BROWNFIELD SOLUTIONS LTD

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

HOLLINS STRATEGIC LAND

Oxford Road, Bodicote

Geo-Environmental Assessment Report

JW/C3797/9600

December 2020

EXECUTIVE SUMMARY	
Location and Brief Site Description	The site is located off Oxford Road, Bodicote, OX15 4BN. The site comprises predominantly an open field with a farm shop, barns and caravan storage present in the southern corner of the site. No potential sources of contamination were noted on-site.
Ground Conditions	Generalised ground conditions from the ground investigation comprise (top down): • Made ground encountered from ground level to between 0.15m and 0.25m bgl. • Natural strata encountered from 0.15mbgl to between 0.45m and 4.00m bgl. • Solid geology encountered from 0.2m bgl to between 0.65m and 4.00m bgl. • No groundwater was encountered during the investigation, but groundwater was recorded in two boreholes between 2.53m and 3.41m bgl.
Human Health - Soils Contamination	• Arsenic (total) was encountered in all tested samples of made ground and natural soils, above residential screening values with home grown produce, however background soil chemistry showed that elevated arsenic is naturally occurring and an area wide issue. The arsenic concentrations identified on site are not uncommon and can be much higher within the District. • The EHO at the local council advised that concentrations such as the ones recorded are not atypical for the area. They stated that often no remedial measures are required in this situation, as background levels are so elevated, and it would not be cost-beneficial [or sustainable] to enforce a requirement for clean cover / removal of soils across the entirety of the Bodicote area. • The EHO made an outline recommendation that supplementary bioaccessibility testing for the arsenic be carried out. • PBET testing revealed the bioaccessible fraction of arsenic was max. 5.3%and therefore adopting this maximum fraction to convert all total concentrations to bioavailable concentrations, the bioavailable arsenic concentrations are all below the residential screening value of 37mg/kg and no further action is considered to be required. • Localised lead and nickel contamination was encountered in one sample of made ground and one sample of natural clay respectively, above residential screening values with home grown produce. • No other determinands were encountered above their respective screening values. • No asbestos was encountered in any samples. • Statistical analysis found the lead exceedance to be an outlier or hotspot.
Ground Gas	Based on the monitoring to date, the site is classified as Green under the NHBC traffic light classification system. Full radon protection measures are required on-site, which will mitigate against any ground gas. Ground gas monitoring is ongoing, and a full assessment will be undertaken on completion of the scheduled monitoring.
Outline Remedial Strategy	The lead in WS01 is a hotspot which should be mitigated by removal of the source or pathway. The nickel exceedance, when compared with the generic screening criteria for public open space was not found to be in exceedance and therefore based on the current development layout, is not considered a significant risk. Preliminary discussions with the Contaminated Land officer indicate that this is a known issue in the general area and they take a pragmatic view. Physiologically-Based Extraction Testing (PBET) has been undertaken for arsenic, showing that the bioavailable fraction of arsenic is generally very low (5.3% max) and therefore risks are considered to be low, and no further remediation is considered to be required. Full radon protective measures are necessary according to current guidance. Verification of the above will be required, with validation reports produced.
Waste	All samples were screened against the HazWasteOnline screening tool and were all found to be Non-Hazardous. Waste acceptance criteria (WAC) testing was outside of the scope of this investigation. If it is anticipated that the gravel strata in the vicinity of WS01 is to be removed from site or re-used on-site, that this material is segregated for additional testing. It should not be utilised in any areas where contact with site end-users is possible due to elevated lead concentrations.

EXECUTIVE SUMMARY	
Foundations and Floor Slabs	Strip foundations are considered suitable. In the northern and eastern areas of the site, these can found on natural limestone gravel at a minimum of 0.45m bgl, providing allowable bearing capacities of upwards of 250kN/m^2. In the southern area, bearing on the weathered marlstone will be required at a minimum of 0.90m bgl, providing an allowable bearing capacity of 110kN/m^2. Localised deepening to 2.00m bgl in the area of WS01 and WS02 will be required, providing at bearing capacity of 140kN/m^2 at this depth. In WS07, where interbedded clay and gravel was encountered, foundations can found on the first gravel layer at 1.0m bgl, providing a bearing capacity of at least 150kN/m^2. The foundation solutions detailed above would keep total settlement within acceptable limits, although in transitional areas foundations would need adequate reinforcement to mitigate against differential settlement. Suspended floor slabs are recommended, however ground bearing floor slabs may be adopted.
Concrete Classification	DS-1 AC-1 conditions prevail.
Highways Design	Superficial Strata CBR – cohesive/fine soils– 3-5% Superficial Strata CBR – granular/coarse soils– up to 60% The above should be confirmed by in-situ testing at formation level by a specialist geotechnical engineer during construction.
Sustainable Drainage Systems (SUDS)	Drainage to soakaways is considered potentially suitable for this site. Indicative soil infiltration rates range from 1.43x10^{-5}m/s to 1.46x10^{-4}m/s.
Further Work	The following further works will be required to progress to the construction phase: • Completion of ground gas monitoring programme. • Issue gas assessment / update gas assessment within this report. • Design of Remedial Strategy and confirmation with the Local Authority, if required. • Demolition Asbestos survey. • Tree survey by qualified arboriculturist. • Detailed foundation design by a structural engineer, including foundation zonation plan and depth schedule. • Production of Ground Gas Protection Measures Verification Plan, if required. • Production of Materials Management Plan (MMP) under the CL:AIRE DoWCoP, if required. • Implementation of the Remedial Strategy and verification of the remedial works.

This executive summary should be read in conjunction with the full report, reference JW/C3797/9600 and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Oxford Road, Bodicote		
Document Name:	Geo-Environmental Assessment Report		
Reference:	JW/C3797/9600		
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Issued By:	**Client:**	**Engineer:**
Brownfield Solutions Ltd Unit 5 Alfred Court Saxon Business Park Stoke Prior Bromsgrove Worcestershire B60 4AD Tel: 01215 729014 brownfield-solutions.com	Hollins Strategic Land Suite 4 1 King Street Manchester M2 6AW	
	Contact: Mr C Orr	Contact:

Written by:

J Wheaton
BSc (Hons) FGS
Project Engineer

Checked by:

W Griffiths
BSc (Hons) CEnv MIEnvSc
Principal Project Engineer

Approved by:

A J Hewitt
BSc (Hons) MSc CGeol CSci FGS
Director

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C3797/04	-	Contamination Plan

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1.0 INTRODUCTION

1.1 Context

This report describes a Geo-Environmental Assessment carried out by Brownfield Solutions Limited (BSL) for Hollins Strategic Land on a site off Oxford Road, Bodicote and has been completed in general accordance with the following guidance:

- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
- CLR11 - Model Procedures for the Management of Land Contamination.
- BS 10175:2011+A2:2017 Investigation of Potentially Contaminated Sites.
- BS5930: 2015+A1:2020 Code of Practice for Ground Investigations.
- BS EN 1997-1:2004+A1:2013 Eurocode 7. Geotechnical design. General rules plus UK National Annex.
- BS EN 1997-2:2007 Eurocode 7 Geotechnical design. Ground investigation and testing plus UK National Annex.
- NHBC Standards. Chapter 4.1: Land Quality - Managing Ground Conditions.

Definitions of terms and acronyms used within this report is presented in Section 11.0.

1.2 Proposed Development

The proposed development is for a residential end use with associated private gardens, highways, public open space (POS) and infrastructure as shown on the illustrative masterplan, drawing No. UD-GA-001 provided to BSL by the client.

1.3 Previous Reports

This report should be read in conjunction with BSL Desk Study Assessment Report (EC/C3797/1552) issued in April 2018.

1.4 Objectives and Scope

The objectives of this report are to determine the geo-environmental setting and ground conditions of the site, highlighting potential risks and areas of concern that may govern the development under the current planning regime. This assessment is also intended to fulfil the requirements of a Ground Investigation Report (GIR) as detailed in BS EN 1997-2:2007.

Following the Phase I Desk Study referenced above, an exploratory investigation was undertaken to confirm the findings of the preliminary CSM and risk assessment and meet any objectives that had not been satisfied. The exploratory investigation was undertaken using trial pitting, window sampling, infiltration testing, gas and groundwater monitoring and laboratory chemical and geotechnical testing, with reporting on the findings.

1.5 Limitations

This assessment has been prepared in accordance with the relevant current legislative framework, guidance and risk assessment methodology as outlined in Appendix A. BSL is not liable for any subsequent changes in the guidance and legislation.

The findings and opinions conveyed via this report are based on information obtained from a number of sources as detailed within this report, BSL have assumed this information is correct and reliable. Nevertheless, BSL cannot and does not guarantee the authenticity or reliability of the information it has relied upon.

BSL have used reasonable skill, care and diligence for the investigation of the site and the production of this report. There may be other conditions prevailing on the site which are outside the scope of work and have not been highlighted by this assessment and therefore have not been considered by this report. Responsibility cannot be accepted for such site conditions not revealed by the assessment.

This report has been prepared for the sole use and reliance of the Client, Hollins Strategic Land. No other third parties may rely upon or reproduce the contents of this report without the written permission of Brownfield Solutions Ltd (BSL). If any unauthorised third party comes into possession of this report, they rely on it at their own risk and BSL do not owe them any Duty of Care.

The investigation carried out on the site has been conducted to provide the best information on the ground conditions within site access and budgetary constraints. The inherent variation of ground conditions allows only for definition of the actual conditions at the locations and depths of exploratory locations at the time of the investigation. Different ground conditions may exist that have not been identified within this investigation.

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

The groundwater results described are only representative of the dates on which they were recorded, and levels may vary seasonally (e.g. due to changes in weather).

This assessment has been based on the proposed planning layouts provided. Any subsequent change to the planning layout may have an impact on the validity of recommendations made within this report. Furthermore, new information, changed practices or new legislation may necessitate revised interpretation of the report after the date of its submission.

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

Where it has not been possible to reasonably use an EC7 compliant investigation technique, a practical alternative has been adopted to obtain indicative soil parameters and any interpretation is based upon engineering experience, local precedent where applicable and relevant published information.

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, unless otherwise stated.

Notwithstanding site observations concerning the presence or otherwise of archaeological issues, asbestos-containing materials (ACM) or invasive weeds (e.g. Japanese knotweed), this report does not constitute a formal survey of these potential issues.

The site plans enclosed in this report should not be scaled off. Any site boundary line depicted on plans does not imply legal ownership of land.

Any recommendations made in this report should be confirmed with the Regulatory Authorities prior to implementation to ensure compliance.

2.0 THE SITE

2.1 Location

The site is located off Oxford Road, Bodicote, OX15 4BN. It is situated approximately 1.5 miles south of Banbury Town Centre, centred on National Grid Reference 446173, 238356 as shown on the Site Location Plan, Drawing No. C3797/01.

2.2 Site Description

The main site features and potential issues identified are detailed below:

Feature	Description
Site Area	Approximately 2.2 hectares.
Site Access	Access to the site is gained off White Post Road to the north of the site.
Current Land Use and Site Features	The site comprises predominantly an open, grassed field with a farm shop in the southern corner of the site. A number of open barns are present to the north of the farm shop, as well as storage areas for a number of caravans. An overhead communications cable was noted running to the farm shop from the south, but generally the site was clear of evidence of services, manhole covers etc.
Potential Sources of Gross Contamination	No potential sources of contamination were noted on-site.
Vegetation	There are sporadic mature/semi-mature trees across the site, and along the south-western boundary. Hedgerows bordered all sides of the site.
Topography	The site is relatively flat, sloping gently to the south-east.
Site Boundaries	All sides of the site were predominantly bordered by hedgerows. The westernmost corner of the site was gated for access to the field and sections of the south-western and south-eastern boundaries were made up of wooden fencing.
Surrounding Area	The site is set within a residential area, bordered by a car dealership and petrol station to the north, housing to the east, a district council office to the south and a primary school to the west.

3.0 SUMMARY OF PREVIOUS REPORTS

3.1 BSL Desk Study

A summary of the relevant points from the Desk Study completed by Brownfield Solutions Ltd (Ref. EC/C3797/1552) is presented below:

- The site has had previous development since 1881. Although the site was mostly undeveloped at this time, a lodge was present in the eastern corner. This was removed by 1900. By 1983-1987 the southern area of the site, now the farm shop, was labelled Tapper's Farm.
- A garage, petrol station and school were in close proximity of the site.
- Identified sources include the on-site farm and made ground and the off-site garage.
- Geology comprises bedrock of the Marlstone Rock Formation (Secondary (A) Aquifer).
- No surface water features are present within 500m of the site.
- The nearest groundwater abstraction is 969m south-east of the site.
- The nearest surface water abstraction is 1045m south-west of the site, used for spray irrigation.
- No faults are within an influencing distance of the site.
- There site does not lie within a Coal Mining Area.
- The risks to human health from the identified sources are considered to be low
- The risk from ground gas is considered to be low to moderate.
- The site is located in an area likely requiring radon protection measures.
- The risk to controlled waters is considered to be low.
- The site is located in a UXO low risk zone.
- Recommendations were for an appropriate Phase II ground investigation to be carried out to confirm the identified risks and obtain information for preliminary design.

4.0 METHOD OF INVESTIGATION

4.1 Objectives

To confirm the risks to the identified receptors and confirm the ground conditions in respect to the identified geotechnical and geo-environmental risks, an appropriate intrusive investigation was undertaken as per the recommendations of the Phase I Desk Study Assessment.

The aim of the fieldwork was to:

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

4.2 Site Works

The following site works have been undertaken as part of the intrusive investigation between the dates of 16th and 18th September 2020. Supplementary hand dug trial pits were undertaken on 5th November 2020.

Method	No.	Range Depths (m bgl)	Purpose
Trial pits – JCB 3CX	7	2.05 – 2.75	Establish general ground conditions and gain good coverage. Allow hand shear vane tests (HSVs) to be carried out on suitable cohesive arisings and obtain samples for contamination and geotechnical testing.
Window sample boreholes – Tracked WS rig	8	0.90 – 4.00	Establish general ground conditions on site. Allow Standard Penetration Tests (SPTs) to be carried out and obtain samples for contamination and geotechnical testing. Installation of ground gas and water monitoring wells.
Infiltration tests (2 tests per location)	3	1.286 – 1.575	Obtain infiltration rates for drainage design.
Trial pits – hand dug	3	0.20 – 0.70	TP03A, TP06A and WS07A were undertaken as supplementary works on 5/11/20 to obtain additional targeted samples for total and bioaccessible arsenic analysis.

The surveyed locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C3797/02. The exploratory hole logs are presented in Appendix B.

The exploratory holes were logged by an experienced geo-environmental engineer in general accordance with the following guidance:

- BS 5930:2015+A1:2020 Code of Practice for Site Investigations.
- BS EN 14688-1:2018 Geotechnical Investigation and Testing – Identification and classification of soil.
- BS EN ISO 14689:2018 Geotechnical investigation and testing – Identification and classification of rock.

4.3 Sampling

During the drilling and excavation of the exploratory holes, representative samples were taken at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing. They were stored and transported in general accordance with BS 10175:2011+A2:2017.

The type of sample was dependent upon the stratum and the purpose of analysis in accordance with current environmental and geotechnical guidance.

The distribution of samples taken across the site is recorded on the exploratory logs and a summary of the samples taken is presented in the table below:

Type	Number
Environmental (ES)	35
Disturbed (D)	27
Bulk (B)	3

4.4 Laboratory Testing

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

In the absence of particularly contaminative processes on site and the lack of visual or olfactory evidence of potential hydrocarbon or other contamination, representative soil samples were screened for the following general suite of determinands at a UKAS approved laboratory:

Determinand	No of Samples
BSL Default Soil Suite: Arsenic, Cadmium, Chromium (III), Chromium (VI), Copper, Nickel, Mercury, Lead, Zinc, Selenium, speciated polycyclic hydrocarbons (PAH 16), water soluble sulphate (2:1 Extract), soil organic matter (SOM) and pH.	2
Soil Suite A: Arsenic, cadmium, chromium (total and hexavalent), copper, lead, mercury, nickel, selenium, zinc and pH.	8
Petroleum Hydrocarbons (TPH CWG) inc BTEX and MTBE.	2
Asbestos Screen.	10
Total Organic Carbon (TOC).	4
Total Arsenic	3
PBET – Arsenic (bioaccessibility)	3

The Chemical Laboratory Testing Results are presented in Appendix C.

Representative disturbed samples were obtained for all soil types encountered. Selected samples were scheduled for testing at an approved laboratory in accordance with BS 1377 'Method of Test for Soils for Civil Engineering Purposes' and BS EN ISO 17892- Parts 1-12:2018 'Geotechnical investigation and testing. Laboratory testing of soil'.

The following tests were scheduled for geotechnical purposes:

Description	No of Samples
Natural Water Content.	10
Plasticity Index Analysis.	10
pH Value.	8
Water Soluble Sulphate Contents.	8
SD1 BRE Full Suite.	2

The Geotechnical Laboratory Testing Results are presented in Appendix D.

4.5 Monitoring

Ground gas and ground water monitoring standpipes were installed in 6 boreholes and subsequently five monitoring visits have been undertaken out of six proposed as part of the current scope, in line with the recommendations of CIRIA C665. All gas monitoring was undertaken using GFM436 infrared gas meter with integral electronic flow analyser.

Flow measurements on each standpipe (l/hr) were taken. Measurements of the percentage volume in air (%v/v) of oxygen (O_2), carbon dioxide (CO_2) and methane (CH_4) were recorded in addition to the percentage Lower Explosive Limit (%LEL) of methane (Note: 100% LEL equates to 5% by volume), the atmospheric pressure (mb) and average temperature during the visit (°C).

Standpipes were constructed in general accordance with the relevant guidance. A summary of the installation construction is presented in the table below:

Location	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata	Purpose
WS01	35mm PVC	0.70 – 2.70	Sandy CLAY	Ground Gas
WS02	35mm PVC	1.00 – 4.00	CLAY and GRAVEL	Ground Gas
WS04	35mm PVC	0.50 – 1.00	SAND and GRAVEL	Ground Gas
WS05	35mm PVC	0.50 – 1.70	SAND and GRAVEL	Ground Gas
WS06	35mm PVC	1.00 – 2.00	Sandy CLAY	Ground Gas
WS07	35mm PVC	1.00 – 4.00	CLAY and GRAVEL	Ground Gas

The gas monitoring visits recorded peak and steady state conditions. Peak results are those that occur on opening the valve on the borehole tap. Steady state conditions are those that occur a period of time afterwards when the initial (accumulated) gases have been purged from the borehole.

Interim ground gas monitoring results are presented in Appendix E of this report.

5.0 GROUND CONDITIONS

5.1 Summary

A brief summary of the ground conditions encountered is presented in the table below:

Stratum	Range Depths - Top (m bgl)	Range Depths - Base (m bgl)	Range Thickness' (m)	Brief Description
Made Ground	0.00 – 0.00	0.15 – 0.25	0.15 – 0.25	Slightly gravelly sand (generally topsoil).
Natural Topsoil	0.00 – 0.00	0.15 – 0.25	0.15 – 0.25	Gravelly SAND.
Natural Clay Strata	0.15 – 3.35	0.90 – 4.00	0.30 – 2.80	Slightly gravelly sandy CLAY.
Natural Sand Strata	0.15 – 1.00	0.45 – 1.90	0.25 – 1.00	Slightly clayey gravelly SAND.
Solid Geology	0.20 – 3.90	0.65 – 4.00	0.10 – 1.60	Sandy GRAVEL with high cobble content.

Details are provided in the logs in Appendix B and the individual strata are described in the sections below.

5.2 Made Ground

Topsoil
Made Ground comprising topsoil was encountered in four locations (TP02, TP03, TP04, WS07) in the southern half of the site from ground level to between 0.15m and 0.25m bgl, generally comprising grass over brown slightly gravelly sand with occasional to frequent rootlets and occasional anthropogenic inclusions of gravel sized brick alongside plastic and ceramic fragments.

General
General (non-topsoil) made ground was encountered in two locations (TP06, WS01) and was observed from ground level to depths between 0.15m and 0.25m bgl. The made ground comprised gravel surfacing over clayey gravelly sand with occasional anthropogenic inclusions of gravel sized brick, concrete and rare ceramic and slate.

5.3 Natural Topsoil

Topsoil was encountered across the field from ground level to between 0.15m and 0.25m bgl, generally comprising brown clayey gravelly sand with occasional to frequent rootlets. Occasional roots were encountered in SA02, SA03 and WS05.

For the purpose of this assessment, topsoil is defined as the upper darker and more fertile layer of the soil profile which is a product of natural chemical, physical, biological and environmental processes. This does not imply compliance with BS 3882:2015.

5.4 Natural Strata

The natural strata was representative of Marlstone Rock Formation at variable stages of weathering. The Marlstone Rock Formation is described by the BGS as *sandy, shell-fragmental and ooidal ferruginous limestone interbedded with ferruginous calcareous sandstone, and generally subordinate ferruginous mudstone beds.*

Natural strata generally comprised a mixture of firm to stiff sandy clay and gravelly sand overlying limestone gravel, cobbles and boulders at shallow depth.

In the north and eastern areas of the site, the weathered bedrock was encountered below the sand and/or clay soils at shallow depth (min. 0.45m bgl in WS03, up to 1.3m bgl (TP05, SA01).

In the south of the site (WS01, WS02, WS06, WS07, TP01, TP02) the topsoil or made ground was underlain by sand to depths of up to 0.8m bgl (TP01) and was underlain by thicker clay soils which were generally described as stiff, however locally soft and lower strength clays were encountered (low SPT values of 3 and 4 were recorded at 1.2m bgl in WS01 and WS02 respectively, and were in part described as damp and soft or firm). In WS01 and WS02 the SPT values improved below 2.0m bgl.

The shallow clay was present to depths of up to 3.0m bgl (WS02) in this area, and in WS02 and WS07, the thick clay was interbedded with thinner layers of gravel (sub 0.5m thick), ultimately refusing (SPT N-Value >50) in the weathered bedrock at circa 4.0m bgl.

In TP01, TP02 and WS01, located to the south of WS02 and WS07, the weathered bedrock (gravel/cobbles) was encountered between depths of 2.2m and 2.5m bgl.

The inferred boundary between the shallow bedrock and thicker clay deposits is shown on the attached Ground Conditions Plan, C3797/03.

5.5 Groundwater

No groundwater was encountered during the main investigation, although the strata was locally described as damp. Water was encountered during the monitoring programme from visit 2, however it's likely that this water was perched and has seeped into the boreholes. The depths and locations present are shown in the table below:

Location	Depth During Monitoring Period, where encountered (range) (m)
WS01	2.53
WS02	2.70 – 3.15
WS04	NGW
WS05	NGW
WS06	NGW
WS07	2.97 – 3.41

5.6 Observations

Contamination
During the works undertaken by BSL, no visual or olfactory evidence of contamination was observed.

Stability of Excavations/Boreholes
The sides of the trial pits were generally stable. Minor collapses occurred in the clay deposits when undertaking infiltration testing in SA01.

The majority of the exploratory holes refused on the limestone encountered across the site. The only two locations that penetrated the limestone gravel, cobbles and boulders were WS02 and WS07. As these locations were in close proximity of each other, it's likely that this area has undergone a higher degree of weathering than the rest of the site.

6.0 TEST RESULTS

6.1 Geotechnical Laboratory Testing

Plasticity Index Analysis
Plasticity index results ranged between 16% and 35%, indicating the cohesive soils to be generally of high to very high plasticity, with one sample of medium plasticity. Associated water contents ranged between 20% and 48%.

After modification of particle size in accordance with NHBC Chapter 4.2, the modified plasticity indices are in the range 8.96% to 30.10% indicating the cohesive soils to be of very low to medium volume change potential.

6.2 Aggressive Ground Conditions – Geotechnical Chemical Testing

The test results for the assessment of aggressive ground conditions are presented in Appendix D. The results are summarised and assessed within Section 8.0 of this report.

6.3 In Situ Geotechnical Testing

In Situ Hand Shear Vane Tests
In general, the cohesive soils were unsuitable for shear vanes due to the gravel content. However, four hand shear vane tests were carried out on suitable cohesive soils recovered from the trial pits. Each shear vane result recorded represents the mean value of three tests undertaken at the specified depth.

The results and distribution of the hand shear vane tests are recorded in kPa on the Exploratory Hole Logs which are presented in Appendix B.

In Situ Standard Penetration Tests
Standard Penetration Tests (SPTs) were carried out within the window sample and cable percussive boreholes at regular 1.0m to 1.5m intervals. The results of the individual blows and the N-values are recorded on the Exploratory Hole Logs in Appendix B.

All SPT N values are uncorrected. Density and strength descriptors are reported in accordance with the guidelines stated in BS 5930:2015+A1:2020, incorporating requirements of BS EN ISO 14688-1:2002, BS EN ISO 14688-2:2004 and BS EN ISO 14689-1:2003.

Soil Infiltration Test Results
Soil infiltration test tests were undertaken within trial pits at 3 No. locations across site, a summary of the results is presented in the table below. These were carried out in general accordance with BRE Digest 365 (BRE 2016) 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 as indicative only. Further discussion concerning the suitability of infiltration testing at the site is provided in Section 7.9.

Location	Stratum Type	Depth (m)	Infiltration Rate (m/sec)	
			Test 1	Test 2
SA01	Sandy clayey GRAVEL with high cobble content	Test 1: 1.575 Test 2: 1.510	$2.23x10^{-5}$	$1.43x10^{-5}$

Location	Stratum Type	Depth (m)	Infiltration Rate (m/sec)	
			Test 1	Test 2
SA02	Sandy GRAVEL with high cobble content	Test 1: 1.507 Test 2: 1.405	$4.66x10^{-5}$	$8.93x10^{-5}$
SA01	Sandy GRAVEL with high cobble content	Test 1: 1.370 Test 2: 1.286	$1.46x10^{-4}$	$1.44x10^{-4}$

The full test results are presented in Appendix D.

6.4 Geo-Environmental Testing

Chemical Laboratory Testing
The chemical test results for soils are presented in Appendix C. The results are summarised and assessed within Section 8.0 of this report.

Ground Gas Monitoring
Monitoring installations have been monitored on 5 occasions to date out of 6 visits scheduled. The results are presented in Appendix E and are summarised and assessed within Section 8.0 of this report.

7.0 GEOTECHNICAL ASSESSMENT

7.1 Ground Model Summary

The site is currently predominantly unoccupied, with the majority of the site comprising an open field. The only structures present relate to a farm shop and open-sided barns in the south-west of the site. There are no known basements and cellars associated with the site.

