.20	0.40
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	21	20	25	22	23
Total mass of sample received	kg	0.001	NONE	0.49	0.48	0.47	0.50	0.48
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.4	8.1	8.0	7.2	7.3
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	640	600	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	-	0.064	0.060	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	0.019	0.015	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	18.9	14.9	-	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	4.6	11	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	2.3	5.3	-	-
Total Sulphur	mg/kg	50	MCERTS	-	260	230	-	-
Total Sulphur	%	0.005	MCERTS	-	0.026	0.023	-	-
Ammonium as NH_4	mg/kg	0.5	MCERTS	-	< 0.5	< 0.5	-	-
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	-	< 0.1	< 0.1	-	-
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0049	0.0076	0.022	0.020	0.0091
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	-	39	21	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	-	20	10	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679379	679380	679381	679382	679383
Sample Reference				TP66	TP58	TP63	TP59	TP78
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.80	0.50	0.20	0.40
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	16/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	100	100	93	47	87
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.5	4.3	2.4	1.4	2.8
Boron (water soluble)	mg/kg	0.2	MCERTS	1.9	1.4	1.8	1.5	1.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	82	220	76	49	97
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	82	220	76	49	98
Copper (aqua regia extractable)	mg/kg	1	MCERTS	28	20	27	33	19
Lead (aqua regia extractable)	mg/kg	1	MCERTS	40	21	31	67	26
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	58	79	72	25	49
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	120	310	120	72	120
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	120	220	88	81	69

Magnesium (water soluble)	mg/kg	5	NONE	-	< 5.0	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	< 2.5	< 2.5	-	-

Pesticide and Herbicide Screen

Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	-	-

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679384	679385	679386	679387	679388
Sample Reference				TP87	TP96	TP94	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	0.50	1.00	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	19/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	20	23	20	19	19
Total mass of sample received	kg	0.001	NONE	0.87	0.34	0.41	0.44	0.38

Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.3	8.0	7.2	8.4	7.8
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	360	-	-	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	0.036	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.014	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	14.4	-	-	-	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	6.9	-	-	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	3.4	-	-	-	-
Total Sulphur	mg/kg	50	MCERTS	180	-	-	-	-
Total Sulphur	%	0.005	MCERTS	0.018	-	-	-	-
Ammonium as NH_4	mg/kg	0.5	MCERTS	< 0.5	-	-	-	-
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	< 0.1	-	-	-	-
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0044	0.0069	0.0093	0.0012	0.014
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	11	-	-	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	5.4	-	-	-	-

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679384	679385	679386	679387	679388
Sample Reference				TP87	TP96	TP94	TP101	TP105
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	0.50	1.00	0.50
Date Sampled				16/12/2016	16/12/2016	16/12/2016	16/12/2016	19/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	73	73	97	72	88
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	1.9	2.2	2.5	1.6	2.4
Boron (water soluble)	mg/kg	0.2	MCERTS	1.1	1.7	1.7	0.8	1.3
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	40	59	82	28	79
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	40	59	82	28	80
Copper (aqua regia extractable)	mg/kg	1	MCERTS	27	24	26	38	29
Lead (aqua regia extractable)	mg/kg	1	MCERTS	16	20	33	28	36
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.4	0.4	0.4	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	46	51	51	67	59
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	45	71	120	50	120
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	82	86	100	98	110
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	-	-	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	-	-	-	-
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	-	-

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679389	679390	679391	679392	679393
Sample Reference				TP108	TP111	TP08	TP114	TP60
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.50	0.50	0.30	0.50
Date Sampled				19/12/2016	19/12/2016	19/12/2016	19/12/2016	19/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	22	22	19	22	21
Total mass of sample received	kg	0.001	NONE	0.40	0.39	0.50	0.38	0.48
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.8	7.5	8.0	7.2	7.8
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	-	-	440	-	-
Total Sulphate as SO_4	%	0.005	MCERTS	-	-	0.044	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	0.013	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	13.0	-	-
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	-	-	9.0	-	-
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	4.5	-	-
Total Sulphur	mg/kg	50	MCERTS	-	-	170	-	-
Total Sulphur	%	0.005	MCERTS	-	-	0.017	-	-
Ammonium as NH_4	mg/kg	0.5	MCERTS	-	-	< 0.5	-	-
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	-	-	< 0.1	-	-
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.024	0.0050	0.0066	0.024	0.0046
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	-	-	9.5	-	-
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	-	-	< 5.0	-	-
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679389	679390	679391	679392	679393
Sample Reference				TP108	TP111	TP08	TP114	TP60
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.30	0.50	0.50	0.30	0.50
Date Sampled				19/12/2016	19/12/2016	19/12/2016	19/12/2016	19/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	89	230	160	190	57
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	2.6	6.3	4.7	5.4	2.6
Boron (water soluble)	mg/kg	0.2	MCERTS	2.5	1.5	1.5	2.8	1.4
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	90	330	230	260	98
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	90	330	230	260	98
Copper (aqua regia extractable)	mg/kg	1	MCERTS	32	12	10	16	15
Lead (aqua regia extractable)	mg/kg	1	MCERTS	44	29	23	38	22
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	71	120	92	93	53
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	140	430	380	370	120
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	140	210	160	190	60
Magnesium (water soluble)	mg/kg	5	NONE	-	-	< 5.0	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	< 2.5	-	-
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	-	-

Lab Sample Number				679394	679395	679396	679397	679398
Sample Reference				TP119	TP124	TP129	TP120	TP126
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	0.30	0.30	0.50
Date Sampled				19/12/2016	19/12/2016	20/12/2016	20/12/2016	20/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	21	25	18	18	24
Total mass of sample received	kg	0.001	NONE	0.44	0.53	0.44	0.40	0.48
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected	Not-detected	Not-detected
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	7.7	7.8	6.9	7.7	7.7
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1	< 1	< 1
Total Sulphate as SO_4	mg/kg	50	MCERTS	480	-	-	-	360
Total Sulphate as SO_4	%	0.005	MCERTS	0.048	-	-	-	0.036
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.011	-	-	-	0.012
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	10.6	-	-	-	12.1
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	11	-	-	-	11
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	5.4	-	-	-	5.6
Total Sulphur	mg/kg	50	MCERTS	210	-	-	-	160
Total Sulphur	%	0.005	MCERTS	0.021	-	-	-	0.016
Ammonium as NH_4	mg/kg	0.5	MCERTS	< 0.5	-	-	-	< 0.5
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	< 0.1	-	-	-	< 0.1
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0081	0.0045	0.022	0.021	0.0058
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	12	-	-	-	61
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	5.8	-	-	-	30
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10	< 0.10	< 0.10
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05	< 0.05	< 0.05
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60	< 1.60	< 1.60

Lab Sample Number				679394	679395	679396	679397	679398
Sample Reference				TP119	TP124	TP129	TP120	TP126
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.50	0.50	0.30	0.30	0.50
Date Sampled				19/12/2016	19/12/2016	20/12/2016	20/12/2016	20/12/2016
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	140	260	210	170	130
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	4.7	6.0	5.3	4.8	5.2
Boron (water soluble)	mg/kg	0.2	MCERTS	2.4	1.6	2.3	4.2	1.9
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	250	340	240	230	350
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	250	340	240	230	350
Copper (aqua regia extractable)	mg/kg	1	MCERTS	14	12	25	24	6.8
Lead (aqua regia extractable)	mg/kg	1	MCERTS	25	27	56	54	18
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	96	120	96	91	120
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	410	480	360	330	550
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	180	180	220	220	140
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	-	-	-	< 5.0
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	-	-	-	< 2.5
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-	Absent	-