The ground conditions can be summarised as below (top down):

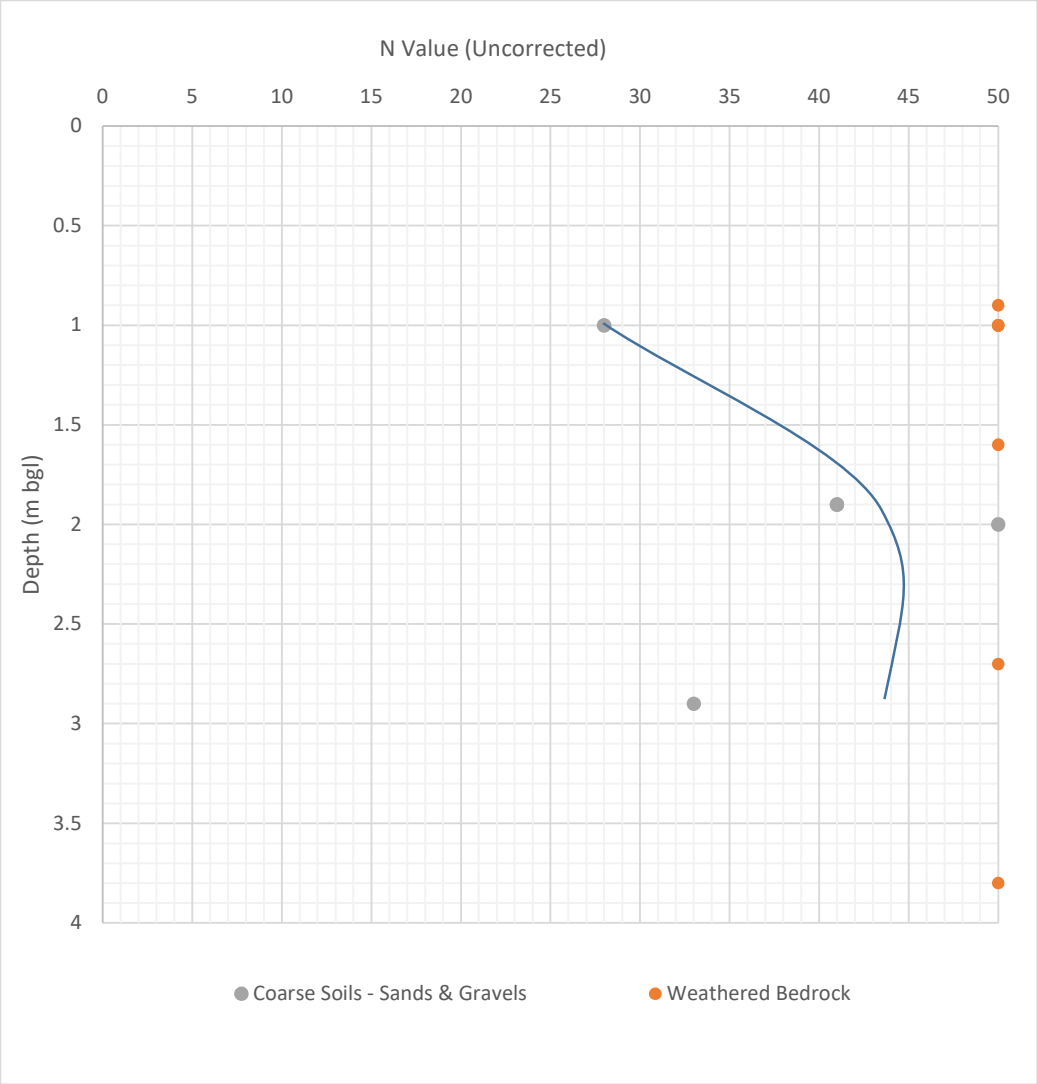
- Made ground generally comprising topsoil or gravel surfacing with anthropogenic inclusions from ground level to between 0.15m and 0.25m bgl.
- Natural deposits comprising gravelly sand proven to depths between 0.45m and 1.90m bgl.
- Natural deposits comprising sandy clay proven to depths between 0.90m and 4.00m bgl.
- Solid geology comprising gravel, cobbles and boulders of limestone proven to depths ranging between 0.65m and 4.00m bgl.
- No groundwater encountered during site works.
- Post site works monitoring groundwater levels ranged between 2.70m and 3.41m bgl.

7.2 Design Soil Parameters

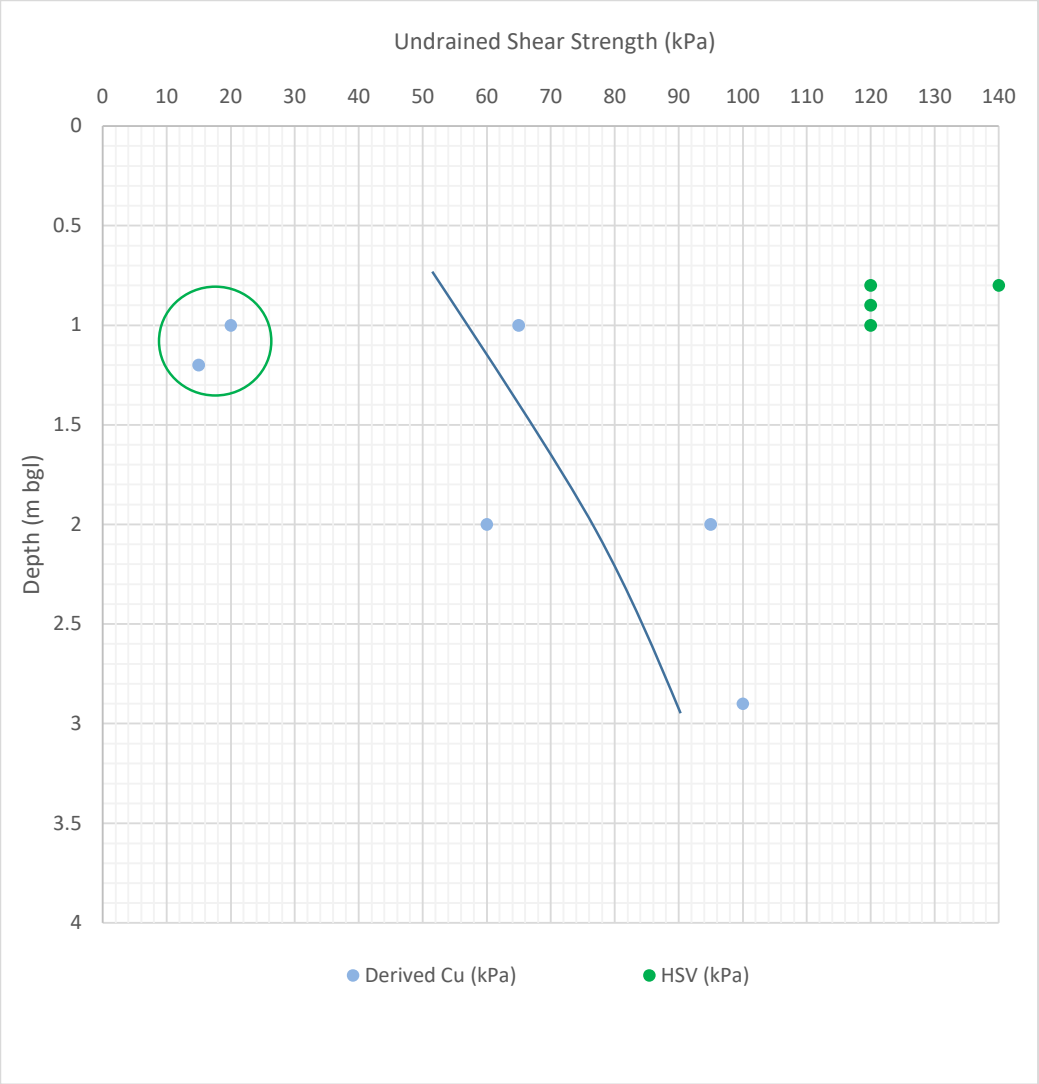
The relevant test results from the prior section have been evaluated to derive geotechnical soil parameters for the site in the following section.

The angle of shearing resistance (ϕ') of the granular (coarse) soils has been derived from the uncorrected SPT N value data and the correlation described by Peck (1967).

Depth (m bgl) vs SPT N value and Depth vs Undrained Shear Strength graphs are also provided below to provide a profile of both the cohesive and granular materials underlying the site.



The above graph shows that generally the SPTs were refusing (N Value of 50+) within the granular weathered limestone. The coarse soils denoted in the graph above include the sand layer present at shallow depth and the deeper interbedded gravel layers identified in WS02 and WS07.



The above graph shows a general increase of shear strength with depth. There is a wide variation between the shear strength values derived from SPTs and the hand shear vane tests. The two lowest shear strengths circled in green above were in the soft clay identified in WS01 and WS02 between circa. 1-2m bgl. A conservative line of fit has been drawn on the graph to provide characteristic values for shear strength, however this would not apply to the soft clays in WS01 and WS02 between 1-2m bgl, which will require further assessment and/or deepening of the foundations.

Characteristic Values

Characterisation of the geotechnical parameters above has been undertaken to obtain characteristic values, which are a cautious estimate of the values affecting the occurrence of the limit state.

The characteristic shear strength for the cohesive strata at 0.90m bgl interpreted from the above graph is 55 kN/m^2, increasing to 66.5kN/m2 at 2.00m bgl.

From the SPTs, the characteristic ϕ' value for the sands and gravels at 1.00m bgl is interpreted to be 35° for Ultimate Limit State conditions, with characteristic ϕ' values for the weathered bedrock being 41°.

7.3 Foundations

The development will comprise traditional two storey residential housing and is considered to be classed as Geotechnical Category 2 in accordance with Eurocode 7.

Preliminary design by calculation has been undertaken to determine the design resistance of the bearing strata in the following section. No proposed structural loads were available at the time of writing, therefore the following recommendations are provisional and should be reviewed at the detailed design stage. However, for the purpose of this assessment a typical load of 50kN has been assumed per storey.

Shallow Foundations – Strip
The most suitable foundations for the proposed houses in the northern and eastern areas of the site are likely to be strip foundations placed within the natural limestone gravel strata at a minimum depth of 0.45m bgl. Characteristic values for allowable bearing capacity for weak marly limestones are upwards of 250kN/m^2.

In the southern area, where thick and variable strength clay deposits were recorded, it is recommended that foundations are deepened to bear on similar weathered marlstone strata. This solution may apply to houses in the vicinity of WS06, where the gravel was encountered at 1.8m bgl. In general, given the nature of the clays and the characteristic undrained shear strengths, strip foundations at 0.90m bgl would provide an allowable bearing capacity of 110kN/m^2. However, in WS01 and WS02, low SPT N Values of 3-4 were encountered at these depths, and it is recommended that delineation and deepening below the soft clay is undertaken.

In the vicinity of WS01 and WS02, where soft clays were encountered, deepening to 2.00m bgl is recommended. At this depth, SPT N Values in the region of 12-19 were recorded. Utilising the more conservative N Value of 12, an allowable bearing capacity of 140kN/m^2 has been calculated.

In WS07, where interbedded clay and gravel was encountered, the first gravel layer was medium dense (N=28) at 1.0m bgl and foundations could bear within the gravel, providing an allowable bearing capacity of at least 150kN/m^2, whilst limiting settlements within the underlying stiff clay layers.

In transitional areas foundations may span cohesive and granular or weathered bedrock strata, and it is recommended foundations are deepened to bear on strata of similar characteristics. Alternatively, if foundations are to span both granular and cohesive strata, it is recommended that the foundations are adequately reinforced and potentially working loads are reduced to mitigate differential settlement issues.

Preliminary calculations indicate that total settlements will be within tolerable limits (<25mm) based on the above allowable bearing capacities, for a 600mm wide strip footing.

General Advice for Shallow Foundations
The bearing stratum should be inspected for ‘soft spots’ within the natural clay strata, such as in WS01 and WS02, or resulting for instance from localised groundwater perched within the overlying fill materials. Soft clay soils were encountered in WS01 and WS02 between depths of approximately 1-2m bgl. Where soft soils are encountered, foundations will need to be deepened to found on suitable strata. The stratum should also be inspected for ‘hard spots” which may require removal.

If the ground conditions encountered during the construction phase differ significantly to the conditions encountered during construction, work should cease and BSL contacted for further advice.

During the construction phase supervision should be on a continuous basis to check the design assumptions are correct and construction conforms to design. Supervision should include inspections, Control Ground Investigations and monitoring.

7.4 Building Near Trees

The clay soils on site are of very low to medium volume change potential. Where foundation excavations (or piles if adopted) encounter cohesive strata in the vicinity of existing, proposed or recently removed trees, foundations should be adjusted in full accordance with NHBC Standards Chapter 4.2. All foundations should be deepened below roots of greater than 5mm diameter during excavations for footings.

A survey of all trees and hedges on the site and within influencing distance of the site boundary should be undertaken to identify tree species and heights by a qualified arboriculturist in accordance with BS 5837:2012 and NHBC Standards. This information will be required in order to assess the effects of trees on the cohesive strata.

Where foundation depths due to trees already present or recently removed exceeds 1.50m, there is a possibility for heave to occur on removal of the tree and guidance states that compressible material or void former is required against the inside face of the foundation, unless it can be satisfied that the soil is not desiccated.

Designs should take suitable precautions to protect against ground heave and the influence of trees if the inclusion of trees is proposed as part of the design of the new development or if evidence of current or former trees is uncovered during construction.

7.5 Floor Slabs

Given the ground conditions encountered on-site, it is recommended that suspended floor slabs are adopted at the site in accordance with NHBC standards.

Where foundation depths due to trees already present in cohesive (shrinkable) strata exceeds 1.50m, there is a possibility for heave to occur on removal of the tree, unless it can be satisfied the soils are not desiccated. In this instance, NHBC Guidance states that either a precast concrete floor (i.e. beam and block), a suspended timber or a cast in-situ concrete floor must be used. We recommend the former, where the required void size for beneath floor slabs on this site is 250mm based on the medium volume change potential clays.

A minimum ventilation void of 150mm should be provided below the underside of precast concrete suspended floors where founding on granular strata.

Ground bearing slabs may be adopted providing the following criteria are satisfied:

- Made ground and any compressible or unsuitable materials (topsoil containing vegetation and organic matter, including tree roots, are excavated and either improved or removed and replaced with suitable materials.
- The foundation depth (such as due to the influence of trees) is less than 1.5m.
- It is demonstrated that desiccation in cohesive soils is not present.
- Any fill beneath the slab is suitable, well-compacted granular material placed in an appropriate thickness in accordance with a suitable specification (e.g. NHBC Standards/SHW Series 600) designed and supervised by an appropriately qualified engineer, with the end performance validated.
- The slab is adequately reinforced.
- Regular construction joints and ties are provided to allow for differential settlement.

The final floor slab design should be of sufficient thickness and sufficiently reinforced to accept the envisaged applied loads, without unacceptable total or differential movement.

Vertical elements within the structure, such as columns and walls will need to be isolated from the ground bearing slab in order to allow for the slab to expand against them without resulting in cracking.

Prior to the placement of the founding materials and the construction of a ground bearing floor slab, the sub-formation and formation will need to be inspected and checked by a geotechnical engineer to ensure the ground conditions are as expected. If soft spots or hard spots are identified at the formation level, they should be reported to the Geotechnical Engineer immediately and remedial actions agreed.

Incorporation of geogrid reinforcement at formation level, before granular material is placed and compacted, will likely minimise required excavation depths and help provide a suitable foundation for the ground bearing slab.

Ground floor slabs should also be designed to incorporate any ground gas protections measures, although results to date do not indicate these will be required at present, subject to ongoing monitoring and regulatory confirmation.

7.6 Site Preparation and Construction

Topsoil and subsoil should be removed from beneath all buildings and hardstanding areas.

Instability of excavations is not generally anticipated provided they are not exposed to adverse weather conditions for any substantial period of time. All excavations should be carried out in accordance with CIRIA Report 97 'Trenching Practice'.

Final site levels are unknown however excavation depths within the weathered strata should readily be achieved using conventional plant (JCB or similar) although high specification plant (tracked 360^{o} or similar) is recommended to maintain the build programme. High specification plant and breaking equipment is likely to be required to penetrate shallow intact bedrock if required.

Allowance should be made for potential over break due to boulders when excavating into the intact Marlstone Formation.

To protect against the effects of heave in areas of cohesive strata, new drainage should be designed to take account of potential ground movement, including where pipes and services which pass through substructure walls or foundations. The volume change potential on this site is very low to medium and the potential ground movements that need to be considered for design are 50 to 100mm.

The post site works groundwater levels ranged between 2.53m (WS01) and 3.41m bgl (WS07) (118.13m to 118.65m AoD). Water was only recorded in WS02 and WS07 on visits 2-4, as well as in WS01 on visit 4, and no groundwater was recorded during the field works, therefore groundwater is unlikely to be encountered within likely excavation depths. Further guidance is provided in CIRIA C750 "Groundwater Control: Design and Practice". It should be noted that groundwater levels will vary seasonally, and the timing of construction may influence requirements.

7.7 Concrete Classification

The soluble sulphate and Ph test results have been assessed in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005. The Design Sulphate (DS) classification and the Aggressive Chemical Environment for Concrete (ACEC) classification are presented in the table below.

For the purposes of this assessment, it is likely that groundwater is present within the permeable bedrock and therefore the groundwater has been classed as mobile.

Stratum	No. Samples	Characteristic SO_4 (g/l)	Characteristic pH	DS Class	ACEC Class
Made Ground	2	0.034	7.1	DS-1	AC-1
Weathered Bedrock	8	0.0325	7.6	DS-1	AC-1
Solid Geology	2	0.018	7.9	DS-1	AC-1

Based on the above, the results of laboratory pH and sulphate content, alongside the BRE full suite tests, indicate that sulphate class DS-1 and ACEC Class AC-1 conditions prevail in accordance with BRE Special Digest 1 "Concrete in aggressive ground" 2005.

The specific concrete mixes (the Design Concrete Class) to be used on site will be determined by the site-specific concrete requirements in terms of the durability and structural performance. These are assessed in terms of the Structural Performance Level (SPL) and any need for Additional Protective Measures (APM) detailed in Part D of BRE Special Digest 1 with further guidance in Pt E and F.

7.8 Highways

Based on Table 5.1 from DMRB IAN 73/06 Rev 1 equilibrium CBR values of up to 60% are likely to be achieved in undisturbed natural granular soils and 3-5% for natural clays soils for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer.

Based on the fines content of the soils, they are considered to be frost susceptible, therefore highway construction should be a minimum thickness of 450mm to mitigate against the risk.

Care should be taken to ensure the stratum at formation level is protected against inclement weather, as this is likely to lead to surface deterioration and a decrease in soils strengths.

7.9 Sustainable Drainage Systems (SUDS)

The tests undertaken across the site indicate good drainage conditions. Based on the infiltration rates obtained, in the order of 10^{-5} and 10^{-4} m/s, it is likely that drainage to soakaways will be feasible at the site. We recommend the design of soakaway drainage is carried out in accordance with BRE 365 and CIRIA C753. Consideration should also be given to future maintenance, as the infiltration capacity can be reduced over time as a result of blinding through ingress of fines.

8.0 GEO-ENVIRONMENTAL RISK ASSESSMENT

8.1 Introduction

The samples were tested for an assessment of the chemical contamination that may pose a risk to human health. The results were examined with reference to a selection of guidance documents as detailed in Appendix A. In this case the LQM/CIEH S4ULs and DEFRA C4SLs for a residential end use with homegrown produce have been adopted as Tier 1 generic screening values.

The apparent exceedance of the relevant screening value is taken as indicating further detailed assessment or remedial action is required.

A summary assessment sheet is presented in Appendix C alongside the chemical test results. Results are discussed in detail in the sections below.

8.2 Soils Test Results and Risk Assessment – Human Health

Metals

A number of metals have been detected above the adopted screening criteria, with the predominant contaminant being widespread arsenic, as shown below.

Metal	Adopted Screening Value (mg/kg)	Location	Depth (m)	Strata Description	Strata Depth Range (m)	Concentration (mg/kg)
Arsenic	37	TP02	0.1	MADE GROUND: Sand topsoil	GL - 0.25	93
		TP02	0.5	Sand	0.25 - 0.70	170
		TP03	0.2	MADE GROUND: Sand topsoil	GL - 0.25	130
		TP03	0.4	CLAY / SAND	0.25 - 1.10	150
		TP04	0.7	GRAVEL	0.50 - 2.10	210
		TP05	0.1	Sand TOPSOIL	GL - 0.15	120
		TP06	0.1	MADE GROUND: Sand	GL - 0.15	130
		TP06	0.6	Sandy CLAY	0.15 - 0.90	310
		WS01	0.2	MADE GROUND: Sand	GL - 0.25	92
		WS07	0.1	MADE GROUND: Sand topsoil	GL - 0.25	140

Metal	Adopted Screening Value (mg/kg)	Location	Depth (m)	Strata Description	Strata Depth Range (m)	Concentration (mg/kg)
Nickel	130	TP06	0.6	Sandy CLAY	0.15 - 0.90	170

Metal	Adopted Screening Value (mg/kg)	Location	Depth (m)	Strata Description	Strata Depth Range (m)	Concentration (mg/kg)
Lead	210	WS01	0.2	MADE GROUND: Sand	GL - 0.25	1700

Supplementary Total Arsenic and PBET Analysis

Additional sampling was undertaken for the purposes of total and PBET arsenic analysis. Samples were taken from three locations targeting made ground (topsoil) and natural clay where the highest total arsenic concentration was recorded (TP06 at 0.6m). Total arsenic concentrations exceeded human health screening criteria in all three samples. Physiologically Based Extraction Testing (PBET) found the

bioavailability of the arsenic in the made ground and natural soils to be between 1.7% and 5.3% as summarised below:

Metal	Screening Value (mg/kg)	Location	Depth (m)	Strata Description	Strata Depth Range (m)	Total Concentration (mg/kg)	Bioaccessible Fraction (Max. %)
Arsenic	37	TP03A	0.2	MADE GROUND: Sand topsoil	GL - 0.25	140	5.3
		TP06A	0.6	Sandy CLAY	0.15 - 0.90	220	3.4
		WS07A	0.1	MADE GROUND: Sand topsoil	GL - 0.25	130	1.7

Asbestos
No asbestos fibres have been detected in any of the six samples screened.

Poly Aromatic Hydrocarbons (PAHs)
No PAHs have been detected above the adopted screening criteria, and generally the concentrations were below the laboratory limits of detection (LOD).

Total Petroleum Hydrocarbons (TPH CWG)
No petroleum hydrocarbons have been identified above the adopted screening criteria, with all concentrations below the laboratory LODs.

BTEX and MTBE
No BTEX or MTBE compounds have been identified above the adopted screening criteria and were all below laboratory LODs.

Total Organic Carbon
Four samples were tested for total organic carbon, with results ranging between 1.6% and 4.2%.

8.3 Statistical Analysis – Human Health

Statistical analysis of the arsenic, lead and nickel concentrations was undertaken to determine the upper 95th percentile of the data populations and to analyse whether any of the exceedances could be considered a statistical outlier, or hotspot.

Statistical assessment was undertaken on the individual strata units. The pertinent data is summarised in the table below;

Data Population (sample size)	Metal (critical conc.)	Max	Mean	Standard Deviation	Upper 95th Percentile (mg/kg)	Outliers?	Upper 95th > Critical conc.
Made Ground/ Topsoil (6)	Total Arsenic (37)	140	121.88	19.22	135.19	No	Yes
	Total Lead (210)	1700	337.17	667.74	871.46	Yes	No (if outlier removed)
Natural Soil (4)	Total Arsenic (37)	310	210	71.18	279.76	No	Yes
	Total Nickel (130)	170	127.5	28.72	155.65	No	Yes

The upper 95th percentile confidence limit for the total arsenic in the made ground and topsoil population is 135.19mg/kg, meaning the true mean is equal to or greater than the critical concentration (37mg/kg). The arsenic was elevated throughout the made ground/ topsoil and natural soils. The mean and upper 95th confidence limit was greater in the natural soils than in the made ground/ topsoil. No arsenic hotspots were identified, with the elevated concentrations being pervasive across the site.

The upper 95th percentile confidence limit for the lead in the made ground and topsoil population is 871.46mg/kg, meaning the true mean is equal to or greater than the critical concentration (210mg/kg). The maximum concentration (1700mg/kg in WS01 at 0.2m) was identified as an outlier (hotspot) and if removed, the upper 95th confidence limit would reduce to 75.43mg/kg and the true mean would be less than the critical concentration.

The upper 95th percentile confidence limit for the nickel in the natural soils population is 155.65mg/kg, meaning the true mean is equal to or greater than the critical concentration (130mg/kg) and the maximum concentration was not an outlier.

8.4 Background Soil Chemistry

The UKSO (UK Soil Observatory) National Soil Inventory (NSI) Soil Geochemical Atlas of England and Wales was consulted to determine background topsoil concentrations of lead, nickel and arsenic.

Lead
The site is in the 70-80th percentile for lead concentrations in the surface soil (64-83mg/kg), meaning sample concentrations in this area are higher than in 70% of samples and lower than 20% of samples in other areas.

Nickel
The site is in the 90-100th percentile for nickel concentrations in the surface soil (39.37-469mg/kg), meaning sample concentrations in this area are higher than in 90% of samples in other areas.

Arsenic
The site is in the 90-100th percentile for arsenic concentrations in the surface soil (30.23 to 820mg/kg), meaning sample concentrations in this area are higher than in 90% of samples in other areas.

The UKSO Soil Geochemistry maps for lead, nickel and arsenic are presented in Appendix F.

8.5 Environmental Health Officer Liaison

The UKSO geochemistry demonstrates that the location of Bodicote and wider area of Banbury and Cotswolds have high levels of metals in the surface soils.

There was no significant made ground underlying the site, and where present the made ground was predominantly reworked topsoil containing inert inclusions such as brick. Therefore, the concentrations identified are considered likely to be background, or naturally occurring, rather than associated with a significant anthropogenic source of contamination.

BSL liaised with the Local Authority Environmental Health Officer (EHO), Mr Trevor Dixon, at Cherwell District Council to establish if there are any specific guidance, precedents or concessions with regards to assessing the risks from metals, particularly arsenic, within the District, which occur at elevated background concentrations. Their response is summarised below;

- No specific guidance was available at the time.
- The EHO is aware of elevated background concentrations of arsenic in the area.
- The concentrations identified on site are not uncommon and can be much higher within the District.
- The presence of elevated arsenic does not always lead to remediation, or soil removal.
  The Environmental Health has on occasion requested bioaccessibility testing to better understand the risks posed.
- No site-specific advice or guidance could be offered at the time.

8.6 Summary – Human Health Risk Assessment

Based on the testing and assessment undertaken it would appear that there is localised nickel and lead contamination, and pervasive arsenic contamination within the made ground, topsoil and shallow natural soils.

There is no identified anthropogenic source of the metals, for example ash, coal, clinker within the made ground, and the arsenic occurred at higher concentrations within the natural soil. Farming practices, such as application of fertilizers or muck spreading, may have contributed to arsenic concentrations in the shallow soils, however the elevated concentrations are considered to be primarily due to a background, naturally occurring source.

The metals pose a potential risk to human health and will require further consideration.

The lead in WS01 is a hotspot and poses a risk to site end-users which should be mitigated by removal of the source or pathway.

The nickel was a localised exceedance within the natural clay at TP06 (0.15-0.9m bgl). The chemical data was compared with generic screening criteria for residential with gardens end-use, which is 130mg/kg. The location of TP06 is in a proposed area of public open space (POS). If the nickel concentration in TP06 at 0.6m is compared with the screening criteria for a residential POS end-use, it no longer exceeds the screening criteria. Therefore, based on the current development layout, the nickel is not considered a significant risk.

The arsenic is pervasive throughout the shallow topsoil, made ground and natural soils and poses a potential risk to site end-users which may require remedial action to remove the source or modify or remove the pathway. Currently the total arsenic concentrations have been determined, however the risk to human health is dependent on the bioavailable fraction of the total.