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679399	679400	679401		
Sample Reference				TP128	TP102	TP130		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	1.00	1.00		
Date Sampled				20/12/2016	20/12/2016	20/12/2016		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1		
Moisture Content	%	N/A	NONE	22	21	21		
Total mass of sample received	kg	0.001	NONE	0.41	0.37	0.47		
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected		
General Inorganics								
pH - Automated	pH Units	N/A	MCERTS	8.1	8.3	8.2		
Free Cyanide	mg/kg	1	MCERTS	< 1	< 1	< 1		
Total Sulphate as SO_4	mg/kg	50	MCERTS	490	-	-		
Total Sulphate as SO_4	%	0.005	MCERTS	0.049	-	-		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.018	-	-		
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	18.3	-	-		
Water Soluble Chloride (2:1)	mg/kg	1	MCERTS	5.7	-	-		
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	2.9	-	-		
Total Sulphur	mg/kg	50	MCERTS	210	-	-		
Total Sulphur	%	0.005	MCERTS	0.021	-	-		
Ammonium as NH_4	mg/kg	0.5	MCERTS	< 0.5	-	-		
Ammonium as NH_4 (leachate equivalent)	mg/l	0.05	MCERTS	< 0.1	-	-		
Fraction Organic Carbon (FOC)	N/A	0.001	NONE	0.0070	0.0036	0.0052		
Water Soluble Nitrate (2:1) as NO_3	mg/kg	2	NONE	70	-	-		
Water Soluble Nitrate (2:1) as NO_3 (leachate equivalent)	mg/l	5	NONE	35	-	-		
Total Phenols								
Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Speciated PAHs								
Naphthalene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Acenaphthylene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Acenaphthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluorene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Phenanthrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(a)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Chrysene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Benzo(b)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(k)fluoranthene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(a)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Indeno(1,2,3-cd)pyrene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Dibenz(a,h)anthracene	mg/kg	0.1	MCERTS	< 0.10	< 0.10	< 0.10		
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	< 0.05	< 0.05	< 0.05		
Total PAH								
Speciated Total EPA-16 PAHs	mg/kg	1.6	MCERTS	< 1.60	< 1.60	< 1.60		

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679399	679400	679401		
Sample Reference				TP128	TP102	TP130		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	1.00	1.00		
Date Sampled				20/12/2016	20/12/2016	20/12/2016		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	94	89	58		
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	3.7	2.4	1.9		
Boron (water soluble)	mg/kg	0.2	MCERTS	1.9	0.5	1.2		
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	< 0.2	< 0.2	< 0.2		
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2		
Chromium (III)	mg/kg	1	NONE	240	53	41		
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	240	53	42		
Copper (aqua regia extractable)	mg/kg	1	MCERTS	7.5	34	29		
Lead (aqua regia extractable)	mg/kg	1	MCERTS	16	28	19		
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	< 0.3		
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	88	93	48		
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0		
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	400	82	41		
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	88	190	64		
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	-	-		
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	-	-		
Pesticide and Herbicide Screen								
Pesticides/Herbicides Screen in Soil	P/A	N/A	NONE	-	-	-		

Lab Sample Number				679402	679403	679404		
Sample Reference				TP21	TP07	TP14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.50	0.40		
Date Sampled				16/12/2016	16/12/2016	16/12/2016		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					

General Inorganics

pH	pH Units	N/A	ISO 17025	7.8	7.6	7.7		
Electrical Conductivity	µS/cm	10	NONE	130	75	110		
Total Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Free Cyanide	µg/l	10	ISO 17025	< 10	< 10	< 10		
Sulphate as SO_4	µg/l	100	ISO 17025	4620	1730	1740		
Chloride	mg/l	0.15	ISO 17025	0.65	0.86	2.0		
Fluoride	µg/l	50	NONE	940	1200	1200		
Ammonium as NH_4	µg/l	15	NONE	33	40	29		
Nitrate as N	mg/l	0.01	NONE	0.36	0.67	1.14		
Nitrate as NO_3	mg/l	0.05	NONE	1.61	2.98	5.04		
Nitrite as N	µg/l	1	NONE	5.0	6.0	6.0		
Nitrite as NO_2	µg/l	5	NONE	16	20	20		
Hardness - Total	mgCaCO3/l	1	NONE	53.6	32.6	52.1		
Bromate by IC	mg/l	0.002	ISO 17025	< 0.002	< 0.002	< 0.002		

Total Phenols

Total Phenols	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		

Speciated PAHs

Naphthalene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Anthracene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(b)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(k)fluoranthene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Benzo(a)pyrene	µg/l	0.01	NONE	< 0.01	< 0.01	< 0.01		
Indeno(1,2,3-cd)pyrene	µg/l	0.001	NONE	< 0.001	< 0.001	< 0.001		
Benzo(ghi)perylene	µg/l	0.001	NONE	< 0.001	< 0.001	< 0.001		

PAH Sums

Sum of Benzo(b)fluoranthene & Benzo(k)fluoranthene	µg/l	0.02	NONE	< 0.02	< 0.02	< 0.02		
Sum of Benzo(ghi)fluoranthene & Indeno(1,2,3-cd)pyrene	µg/l	0.002	NONE	< 0.002	< 0.002	< 0.002		
Sum of Benzo(b)fluoranthene, Benzo(k)fluoranthene, Benzo(ghi)fluoranthene & Indeno(1,2,3-cd)pyrene	µg/l	0.022	NONE	< 0.02	< 0.02	< 0.02		