8.7 Arsenic Modelling

Due to the widespread presence of exceedances of total arsenic in the soils, further detailed assessment has been undertaken to determine the risk. Following receipt and assessment of the total arsenic results following the main investigation, and discussion with the EHO, BSL returned to site to obtain additional targeted samples and have undertaken Physiologically Based Extraction Testing (PBET) bioaccessibility analysis on three samples.

The testing revealed the bioaccessible fractions to be between 1.7% and 5.3%. To understand how the bioavailability of the arsenic and thus the risk would respond to bioaccessibility fractions, BSL has modelled the bioavailability for the arsenic, utilising the formula RBA_{soil} = 0.874 * IVBA – 0.028, where IVBA is the in-vitro bioaccessibility. Results are summarised in the table below:

Strata Type	Screening Value (Residential w/ Home Grown Produce) mg/kg	Total Arsenic Range (mg/kg)	Bioavailable Arsenic at 5.3% Bioaccessibility (mg/kg)
MADE GROUND / Topsoil	37	93 – 140	4.2 – 6.5
Natural Clay and Sand	37	150 – 310	6.9 – 14.3

Adopting the **worst case** 5.3% bioaccessibility, the bioavailable concentrations of arsenic within all samples of topsoil, made ground and natural soils fall below the screening value of 37mg/kg. Given this, it is not

thought that the arsenic concentration recorded in the soils will cause significant risks to human health and no remedial measures are considered to be required.

Sensitivity Analysis
Taking the worst case bioaccessibility fraction recorded by the PBET analysis, it is possible for total arsenic concentrations in the soil to reach circa. 800mg/kg and still be within acceptable limits.

Utilising the maximum concentration recorded on-site (310 mg/kg), a bioaccessibility in excess of 13.6% would be required before the bioavailable soil concentrations would exceed the screening value.

Based on this sensitivity analysis of the PBET and total arsenic results, it is likely that any variation of total arsenic or bioaccessibility would remain within acceptable limits, given an increase of over 2.5x the worst-case recorded on-site total arsenic or bioaccessible fraction would be required to result in an exceedance of human health the screening criteria.

8.8 Controlled Waters Risk Assessment

Elevated background concentration of metals, primarily arsenic, have been identified in the made ground and natural soils underlying the site. As the metal contamination is indicated to be naturally occurring, with no significant anthropogenic sources identified and no other identified contaminants, the site is not considered to pose a significant risk to controlled waters.

The site is underlain directly by a Secondary (A) Aquifer; however, it is not in a Source Protection Zone and there are no groundwater abstraction points or surface water features in the vicinity. The natural ground conditions typically comprise an unsaturated sand layer overlying a clay aquiclude overlying the weathered limestone, no groundwater was encountered to depths of up to 4.0m bgl.

Whilst there are exceedances in soil concentrations, these are not considered to represent a significant risk of pollution of controlled waters as there is no evidence of artificial accumulations of these substances on the site and it is likely these substances originate from the natural geology.

Based on the investigation works undertaken to date and subject to agreement with the Environment Agency, the site is not considered to pose a significant risk to controlled water for the following reasons:

- The highest arsenic concentrations were recorded in the natural soils, the made ground was generally reworked natural topsoil containing rare anthropogenic inclusions such as ceramic and brick.
- No anthropogenic sources of these contaminants were identified during the ground investigation and are likely to be representative of naturally occurring background concentrations. It would be unviable and disproportionate to consider removing all soils with elevated arsenic from the site.
- There is no indication under present conditions of pollution of controlled waters and conditions following development of the site will not be any worse, indeed they may improve with increased hard cover and water retaining imported garden soils.
- There are no watercourses within 500m, providing considerable distance for attenuation and contaminant degradation.
- The site does not lie within 500m of an SPZ.
- There are no groundwater abstractions within 950m.
- There are no potable (sensitive) water abstractions within 1000m.

8.9 Permanent Ground Gas and Vapours Results

Five ground gas monitoring visits have been carried out between the dates of 1st and 18th November 2020. A further one visit is scheduled. Results are summarised in the table below:

	CH_4 (%)		CO_2 (%)		O_2 (%)		CO (ppm)		H_2S (ppm)		TVOC (ppm)		Flow	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Peak	0.1	0.1	0.9	5.8	11.8	19.7	0.0	0.0	0.0	0.0	NA	NA	0.1	0.4
Steady	0.1	0.1	0.6	5.2	11.8	20.0	0.0	0.0					0.1	0.2

Notes: CH_4 = Methane; CO_2= Carbon dioxide; O_2= Oxygen; CO= Carbon Monoxide; H_2S= Hydrogen Sulphide; TVOC (PID)= Total Volatile Organic Compounds (as measured with Photo Ionisation Detector); ppm= Parts Per Million.

No methane was recorded, and therefore the limit of detection of 0.1% v/v was used. The highest carbon dioxide concentrations were recorded in WS01 (5.8% v/v) on the third visit. The maximum flow of 0.4 l/hr was recorded in WS02 on the second visit. In a number of locations, no flow was recorded and therefore the limit of detection of 0.1% v/v was used.

The atmospheric pressure ranged between 982mb and 1022mb during periods of steady and falling pressure.

Groundwater levels were recorded within the response zones in WS02 and WS07 on the second and third visits, with water recorded in WS01 on visit 4.

8.10 Ground Gas Risk Assessment

In order to assess the ground gas situation and the requirement for ground gas precautionary measures at the site, guidance was taken from CL:AIRE Research Bulletin RB17 and CIRIA C665 'Assessing risks posed by hazardous ground gases to buildings' and BS8485:2015+A1:2019 'Code of Practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'.

Given that the site is within an area requiring full radon protection measures, it is likely that radon protection will give good resistance to ground gas ingress.

As the proposed end-use is for low rise residential, guidance dictates that the gas monitoring results should be assessed in accordance with the Boyle and Witherington.

The Boyle and Witherington methodology uses the concept of a Gas Screening Value (GSV) which is derived using the following equation: (max gas concentration / 100) x maximum flow.

Generally, no positive flows were encountered, however a maximum positive steady flow of 0.2l/hr was used to derive worst-case GSVs. The GSV's for the site are presented below.

Gas	GSV (l/h)	Typical Threshold Concentration Exceeded	Classification
Methane	0.0002	No	Green
Carbon Dioxide	0.0116	No	Green

The GSV for carbon dioxide place the site the site into Green classification of the Boyle and Witherington Traffic Light System as outlined in CIRIA C665, as generally concentrations of carbon dioxide were below 5% v/v on-site and limited methane was recorded. However, in WS01 in the south-west of the site, concentrations of carbon dioxide greater than 5% v/v were recorded consistently on all monitoring visits where monitored, with the exception of visit 5, and therefore locally Amber 1 conditions would prevail.

However, the requirement for radon protection measures across the site would mitigate against the elevated carbon dioxide levels in this area.

Confirmation of the classification will be made following completion of the current monitoring period.

8.11 Potable Water Supply

The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR.

8.12 Qualitative Risk Assessment

The CSM has been revised based on the findings of the site investigation and laboratory testing results and these are presented overleaf. Unless stated otherwise, in respect to off-site sources, only risks that are assessed as moderate and above within the preliminary CSM have been carried forward to this section, or where a previously unidentified potential source, pathway and / or receptor has been identified from the recent site works.

Human Health						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
On site Made Ground and Natural Soils Arsenic	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	Total arsenic was encountered above its respective residential screening value in all tested samples, encountered in the made ground, topsoil and shallow natural soils. Given that there was no identified anthropogenic source, the majority of the site is greenfield, and elevated levels were encountered in natural soils, the arsenic is considered to be naturally occurring. The UKSO geochemical atlas confirms the site is in the 90-100th percentile for background arsenic concentrations in the soil. However, following completion of supplementary bioaccessibility testing this has shown that the bioavailable fractions of arsenic are between 1.7% and 5.3%. Utilising the maximum recorded fraction as the most cautious outcome brings the concentrations of arsenic below their respective screening criteria for residential with home grown produce and therefore risks are considered to be low.
On site Made Ground Lead	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	Significantly elevated lead was encountered within one sample of made ground, encountered in WS01 in the south-west of the site. This reading was far higher than the surrounding levels, which were all below residential screening values, and statistical analysis has confirmed this sample to be a statistical outlier, or hotspot. Once this sample is removed, the true mean of the lead concentration is below the screening criteria. As well as this, the material was encountered between ground level and 0.25m bgl in an area where demolition of the current structures and development will occur and therefore it's likely that this material will be removed. Finally, the location is in an area of proposed road, and therefore the area will be covered in hard standing, which will block pathways for site end-users. Given the above, it's unlikely that site end-users will come into contact with this material and risks are considered to be low.
On site Natural Soil Nickel	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	Elevated nickel was encountered in TP06, in natural clay between 0.15m and 0.90m bgl, in the north-west of the site, which exceeded the screening criteria for residential with plant uptake end-use (130mg/kg). However, the proposed layout indicates the north of the site, including the location of TP06, is intended to be utilised for public open space. Utilising the residential POS screening value for nickel (230mg/kg), there would be no exceedances. The risk is considered to be low.

Human Health						
Potential Source	**Potential Pathway**	**Potential Receptor**	**Likelihood**	**Severity**	**Level of Risk**	**Justification**
On site Made Ground Other metals, PAHs, asbestos	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	With the exception of the metals described in the CSM above, no other contaminants were identified, and no asbestos was detected. Made ground encountered was minimal in thickness, comprised predominantly of reworked natural soil and topsoil with minor anthropogenic inclusions. Due to the lack of contamination, it is unlikely that the made ground will affect site end-users and the risk is considered to be low.
On site Made Ground Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Unlikely	Mild	Low	No significant anthropogenic contamination was encountered on-site and therefore risks are considered to be low. However, any possible contaminants within the soil/groundwater could potentially attack the clean potable water supply pipe, predominantly metals. Contaminants should be assessed in accordance with the relevant guidance to determine the correct pipe material and level of precautions required.
Made Ground Ground Gas (carbon dioxide and methane)	Migration into confined spaces, inhalation and asphyxiation/ explosion	End-users / property / structures	Low likelihood	Medium to Severe	Green	Gas results are interim, but ground gas levels recorded at the site were generally low, with no methane recorded and carbon dioxide levels of <5% v/v. Therefore, given the typically low concentrations of gases and lack of significant positive flows, gas risks place the site in Green category (Low risk). However, carbon dioxide levels of over 5% were encountered in WS01 in the south-west of the site on all possible visits and therefore this area would locally be classified as Amber 1. Radon protection measures will mitigate any gas risks on-site. The full gas assessment will be update following completion of the monitoring programme.
Natural Geology Radon	Migration into confined spaces, inhalation	End-users	Likely	Medium	Moderate	BR 211 (2007) radon advice indicates full radon protection measures are required.
Farm Buildings Metals, PAHs, asbestos	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Unlikely	Medium	Low	No specific contamination associated with either the historic lodge or farm buildings was encountered, and therefore it's unlikely that these sources will present a risk to site end-users. The risk is considered to be low.

Controlled Waters						
Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk	Justification
Made Ground and Natural Soils Metals	Leaching through unsaturated zone / Migration through saturated zone	Secondary (A) Aquifer (Groundwater)	Low likelihood	Medium	Low	Elevated background concentration of metals, primarily arsenic, have been identified in the made ground and natural soils underlying the site. As the metal contamination is indicated to be naturally occurring, with no significant anthropogenic sources identified and no other identified contaminants, the site is not considered to pose a significant risk to controlled waters. As well as this, there are no groundwater or potable water abstractions, Source Protection Zones, surface water features or rivers near to the site, allowing significant distance for attenuation and degradation of any contaminants. The aquifer is not considered to be sensitive. In some locations, relatively impermeable clays were encountered, predominantly in the south of the site, which would inhibit migration of contaminants. By virtue of the development taking place, this should contribute to an overall "betterment" of groundwater quality. The risk considered to be low.
Farm Buildings Metals, PAHs	Leaching through unsaturated zone / Migration through saturated zone	Secondary (A) Aquifer (Groundwater)	Unlikely	Medium	Low	No significant contamination associated with the farm buildings was encountered and therefore the risk to controlled waters is considered to be low.

8.13 Outline Remedial Measures

The level of protection for the clean potable water supply pipes should be determined using the local water company risk assessment criteria in accordance with UKWIR. This was beyond the scope of work.

One lead hotspot was identified in the shallow made ground in WS01. This area will be covered in hardstanding post-development and is likely to be removed during site preparation. Removal of the hotspot (or pathway) will mitigate the risk to end-users.

One exceedance of the residential with homegrown produce screening criteria for nickel was recorded in TP06 within the natural clay, however this assumes the elevated nickel is widespread and present in proposed gardens. The dataset within the natural soils specifically is limited however only one exceedance was recorded from all the samples tested. The current proposed layout indicates the location of TP06 is within a POS and comparison of the concentration with the higher criteria for POS indicates that it does not pose a risk.

Arsenic was elevated in all samples, including made ground, topsoil and natural strata. The arsenic is indicated to be naturally occurring, and indeed the concentrations in the natural soils are higher than in the made ground and topsoil.

As it appears that elevated arsenic is a regional issue, rather than a site specific one, BSL liaised with the EHO at the local council, who advised that concentrations such as the ones recorded are not atypical for the area. They stated that often no remedial measures are required in this situation, as background levels are so elevated, and it would not be cost-beneficial [or sustainable] to enforce a requirement for clean cover / removal of soils across the entirety of the Bodicote area. The EHO made an outline recommendation that supplementary bioaccessibility testing for the arsenic is carried out, and if the accessibility is low, then it is likely that the topsoil and shallow made ground would fall below the screening values and no further action would be required.

Following completion of PBET testing and further assessment, as outlined in Section 8.7, it is not considered that remediation of the elevated arsenic is required, as the bioaccessibility of the tested samples was low and bioavailable fractions were well below the screening criteria.

If required, prior to import or re-use of clean cover soils, they should be tested to confirm chemical suitability. After installation of the clean cover, soil depths should be verified by a suitably qualified independent geo-environmental engineer, such as BSL.

In order to minimise the volume of material that is treated or removed the target level should be set using Quantitative Risk Assessment. This will justify keeping the maximum volume of material on site possible and/or keeping to a minimum amount of soil treated, thereby minimising remediation cost.

Ground Gas Protection Systems
Full radon protection is required for new buildings in this area. Utilising CL:AIRE RB17, where the below criteria are met, with the exception of providing radon protection measures, no other mitigation requirements are needed.

- There are no credible sources and pathways for landfill gas migration from an off-site landfill.
- The site has not been a registered landfill.
- Made ground is generally less than 3m thick, and less than a maximum of 5m thick.
- Total organic carbon testing does not exceed 4% for made ground or 6% for made ground in place for over 20 years.
- Made ground soils are present.

- Radon protection measures are required.

Gas monitoring is ongoing, however monitoring to date has revealed that the prevailing gas results indicate the site falls into the NHBC Green classification, as carbon dioxide has generally been recorded at less than 5%v/v. No protection measures are required with respect to ground gas (carbon dioxide and methane) and where elevated gas levels were recorded (WS01 in the south of the site), radon protection measures will provide sufficient mitigation.

Note that If the installation of the membrane is not verified by a suitably qualified independent engineer in accordance with CIRIA C735, then this will score 0 points and the criteria will not be met. This may have serious implications in terms of achieving regulatory sign off, potentially causing costly delays and potentially placing end users of the site and the structure at risk.

All installations should be subject to verification. The verifier should be independent, competent and suitably trained; BSL can provide this service. We recommend validation requirements should be discussed with the Local Authority prior to installation.

General
It is recommended that the approval of the Regulators (Local Authority /NHBC / Environment Agency) is obtained in regard to the above prior to any irrevocable action is taken at the site. In particular, focus should be on the widespread elevations of arsenic.

Once the above bodies have approved the above outline remedial proposals, a Remedial Strategy and a Verification Plan for Ground Gas Protection Measures will need to be produced to meet planning requirements and submitted to the regulatory authorities for approval. This will also give guidance to enable a suitably qualified contractor to carry out the works.

In addition, the writing and approval of a Materials Management Plan (MMP) or suitable exemptions/permits will be required to allow re-use of suitable material at the site if required.

A watching brief is recommended during groundworks for any unidentified sources of contamination. If any gross contaminated material is encountered works should cease in that area and BSL consulted.

Once remediation is complete, verification reports will need to be produced by a suitably qualified independent geo-environmental engineer, such as BSL, in order to achieve regulatory sign off.

8.14 Health and Safety Issues

During the reclamation and construction phases of the site development it will be necessary to protect the health and safety of site personnel. The risk to construction and ground workers is assessed in the table below:

Potential Source	Potential Pathway	Potential Receptor	Likelihood	Severity	Level of Risk
Made Ground (heavy metals, PAHs, petroleum hydrocarbons)	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Likely	Medium	Moderate
Ground gas	Inhalation in confined spaces/trenches	Construction Workers	Low likelihood	Severe	Moderate

Localised lead and nickel was identified in the made ground and natural soils, posing a moderate risk to site workers who are exposed to the soil. The risk from made ground will be mitigated by standard PPE including gloves. Welfare facilities should be made available to wash before hand to mouth activities.

It is noted that concentrations of carbon dioxide (an asphyxiant) in the soil exceed HSE Workplace Exposure Limits for personnel in the working environment of 1.5% for short term (15 minutes) exposure and/or 0.5% for long term exposure. Furthermore, soil concentrations of oxygen are below the HSE recommendations of 18%.

Soil gas concentrations are not necessarily reflected by those in the breathing zone, all contractors and maintenance workers should be made aware of the possible presence of carbon dioxide and should take all necessary health and safety precautions when working in trenches or confined spaces.

General guidance on these matters is given in the Health and Safety Executive (HSE) document "Protection of Workers and the General Public during the Redevelopment of Contaminated Land". In summary, the following measures are suggested to provide a minimum level of protection:

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

8.15 Asbestos

The investigation of asbestos issues within structures was beyond the scope of this report. However, guidance from UK Government indicates that asbestos should be assumed to be present in buildings unless proven otherwise.

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

Excavations in soils containing asbestos should comply with the CL:AIRE publication 'Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials' (CARSOIL) and CAR 2012. All such works will need to be agreed with the regulatory bodies (HSE and/or LA).

Additional guidance is provided within the BSL methodology Guidance Note in Appendix A.

9.0 WASTE SOIL CLASSIFICATION & ASSESSMENT

9.1 Summary

BSL have undertaken a preliminary assessment of potential excavation waste to arise from the site during redevelopment to:

- Classify the excavation waste to arise as either hazardous or non-hazardous.
- Identify the most sustainable options for the wastes to arise in accordance with the waste hierarchy.
- Provide a written description of the waste required as part of the Duty of Care.
- Provide details of "hazardous properties" to complete hazardous waste consignment note (where applicable).
- Be able to provide a basic classification report to a landfill operator (where waste is destined for landfill disposal).

9.2 Waste Classification Procedure

As described in the 'Waste Duty of Care Code of Practice (2016)' any substance or object that the holder discards, intends to discard or is required to discard is a waste. It is the responsibility of the waste producer to classify this waste. The classification process is described in the 'Guidance on the classification and assessment of waste' WM3 and aims to determine whether the waste is Hazardous or Non-Hazardous to human health and the environment.

Hazardous wastes are signified by entries where the code is followed by an asterisk, where some wastes are deemed hazardous without further assessment, which are termed "Absolute Entries" e.g. most waste oils. Alternatively, waste entries are termed "Mirror" entries that require further assessment of hazardous properties, in order to determine whether they are hazardous waste or not (e.g. soil and stones). The EWC codes relevant to excavation wastes are:

- 17 05 03* - soil and stones containing dangerous substances.
- 17 05 04 – soil and stones other than those mentioned in 17 05 03.

The Landfill Directive (Directive 1999/31/EC on the landfilling of waste, Decision 2003/33/EC and Landfill Regulations 2005) led to the establishment of a methodology for classifying wastes.

Wastes first need to be classified based on their total concentrations and classified as either hazardous or non-hazardous waste. WAC testing is only required if the end disposal route is a landfill and WAC analysis must not be used for waste classification.

Wastes can only be accepted at a landfill if they meet the relevant Waste Acceptance Criteria (WAC) for that type of landfill. A waste must comply with the WAC limits for the relevant landfill, otherwise the soil will need to be pre-treated. There are three different WAC criteria, these are:

- Inert waste.
- Stable Non-Reactive Hazardous Waste (SNRHW).
- Hazardous waste.

There are no standard set of WAC limits for non-hazardous landfill sites and each non-hazardous landfill will have its own set of criteria under which it is licenced to accept non-hazardous waste. These will need to be determined through the selected waste receiver prior to disposal.

A non-hazardous waste should not be compared with WAC limits for hazardous or SNRHW waste sites and the WAC test should only be used to determine if the waste is suitable for disposal at an inert waste landfill site. Likewise, wastes classified as hazardous based on their total concentrations should not be compared with WAC limits for inert waste landfill sites, as these will not be accepted.

Details of how material should be classified for waste disposal are presented in the BSL Methodology and Guidance in Appendix A and are summarised in the table below:

	PRIOR TO LEAVING SITE			
Classification based on Total Concentrations[1]	**Non-Hazardous Waste**		**Hazardous Waste**	
	IF SOILS CANNOT BE RE-USED ELSEWHERE AND MUST GO TO LANDFILL			
WAC testing	Below inert WAC limit values	Above inert WAC limit values	Below hazardous WAC limit values[4]	> WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.
4 Possibility that wastes could be classified as stable Nonreactive HAZARDOUS waste in non-hazardous Landfill (e.g. soils containing low concentrations of asbestos, gypsum or sulphate bearing soils).

Waste classified as non-hazardous can be accepted into a non-hazardous landfill without having to pass any numerical WAC.

Soils above hazardous WAC limit values require pre-treatment prior to disposal. The effective pre-treatment, typically involving separation, sorting and screening, can offer cost savings through reducing the hazardous nature and volumes of soil. Costs for disposal of non-hazardous/hazardous soils are significant compared to the disposal of inert material.

Inert Waste
The possibility of automatic inert classification of the naturally occurring "clean" soils should be explored in accordance with Section 4.3 of the EA guidance document. The Council Decision includes a list of wastes in Section 2.1.1 of the document that are assumed to be inert and therefore acceptable at a landfill for inert waste without testing. This is the case if:

- They are single stream waste of a single waste type (although different waste types from the list may be accepted together if they are from a single source); and
- There is no suspicion of material or substances such as metals, asbestos, plastics, chemicals, etc to an extent which increases the risk associated with the waste sufficiently to justify contamination and they do not contain other classes of landfill.

9.3 Waste Classification and Waste Acceptance Criteria (WAC)

We have reviewed the testing results and assessed them through a waste classification database which allows users to code and classify waste as defined in the EWC (European Waste Catalogue) based on EC Regulation 1272/2008 on the Classification, Labelling and Packaging of Substances and Mixtures (CLP) and latest Environment Agency guidance (WM3 "Guidance on the classification and assessment of waste - Technical Guidance").

Ten samples were tested to assess whether they contained any contaminants in the hazardous range when screened against assessment criteria within WM3 using the HazWasteOnline tool.

The Waste Classification Report is presented in Appendix G.

Based on the waste classification database assessment, all soils have been classified as **non-hazardous.**

General
If any gross hydrocarbon contaminated material is encountered during the construction phase, it is possible that this may be classified as hazardous and testing should be undertaken at that time.

Where it is necessary to dispose material off site it is recommended that materials are segregated and sufficient time is allowed to further classify the actual soil arisings that constitute the waste, including discussion with landfill sites and waste transfer stations to find the best disposal route. It is illegal to dilute and mix soils without a suitable permit.

9.4 Re-use of Soils

By definition in law, any material excavated from the ground becomes waste at the moment of excavation. If that soil (now a "waste") is then placed on another part of the development site (or used on another development site) without an appropriate materials management plan, permit or exemption being in place, by law this material is defined as "illegally deposited waste".

Landfill tax rules allow HM Revenue & Customs (HMRC) to recover landfill tax on illegally deposited waste on construction sites. This could lead to excessive costs without the correct documentation in place. In addition, a person who makes, knowingly causes or knowingly facilitates a disposal to be made at an unauthorised site is also liable to pay Landfill Tax.

In order to comply with UK legislation and avoid excessive costs, if the re-use of soils is proposed on site, this should be done in accordance with the relevant exemptions or permits in place.

In WS01 in the south of the site, contaminated gravel surfacing with elevated lead concentrations was encountered. At present, it is not thought to pose a risk to site end-users following development, as the material will likely be covered or removed from site. However, if it is proposed that this material is excavated and retained for re-use on-site, it is recommended that the material be segregated and additional sampling and testing undertaken, to ensure re-use will not put site end-users at risk. If re-use is proposed, then the re-use will require a Materials Management Plan (MMP).

Soils Re-use Under DoWCoP
One of the main industry mechanisms for allowing the re-use of soils in construction is the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE DoWCoP) also known as a Materials Management Plan (MMP). Further guidance is provided in the BSL Methodology and Guidance in Appendix A.

To implement the DoWCoP (for Route A), there is a requirement to notify the Environment Agency and Local Authority of the intention to use the code of practice in principal, after which there is a 21-day notice period for their response.

In order to re-use soils under the DoWCoP, there are four key criteria that need to be met:

- The aims and objectives of the project meet the requirements of the Waste Framework Directive (does not harm human health or the environment).
- The soils can be demonstrated to be suitable for use (backed up by chemical/geotechnical testing and assessment).
- There is certainty of use (planning consents are in place alongside materials tracking, which should be in place as part of good site practice in any case).

- Quantity (the quantity of materials used should be known).

Information on existing site levels, proposed levels, volumes generated (e.g. foundation / drainage excavation arisings) would need to be known in order to complete the MMP.

If the DoWCoP is the chosen route, the MMP should be in place and declared by a Qualified Persons (QP) before works commence, otherwise excavated soils could constitute an illegal deposit of waste and enforcement action could be taken by the EA and HMRC.

The declared MMP should be amended as new import sources are added.

Once the project is complete, a verification report detailing soils re-use/import will need to be produced and submitted to CL:AIRE, which may be subject to a random audit process. Sites found to be non-complaint with the CoP can be referred to the EA for further investigation.

Regardless of implementing re-use under the code of practice or not, all sites should have some form of materials tracking in place in compliance with current legislation. Any re-use scheme should also be designed to minimise disposal costs.

In terms of the re-use of the gravel surfacing, the DoWCoP does cover aggregates, but only on the site of origin, and the EA WRAP aggregate Quality Protocol might best apply to ensure quality standards, which are discussed further below.

Soils Re-use under Exemptions and Permits
Other potentially suitable options to allow the re-use and/or import of soils and aggregates on site are provided in the table below:

Re-use Mechanism	Description
U1 Exemption	Can be applied to re-use/import of soils and stones, but only up to 1000 tonnes or for brick and concrete up to 5000 tonnes. This is usually an efficient way to re-use small volumes of waste materials. However, only one U1 can be filled in per site in any 3-year period. Quick and free via online registration.
WRAP Quality Protocols	Describes how processed demolition arisings can be removed from regulatory waste regime. Requires a demonstration of appropriateness by: • Factory Production Control Manual. • Facility Permit (or Exemption). • Grading Analysis.
Waste Framework Directive (WFD) exclusion	In regard to "clean" naturally occurring soils only that are to be re-used on their site of origin, these are covered by a Waste Framework Directive (WFD) exclusion which is an EA regulatory position statement. So long as the project can prove the four criteria listed above for the DoWCoP, then permits or the DoWCoP are not required. However, many projects still use the CoP to ensure compliance.
T5 Screening and blending of waste	The T5 exemption allows you to temporarily treat waste on a small scale to produce aggregate or soil at a particular location, such as a construction or demolition site. The limit is 5,000 tonnes. This applies to: • Screening soil on a demolition site to remove wood and rubble. • Blending soil and compost that has been produced under an exemption on a construction site to produce better soil for landscaping on that site (e.g. peaty deposits). • Crushing waste (except bricks, tiles and concrete) before screening or blending • Grading waste concrete after it has been crushed to produce a certain type of aggregate.
T7 Exemption	The T7 allows treatment of waste bricks, tiles and concrete by crushing, grinding or reducing in size. This needs to be registered with the Local Authority.

Re-use Mechanism	Description
Other Permitting Routes	Other options include use under an Environmental Permit (Standard or Bespoke Rules), however these may be a time consuming and costly route, where use of the other above options (if applicable) are likely to be more feasible in construction.

10.0 CONCLUSIONS

10.1 Geo-Environmental

Geo-Environmental – Human Health
Testing of the made ground and shallow natural soils at the site revealed widespread arsenic contamination across the site, as well as localised exceedances of lead in the south of the site (WS01) and nickel in the north-west of the site (TP06).

No exceedances of PAHs, petroleum hydrocarbons, BTEX or MTBE compounds were encountered on-site.

No asbestos was encountered within any of the samples tested.

There is a low risk to site end-users posed from bioavailable arsenic concentrations encountered in the made ground, topsoil and shallow natural soils.

Risks from the localised lead hotspot and localised nickel exceedances in WS01 and TP06 respectively are both considered to pose a low risk to site end-users based on current site levels and development layout.

Ground gas monitoring has revealed a maximum peak carbon dioxide concentration of 5.8%v/v and no recorded methane concentrations. Ground gas monitoring is ongoing however at this stage BSL do not consider carbon dioxide concentrations to typically exceed 5% v/v and the GSV places the site in NHBC Green Category.

However, full radon protection measures are a requirement in new buildings on the site, which would be sufficient to mitigate the potential ground gas risk.

Geo-Environmental – Controlled Waters
The overall risk to controlled waters is considered to be low and no further action is required.

Waste
Waste classification for the made ground and natural soils at the site has revealed the soils to be non-hazardous.

10.2 Geotechnical

Foundations
The most suitable foundations for the proposed development are strips, founding on the natural limestone gravel strata at a minimum depth of 0.45m bgl in the north and eastern areas of the site, and deeper in the southern area, to bear on similar weathered marlstone strata.

Characteristic bearing capacities for the weak marly limestones are upwards of 500kN/m^2, where clays would give a circa 110kN/m^2 at minimum depths of 0.90m bgl.

Floor slabs
Suspended or ground bearing floor slabs may be adopted at the site.

Concrete classification
Classification of the made ground and natural soils show prevailing sulphate class DS-1 and ACEC Class AC-1 conditions.

Highways
CBR's of 60% are likely to be achievable in undisturbed natural granular soils, and 3-5% in natural clay soils for pavement design purposes, unless proven otherwise by in-situ testing.

Drainage (SUDS)
Given the infiltration rates recorded on-site, it is likely that soakaway drainage will be suitable on-site.

10.3 Further Work

The following further work is considered necessary to progress the site to construction phase:

- Completion of ground gas monitoring programme.
- Issue gas assessment / update gas assessment within this report.
- Design of Remedial Strategy and confirmation with the Local Authority, if required.
- Demolition Asbestos survey.
- Tree survey by qualified arboriculturist.
- Detailed foundation design by a structural engineer, including foundation zonation plan and depth schedule.
- Production of Ground Gas Protection Measures Verification Plan, if required.
- Production of Materials Management Plan (MMP) under the CL:AIRE DoWCoP, if required.
- Implementation of the Remedial Strategy and verification of the remedial works.

11.0 ABBREVIATIONS AND DEFINITIONS

GLOSSARY	
Term / Abbreviation	**Definition**
AST	Above Ground Storage Tank.
B(a)P	Benzo (a) Pyrene.
BGS	British Geological Survey.
BRE	Building Research Establishment.
BS	British Standard.
BSL	Brownfield Solutions Ltd.
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes.
CBR	California Bearing Ratio (used in pavement/highways design).
CAR 2012	Control of Asbestos Regulations (2012).
CBCB	Cheshire Brine Compensation Board.
CBCD	Cheshire Brine Compensation District.
CBR	California Bearing Ratio.
CIEH	Chartered Institute of Environmental Health.
CIRIA	Construction Industry Research Association.
CL:AIRE	Contaminated Land: Applications in Real Environments.
CLEA	Contaminated Land Exposure Assessment.
CLO	Contaminated Land Officer.
COMAH	Control of Major Accident Hazards.
Contamination	Presence of a substance which is in, on or under land, and which has the potential to cause significant harm or to cause significant pollution of controlled water. There is no assumption in this definition that harm results from the presence of the contamination. Naturally enhanced concentrations of harmful substances can fall within this definition of contamination. Contamination may relate to soils, surface water, groundwater or ground gas.
Controlled Waters	Inland freshwater (any lake, pond or watercourse above the freshwater limit), water contained in underground strata and any coastal water between the limit of highest tide or the freshwater line to the three-mile limit of territorial waters.
CPT	Cone Penetration Test.
CSM	Conceptual Site Model. A schematic hypothesis of the nature and sources of contamination, potential migration pathways (including description of the ground and groundwater) and potential receptors, developed on the basis of the information from the preliminary investigation and refined during subsequent phases of investigation and which is an essential part of the risk assessment process. The conceptual site model is initially derived from the information obtained by the preliminary investigation (i.e. the Phase I Desk Study). This conceptual model is used to focus subsequent investigations, where these are considered to be necessary, in order to meet the objectives of the investigations and the risk assessment. The results of intrusive investigations can provide additional data that can be used to further refine the conceptual site model.
DCP	Dynamic Cone Penetrometer.
DNAPL	Dense Non-Aqueous Phase Liquid.
DoWCoP	Definition of Waste Code of Practice.
DWS	Drinking Water Standard.
EA	Environment Agency.
EHO	Environmental health Officer.
EQS	Environmental Quality Standard.
GAC	Generic Assessment Criteria.

GLOSSARY	
Term / Abbreviation	**Definition**
GDR	Geotechnical Design Report.
GFR	Geotechnical Feedback Report.
GIR	Ground Investigation Report.
GSV	Gas Screening Value.
Harm	Adverse effect on the health of living organisms, or other interference with ecological systems of which they form part, and, in the case of human health, including property/structures and water supply pipelines.
Hazard	Inherently dangerous quality of a substance, procedure or event.
HDPE	High Density Polyethylene.
HSV	Hand Shear Vane.
K	Modulus of Subgrade Reaction.
LCRM	Land Contamination: Risk Management (EA guidance).
LNAPL	Light Non-Aqueous Phase Liquid (petrol, diesel, kerosene).
LOD	Limit of Detection (for particular method adopted).
MMP	Materials Management Plan.
Mv	Modulus of Volume of Compressibility.
ND	Not Detected.
NHBC	National House Building Council.
NR	Not Recorded.
OS	Ordnance Survey.
PAH	Polycyclic Aromatic Hydrocarbon.
Pathway	Mechanism or route by which a contaminant comes into contact with, or otherwise affects, a receptor.
PCB	Poly-Chlorinated Biphenyl.
PCSM	Preliminary Conceptual Site Model.
pH	Scale used to specify how acidic or basic a water-based solution is.
PHC	Petroleum Hydrocarbons.
PID	Photo Ionisation Detector.
PNEC	Predicted No-Effect Concentration.
Precision	Level of agreement within a series of measurements of a parameter.
PSD	Particle Size Distribution.
PVC	Polyvinyl Chloride.
Receptor	Human health, living organisms, ecological systems, controlled waters (surface waters and groundwater within aquifers), atmosphere, structures and utilities that could potentially be adversely affected by contaminant(s).
Risk	Probability of the occurrence, magnitude and consequences of an unwanted adverse effect on a receptor.
Risk Assessment	Process of establishing, to the extent possible, the existence, nature and significance of risk.
Sampling	Methods and techniques used to obtain a representative sample of the material under investigation.
SOM	Soil Organic Matter.
Source	Location from which contamination is, or was, derived. This could possibly be the location of the highest soil, groundwater or gas concentration of the contaminant(s).
SPT	Standard Penetration Test.
SVOCs	Semi Volatile Organic Compounds.
TOC	Total Organic Carbon.
TPH CWG	Total Petroleum Hydrocarbon (Criteria Working Group).

GLOSSARY	
Term / Abbreviation	**Definition**
TVOCs	Total volatile organic compounds.
UCS	Unconfined Compressive Strength.
Uncertainty	Parameter, associated with the result of a measurement that characterises the dispersion of the values that could reasonably be attributed to the measurement.
UST	Underground Storage Tank.
UXO	Unexploded Ordnance.
VCCs	Vibro Concrete Columns.
VSCs	Vibro Stone Columns
VOCs	Volatile Organic Compounds.
WAC	Waste Assessment Criteria.
WFD (in waste context)	Waste Framework Directive.
WFD (in water context)	Water Framework Directive.
Units	**Definition**
°	Degrees
Φ	Phi angle (in degrees)
g/l	Grams per Litre
Km	Kilometres
kPa	Kilo Pascal (Equivalent to kN/m^2)
$KN/m^2/mm$	Kilo Newton per metered squared per millimeter
kN/m^2	Kilo Newtons per metre squared
kPa	Kilo Pascal (Equivalent to kN/m^2)
l/hr	Litres per hour
MJ/kg	Mega joule per kilogram
MN	Mega Newton
M^2/MN	Mega Newton per metre squared
M	Metres
m bgl	Metres Below Ground Level
m OD	Metres Ordnance Datum (sea level)
µg/l	Micrograms per Litre (parts per billion)
µm	Micrometre
mb	Millibars (atmospheric pressure)
mg/kg	Milligrams per kilogram (parts per million)
mg/m^3	Milligram per metre cubed
mm	Millimetre
ppb	Parts Per Billion
Ppm	Parts Per Million

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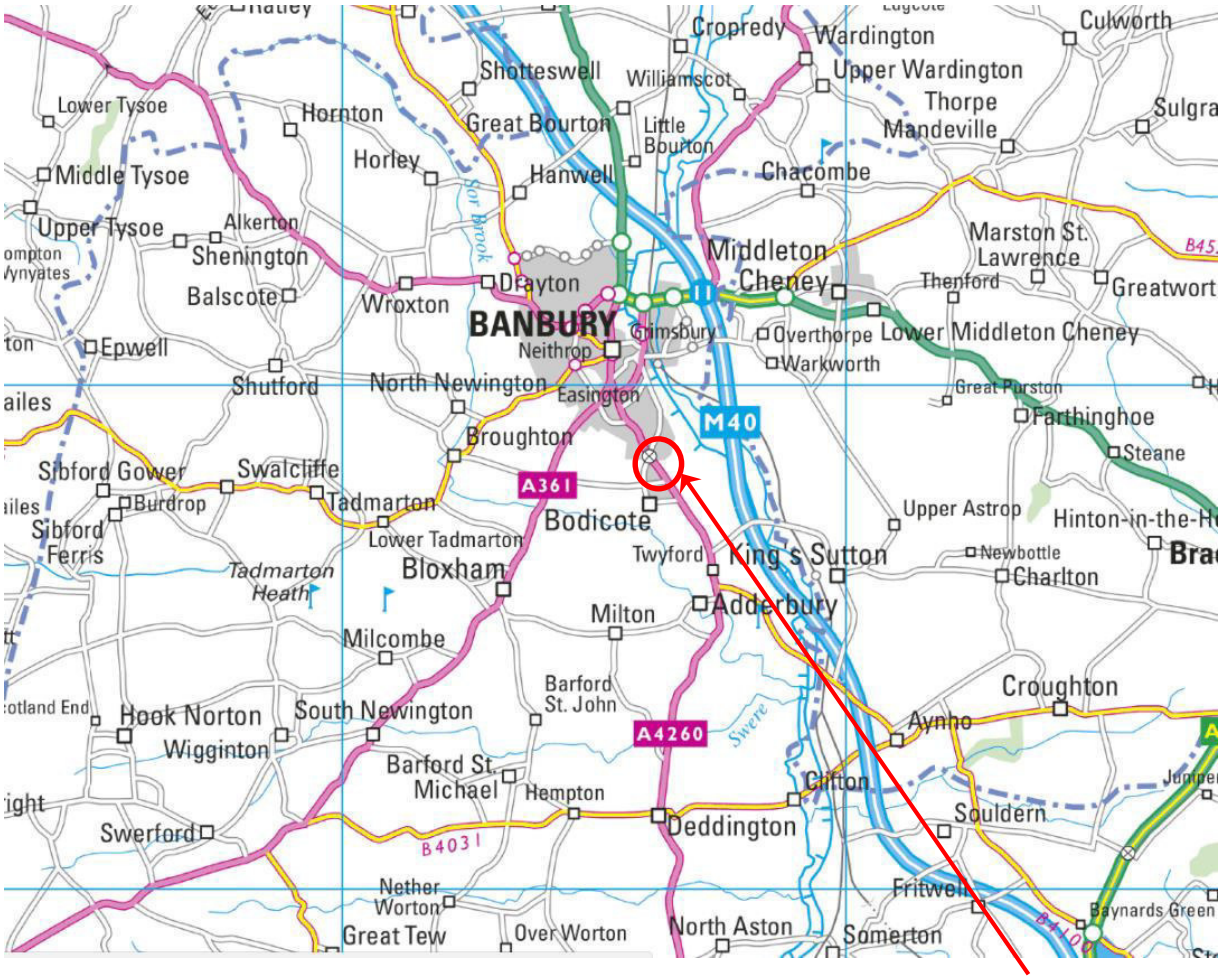
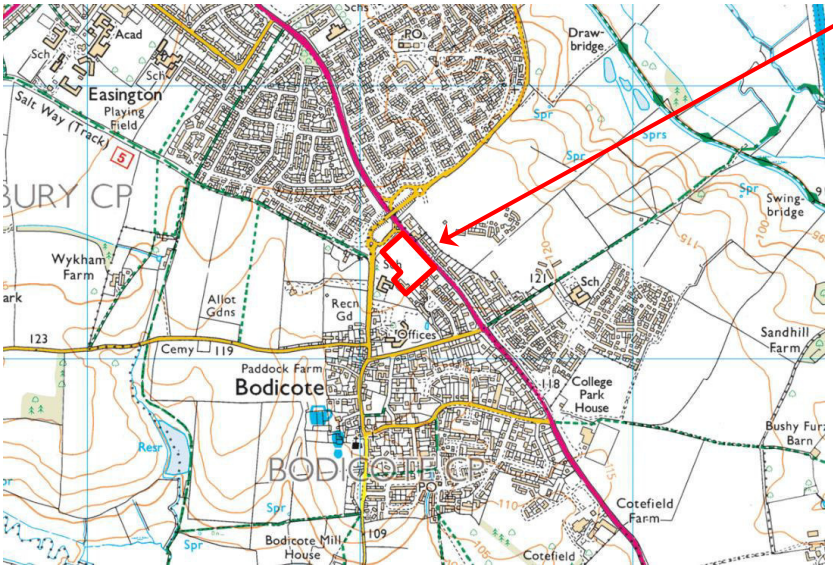
DRAWINGS





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HOLLINS STRATEGIC LAND
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Site Location Plan
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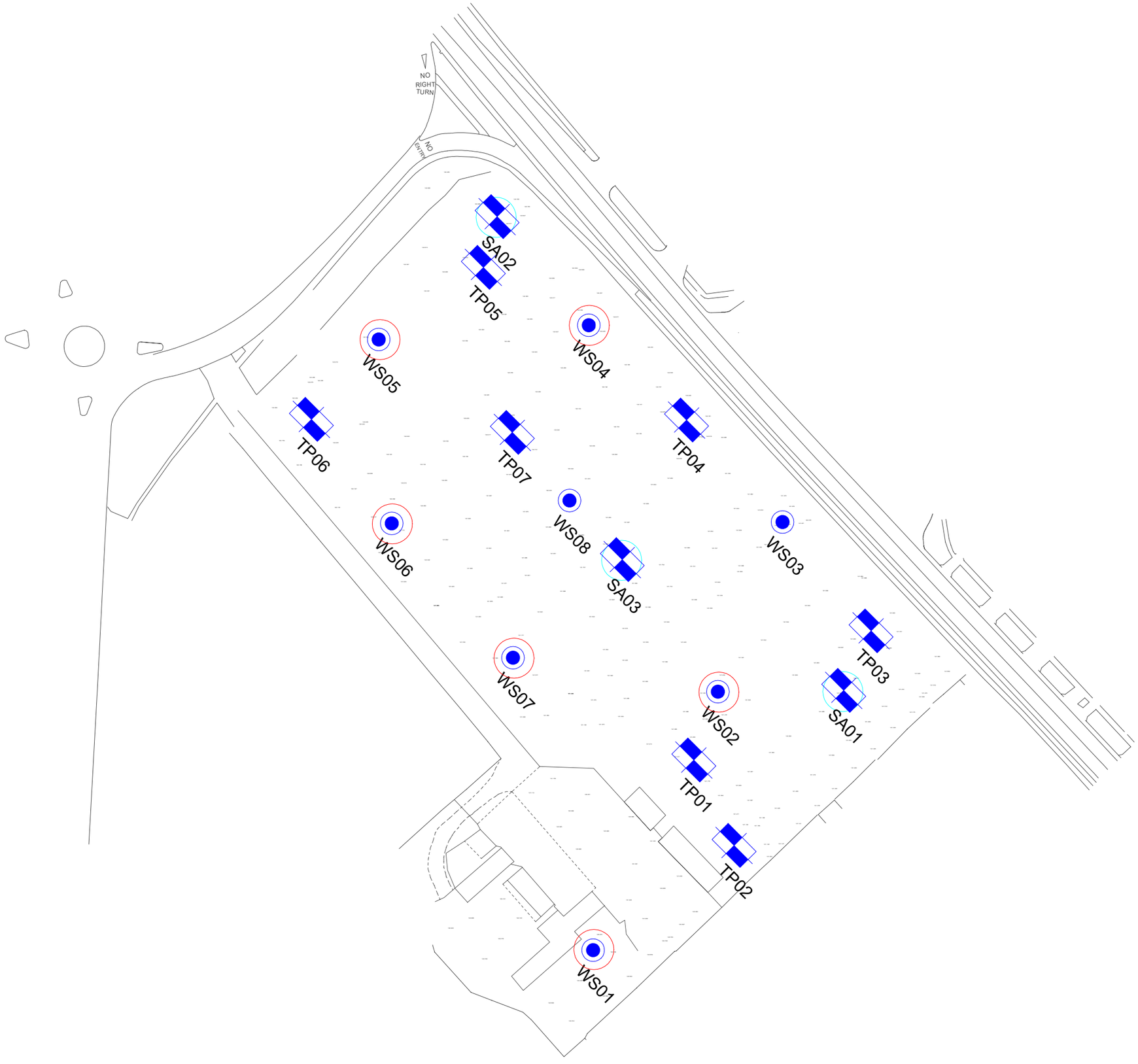

KEY

- TPXX — TRIAL PIT
- WSXX — WINDOW SAMPLE BOREHOLE
- SOAKAWAY INFILTRATION TEST
- BOREHOLE INSTALLATION

NOTES

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CLIENT

HOLLINS STRATEGIC LAND

PROJECT TITLE

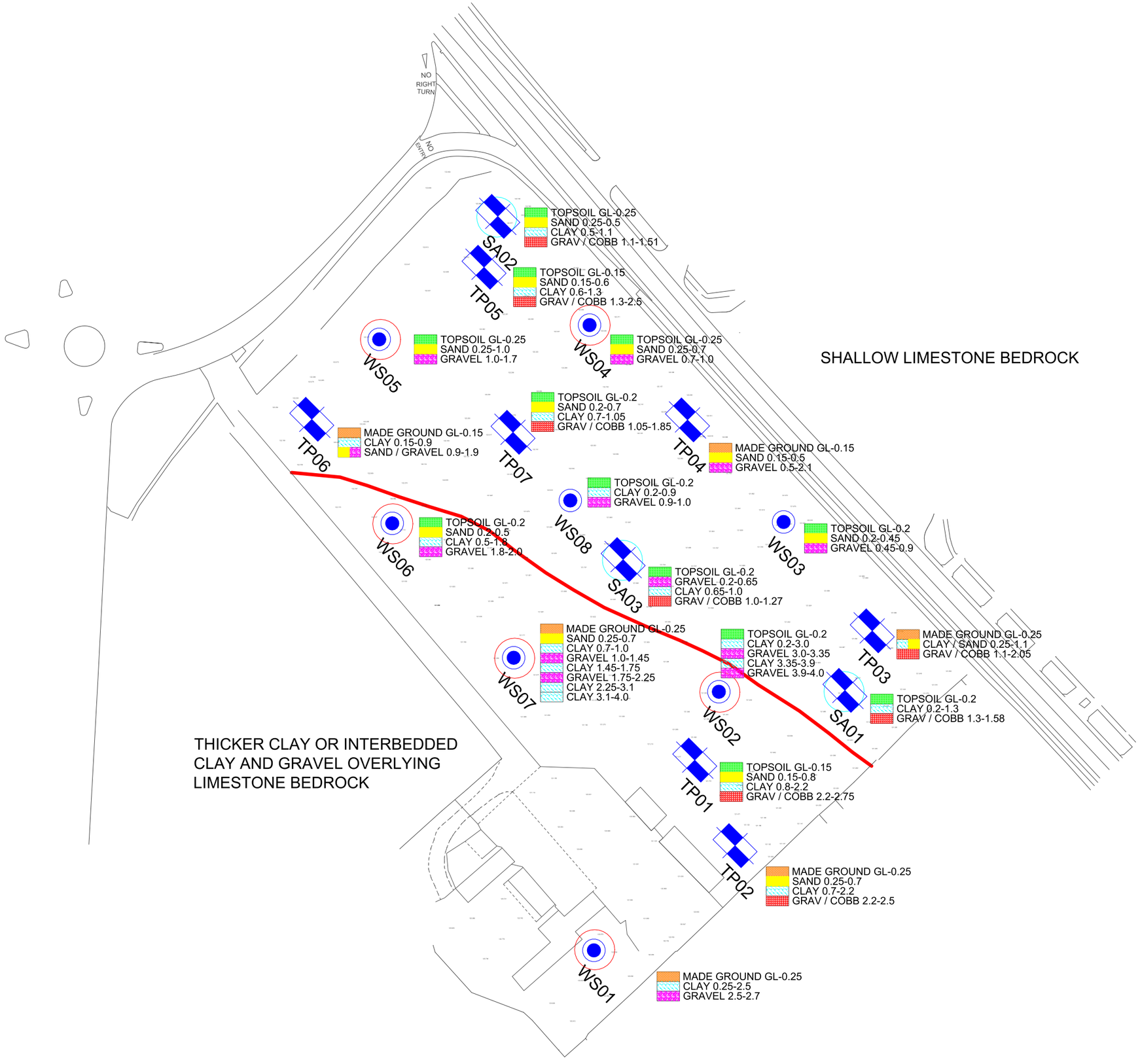
BODICOTE, OXFORDSHIRE

DRAWING TITLE

EXPLORATORY HOLE LOCATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C3797/02	-	NTS	15/09/20

DRAWN BY	CHECKED BY
JW	WG



KEY

- TPXX — TRIAL PIT
- WSXX — WINDOW SAMPLE BOREHOLE
- SOAKAWAY INFILTRATION TEST
- BOREHOLE INSTALLATION
- INFERRED BOUNDARY BETWEEN SHALLOW BEDROCK AND THICKER CLAY DEPOSITS

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GROUND CONDITIONS PLAN

DRAWING No.	REVISION	SCALE	DATE
C3797/03	-	NTS	20/10/2

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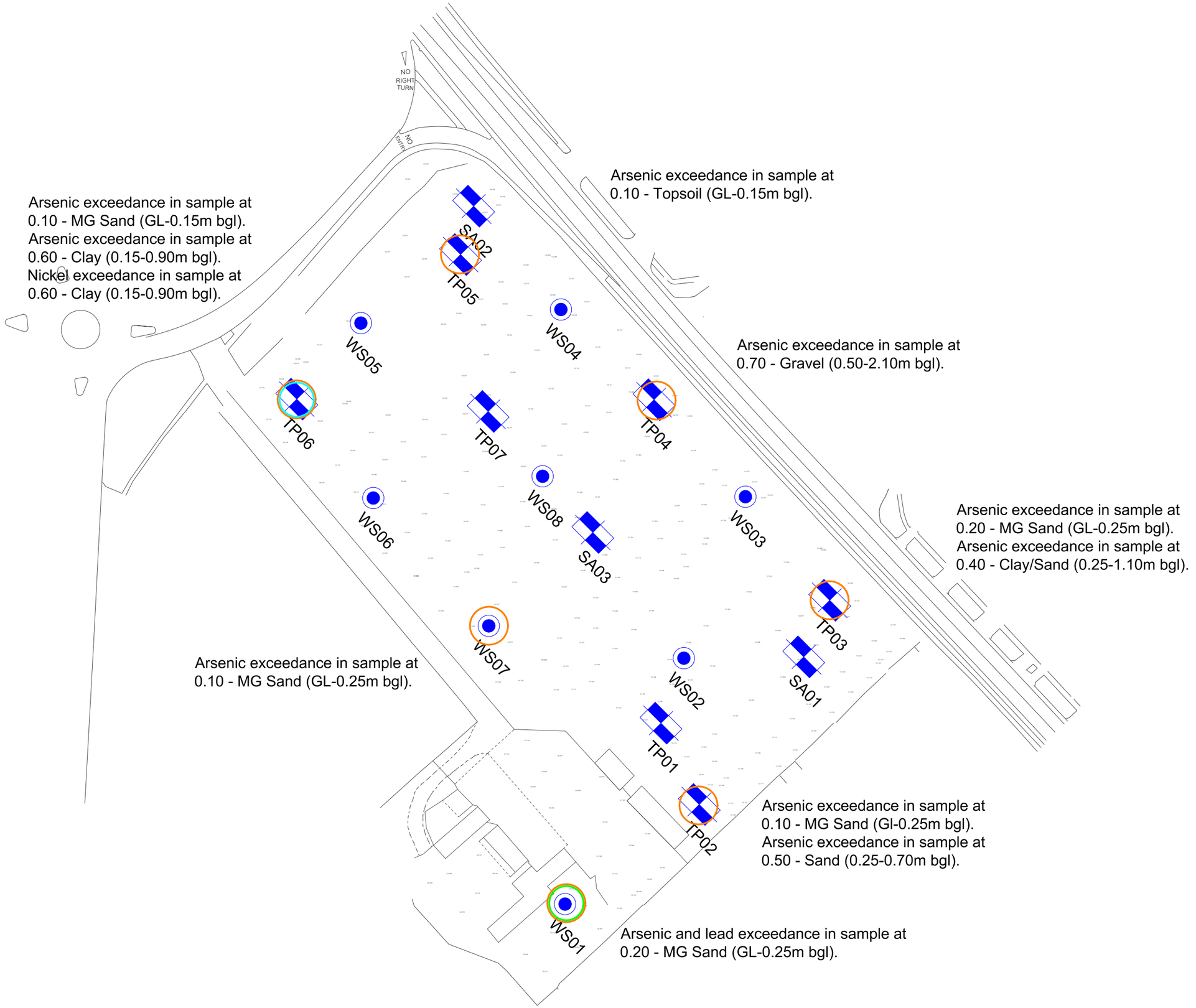

KEY

- TPXX — TRIAL PIT
- WSXX — WINDOW SAMPLE BOREHOLE
- ARSENIC EXCEEDANCE
- LEAD EXCEEDANCE
- NICKEL EXCEEDANCE

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PROJECT TITLE

BODICOTE, OXFORDSHIRE

DRAWING TITLE

CONTAMINATION PLAN

DRAWING No.	REVISION	SCALE	DATE
C3797/02	-	NTS	26/10/2

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APPENDIX A

BSL Methodology and Guidance

BSL Methodology and Guidance – Geo-Environmental Assessment Reports

This Appendix provides information on the approaches, methods and guidance used by Brownfield Solutions Ltd in the preparation of this report.