Analytical Report Number: 16-36329

Project / Site name: Wykham Park Farm

Lab Sample Number				679402	679403	679404		
Sample Reference				TP21	TP07	TP14		
Sample Number				None Supplied	None Supplied	None Supplied		
Depth (m)				0.50	0.50	0.40		
Date Sampled				16/12/2016	16/12/2016	16/12/2016		
Time Taken				None Supplied	None Supplied	None Supplied		
Analytical Parameter (Leachate Analysis)	**Units**	**Limit of detection**	**Accreditation Status**					
Heavy Metals / Metalloids								
Aluminium (dissolved)	mg/l	0.012	ISO 17025	0.70	0.22	0.32		
Antimony (dissolved)	µg/l	1.7	ISO 17025	< 1.7	< 1.7	< 1.7		
Arsenic (dissolved)	µg/l	1.1	ISO 17025	< 1.1	1.9	< 1.1		
Barium (dissolved)	µg/l	0.05	ISO 17025	5.8	2.5	6.1		
Boron (dissolved)	µg/l	10	ISO 17025	< 10	< 10	< 10		
Cadmium (dissolved)	µg/l	0.08	ISO 17025	< 0.08	< 0.08	< 0.08		
Chromium (hexavalent)	µg/l	5	NONE	< 5.0	< 5.0	< 5.0		
Chromium (III)	µg/l	1	NONE	1.2	< 1.0	1.2		
Chromium (dissolved)	µg/l	0.4	ISO 17025	1.2	0.7	1.2		
Cobalt (dissolved)	µg/l	0.3	ISO 17025	0.4	< 0.3	0.7		
Copper (dissolved)	µg/l	0.7	ISO 17025	4.0	1.9	5.7		
Iron (dissolved)	mg/l	0.004	ISO 17025	0.72	0.20	0.57		
Lead (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Manganese (dissolved)	µg/l	0.06	ISO 17025	6.0	1.8	8.6		
Mercury - CV-AFS	ug/l	0.007	NONE	< 0.007	< 0.007	< 0.007		
Molybdenum (dissolved)	µg/l	0.4	ISO 17025	< 0.4	1.3	< 0.4		
Nickel (dissolved)	µg/l	0.3	ISO 17025	< 0.3	0.4	< 0.3		
Silver (dissolved)	µg/l	1	NONE	< 1.0	< 1.0	< 1.0		
Selenium (dissolved)	µg/l	4	ISO 17025	5.2	4.8	5.2		
Tin (dissolved)	µg/l	1	ISO 17025	< 1.0	< 1.0	< 1.0		
Vanadium (dissolved)	µg/l	1.7	ISO 17025	< 1.7	2.7	< 1.7		
Zinc (dissolved)	µg/l	0.4	ISO 17025	4.2	0.7	3.1		

Calcium (dissolved)	mg/l	0.012	ISO 17025	21	13	20		
Magnesium (dissolved)	mg/l	0.005	ISO 17025	0.50	0.041	0.29		
Sodium (dissolved)	mg/l	0.01	ISO 17025	1.9	1.9	1.9		