The term 'geo-environmental' is used to describe aspects relating to ground-related environmental issues (such as potential soils and groundwater contamination). The term 'geotechnical' is used to describe aspects relating to the physical nature of the site (such as foundation requirements). It should be noted that this is an integrated investigation and these two main aspects are related, unless otherwise specified within the report.

Desk Studies are written in broad agreement with BS 10175:2011+A2:2017. The first stage of a two-staged investigation and assessment of a site is the Preliminary Investigation (BS 10175:2011+A2:2017), often referred to as a Phase 1 Desk Study Assessment, comprising a 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+A2:2017.

Legislative Background

Environmental liabilities and risks have been evaluated in terms of a source -pathway - target relationship in accordance with the approach set out in:

- The 1995 Environment Act;
- The Contaminated Land (England) Regulations 2000;
- The DETR circular 02/2000 Environmental Protection Act 1990: Part IIA Contaminated Land.

Contaminated land is defined within the legislative framework as land which is in such condition by reason of substances in, on or under the land that:

1) Significant harm is being caused or there is a significant possibility of such harm being caused;
2) Significant pollution of controlled waters is being or is likely to be caused.

The potential for harm is based on the presence of three factors:

- **Source** - substances that are potential contaminants or pollutants that may cause harm;
- **Pathway** - a potential route by which contaminants can move from the source to the receptor;
- **Receptor** - a receptor that may be harmed, for example the water environment, humans and water.

Where a source, pathway and target are all present a pollutant linkage exists and there is potential for harm to be caused. The presence of a source does not automatically imply that a contamination problem exists, since contamination must be defined in terms of pollutant linkages and unacceptable risk of harm. The nature and importance of both pathways and receptors are site specific and will vary according to the intended end use of the site, its characteristics and its surroundings.

The key principle which supports the SPR approach is 'suitable for use' criteria. This requires remedial action only where contamination is considered to pose unacceptable actual or potential risks to health or the environment and, taking into account the proposed use of the site.

Relevant Guidance Documents
This report has been prepared in accordance with the list of guidance below however the list is not exhaustive:

- DETR Circular 02/2000, Contaminated Land: Implementation of Part IIA of the Environmental Protection Act 1990.
- CLR11 – Model Procedures.
- Brownfields – Managing the development of previously developed land – A client's guide, CIRIA 2002.
- DEFRA and Environment Agency publications CLR7 – 10, supported by the TOX guides and SGV guides, dated March 2002.
- Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the EPA1990, May 2002.
- Contamination and Environmental Matters - Their implications for Property Professionals (2nd Edition RICS Nov 2003).
- BS 10175:2011+A2:2017.

Relevant Legislative Documents
The following is a non-exhaustive list of legislative framework documents that has been considered in the production of this report:

- The Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance (2012).
- The Environment Protection Act (1990).
- The Water Resources Act (1991).
- The Environment Act (1995).
- The Contaminated Land (England) Act (2000).
- The Pollution Prevention and Control (England and Wales) Regulations (2000).
- The Landfill Regulations (England and Wales) Regulations (2002).
- The Landfill (England and Wales) (Amendment) Regulations (2004).
- Contaminated Land (England) Regulations (2012).
- Health and Safety at Work Act.

Contaminated Land Risk Assessment

Contaminated Land Risk Assessment is a technique that identifies and considers the associated risk, determines whether the risks are significant and whether action needs to be taken. The four main stages of risk assessment are:

Hazard Identification → Hazard Assessment → Risk Estimation → Risk Evaluation

CLR11 outlines the framework to be followed for risk assessment in the UK. The framework is designed to be consistent with UK legislation and policies including planning. The starting point of the risk assessment is to identify the context of the problem and the objectives of the process. Under CLR11, three tiers of risk assessment exist - Preliminary, Generic Quantitative and Detailed Quantitative.

Formulating and developing a conceptual model for the site is an important requirement of risk assessment, this supports the identification and assessment of pollutant linkages. Development of the conceptual model forms the main part of preliminary risk assessment, and the model is subsequently refined or revised as more information and understanding is obtained through the risk assessment process.

Risk is a combination of the likelihood of an event occurring and the magnitude of its consequences. Therefore, both the likelihood and the consequences of an event must be taken into account when assessing risk.

The risk assessment process needs to take into account the degree of confidence required in decisions. Identification of uncertainties is an essential step in risk assessment.

The likelihood of an event is classified on a four-point system using the following terms and definitions from CIRIA C552:

- **High likelihood**: There is a pollution linkage and an event 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 pollution linkage and all the elements are present and in the right place, which means it is probable that an event will occur. Circumstances are such that the event is not inevitable, but possible in the short term and likely over the long term;

- **Low likelihood**: There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain even over a longer period such event would take place, and is less likely in the short term;

- **Unlikely**: There is a pollution linkage but circumstances are such that it is improbable the event would occur even in the long term.

The severity is also classified using a system based on CIRIA C552. The terms and definitions are:

- **Severe**: Short term (acute) risk to human health likely to result in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. Short-term risk of pollution of sensitive water resources. Catastrophic damage to buildings or property. A short-term risk to a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
  Examples – High concentrations of contaminant on surface of recreation area, major spillage of contaminants from site into controlled waters, explosion causing building to collapse;

- **Medium**: Chronic damage to human health ('significant harm' as defined in DETR 2000). Pollution of sensitive water resources. A significant change in a particular ecosystem or organism forming part of that ecosystem (note definition of ecosystem in 'Draft Circular on Contaminated Land', DETR 2000);
  Examples - Concentrations of contaminants exceed the generic assessment criteria, leaching of contaminants from a site to a Principal or Secondary Aquifer, death of species within a designated nature reserve;

- **Mild**: Pollution of non-sensitive water resources. Significant damage to crops, buildings, structures and services ('significant harm' as defined in 'Draft Circular on Contaminated Land', DETR 2000). Damage to sensitive buildings, structures, services or the environment;
  Examples – Pollution of non-classified groundwater or damage to buildings rendering it unsafe to occupy.

- **Minor**: harm, not necessarily significant harm, which may result in financial loss or expenditure to resolve. Non-permanent health effects to human health (easily prevented by use of personal protective clothing etc). Easily repairable effects of damage to buildings, structures and services.

Examples – Presence of contaminants at such concentrations PPE is required during site work, loss of plants in landscaping scheme or discolouration of concrete.

Once the likelihood and severity have been determined, a risk category can be assigned using the table below.

		Consequences			
		Severe	Medium	Mild	Minor
Probability	Highly likely	Very high	High	Moderate	Moderate/low
	Likely	High	Moderate	Moderate/low	Low
	Low likelihood	Moderate	Moderate/low	Low	Very low
	Unlikely	Moderate/low	Low	Very Low	Very low
	No Linkage	No risk			

Definitions of the risk categories obtained from the above table are as follows together with an assessment of the further work that might be required:

- **Very high**: There is a high probability that severe harm could arise to a designated receptor from an identified hazard or there is evidence that severe harm is currently happening. This risk, if realised, could result in substantial liability. Urgent investigation and remediation are likely to be required;

- **High**: Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation is required and remedial works may be necessary in the short term and are likely over the longer term;

- **Moderate**: It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any such harm would be severe, or if any harm were to occur it would be more likely to be relatively mild. Investigation is normally required to clarify the risk and determine the liability. Some remedial works may be required in the longer term;

- **Low**: It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild;

- **Very Low**: There is a low possibility that harm could arise to a receptor. In the event of such harm being realised, it is not likely to be severe.

Some linkages may be identified which constitutes 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.

Ground Gas Guidance

Redevelopment on brownfield sites is an ever increasing occurrence, including those sites where a potential ground gas issue is present.

BS8485:2015+A1:2019 and CIRIA C665 is the current guidance which gives up-to-date advice on all aspects of ground gas. It outlines good practice in investigation, the collection of relevant data and monitoring programmes in a risk-based approach to gas contaminated land. Two semi-quantitative methods are set out for the assessment of risk:

1 For low rise housing with a ventilated under floor void at minimum 150 mm (Boyle and Witherington);
2 For all other development types (Wilson and Card).

Both methods use the concept of Gas Screening Values (GSVs) to identify levels of risk. The mitigation and management of potentially unacceptable risk is described with reference to both passive and active systems of gas. Source removal is also discussed as an option.

CIRIA C665 and the advice it contains has been prepared to be generally consistent with CLR11 *Model Procedures for the management of land contamination* (Defra and Environment Agency, 2004a). The aim of CIRIA C665 is a consistent approach to decision making, particularly relating to the scope of protective design measures on a site specific basis.

Legislative Framework
CIRIA C665 provides technical guidance however also recognises the context into which the guidance has to be employed. Government policy is based upon a "suitable for use approach", which is relevant to both the current and proposed future use of land. When considering the current use of land, Part IIA of the Environment Protection Act 1990 provides the regulatory regime. The presence of hazardous ground gases could provide the "source" in a "pollutant linkage" which could lead the regulator to determine that considerable harm or there is a significant possibility of such harm being caused. Under such circumstances, the regulator would determine the land to be "contaminated land" under the provisions of the Act, setting out the process of remediation as described in the DETR Circular 02/2000 *Statutory guidance on contaminated land* (DETR, 2000a).

Frequency and Duration of Monitoring
The monitoring period for a specific site covers the "worst case" scenario. A "worst case" scenario will occur during falling atmospheric pressure and, in particular, weather conditions such as rainfall, frost and dry weather.

The benefits of the additional information and whether it is likely to change the scope of gas protection should be considered, as are the consequences of failing to characterise adequately pollutant linkages. Investigations concerned with soil gas are required to provide monitoring data sufficient to allow prediction of worst case conditions enabling the confident assessment of risk and subsequent design of appropriate gas protection schemes. Monitoring programmes should not be an academic exercise in data collection.

Below are matrices that will aid in determining an appropriate number of gas monitoring visits and the length of monitoring period.

Typical/idealised periods of monitoring

		Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	1 month	2 months	3 months	6 months	12 months
	Moderate (Flats)	2 months	3 months	6 months	12 months	24 months
	High (Residential with Gardens)	3 months	6 months	6 months	12 months	24 months

Typical/idealised frequency of monitoring

		Generation of Potential Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4	6	6	12	12
	Moderate (Flats)	6	6	9	12	24
	High (Residential with Gardens)	6	9	12	24	24

Note

1 NHBC guidance also recommends this period of monitoring (Boyle and Witherington, 2007).
2 There is no industry consent over "high", "medium" or "low" generation potential of source.
3 At least two sets of readings should be at low and falling atmospheric pressure (but not restricted to periods below <1000 mb) known as worst case conditions. Historical data can be used as part of the data set (Table 5.5b).

It is recommended that newly installed monitoring wells are left for 24 hours to allow the soil gas to reach equilibrium. It should be recognised, however, that some soil gas regimes could take considerably longer (up to seven days). Interpretation of any initial readings should take this equilibrium process into account.

Contaminated Land Screening Values

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

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

Source-Pathway-Receptor

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

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

The purpose of using Tier 1 screening levels is to have a simple means of assessing the potential contamination of a site and to inform decisions on whether further investigation is warranted or whether an option to undertake clean up based on the data to hand is cost effective.

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

CLEA guidance has gone through a number of revisions, all of the original SGV's that were published have been withdrawn and publication of new SGV's commenced in 2009.

For determinands where no SGVs are available, S4UL values have been published using the CLEA 1.06 Model. These are the third set of generic assessment criteria generated by CIEH, and replace the previous two sets of GACs. The revised S4UL values are based on greater knowledge of relevant toxicology and further consideration of exposure frequencies.

No SGV or S4UL is available for lead as this is derived based on blood lead levels. C4SL values for six determinands including lead was published by DEFRA/CL:AIRE in December 2014 and they represent a low risk as opposed to minimal risk. The C4SL values are based on a sandy loam with 6% Soil Organic Matter. These screening values were published by DEFRA for Part 2A use, although with the dual purpose for use under planning. However these have not been officially accepted by Local Government for use under planning. S4ULs remain the first reference due to the broader range of end uses and soil organic content.

The preference from the EA is that site specific screening levels are used wherever possible. Due to numerous factors it is not always possible to utilise site specific values. In these instances the following data sources are used in the order of preference given below:

- CIEH S4UL values (derived by CIEH/LQM)
- DEFRA/CL:AIRE C4SL's
- CL:AIRE GAC values
- Current UK SGV's
- Guidance from other European countries
- Guidance from the outside Europe

Controlled Waters
The European Water Framework Directive (WFD) became UK law in December 2003. It was created to ensure that European countries manage their rivers, groundwater and lakes so that they stay healthy for people and for wildlife.

This is achieved by the use of chemical standards for surface waters and groundwater. These values describe concentrations of chemicals that are not expected to cause harm to environmental organisms or human health, provided they are not exceeded. The same chemical may have several standards for different environmental regimes, and for different protection objectives.

Statutory Standards are set in legislation and if exceeded, this constitutes non-compliance with statutory obligations. European Directives are implemented in England and Wales by corresponding statutory instruments (i.e. regulations). The statutory instruments can be the exact same standards as they appear in the Directive or be more stringent.

A number of non-statutory standards also exist, these are set by various organisations (including the EA) for chemicals that are considered to be of concern, but are not covered by any specific legislation.

The chemical standards used in the UK to control impaction of contamination on controlled waters are Environmental Quality Standards (EQS). The EQS's cover a large number of compounds.

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

Further Assessment

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

Source	Contaminant	Unit	Proposed End Use														
			Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
		SOM (%)	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
LQM S4UL	Arsenic	mg/kg	37	37	37	40	40	40	640	640	640	79	79	79	170	170	170
LQM S4UL	Cadmium	mg/kg	11	11	11	85	85	85	190	190	190	120	120	120	532	532	532
LQM S4UL	Chromium (III)	mg/kg	910	910	910	910	910	910	8600	8600	8600	1500	1500	1500	33000	33000	33000
LQM S4UL	Chromium (VI)	mg/kg	6	6	6	6	6	6	33	33	33	7.7	7.7	7.7	220	220	220
LQM S4UL	Copper	mg/kg	2400	2400	2400	7100	7100	7100	68000	68000	68000	12000	12000	12000	44000	44000	44000
C4SL	Lead	mg/kg	200	200	200	330	330	330	2300	2300	2300	760	760	760	1400	1400	1400
LQM S4UL	Mercury, Elemental	mg/kg	1.2	1.2	1.2	1.2	1.2	1.2	58	58	58	16	16	16	30	30	30
LQM S4UL	Nickel	mg/kg	180	180	180	180	180	180	980	980	980	230	230	230	3400	3400	3400
LQM S4UL	Selenium	mg/kg	250	250	250	430	430	430	12000	12000	12000	1100	1100	1100	1800	1800	1800
LQM S4UL	Zinc	mg/kg	3700	3700	3700	40000	40000	40000	730000	730000	730000	81000	81000	81000	170000	170000	170000
LQM S4UL	Phenol (total)	mg/kg	280	550	1100	750	1300	2300	760	1500	3200	760	1500	3200	760	1500	3200
LQM S4UL	Acenaphthene	mg/kg	210	510	1100	3000	4700	6000	84000	97000	100000	15000	15000	15000	29000	30000	30000
LQM S4UL	Acenaphthylene	mg/kg	170	420	920	2900	4600	6000	83000	97000	100000	15000	15000	15000	29000	30000	30000
LQM S4UL	Anthracene	mg/kg	2400	5400	11000	31000	35000	37000	520000	540000	540000	74000	74000	74000	150000	150000	150000
LQM S4UL	Benz(a)anthracene	mg/kg	7.2	11	13	11	14	15	170	170	180	29	29	29	49	56	62
LQM S4UL	Benzo(a)pyrene	mg/kg	2.2	2.7	3.0	3.2	3.2	3.2	35	35	36	5.7	5.7	5.7	11	12	13
LQM S4UL	Benzo(b)fluoranthene	mg/kg	2.6	3.3	3.7	3.9	4	4	44	44	45	7.1	7.2	7.2	13	15	16
LQM S4UL	Benzo(ghi)perylene	mg/kg	320	340	350	360	360	360	3900	4000	4000	640	640	640	1400	1500	1600
LQM S4UL	Benzo(k)fluoranthene	mg/kg	77	93	100	110	110	110	1200	1200	1200	190	190	190	370	410	440
LQM S4UL	Chrysene	mg/kg	15	22	27	30	31	32	350	350	350	57	57	57	93	110	120
LQM S4UL	Dibenz(a,h)anthracene	mg/kg	0.24	0.28	0.30	0.31	0.32	0.32	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4
LQM S4UL	Fluoranthene	mg/kg	280	560	890	1500	1600	1600	23000	23000	23000	3100	3100	3100	6300	6300	6400
LQM S4UL	Fluorene	mg/kg	170	400	860	2800	3800	4500	63000	68000	71000	9900	9900	9900	20000	20000	20000
LQM S4UL	Indeno(1,2,3,cd)pyrene	mg/kg	27	36	41	45	46	46	500	510	510	82	82	82	150	170	180
LQM S4UL	Naphthalene	mg/kg	2.3	5.6	13	2.3	5.6	13	190	460	1100	4900	4900	4900	1200	1900	3000
LQM S4UL	Phenanthrene	mg/kg	95	220	440	1300	1500	1500	22000	22000	23000	3100	3100	3100	6200	62000	6300
LQM S4UL	Pyrene	mg/kg	620	1200	2000	3700	3800	3800	54000	54000	54000	7400	7400	7400	15000	15000	15000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 5 - 6	mg/kg	42	78	160	42	78	160	3200	5900	12000	570000	590000	600000	95000	130000	180000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 6 - 8	mg/kg	100	230	530	100	230	530	7800	17000	40000	600000	610000	620000	150000	220000	320000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 8 - 10	mg/kg	27	65	150	27	65	150	2000	4800	11000	13000	13000	13000	14000	18000	21000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 10 - 12	mg/kg	130	330	760	130	330	770	9700	23000	47000	13000	13000	13000	21000	23000	24000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 12 - 16	mg/kg	1100	2400	4300	1100	2400	4400	59000	82000	90000	13000	13000	13000	25000	25000	26000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 16 - 35	mg/kg	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
LQM S4UL	Petroleum Hydrocarbons Aliphatic EC 35 - 44	mg/kg	65000	92000	110000	65000	92000	110000	1600000	1700000	1800000	250000	250000	250000	450000	480000	490000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 5 - 7	mg/kg	70	140	300	370	690	1400	26000	46000	86000	56000	56000	56000	76000	84000	92000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 7 - 8	mg/kg	130	290	660	860	1800	3900	56000	110000	180000	56000	56000	56000	87000	95000	100000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 8 - 10	mg/kg	34	83	190	47	110	270	3500	8100	17000	5000	5000	5000	7200	8500	9300
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 10 - 12	mg/kg	74	180	380	250	590	1200	16000	28000	34000	5000	5000	5000	9200	9700	10000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 12 -16	mg/kg	140	330	660	1800	2300	2500	36000	37000	38000	5100	5100	5000	10000	10000	10000
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 16 - 21	mg/kg	260	540	930	1900	1900	1900	28000	28000	28000	3800	3800	3800	7600	7700	7800
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 21 - 35	mg/kg	1100	1500	1700	1900	1900	1900	28000	28000	28000	3800	3800	3800	7800	7800	7900
LQM S4UL	Petroleum Hydrocarbons Aromatic EC 35 - 44	mg/kg	1100	1500	1700	1900	1900	1900	28200	28200	28200	3800	3800	3800	7800	7800	7900
LQM S4UL	Benzene	mg/kg	0.087	0.17	0.37	0.38	0.7	1.4	27	47	90	72	72	73	90	100	110
LQM S4UL	Toluene	mg/kg	130	290	660	880	1900	3900	56000	110000	180000	56000	56000	56000	87000	95000	100000
LQM S4UL	Ethyl Benzene	mg/kg	47	110	260	83	190	440	5700	13000	27000	24000	24000	25000	17000	22000	27000
LQM S4UL	Xylene - o	mg/kg	60	140	330	88	210	480	6600	15000	33000	41000	42000	43000	17000	24000	33000
LQM S4UL	Xylene - m	mg/kg	59	140	320	82	190	450	6200	14000	31000	41000	42000	43000	17000	24000	32000
LQM S4UL	Xylene - p	mg/kg	56	130	310	79	180	430	5900	14000	30000	41000	42000	43000	17000	23000	31000
CL:AIRE 2010	MTBE (methyl tert-butyl ether)	mg/kg	49	84	160	49	84	160	7900	13000	24000	49	84	160	49	84	160
LQM S4UL	Chloroethene (Vinyl Chloride)	mg/kg	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4
LQM S4UL	1,2-Dichloroethane (1,2-DCA)	mg/kg	0.0071	0.011	0.019	0.0092	0.013	0.023	0.67	0.97	1.7	29	29	29	21	24	28
LQM S4UL	1,1,1-Trichloroethane	mg/kg	8.8	1.8	39	9	18	40	660	1300	3000	14000	14000	14000	57000	76000	100000
LQM S4UL	1,1,2,2-Tetrachloroethane	mg/kg	1.6	3.4	7.5	3.9	8	17	270	550	11000	1400	1400	1400	1800	2100	2300
LQM S4UL	1,1,1,2-Tetrachloroethane	mg/kg	1.2	2.8	6.4	1.5	3.5	8.2	0.79	1.9	4.4	1400	1400	1400	1500	1800	2100
LQM S4UL	Tetrachloroethene (PCE)	mg/kg	0.18	0.39	0.9	0.18	0.4	0.92	19	42	95	1400	1400	1400	810	1100	1500
LQM S4UL	Tetrachloromethane (carbon tetrachloride)	mg/kg	0.026	0.056	0.13	0.026	0.056	0.13	2.9	6.3	14	890	920	950	190	270	400

			Proposed End Use														
Source	Contaminant	Unit	Residential with Homegrown Produce			Residential without Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
		SOM (%)	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6	1	2.5	6
LQM S4UL	Trichloroethene **(TCE)**	mg/kg	0.016	0.034	0.075	0.017	0.036	0.08	1.2	2.6	5.7	120	120	120	70	91	120
LQM S4UL	Trichloromethane (chloroform)	mg/kg	0.91	1.7	3.4	1.2	2.1	4.2	99	170	350	2500	2500	2500	2600	2800	3100
LQM S4UL	Chlorobenzene	mg/kg	0.45	1	2.4	0.46	1	2.4	56	130	290	11000	13000	14000	1300	2000	2900
LQM S4UL	1, 2 Dichlorobenzene	mg/kg	23	55	130	24	57	130	2000	4800	11000	90000	95000	98000	24000	26000	51000
LQM S4UL	1, 3 Dichlorobenzene	mg/kg	0.4	1	2.3	0.44	1.1	2.5	30	73	170	300	300	300	390	440	470
LQM S4UL	1, 4 Dichlorobenzene	mg/kg	61	150	350	61	150	340	4400	10000	25000	17000	17000	17000	26000	36000	36000
LQM S4UL	1, 2, 3 Trichlorobenzene	mg/kg	1.5	3.6	8.6	1.5	3.7	8.8	102	250	590	1800	1800	1800	770	1100	1600
LQM S4UL	1, 2, 4 Trichlorobenzene	mg/kg	2.6	6.4	15	2.6	6.4	15	220	530	1300	15000	17000	19000	1700	2600	4000
LQM S4UL	1, 2, 3, 4 Trichlorobenzene	mg/kg	0.33	0.81	1.9	0.33	0.81	1.9	23	55	130	1700	1700	1800	280	580	860
LQM S4UL	1, 2, 3, 4 Tetrachlorobenzene	mg/kg	15	36	78	24	56	120	1700	3080	4400	830	830	830	1500	1600	1600
LQM S4UL	1, 2, 3, 5 Tetrachlorobenzene	mg/kg	0.66	1.6	3.7	0.75	1.9	4.3	49	120	240	78	79	79	110	120	130
LQM S4UL	1, 2, 4, 5 Tetrachlorobenzene	mg/kg	0.33	0.77	1.6	0.73	1.7	3.5	42	72	96	13	13	13	25	26	26
LQM S4UL	Pentachlorobenzene	mg/kg	5.8	12	22	19	30	38	640	770	830	100	100	100	190	190	190
LQM S4UL	Hexachlorobenze	mg/kg	1.8	3.3	4.9	4.1	5.7	6.7	110	120	120	16	16	16	30	30	30

See LQM/CIEH S4ULs for Human Health Risk Assessment document for notes regarding derivation.

Re-Use Of Waste - Guidance Note

Definition of Waste
The Environment Agency considers waste to be *"...any material that is discarded, or intended to be discarded..."* This includes any soil from trenches, footing, site strip etc. It is no longer required in its original location, therefore it is considered to be waste.

CL:AIRE: Code of Practice
Where materials are excavated for construction purposes, wherever possible these should be retained on site for engineering purposes if they are suitable for use. This can be implemented under the CL:AIRE "Development Industry Code of Practice for the Definition of Waste" (CL:AIRE DoWCoP), also commonly referred to as a "Materials Management Plan".

The developer/contractor is advised to complete all works under the DoWCoP.

Potential scenarios where soils may be able to be re-used:

- Material capable of being used in another place on the same site without treatment.
- Material capable of being used in another place on the same site following ex-situ treatment on site.
- Material capable of being used in another development site without treatment (Direct Transfer).
- Material capable of being used in another development site following ex-situ treatment on another site eg Hub site.

The Code of Practice requires 4 No. Factors to be addressed:

1. Protection of human health and protection of the environment.
2. Suitability of use, without further treatment.
3. Certainty of use.
4. Quantity of material.

In order to satisfy these requirements the following are required:

i) Consultation/approval with Local Authority & Environment Agency to confirm they have no objections to the proposed re-use of waste soils, or the risk assessments for the site.
ii) Risk Assessments to demonstrate that the site does not present an Environmental Hazard.
iii) Remediation Strategy for contaminated sites (or Design Statement for non-contaminated sites).
iv) Materials Management Plan (MMP) which details material generated stockpiles and the end use.
v) Volume calculations.
vi) Planning permission for the development.
vii) Contractual details to be clear, regarding who steps in is a contractor goes into administration/liquidation.