Analytical Report Number : 16-36329

Project / Site name: Wykham Park Farm

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and topsoil/loam soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
679354	TP21	None Supplied	0.50	Light brown loam and clay.
679355	TP19	None Supplied	0.20	Light brown loam and clay with vegetation.
679356	TP20	None Supplied	0.50	Light brown loam and clay with vegetation.
679357	TP45	None Supplied	0.30	Light brown loam and clay with vegetation.
679358	TP39	None Supplied	0.50	Light brown loam and clay with vegetation.
679359	TP49	None Supplied	0.50	Light brown clay and loam with vegetation.
679360	TP21	None Supplied	0.20	Light brown loam and clay with vegetation.
679361	TP05	None Supplied	0.70	Light brown loam and clay with vegetation.
679362	TP05	None Supplied	0.20	Light brown loam and clay with vegetation.
679363	TP03	None Supplied	0.20	Light brown loam and clay with vegetation.
679364	TP02	None Supplied	0.50	Light brown loam and clay with vegetation.
679365	TP10	None Supplied	0.50	Light brown loam and clay with vegetation.
679366	TP37	None Supplied	1.00	Light brown loam and clay with vegetation.
679367	TP07	None Supplied	0.50	Light brown loam and clay with vegetation.
679368	TP06	None Supplied	0.20	Light brown loam and clay with gravel and vegetation.
679369	TP18	None Supplied	1.00	Light brown loam and clay with gravel.
679370	TP16	None Supplied	0.60	Light brown loam and clay.
679371	TP14	None Supplied	0.40	Light brown loam and clay with vegetation.
679372	TP14	None Supplied	0.20	Light brown loam and clay with vegetation.
679373	TP25	None Supplied	0.50	Light brown loam and clay with vegetation.
679374	TP42	None Supplied	0.50	Light brown loam and clay.
679375	TP53	None Supplied	0.20	Light brown loam and clay with vegetation.
679376	TP30	None Supplied	1.00	Light brown loam and clay.
679377	TP47	None Supplied	0.30	Light brown loam and clay with vegetation.
679378	TP23	None Supplied	0.50	Light brown loam and clay with vegetation.
679379	TP66	None Supplied	0.20	Light brown loam and clay with vegetation.
679380	TP58	None Supplied	0.80	Light brown loam and clay with vegetation.
679381	TP63	None Supplied	0.50	Light brown loam and clay with vegetation.
679382	TP59	None Supplied	0.20	Brown loam and clay with vegetation.
679383	TP78	None Supplied	0.40	Light brown loam and clay with vegetation.
679384	TP87	None Supplied	0.50	Light brown clay and loam.
679385	TP96	None Supplied	0.50	Light brown loam and clay with vegetation.
679386	TP94	None Supplied	0.50	Light brown loam and clay with vegetation.
679387	TP101	None Supplied	1.00	Light brown clay and loam.
679388	TP105	None Supplied	0.50	Light brown loam and clay with vegetation.
679389	TP108	None Supplied	0.30	Light brown loam and clay with vegetation.
679390	TP111	None Supplied	0.50	Light brown loam and clay with vegetation.
679391	TP08	None Supplied	0.50	Light brown loam and clay with vegetation.
679392	TP114	None Supplied	0.30	Light brown loam and clay with vegetation.
679393	TP60	None Supplied	0.50	Light brown loam and clay with vegetation.
679394	TP119	None Supplied	0.50	Light brown loam and clay with vegetation.
679395	TP124	None Supplied	0.50	Light brown loam and clay with vegetation.
679396	TP129	None Supplied	0.30	Light brown loam and clay with vegetation.
679397	TP120	None Supplied	0.30	Light brown loam and clay with vegetation.
679398	TP126	None Supplied	0.50	Light brown loam and clay with vegetation.
679399	TP128	None Supplied	0.50	Light brown loam and clay with vegetation.
679400	TP102	None Supplied	1.00	Light brown clay and loam.
679401	TP130	None Supplied	1.00	Light grey clay and sand.

Analytical Report Number : 16-36329

Project / Site name: Wykham Park Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	**Analytical Method Description**	**Analytical Method Reference**	**Method number**	**Wet / Dry Analysis**	**Accreditation Status**
Ammonium as NH4 in leachate	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	NONE
Ammonium as NH4 in soil	Determination of Ammonium/Ammonia/ Ammoniacal Nitrogen by the colorimetric salicylate/nitroprusside method, 10:1 water extraction.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L082-PL	W	MCERTS
Asbestos identification in soil	Asbestos Identification with the use of polarised light microscopy in conjunction with disperion staining techniques.	In house method based on HSG 248	A001-PL	D	ISO 17025
Boron in leachate	Determination of boron in leachate. Sample acidified and followed by ICP-OES.	In-house method based on MEWAM	L039-PL	W	ISO 17025
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES.	In-house method based on Second Site Properties version 3	L038-PL	D	MCERTS
Bromate in Leachate	Determination of bromate in leachate based on ion chromatography	In house method based on Standard Methods for the Analysis of Water and Waste Water, method 4500	L008-PL	W	ISO 17025
Chloride in leachate	Determination of Chloride colorimetrically by discrete analyser.	In house based on MEWAM Method ISBN 0117516260.	L082-PL	W	ISO 17025
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests. 2:1 extraction.	L082-PL	D	MCERTS
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Electrical conductivity at 20oC of leachate	Determination of electrical conductivity in leachate by electrometric measurement.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L031-PL	W	NONE
Fluoride in leachate	Determination of fluoride in leachate by 1:1ratio with a buffer solution followed by Ion Selective Electrode.	In-house method based on Use of Total Ionic Strength Adjustment Buffer for Electrode Determination"	L033-PL	W	NONE
Fraction of Organic Carbon in soil	Determination of fraction of organic carbon in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L023-PL	D	NONE
Free cyanide in leachate	Determination of free cyanide by distillation followed by colorimetry.	In-house method	L080-PL	W	ISO 17025
Free cyanide in soil	Determination of free cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	MCERTS
Hexavalent chromium in leachate	Determination of hexavalent chromium in leachate by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	NONE
Hexavalent chromium in soil (Lower Level)	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphenylcarbazide followed by colorimetry.	In-house method	L080-PL	W	MCERTS
Magnesium, water soluble, in soil	Determination of water soluble magnesium by extraction with water followed by ICP-OES.	In-house method based on TRL 447	L038-PL	D	NONE