The use of the CoP is effectively industry regulated, there is a requirement to appoint an independent Qualified Person (QP) who checks all the requirements have been met and registers the documentation with the Environment Agency. This person must not have had any involvement with the preparing of the risk assessments or remedial strategy on the site.
Soils which require treatment on site (eg bioremediation, stabilisation) will require an Environmental Permit for treatment, together with justification and validation to prove, once treated, this material is suitable for use.
Site management procedures need to be in place to ensure that material is tracked through from excavation stockpiling, treatment and remediation processes. Should the process of material tracking be considered non-robust, or not adhered to, this may fail the test whether excavated materials may be considered non-waste.

Waste Classification For Soils

Introduction

Waste producers have a duty of care to classify the waste they are producing:

- before it is collected, disposed of or recovered.
- to identify the controls that apply to the movement of the waste.
- to complete waste documents and records.
- to identify suitably authorised waste management options.
- to prevent harm to people and the environment.

The most sustainable and economic method of dealing with waste soil is usually the retention and re-use on site. Where this is not possible there are three main options for the disposal of soils:

1. Disposal to a permitted waste recycling facility.
2. Re-use on another site (subject to the suitability).
3. Disposal to a landfill site.

The disposal to a permitted facility will be subject to the **specific conditions of the permits for each individual facility** and will vary dependent on location and environmental sensitivity of the receiving site. Re-use on another site will also be subject to the acceptability criteria of that site.

The guidance below relates to disposal to **landfill sites only**.

Background for Landfill Disposal

In July 2005 the United Kingdom implemented the European Directive 1999/31/EC (The Landfill Directive), this introduced the current regime for waste and waste disposal to landfill. The Landfill Directive places controls on waste disposal. These controls include requirements to follow the waste acceptance procedures and criteria that have been agreed by the Council of the European Union and are laid out in Council Decision 2003/33/EC.

Before a waste can be accepted at a landfill site, the landfill **operator** must be satisfied that the waste meets his permit conditions, the waste acceptance procedures (WAP) and waste acceptance criteria (WAC).

If disposal to landfill is the best management option for the waste soils, these procedures **must** be followed or the operator may refuse to accept the waste.

Key Points

- Not all waste can be landfilled
- Landfills are classified according to whether they can accept **hazardous**, **non-hazardous** or **inert** wastes.
- Wastes can only be accepted at a landfill if they meet the waste acceptance criteria (WAC) for that class of landfill.
- Most wastes must be treated before you can send them to landfill.
- There are formal processes for identifying and checking wastes that must be followed before wastes can be accepted at a landfill site.

Classification

Wastes are listed in the European Waste Catalogue (EWC 2002) and grouped according to generic industry, process or waste types. Wastes within the EWC are either hazardous or non-hazardous. Some of these wastes are hazardous without further assessment (absolute entries) or are 'mirror' entries that require further assessment of their hazardous properties in order to determine whether they are hazardous waste.

Waste soil has mirror entries on the EWC and as such the first phase of the waste classification process is that of determining if the waste is hazardous or not i.e the hazard assessment. The most common EWC waste codes related to soil are:

17 05	**soil (including excavated soil from contaminated sites), stones and dredging spoil**
17 05 03*	soil and stones containing dangerous substances
17 05 04	soil and stones other than those mentioned in 17 05 03

Soils may contain certain contaminants (eg asbestos, oil,) which have prescribed concentration thresholds, that if breached will render the material hazardous waste. These are based on specific "hazardous properties" which include hazards such as carcinogenicity, flammability and toxicity.

In the first instance the concentrations of plausible contaminants within the soil should be identified and wastes should be **classified based on their total concentrations**.

Waste Definitions

Inert	• Will not undergo any significant physical, chemical or biological transformations. • Will not dissolve. • Will not burn. • Will not physically or chemically react. • Will not biodegrade. • Will not adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health. • Has insignificant total leachability and pollutant content. • Produces a leachate with an ecotoxicity that is insignificant (if it produces leachate).
Non-Hazardous	Is not inert (see above) Is not hazardous (see below)
Hazardous	Soil has hazardous properties as defined in WM3 (Guidance on the classification and assessment of waste (1st edition 2015)- Technical Guidance)
Stable Non-reactive hazardous waste#	Hazardous waste, the leaching behaviour of which will not change adversely in the long-term, under landfill design conditions or foreseeable accidents either: in the waste alone (for example, by biodegradation), under the impact of long-term ambient conditions (for example, water, air, temperature or mechanical constraints) or by the impact of other wastes (including waste products such as leachate and gas).

This option allows hazardous waste that is stable and thus has a low leaching potential to be deposited in cells with a standard of containment consistent with non-hazardous wastes.

WAC Testing

The purpose of WAC analysis is to confirm that the waste complies with the relevant WAC for the receiving landfill. If the waste has any disposal route other than a landfill site (e.g. recycling facility, incineration etc) the **WAC is not relevant.** Furthermore the WAC limits **cannot be used to make an assessment of whether a waste is hazardous**. WAC testing does however define if a non-hazardous waste is suitable for an inert landfill.

Classification based on Total Concentrations[1]	Non-Hazardous Waste		Hazardous Waste	
WAC testing	Below inert WAC limit values:	Above inert WAC limit values:	Below hazardous WAC limit values	Above hazardous WAC limit values
Landfill requirements	INERT landfill	NON-HAZARDOUS landfill[2]	HAZARDOUS landfill	PRE-TREATMENT[3]

1 Total concentrations are defined as tests results on solids as opposed to leachate (i.e. a liquid).
2 Individual sites may have certain limit values pre-determined in their licence.
3 After pre-treatment the material characteristics may have changed to an extent that allow the soil to be re-classified.

Hydrocarbons in Soils

WM3 uses the term Oil or Waste Oil to cover hydrocarbons products such as fuel oil, petrol or diesel. These are defined by WM3 as hazardous under an absolute entry in the List of Wastes. However hydrocarbons in soils are a mixture rather than a pure product and are therefore not absolute entries.

Known Oils

The simplest scenario is where the identity of the contaminating oil is known or can be identified. If the oil is known the manufacturer's or supplier's REACH compliant safety data sheet for the specific oil can be obtained and the hazard statement codes on that Safety Data Sheet can be used for the hazardous waste assessment.

Where the identity of the oil can only be identified down to a petroleum group level (i.e. the contaminating oil is known to be diesel, but the specific type/brand is unknown), then the classification of that petroleum group should be used in the assessment. The marker compounds associated with that petroleum group may be used to confirm carcinogenicity.

Oils may contain a range of hydrocarbons, so the presence of for instance Diesel Range Organics (DRO) does not enable the assessor to conclude that diesel is present. These hydrocarbons may have arisen from other oils, the laboratory needs

to provide an interpretation of the chromatograph to determine if it is consistent with diesel or weathered diesel as a whole.

The concentration of known oils should be determined using a method that as a minimum spans the range in which the carbon numbers for that known oil fall.

Unknown Oils

Where hydrocarbons are contaminating soils it is likely that the oil will be unknown or cannot be determined.

WM3 states that:

> For contaminated land specific consideration must be given to the following before proceeding;
>
> - The presence of other organic contaminants, for example solvents or coal tar that could be detected as hydrocarbons. Coal Tar is not an oil and is considered separately in WM3 example 2. Where the site history or investigation indicates the presence of hydrocarbons from oil and other sources (e.g. coal tar), and the origin of the hydrocarbons cannot reliably be assigned to either, then a worst case approach of considering the hydrocarbons both as waste oil (in accordance with this example) and from other sources, for example coal tar should be taken.
> - The presence of diesel, or weathered diesel, should be specifically considered by the laboratory and where this is confirmed by the hydrocarbon profile the oil should be assessed as a known or identified oil (diesel).

The use of **marker compounds** is optional; however it is recommended that where possible the marker compounds should be used. WM3 states:

> If the identity of the oil is unknown, and the petroleum group cannot be established, then the oil contaminating the waste can be classified as non-carcinogenic/mutagenic due to the presence of oil if all three of the following criteria are met:
>
> - The waste contains benzo[a]pyrene (BaP) at a concentration of less than 0.01% (1/10,000th) of the TPH concentration (This is the carcinogenic limit specified in table 3.1 of the CLP for BaP)
> - This has been determined by an appropriate and representative sampling approach in accordance with the principles set out in Appendix D of WM3, and
> - The analysis clearly demonstrates, for example by carbon bands or chromatograph, and the laboratory has reasonably concluded that the hydrocarbons present have not arisen from petrol or diesel.

For example:

TPH Concentration (mg/kg)	Petrol or Diesel	BaP (mg/kg)	Classification
10,000	No	0.9	Non- Hazardous
1,000	No	Not available	Hazardous
1,000	Yes	Not relevant	Hazardous

References

1. Environmental Permitting (England and Wales) Regulations 2010 (as amended) (EP Regulations), the Landfill Directive (1999/31/EC) and the subsequent Council Decisions.
2. Environment Agency Environmental Permitting Regulations: "Inert Waste Guidance- Standards and Measures for the Deposit of Inert Waste on Land" 2009.
3. Environment Agency "Waste acceptance at landfills - Guidance on waste acceptance procedures and criteria" Nov 2010.
4. Environment Agency "Guidance on the classification and assessment of waste (Technical Guidance WM3)".
5. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).
6. Directive 2008/98/EC of the European Parliament and of the Council of 19 November 2008 on waste and repealing certain Directives
7. 2014/955/EU: Commission Decision of 18 December 2014 amending Decision 2000/532/EC on the list of waste pursuant to Directive 2008/98/EC of the European Parliament
8. Environmental Permitting Guidance The Landfill Directive For the Environmental Permitting (England and Wales) Regulations 2010 Updated March 2010 Version 3.1
9. Classification, Labelling and Packaging of Substances Regulation (EC 1272/2008) (CLP).

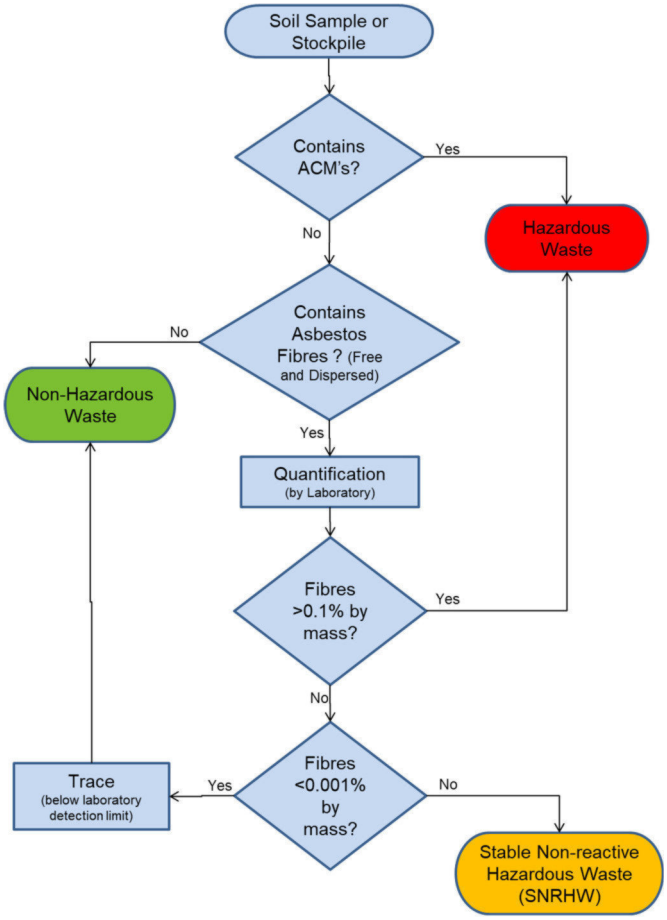
Additional Asbestos Guidance Notes

Disposal

The 1st Edition of WM3 "Guidance on the classification and assessment of waste", details the way in which Asbestos is assessed within soils.

The assessment of asbestos containing waste is dependent on whether the asbestos is present as:

- Fibres that are free and dispersed, or
- Identifiable pieces of asbestos containing materials (ACM's)



Identifiable pieces of asbestos are any particle of a size that can be identified as potentially being asbestos by a competent person if examined by the naked eye. The result is that commonly soils with visible ACM's are sorted and the ACM's removed by hand picking and separate disposal.

Asbestos concentrations below 0.001% by mass are below standard laboratory detection limits and are not currently regarded as containing asbestos for the purposes of disposal and may be disposed of to an inert landfill site[1]. These levels are often termed "trace" by laboratories.

Asbestos concentrations between 0.001% and 0.1% are stable non-reactive hazardous waste (SNRHW)[1]. Waste transfer stations where soil recycling takes place may be able to take SNRHW, but are unlikely to take soils containing asbestos above trace concentrations.

The following codes should be assigned to the asbestos waste as appropriate:

17 06	**Insulation materials and asbestos-containing construction materials**
17 06 01	Insulation materials containing asbestos
17 06 03	Other insulation materials consisting of or containing hazardous substances
17 06 04	Insulation materials other than those mentioned in 17 06 01 and 17 06 03
17 06 05	Construction material containing asbestos

WM3 indicates that 17 06 05 would normally be used in preference to 17 06 01 for the asbestos in asbestos contaminated soil and stones.

Construction materials containing asbestos and "*other suitable materials*" may be landfilled at landfills for non-hazardous waste in accordance with the Landfill Directive without testing.

This means that wastes that are only hazardous because of their asbestos content can be disposed of at landfills for non-hazardous waste in separate landfill cells that only accept asbestos wastes and other suitable materials. The Landfill Directive requires that stable non-reactive hazardous waste shall not be deposited with biodegradable waste (for example organic material, household waste, paper etc..) and must meet the waste acceptance criteria set out in accordance with Annex II.

Construction

Health and Safety Executive (HSE) guidance on asbestos is not directly related to soil and much of the guidance focuses on the removal of asbestos from buildings. The overarching legislation is the Control of Asbestos Regulation (CAR 2012). However where work involves (or is likely to involve) contact with asbestos then CAR 2012 requires a risk assessment including whether or not the work is licensed or notifiable non-licensed work and may require an Asbestos Management Plan. Work becomes notifiable if it is considered that the control limit could be exceeded.

Brownfield sites frequently have soils that contain asbestos and the presence of asbestos needs to be considered within the context of construction, particularly in relation to groundworks. The exposure of soils and the use of excavators and plant to move soil around increases the possibility of fibres becoming airborne. However it is good site practice to not generate dusts and to employ dust suppression on all sites regardless of the presence of asbestos.

The legal control limit for asbestos is 0.1f/ml over a continuous four hour period. The control limit is not a '*safe*' level and exposure from work activities involving asbestos must be reduced to as far below the control limit as possible.

Clearly the higher the concentrations in the soil the greater potential there is for fibres to be released, however IOM publication TM/88/14 "the release of dispersed asbestos fibres from soil" 1988 concludes that:

- Mixtures of asbestos in dry soils with asbestos content as low as 0.001% can produce airborne respirable asbestos concentrations greater than 0.1f/ml in dust clouds where the respirable dust concentrations are less than 5mg/m^3.
- An action limit is recommended of no higher than 0.001% asbestos in soils above which steps should be taken to minimise exposure to airborne fibres (eg by wetting).
- The addition of relatively small quantities (10%) of water can reduce the airborne fibre concentrations by an order of magnitude.

Where asbestos has been identified at concentrations above 0.001% as free and dispersed fibres in the soil precautions need to be adopted. Concentrations below this are considered to be normal background, although good site practice dictates that the generation of dusts should be avoided and therefore any fugitive fibre release from minor concentrations should be kept to a practical minimum.

End Use

The use of materials containing asbestos and material containing asbestos is prohibited under EU legislation. There is currently a Joint Industry Working Group (JIWG) tasked with producing a Code of Practice for Asbestos in Soil, Made Ground and Construction & Demolition Material that will clarify in due course the position of the various government agencies.

Asbestos containing materials can remain in situ under a suitable cover system which may be hardsurfacing or soft landscaping (with or without hard dig layers and markers).

There is a risk that future maintenance may compromise such systems and details of the presence of asbestos should be kept in the Health and Safety File.

Preliminary publications from JIWG (April 2015) provide guides for decision making in relation to construction. These are at a "Beta" test stage and further publications will be provided in due course.

The re-use of waste soils should be undertaken in accordance with the CL:AIRE Code of Practice and is subject to suitable risk assessments demonstrating low risk . There is nothing that specifically excludes the re-use of soils containing asbestos as fill to raise levels. However the movement of materials increases the risk of fibres becoming airborne and suitable precautions will be required.

The re-use of soils containing asbestos at concentrations above hazardous waste levels is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be feasible where there is a long program for implementation.

Asbestos in Soil as Free Fibres

Concentration (by weight)	Waste Disposal				Construction Issues	End Use	
	Recycle	Inert	SNR Hazardous	Hazardous		Suitable for re-use on site	Precautions
Not detected	√	√			No precautions necessary, however on a brownfield site asbestos not previously identified may be found during works and a statement within the contractors method statement for how they will deal with this unforeseen asbestos would be good practice to ensure compliance with CAR2012.	Yes	None
Trace (<0.001%)		√ [2]			Precautions are unlikely to be required, however a detailed method statement may be required to ensure compliance with CAR2012. Basic asbestos management good practice will be required. Typically precautions would include: • Ensuring soils do not dry out to become dusty. • Site personnel have the risk communicated at induction stage.	Yes Soils can be re-used under CL:AIRE CoP with the correct precautions in place.	Generally clean cover or hardstanding cover required.
0.001% – 0.099%			√		Contractor needs to produce an Asbestos Management Plan in accordance with CAR2012 as part of their method statement. Typical precautions would include: • Site personnel have the risk communicated at induction stage. • Ensuring personnel have suitable training. • Task monitoring to inform PPE requirements. • Ensuring soils do not dry out to become dusty and that misting is available during groundworks. • Separate stockpiling. • Clean haulage routes.	Possibly Soils may be able to be re-used under CL:AIRE CoP, subject to a satisfactory Risk Assessment and regulatory agreement with the correct precautions in place.	Clean cover or hardstanding cover required.
0.1+%				√	Contractor needs to produce an Asbestos Management Plan in accordance with CAR2012 as part of their method statement. Typical precautions would include: • Site personnel have the risk communicated at induction stage. • Ensuring personnel have suitable training. • Task monitoring to inform PPE requirements. • Site wide and or perimeter monitoring. • Ensuring soils do not dry out to become dusty and that misting is available during groundworks. • Separate stockpiling. • Clean haulage routes. • Decontamination unit	Unlikely [3] Re-use of soils containing asbestos within an earthworks scheme will involve significant engineering and the risk for generating dusts will be significantly increased with repeated handling and compaction.	Clean cover and a hard dig layer. A plan should be in place for future excavations as part of the Health and Safety File.

2 The standard laboratory detection limit is normally 0.001%. Below 0.001% is trace and currently regarded as not containing asbestos for the purposes of disposal off site. However the waste producer has a duty to fully classify the waste and the presence of trace asbestos should be declared. Consequently it is unlikely that a waste treatment site will take this soil and an inert landfill may make a commercial decision to only take it under some circumstances.

3 The re-use of soils containing asbestos at concentrations above hazardous waste is likely to meet with regulatory opposition. Assuming a suitable strategy could be agreed this would take a considerable amount of time and is only likely to be warranted where there a long program for implementation.

APPENDIX B

Exploratory Hole Logs

BROWNFIELD SOLUTIONS LTD

Trial Pit Log

No.
SA01
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446241E, 238331N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.80m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20 - 17/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES		0.20	121.60		Grass over brown slightly gravelly sand with frequent rootlets (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
	0.80	HSV	120kPa				Firm to stiff brown slightly gravelly sandy CLAY of high strength. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone, ironstone and quartzite.
	0.90	D					
	1.40	D ES		1.30	120.50		Brown / grey clayey sandy angular to sub-angular fine to coarse GRAVEL and COBBLES of limestone and ironstone with rare boulders. Boulders are angular of limestone.
				1.58	120.22		End of Trial Pit at 1.58m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Soakaway tests undertaken at 1.575m and 1.510m bgl.
4. Minor collapases in clay when undertaking soakaway tests.
5. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Trial Pit Log

No.
SA02
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446150E, 238455N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.58m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20 - 17/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.25	122.34		Grass over brown slightly gravelly sand with frequent rootlets and occasional roots (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
	0.40	ES		0.50	122.08		Brown clayey gravelly fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse of chert, quartzite and limestone.
							Stiff to very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone, ironstone and quartzite.
	1.30	D ES		1.10	121.48		Brown / grey sandy angular fine to coarse GRAVEL and COBBLES of limestone with rare boulder content. Boulders are angular of limestone.
				1.51	121.08		End of Trial Pit at 1.51m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Soakaway tests undertaken at 1.507m and 1.405m bgl.
4. Pit stable.
5. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Trial Pit Log

No.
SA03
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446183E, 238365N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.78m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	17/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
				0.20	121.58		Grass over brown slightly gravelly sand with frequent rootlets and occasional roots (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
				0.65	121.12		Brown clayey sandy angular to sub-angular fine to coarse GRAVEL of limestone.
				1.00	120.78		Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and quartzite.
				1.37	120.40		Brown / grey sandy angular fine to coarse GRAVEL and COBBLES of limestone with low boulder content. Boulders are angular of limestone. Difficult to excavate.
							End of Trial Pit at 1.37m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Soakaway tests undertaken at 1.370m and 1.286m bgl.
4. Pit stable.
5. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

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Trial Pit Log

No.
TP01
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446202E, 238313N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.45m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES		0.15	121.30		Grass over brown slightly gravelly sand with frequent rootlets (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
	0.50	ES					Brown slightly gravelly fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
	0.90	D		0.80	120.65		
	1.00	HSV	120kPa				Firm to stiff brown slightly sandy slightly gravelly CLAY of high strength. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and quartzite.
	1.10	ES					
	2.50	B		2.20	119.25		Brown / grey fine to coarse sandy clayey sub-angular to sub-rounded GRAVEL and COBBLES of limestone and ironstone with low boulder content. Boulders are sub-angular of limestone. *Becoming difficult to excavate below 2.50m bgl.*
				2.75	118.70		End of Trial Pit at 2.75m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

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Trial Pit Log

No.
TP02
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446213E, 238290N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.11m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES					MADE GROUND: Grass over brown slightly gravelly sand with frequent rootlets (Topsoil). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite with plastic.
				0.25	120.86		*Band of angular cobbles and boulders of limestone encountered between 0.10m and 0.25m bgl.*
	0.50	ES					Brown slightly gravelly fine to coarse SAND. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
				0.70	120.41		Stiff brown slightly gravelly sandy CLAY of high strength. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and quartzite.
	0.80	HSV	140kPa				*Low cobble and rare boulder content encountered below 0.90m bgl. Cobbles and boulders are angular to sub-angular of limestone.*
	0.85	D					
	2.10	D					*Low boulder content encountered below 2.10m bgl. Boulders are angular to sub-angular of limestone.*
				2.20	118.91		Brown / grey fine to coarse sandy clayey sub-angular to sub-rounded GRAVEL and COBBLES of limestone and ironstone with medium boulder content. Boulders are sub-angular of limestone.
				2.50	118.61		End of Trial Pit at 2.50m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

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Trial Pit Log

No.
TP03
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446249E, 238347N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.85m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.20	ES		0.25	121.60		MADE GROUND: Grass over brown slightly gravelly sand with frequent rootlets (Topsoil). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite with rare brick.
	0.40	ES					Firm to stiff brown slightly gravelly sandy CLAY / clayey SAND. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone, ironstone and quartzite.
	1.30	D		1.10	120.75		Brown clayey sandy angular to sub-angular fine to coarse GRAVEL and COBBLES of limestone and ironstone with rare boulders. Boulders are angular of limestone.
							Medium cobble content and becoming difficult to excavate below 1.50m bgl.
	2.00	B					*Predominantly COBBLES and BOULDERS below 1.85m bgl.*
				2.05	119.80		End of Trial Pit at 2.05m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

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Trial Pit Log

No.
TP04
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446200E, 238402N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.99m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES		0.15	121.84		MADE GROUND: Grass over brown slightly gravelly sand with frequent rootlets (Topsoil). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite with rare ceramic.
				0.50	121.49		Brown gravelly fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse of chert, quartzite and limestone.
	0.70	D ES					Brown slightly clayey sandy angular to sub-angular fine to coarse GRAVEL of limestone with medium cobble content. Cobbles are angular of limestone.
							Becoming sandy GRAVEL and COBBLES and difficult to excavate below 1.10m bgl.
	1.40	D					
	2.00	B					
				2.10	119.89		End of Trial Pit at 2.10m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

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Trial Pit Log

No.
TP05
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446147E, 238442N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.46m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES		0.15	122.30		Grass over brown slightly gravelly sand with frequent rootlets (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
				0.60	121.86		Brown slightly clayey gravelly fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse of chert, quartzite and limestone.
	0.70	D ES					Firm to stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone, ironstone and quartzite.
				1.30	121.16		Brown / grey clayey sandy angular to sub-angular fine to coarse GRAVEL and COBBLES of limestone and ironstone with rare boulders. Boulders are angular of limestone.
							Medium boulder content encountered below 2.0m bgl.
							Predominantly COBBLES and BOULDERS below 2.20m bgl.
				2.50	119.96		End of Trial Pit at 2.50m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Trial Pit Log

No.
TP06
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446102E, 238402N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.80m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES		0.15	122.66		MADE GROUND: Gravel surfacing over brown slightly gravelly sand with frequent rootlets. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone, chert and quartzite.
	0.60	D ES					Firm to stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone, ironstone and quartzite.
	1.00	D ES		0.90	121.90		Brown slightly clayey fine to coarse SAND and angular to sub-angular fine to coarse GRAVEL of limestone and ironsone with medium cobble content. Cobbles are angular to sub-angular of limestone.
							Medium boulder content and becoming difficult to excavate below 1.60m bgl.
				1.90	120.90		End of Trial Pit at 1.90m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Trial Pit Log

No.
TP07
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446154E, 238399N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.14m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	16/09/20

Hole Type	Scale	Logged	Checked
TP	1:25	JW	LG

Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
	Depth (m)	Type	Results				
	0.10	ES		0.20	121.94		Grass over brown slightly gravelly sand with frequent rootlets (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of chert and quartzite.
	0.50	ES		0.70	121.44		Brown slightly clayey gravelly fine to coarse SAND. Gravel is sub-angular to sub-rounded fine to coarse of chert, quartzite and limestone.
	0.90	HSV	120kPa	1.05	121.09		Firm to stiff brown slightly gravelly sandy CLAY of high strength. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone, ironstone and quartzite.
	1.60	D		1.85	120.29		Brown / grey clayey sandy angular to sub-angular fine to coarse GRAVEL and COBBLES of limestone and ironstone with low boulder content. Boulders are angular of limestone. *Medium boulder content below 1.20m bgl.* *Becoming difficult to excavate below 1.50m bgl.*
							End of Trial Pit at 1.85m