Analytical Report Number : 16-36329

Project / Site name: Wykham Park Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Mercury Low Level in leachate	Mercury in leachate by millennium merlin AFS analyser	In-house method based on USEPA method 1631	L085-PL	W	NONE
Metals by ICP-OES in leachate	Determination of metals in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L038-PL	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L019-UK/PL	W	NONE
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (skalar)	L080-PL	W	MCERTS
Nitrate, leachate soluble, in leachate	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08,	L078-PL	W	NONE
Nitrate, water soluble, in soil	Determination of nitrate by reaction with sodium salicylate and colorimetry.	In-house method based on Examination of Water and Wastewatern & Polish Standard Method PN-82/C-04579.08, 2:1 extraction.	L078-PL	D	NONE
Nitrite as N in leachate	Determination of nitrite in leachate by addition of sulphanilamide and NED followed by discrete analyser (colorimetry).	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L082-PL	W	NONE
Nitrite, leachate soluble, in leachate	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton & Polish Standard Method PN-82/C-04579.08	L077-PL	W	NONE
NRA Leachate Prep	10:1 extract with de-ionised water shaken for 24 hours then filtered.	In-house method based on National Rivers Authority	L020-PL	W	NONE
Pesticides and Herbicides in soil screening	In-house method	In-house method		W	NONE
pH at 20oC in leachate	Determination of pH in leachate by electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L005-PL	W	ISO 17025
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L099-PL	D	MCERTS
Phenols, speciated, in leachate, by GCMS	Determination of speciated phenols in leachate by extraction in hexane followed by GC-MS.	In-house method based on USEPA 8270	L070-PL	W	NONE
Speciated EPA-16 PAHs in leachate	Determination of PAH compounds in leachate by extraction in dichloromethane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L102B-PL	W	NONE
Speciated EPA-16 PAHs in soil	Determination of PAH compounds in soil by extraction in dichloromethane and hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L064-PL	D	MCERTS
Specific PAH sums in leachate	Determination of PAH compounds in leachate by extraction in hexane followed by GC-MS with the use of surrogate and internal standards.	In-house method based on USEPA 8270	L070-PL	W	NONE

Analytical Report Number : 16-36329

Project / Site name: Wykham Park Farm

Water matrix abbreviations: Surface Water (SW) Potable Water (PW) Ground Water (GW)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight.	In-house method based on British Standard Methods and MCERTS requirements.	L019-UK/PL	D	NONE
Sulphate in leachates	Determination of sulphate in leachate by acidification followed by ICP-OES.	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil.	L039-PL	W	ISO 17025
Sulphate, water soluble, in soil (16hr extraction)	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests, 2:1 water:soil extraction, analysis by ICP-OES.	L038-PL	D	MCERTS
Total cyanide in leachate	Determination of total cyanide by distillation followed by colorimetry.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton (Skalar)	L080-PL	W	ISO 17025
Total Hardness of leachates	Determination of hardness in leachates by calculation from calcium and magnesium.	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L045-PL	W	NONE
Total sulphate (as SO4 in soil)	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests	L038-PL	D	MCERTS
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, Chemical and Electrochemical Tests""	L038	D	MCERTS
Total Sulphur in soil	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In-house method based on BS1377 Part 3, 1990, and MEWAM 2006 Methods for the Determination of Metals in Soil	L038-PL	D	MCERTS

For method numbers ending in 'UK' analysis have been carried out in our laboratory in the United Kingdom.
For method numbers ending in 'PL' analysis have been carried out in our laboratory in Poland.
Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30oC.