1.0
2.0
3.0
4.0
5.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Pit stable.
4. Pit backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS01
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446176E, 238263N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	120.81m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.25	120.56		MADE GROUND: Gravel surfacing over brown clayey gravelly fine to coarse sand. Gravel is angular to sub-rounded fine to coarse of brick, concrete, limestone and rare slate.
		0.90	D ES					Firm brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is sub-angular fine to coarse of limestone and ironstone.
		1.20	SPT	N=3 (1,1/1,1,0,1)				
								Becoming soft and damp between 1.80m and 1.85m bgl.
		2.00	SPT	N=12 (1,1/2,2,4,4)				
		2.50	D		2.50	118.31		Brown fine to coarse sandy sub-angular fine to coarse GRAVEL of sandstone and ironstone.
		2.70	SPT	N≥50 (25 for 20mm/50 for 15mm)	2.70	118.11		End of Borehole at 2.70m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole installed to 2.70m bgl; GL-0.70m bgl plain, 0.70-2.70m bgl slotted.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS02
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446208E, 238331N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.28m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES		0.20	121.08		Grass over brown clayey gravelly sand with occasional rootlets (TOPSOIL). Sand is fine to coarse. Gravel is sub-angular to sub-rounded fine to coarse of chert.
		0.70	D					Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and quartzite.
		1.00	ES SPT	N=4 (1,1/1,1,1,1)				*Becoming soft to firm between 1.00 and 1.55m bgl.*
		1.80	D					*Becoming slightly sandy and gravelly below 1.55m bgl.*
		2.00	SPT	N=19 (3,3/4,5,5,5)				*Becoming firm between 2.00m and 2.35m bgl.*
		2.90	SPT	N=33 (25 for 120mm/10,7,7,9)	3.00	118.28		Brown fine to coarse sandy sub-angular fine to coarse GRAVEL of limestone and ironstone.
		3.50	D		3.35	117.94		Very stiff grey slightly gravelly silty CLAY. Gravel is sub-angular fine to medium of mudstone.
		3.80	SPT	N≥50 (25 for 70mm/50 for 230mm)	3.90 4.00	117.38 117.28		Brown clayey sandy angular to sub-angular fine to coarse GRAVEL of limestone.
								End of Borehole at 4.00m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole installed to 4.00m bgl; GL-1.00m bgl plain, 1.00-4.00m bgl.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS03
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446225E, 238375N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.84m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	122.64		Grass over clayey gravelly sand with occasional rootlets (TOPSOIL). Sand is fine to coarse.
		0.30	ES		0.45	122.39		Clayey gravelly fine to coarse SAND. Gravel is angular to sub-rounded fine to coarse of chert, limestone.
		0.70	D ES					Brown / grey slightly clayey sandy sub-angular fine to coarse GRAVEL of limestone and sandstone. Sand is fine to coarse.
		0.90	SPT	N≥50 (25 for 130mm/50 for 80mm)	0.90	121.94		End of Borehole at 0.90m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS04
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446174E, 238427N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.27m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.25	122.02		Grass over clayey gravelly sand with occasional rootlets (TOPSOIL). Sand is fine to coarse.
					0.70	121.57		Brown gravelly very clayey fine to coarse SAND. Gravel is angular to sub-angular fine to coarse of limestone and ironstone.
		0.90	D					Brown / grey clayey sandy angular fine to coarse GRAVEL of limestone and sandstone. Sand is fine to coarse.
		1.00	SPT	N≥50 (6,7/50 for 180mm)	1.00	121.27		End of Borehole at 1.00m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole installed to 1.00m bgl; GL-0.50m bgl plain, 0.50-1.00m bgl slotted.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS05
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446119E, 238423N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.94m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.20	ES		0.25	122.70		Grass over clayey gravelly sand with occasional rootlets and rare roots (TOPSOIL). Sand is fine to coarse.
		0.50	D					Brown gravelly clayey fine to coarse SAND. Gravel is angular to sub-angular fine to coarse of limestone and ironstone.
								Very gravelly below 0.80m bgl.
		1.00	SPT	N≥50 (25 for 110mm/50 for 245mm)	1.00	121.94		Brown / grey clayey fine to coarse SAND and sub-angular fine to medium GRAVEL of limestone.
		1.60	SPT	N≥50 (18,7/50 for 265mm)	1.70	121.24		*Limestone cobble encountered at 1.65m bgl.*
								End of Borehole at 1.70m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole installed to 1.70m bgl; GL-0.50m bgl plain, 0.50-1.70m bgl slotted.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS06
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446123E, 238375N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	122.08m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	121.88		Grass over clayey gravelly sand with occasional rootlets (TOPSOIL). Sand is fine to coarse.
					0.50	121.58		Brown gravelly clayey fine to coarse SAND. Gravel is angular to sub-angular fine to coarse of limestone and ironstone.
		0.90	D ES					Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and quartzite.
		1.00	SPT	N=13 (1,1/4,4,3,2)				*Becoming firm between 1.00m and 1.60m bgl.*
		1.80	D		1.80	120.28		Brown sandy clayey sub-rounded fine to coarse GRAVEL of sandstone.
		2.00	SPT	N≥50 (25 for 145mm/50 for 230mm)	2.00	120.08		End of Borehole at 2.00m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole installed to 2.00m bgl; GL-1.00m bgl plain, 1.00-2.00m bgl slotted.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS07
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446155E, 238339N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.62m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
		0.10	ES					MADE GROUND: Grass over clayey gravelly sand with occasional rootlets (Topsoil). Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of chert, limestone and rare brick.
					0.25	121.37		
		0.50	ES					Brown slightly clayey gravelly fine to coarse SAND with rare rootlets. Gravel is sub-angular to sub-rounded fine to coarse of chert, quartzite and limestone.
					0.70	120.92		
		0.90	D					Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and ironstone.
		1.00	SPT	N=28 (10,12/10,7,6,5)	1.00	120.62		*Limestone gravel below 0.90m bgl.*
								Brown / grey sub-angular fine to coarse gravel of limestone and sandstone.
					1.45	120.17		
		1.60	D					Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is sub-angular to rounded fine to coarse of limestone and ironstone.
					1.75	119.87		
		1.90	SPT	N=41 (25 for 125mm/14,10,6,11)				Brown clayey sandy sub-rounded fine to coarse GRAVEL of sandstone. Sand is fine to coarse.
					2.25	119.37		
								Stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse.
		2.90	SPT	N=20 (2,3/3,5,5,7)				*Becoming soft to firm and damp between 3.00m and 3.10m bgl.*
					3.10	118.52		Very stiff grey slightly gravelly silty CLAY. Gravel is angular fine to coarse of mudstone.
		3.60	D					
		3.80	SPT	N≥50 (5,6/50 for 295mm)				
					4.00	117.62		End of Borehole at 4.00m

1.0 2.0 3.0 4.0 5.0 6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole installed to 4.00m bgl; GL-1.00m bgl plain, 1.00-4.00m bgl slotted.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

BROWNFIELD SOLUTIONS LTD

Borehole Log

Window Sampler No.
WS08
Sheet 1 of 1

PROJECT NO:	C3797	**CO-ORDS:**	446169E, 238381N
PROJECT NAME:	OXFORD ROAD, BODICOTE	**LEVEL:**	121.99m OD
CLIENT:	HOLLINS STRATEGIC LAND	**DATES:**	18/09/20

Hole Type	Scale	Logged	Checked
WS	1:30	JW	LG

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description
		Depth (m)	Type	Results				
					0.20	121.79		Grass over clayey gravelly sand with occasional rootlets (TOPSOIL). Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of chert and limestone.
		0.70	D					Stiff to very stiff brown slightly gravelly sandy CLAY. Sand is fine to coarse. Gravel is angular to sub-rounded fine to coarse of limestone and ironstone.
					0.90	121.09		
		1.00	SPT	N≥50 (25 for 145mm/50 for 110mm)	1.00	120.99		Grey / brown slightly clayey sandy angular fine to coarse GRAVEL of limestone and sandstone.
								End of Borehole at 1.00m

1.0
2.0
3.0
4.0
5.0
6.0

Remarks

1. Location scanned with Radiodetection and GPR.
2. No groundwater encountered.
3. Borehole backfilled with arisings.

ES = Environmental Sample
D = Disturbed Sample
B = Bulk Sample
LB = Large Bulk Sample
U = Undisturbed Sample
UT = Undisturbed Thin Wall Sample
SPT = Standard Penetration Test
PID = Photoionization Detector (ppm)
PPM = Part Per Million
HSV = Hand Shear Vane

APPENDIX C

Chemical Testing Results

Jake Wheaton
Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

e: j.wheaton@brownfield-solutions.co.uk

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 : 20-31731

Project / Site name:	Oxford Raod, Bodicote	**Samples received on:**	23/09/2020
Your job number:	C3797	**Samples instructed on/ Analysis started on:**	23/09/2020
Your order number:	C3797 1283 WG	**Analysis completed by:**	30/09/2020
Report Issue Number:	1	**Report issued on:**	30/09/2020
Samples Analysed:	14 soil samples		

Signed: A. Czerwińska

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
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

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Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629215	1629216	1629217	1629218
Sample Reference				TP01	TP02	TP02	TP03
Sample Number				1	1	2	1
Depth (m)				0.10	0.10	0.50	0.20
Date Sampled				16/09/2020	16/09/2020	16/09/2020	16/09/2020
Time Taken				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
Moisture Content	%	N/A	NONE	-	16	15	16
Total mass of sample received	kg	0.001	NONE	-	0.5	1.5	1.5
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected	-	Not-detected
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	-	8	7.9	7.1
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	30
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	0.015
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	14.8
Organic Matter	%	0.1	MCERTS	-	-	-	7.3
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-	-	4.2
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Pyrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Chrysene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-	-	< 0.80
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	93	170	130
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	-	130	310	230
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	130	310	230
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	17	9	20
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	60	43	81
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	56	110	94
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	300	220	250
Monoaromatics & Oxygenates							
Benzene	µg/kg	1	MCERTS	-	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	< 1.0

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629215	1629216	1629217	1629218
Sample Reference				TP01	TP02	TP02	TP03
Sample Number				1	1	2	1
Depth (m)				0.10	0.10	0.50	0.20
Date Sampled				16/09/2020	16/09/2020	16/09/2020	16/09/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	-	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	< 1.0

Monoaromatics & Oxygenates

Benzene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
Toluene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
o-xylene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	-	-	-	< 0.001

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	< 10

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629219	1629220	1629221	1629222
Sample Reference				TP03	TP04	TP04	TP05
Sample Number				2	1	2	1
Depth (m)				0.40	0.10	0.70	0.10
Date Sampled				16/09/2020	16/09/2020	16/09/2020	16/09/2020
Time Taken				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
Moisture Content	%	N/A	NONE	13	12	11	15
Total mass of sample received	kg	0.001	NONE	0.5	1.5	1.5	1.5
Asbestos in Soil	Type	N/A	ISO 17025	-	Not-detected	-	Not-detected
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	8.9	-	10.2	7.8
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	-
Organic Matter	%	0.1	MCERTS	-	-	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	2.6	-	-
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	-
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-	-	-
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	150	-	210	120
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	280	-	360	220
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	280	-	360	220
Copper (aqua regia extractable)	mg/kg	1	MCERTS	6.7	-	3.9	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	41	-	34	56
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	-	< 0.3	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	110	-	120	90
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	-	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	260	-	240	240
Monoaromatics & Oxygenates							
Benzene	µg/kg	1	MCERTS	-	-	-	-
Toluene	µg/kg	1	MCERTS	-	-	-	-

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629219	1629220	1629221	1629222
Sample Reference				TP03	TP04	TP04	TP05
Sample Number				2	1	2	1
Depth (m)				0.40	0.10	0.70	0.10
Date Sampled				16/09/2020	16/09/2020	16/09/2020	16/09/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-	-	-
o-xylene	µg/kg	1	MCERTS	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	-

Monoaromatics & Oxygenates

Benzene	mg/kg	0.001	MCERTS	-	-	-	-
Toluene	mg/kg	0.001	MCERTS	-	-	-	-
Ethylbenzene	mg/kg	0.001	MCERTS	-	-	-	-
p & m-xylene	mg/kg	0.001	MCERTS	-	-	-	-
o-xylene	mg/kg	0.001	MCERTS	-	-	-	-
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	-	-	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629223	1629224	1629225	1629226
Sample Reference				TP06	TP06	TP07	WS01
Sample Number				1	2	1	1
Depth (m)				0.10	0.60	0.10	0.20
Date Sampled				16/09/2020	16/09/2020	16/09/2020	18/09/2020
Time Taken				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
Moisture Content	%	N/A	NONE	13	26	-	11
Total mass of sample received	kg	0.001	NONE	1.5	1.5	-	1.5
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	-	Not-detected	Not-detected
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.3	7.3	-	7.6
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-	-	68
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-	-	0.034
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-	-	34
Organic Matter	%	0.1	MCERTS	-	-	-	2.8
Total Organic Carbon (TOC)	%	0.1	MCERTS	2.3	-	-	1.6
Speciated PAHs							
Naphthalene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Fluorene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	-	-	-	0.34
Anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	-	-	-	0.91
Pyrene	mg/kg	0.05	MCERTS	-	-	-	0.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-	-	0.71
Chrysene	mg/kg	0.05	MCERTS	-	-	-	0.52
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	0.58
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-	-	0.54
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-	-	0.59
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-	-	0.38
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-	-	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-	-	0.51
Total PAH							
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-	-	5.98
Heavy Metals / Metalloids							
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	130	310	-	92
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	280	500	-	170
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	280	500	-	170
Copper (aqua regia extractable)	mg/kg	1	MCERTS	11	< 1.0	-	18
Lead (aqua regia extractable)	mg/kg	1	MCERTS	52	58	-	1700
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	120	170	-	67
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	230	300	-	200
Monoaromatics & Oxygenates							
Benzene	µg/kg	1	MCERTS	-	-	-	< 1.0
Toluene	µg/kg	1	MCERTS	-	-	-	< 1.0

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629223	1629224	1629225	1629226
Sample Reference				TP06	TP06	TP07	WS01
Sample Number				1	2	1	1
Depth (m)				0.10	0.60	0.10	0.20
Date Sampled				16/09/2020	16/09/2020	16/09/2020	18/09/2020
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**				
Ethylbenzene	µg/kg	1	MCERTS	-	-	-	< 1.0
p & m-xylene	µg/kg	1	MCERTS	-	-	-	< 1.0
o-xylene	µg/kg	1	MCERTS	-	-	-	< 1.0
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-	-	< 1.0
Monoaromatics & Oxygenates							
Benzene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
Toluene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
Ethylbenzene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
p & m-xylene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
o-xylene	mg/kg	0.001	MCERTS	-	-	-	< 0.001
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	-	-	-	< 0.001
Petroleum Hydrocarbons							
TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	< 2.0
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-	-	< 8.0
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-	-	< 8.0
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	< 10
TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-	-	< 0.001
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-	-	< 1.0
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-	-	< 2.0
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-	-	< 10
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-	-	< 10
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-	-	< 10

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629227	1629228
Sample Reference				WS01	WS07
Sample Number				2	1
Depth (m)				0.90	0.10
Date Sampled				18/09/2020	18/09/2020
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	-	< 0.1
Moisture Content	%	N/A	NONE	-	13
Total mass of sample received	kg	0.001	NONE	-	1.5
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected	Not-detected
General Inorganics					
pH - Automated	pH Units	N/A	MCERTS	-	6.9
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	-	-
Organic Matter	%	0.1	MCERTS	-	-
Total Organic Carbon (TOC)	%	0.1	MCERTS	-	-
Speciated PAHs					
Naphthalene	mg/kg	0.05	MCERTS	-	-
Acenaphthylene	mg/kg	0.05	MCERTS	-	-
Acenaphthene	mg/kg	0.05	MCERTS	-	-
Fluorene	mg/kg	0.05	MCERTS	-	-
Phenanthrene	mg/kg	0.05	MCERTS	-	-
Anthracene	mg/kg	0.05	MCERTS	-	-
Fluoranthene	mg/kg	0.05	MCERTS	-	-
Pyrene	mg/kg	0.05	MCERTS	-	-
Benzo(a)anthracene	mg/kg	0.05	MCERTS	-	-
Chrysene	mg/kg	0.05	MCERTS	-	-
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	-	-
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	-	-
Benzo(a)pyrene	mg/kg	0.05	MCERTS	-	-
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	-	-
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	-	-
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	-	-
Total PAH					
Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	-	-
Heavy Metals / Metalloids					
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	-	140
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	-	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	-	< 1.2
Chromium (III)	mg/kg	1	NONE	-	240
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	-	240
Copper (aqua regia extractable)	mg/kg	1	MCERTS	-	10
Lead (aqua regia extractable)	mg/kg	1	MCERTS	-	74
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	-	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	-	97
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	-	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	-	270
Monoaromatics & Oxygenates					
Benzene	µg/kg	1	MCERTS	-	-
Toluene	µg/kg	1	MCERTS	-	-

Analytical Report Number: 20-31731
Project / Site name: Oxford Raod, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1629227	1629228
Sample Reference				WS01	WS07
Sample Number				2	1
Depth (m)				0.90	0.10
Date Sampled				18/09/2020	18/09/2020
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Ethylbenzene	µg/kg	1	MCERTS	-	-
p & m-xylene	µg/kg	1	MCERTS	-	-
o-xylene	µg/kg	1	MCERTS	-	-
MTBE (Methyl Tertiary Butyl Ether)	µg/kg	1	MCERTS	-	-

Monoaromatics & Oxygenates

Benzene	mg/kg	0.001	MCERTS	-	-
Toluene	mg/kg	0.001	MCERTS	-	-
Ethylbenzene	mg/kg	0.001	MCERTS	-	-
p & m-xylene	mg/kg	0.001	MCERTS	-	-
o-xylene	mg/kg	0.001	MCERTS	-	-
MTBE (Methyl Tertiary Butyl Ether)	mg/kg	0.001	MCERTS	-	-

Petroleum Hydrocarbons

TPH-CWG - Aliphatic >EC5 - EC6	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC6 - EC8	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aliphatic >EC10 - EC12	mg/kg	1	MCERTS	-	-
TPH-CWG - Aliphatic >EC12 - EC16	mg/kg	2	MCERTS	-	-
TPH-CWG - Aliphatic >EC16 - EC21	mg/kg	8	MCERTS	-	-
TPH-CWG - Aliphatic >EC21 - EC35	mg/kg	8	MCERTS	-	-
TPH-CWG - Aliphatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-

TPH-CWG - Aromatic >EC5 - EC7	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC7 - EC8	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC8 - EC10	mg/kg	0.001	MCERTS	-	-
TPH-CWG - Aromatic >EC10 - EC12	mg/kg	1	MCERTS	-	-
TPH-CWG - Aromatic >EC12 - EC16	mg/kg	2	MCERTS	-	-
TPH-CWG - Aromatic >EC16 - EC21	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic >EC21 - EC35	mg/kg	10	MCERTS	-	-
TPH-CWG - Aromatic (EC5 - EC35)	mg/kg	10	MCERTS	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-31731
Project / Site name: Oxford Raod, Bodicote

* 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 loam (MCERTS) 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 *
1629216	TP02	1	0.1	Brown loam and clay with gravel and vegetation.
1629217	TP02	2	0.5	Brown loam and clay with gravel and vegetation.
1629218	TP03	1	0.2	Brown loam and clay with gravel and vegetation.
1629219	TP03	2	0.4	Brown loam and clay with gravel.
1629220	TP04	1	0.1	Brown loam and clay with gravel and vegetation.
1629221	TP04	2	0.7	Brown loam and clay with gravel and vegetation.
1629222	TP05	1	0.1	Brown loam and clay with gravel and vegetation.
1629223	TP06	1	0.1	Brown loam and clay with gravel and vegetation.
1629224	TP06	2	0.6	Brown loam and clay with gravel and vegetation.
1629226	WS01	1	0.2	Brown loam and sand with gravel and brick.
1629228	WS07	1	0.1	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 20-31731
Project / Site name: Oxford Raod, Bodicote

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
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.	L038-PL	D	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
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
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
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
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
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
Total organic carbon (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate.	In house method.	L009-PL	D	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	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
TPHCWG (Soil)	Determination of hexane extractable hydrocarbons in soil by GC-MS/GC-FID.	In-house method with silica gel split/clean up.	L088/76-PL	W	MCERTS
BTEX and MTBE in soil (Monoaromatics)	Determination of BTEX in soil by headspace GC-MS.	In-house method based on USEPA8260	L073B-PL	W	MCERTS
Sulphate, water soluble, in soil	Determination of water soluble sulphate by ICP-OES. Results reported directly (leachate equivalent) and corrected for extraction ratio (soil equivalent).	In house method.	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.

Jake Wheaton
Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

e: j.wheaton@brownfield-solutions.co.uk

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 : 20-40221

Project / Site name:	Oxford Road, Bodicote	**Samples received on:**	06/11/2020
Your job number:	C3797	**Samples instructed on/ Analysis started on:**	06/11/2020
Your order number:	C3797 XXXX JW	**Analysis completed by:**	13/11/2020
Report Issue Number:	1	**Report issued on:**	13/11/2020
Samples Analysed:	3 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
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.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-40221
Project / Site name: Oxford Road, Bodicote
Your Order No: C3797 XXXX JW

Lab Sample Number				1677177	1677178	1677179
Sample Reference				TP03A	TP06A	WS07A
Sample Number				0.2	0.6	0.1
Depth (m)				0.10-0.30	0.50-0.70	0.05-0.20
Date Sampled				05/11/2020	05/11/2020	05/11/2020
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	%	0.01	NONE	17	24	14
Total mass of sample received	kg	0.001	NONE	0.7	0.9	1
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	140	220	130

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-40221
Project / Site name: Oxford Road, Bodicote

* 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 loam (MCERTS) 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 *
1677177	TP03A	0.2	0.10-0.30	Brown loam and clay with gravel and vegetation.
1677178	TP06A	0.6	0.50-0.70	Brown loam and clay with gravel and vegetation.
1677179	WS07A	0.1	0.05-0.20	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 20-40221
Project / Site name: Oxford Road, Bodicote

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. (30 oC)	In house method.	L019-UK/PL	W	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.

Jake Wheaton
Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

e: j.wheaton@brownfield-solutions.co.uk

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 : 20-40214

Project / Site name:	Oxford Road, Bodicote	**Samples received on:**	06/11/2020
Your job number:	C3797	**Samples instructed on/ Analysis started on:**	06/11/2020
Your order number:	C3797 XXXX JW	**Analysis completed by:**	17/11/2020
Report Issue Number:	1	**Report issued on:**	17/11/2020
Samples Analysed:	3 soil samples		

Signed:

Joanna Wawrzeczko
Technical Reviewer (Reporting Team)
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.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-40214
Project / Site name: Oxford Road, Bodicote
Your Order No: C3797 XXXX JW

Lab Sample Number				1677144	1677145	1677146
Sample Reference				TP03A	TP06A	WS07A
Sample Number				0.2	0.6	0.1
Depth (m)				0.10-0.30	0.50-0.70	0.05-0.20
Date Sampled				05/11/2020	05/11/2020	05/11/2020
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**			
Stone Content	%	0.1	NONE	19	52	17
Moisture Content	%	0.01	NONE	17	24	14
Total mass of sample received	kg	0.001	NONE	0.7	0.9	1
Heavy Metals / Metalloids						
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	140	210	140
PBET Results (Bioaccessibile Fraction)						
Arsenic (Stomach)	%	0.5	NONE	0	0.2	0
Arsenic (Intestine 1)	%	0.5	NONE	5.3	0.1	1.2
Arsenic (Intestine 2)	%	0.5	NONE	0.8	3.4	1.7
Bioaccessible Fraction %	Maximum % BAF			**5.3 % (I1)**	**3.4 % (I2)**	**1.7 % (I2)**

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-40214
Project / Site name: Oxford Road, Bodicote

* 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 loam (MCERTS) 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 *
1677144	TP03A	0.2	0.10-0.30	Brown loam and clay with gravel and vegetation.
1677145	TP06A	0.6	0.50-0.70	Brown clay and loam with gravel and vegetation.
1677146	WS07A	0.1	0.05-0.20	Brown loam and clay with gravel and vegetation.

Analytical Report Number : 20-40214
Project / Site name: Oxford Road, Bodicote

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. (30 oC)	In house method.	L019-UK/PL	W	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
PBET	In House Method	In house method based on Ruby et.al.		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.

APPENDIX D

Geotechnical Testing Results

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

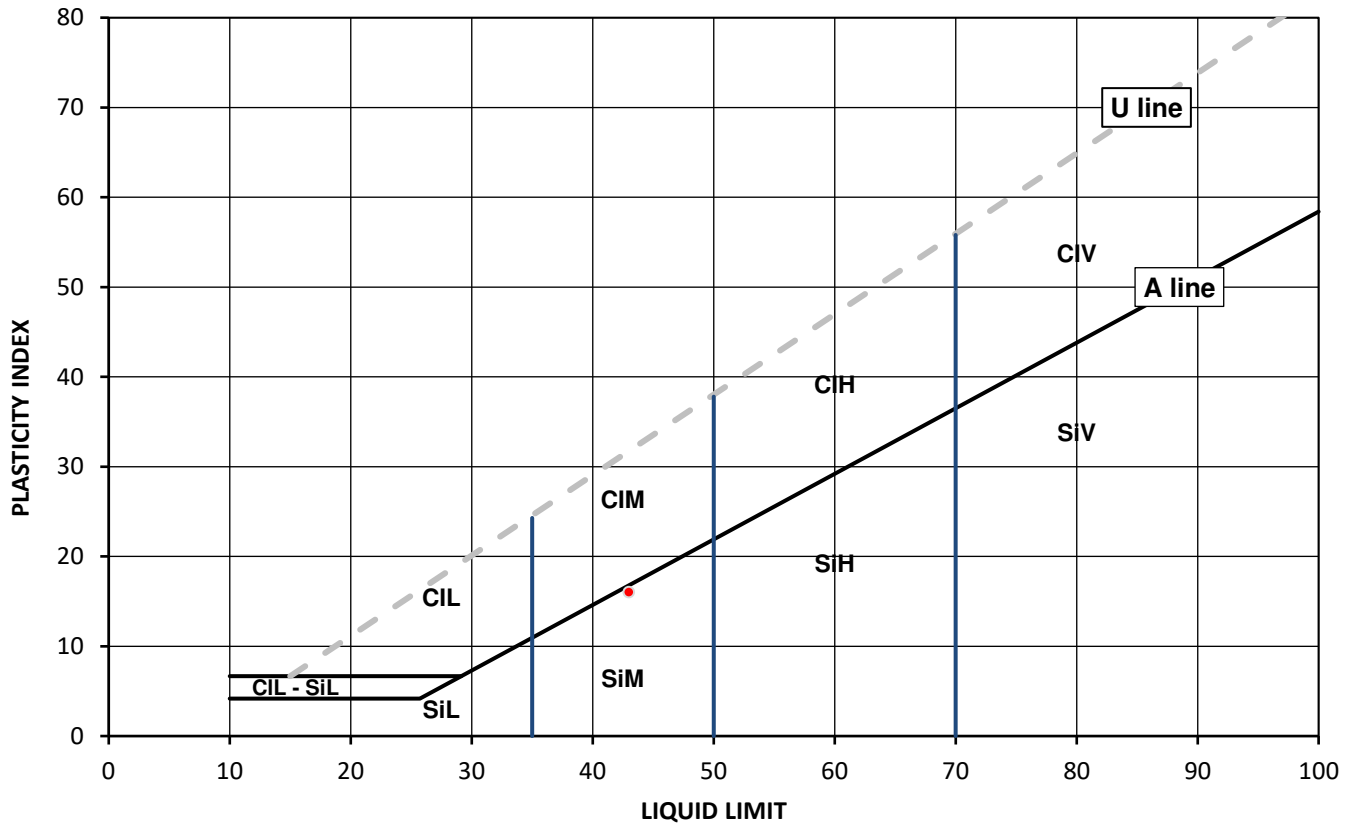
Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	16/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628348	Depth Top [m]:	0.90
Hole No.:	SA01	Depth Base [m]:	Not Given
Sample Reference:	2	Sample Type:	D
Soil Description:	Reddish brown slightly gravelly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20	43	27	16	82



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	16/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

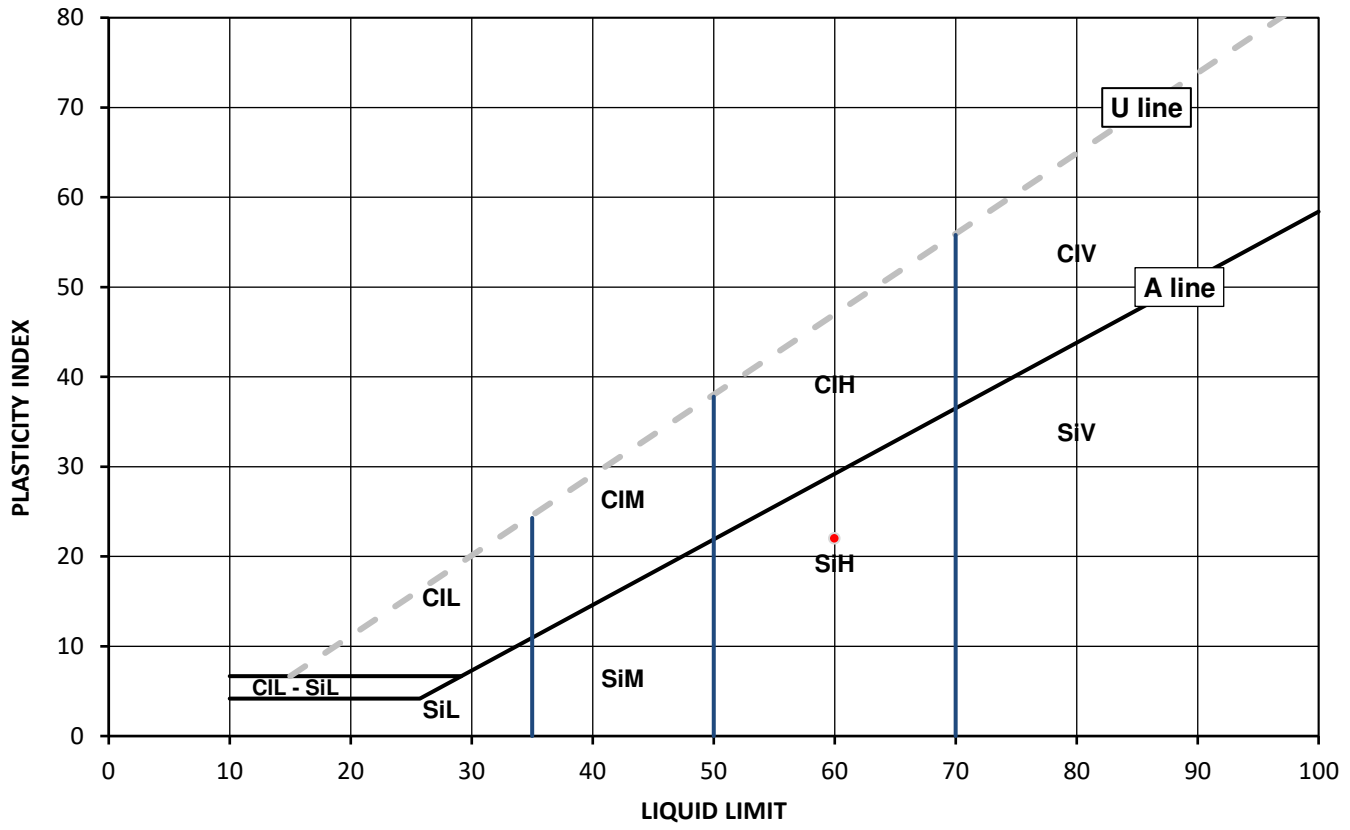
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628349	Depth Top [m]:	0.85
Hole No.:	TP02	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	D
Soil Description:	Brown slightly gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
32	60	38	22	89



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	16/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

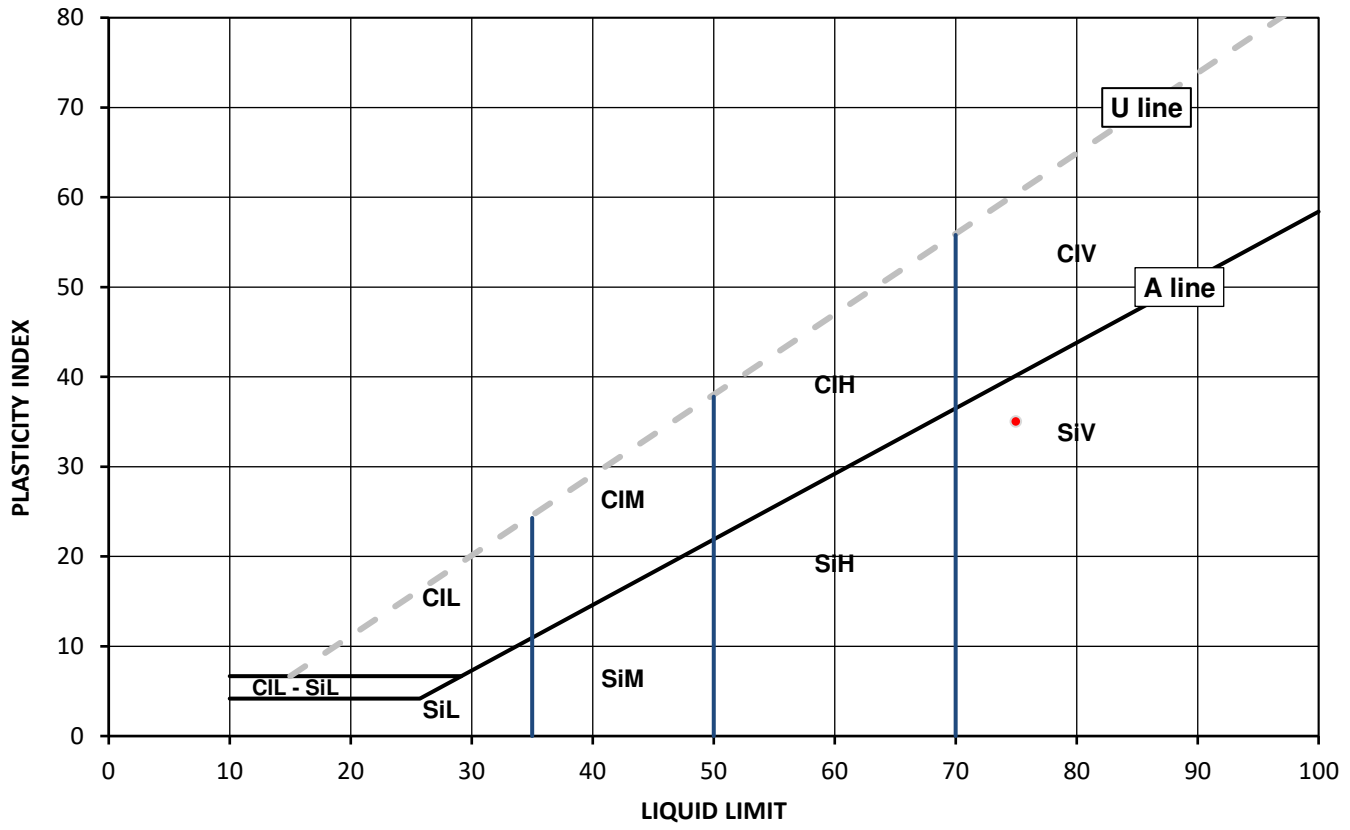
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628350	Depth Top [m]:	0.70
Hole No.:	TP05	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	D
Soil Description:	Brown slightly gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
35	75	40	35	86



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	16/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

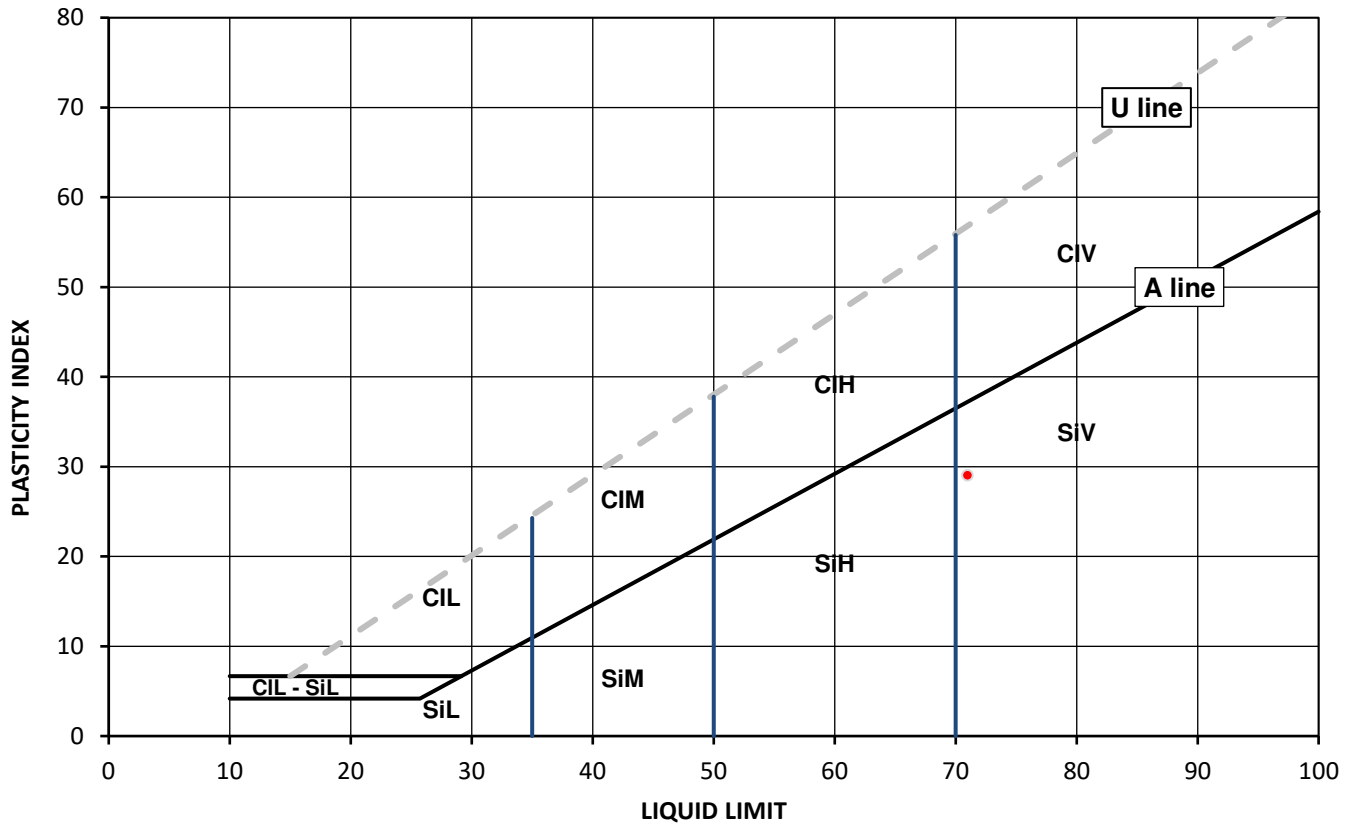
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628351	Depth Top [m]:	0.60
Hole No.:	TP06	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	D
Soil Description:	Brown slightly gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
36	71	42	29	92



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

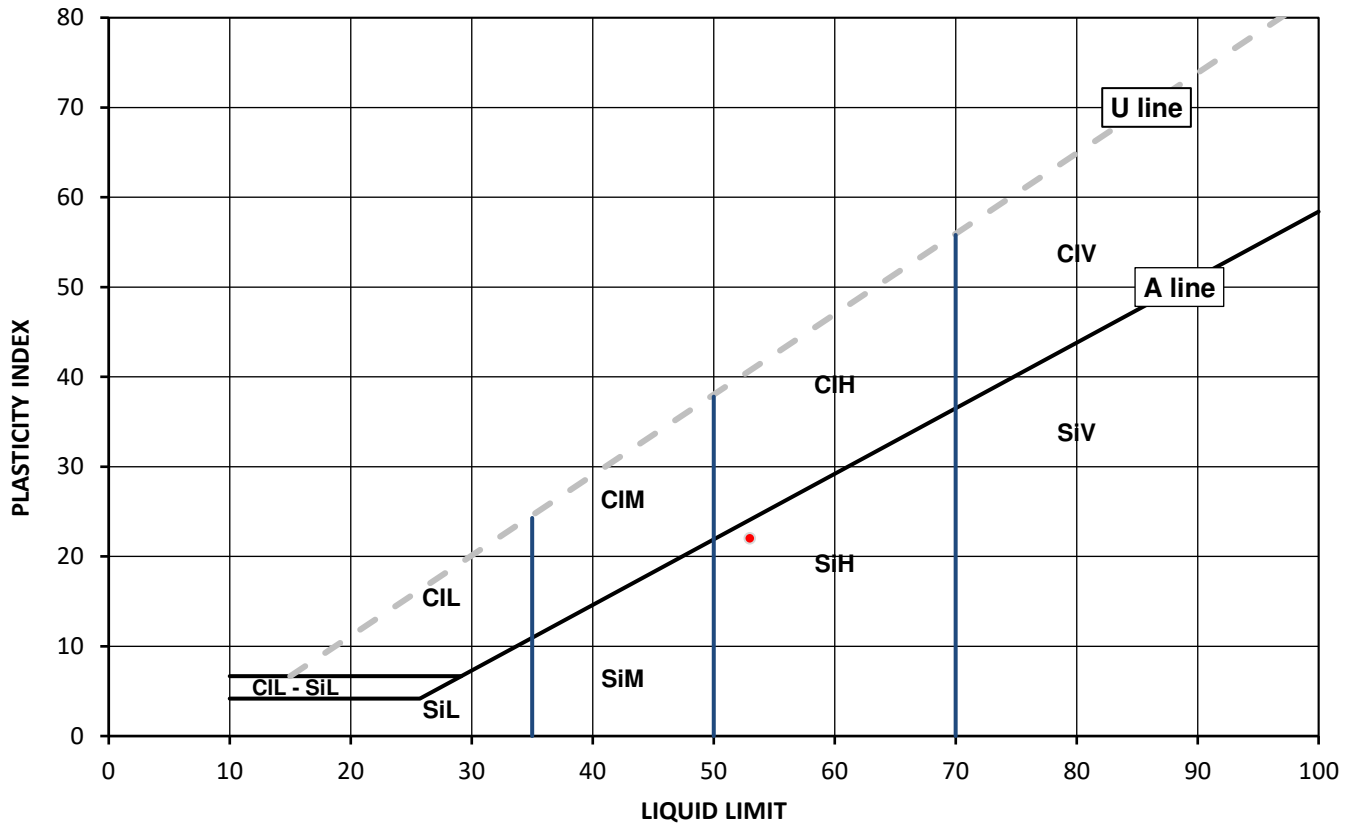
Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	18/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628352	Depth Top [m]:	0.90
Hole No.:	WS01	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	D
Soil Description:	Brown slightly gravelly slightly sandy CLAY		
Sample Preparation:	Tested after washing to remove >425um		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
33	53	31	22	80



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	18/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

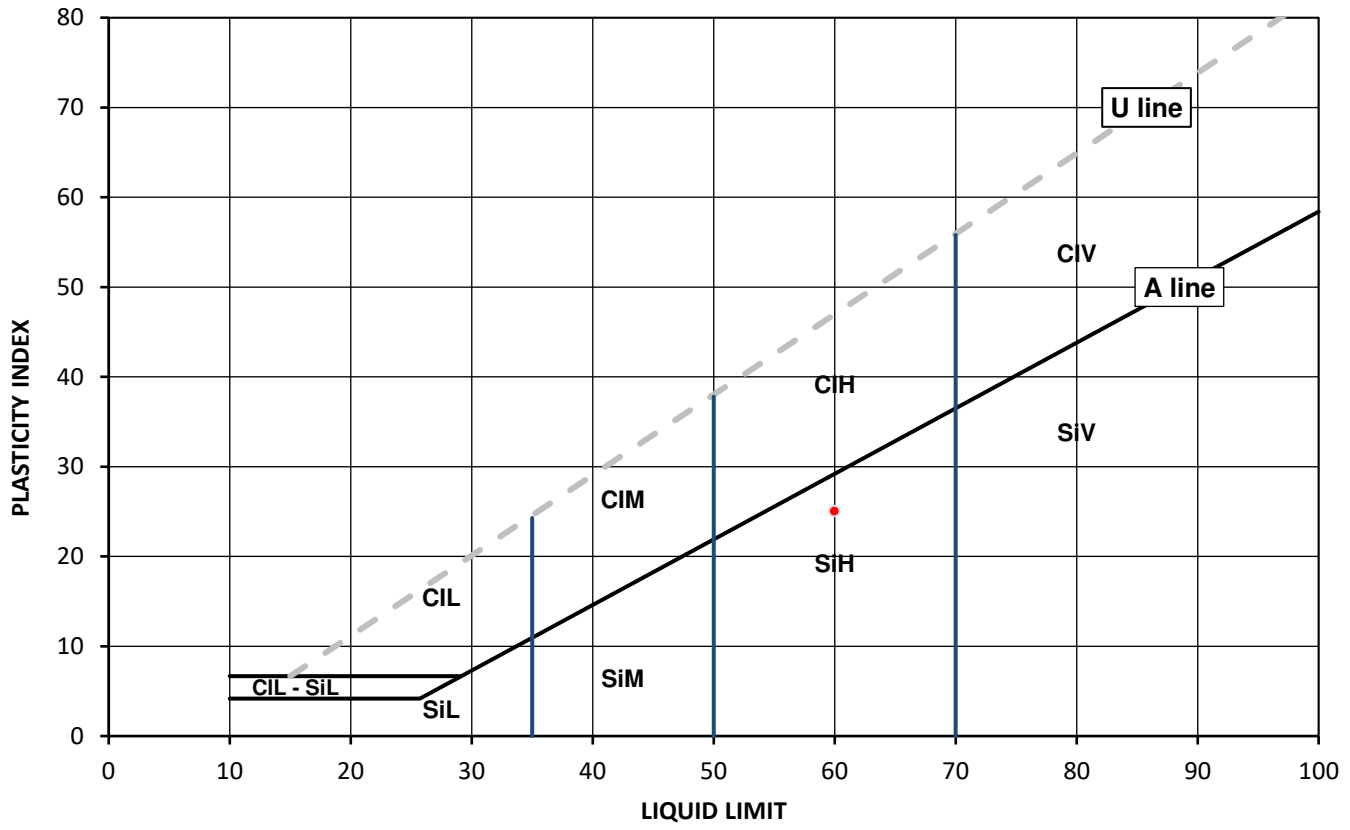
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628353	Depth Top [m]:	0.70
Hole No.:	WS02	Depth Base [m]:	Not Given
Sample Reference:	2	Sample Type:	D
Soil Description:	Brown slightly gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
32	60	35	25	87



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
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Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	18/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

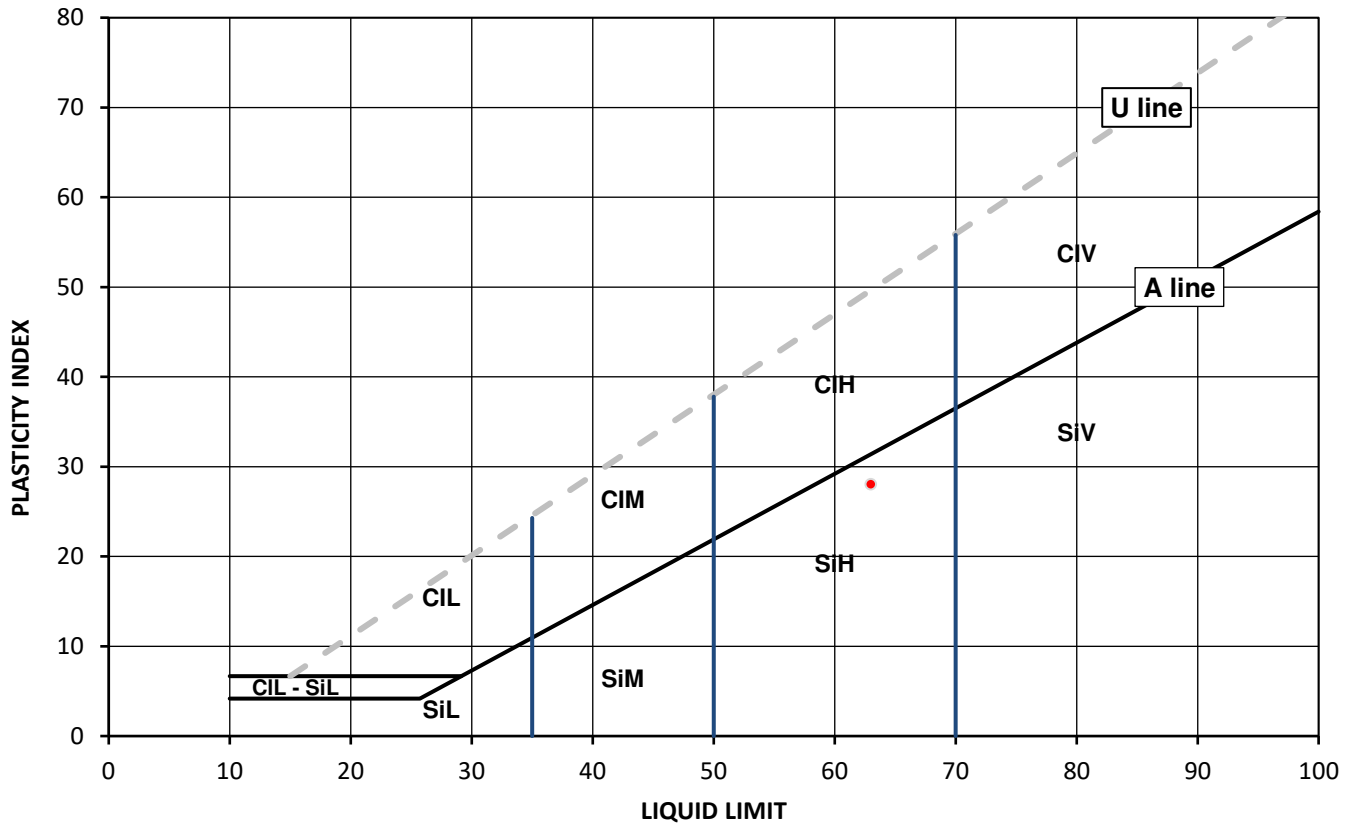
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628354	Depth Top [m]:	1.80
Hole No.:	WS02	Depth Base [m]:	Not Given
Sample Reference:	4	Sample Type:	D
Soil Description:	Brown slightly gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
48	63	35	28	76



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

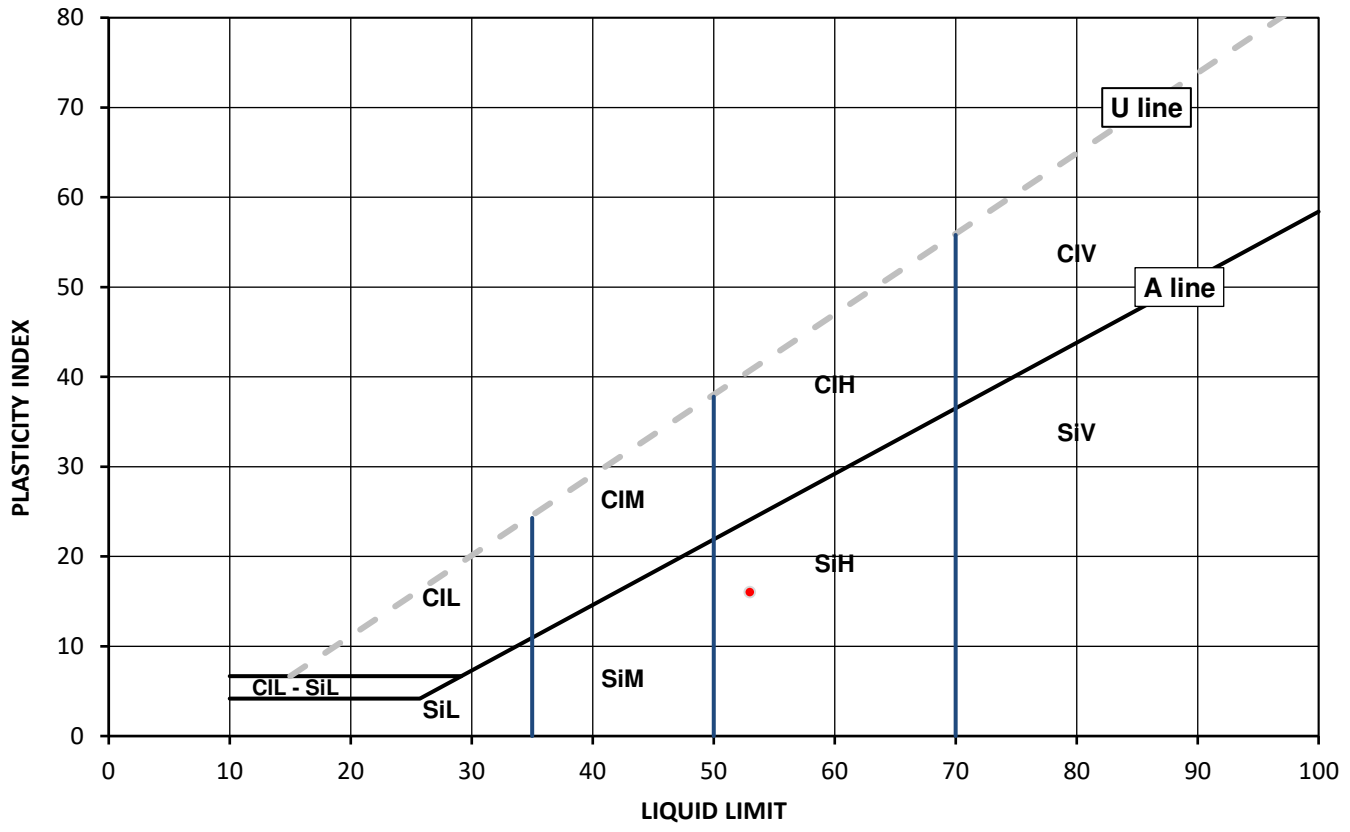
Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	18/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628355	Depth Top [m]:	0.90
Hole No.:	WS07	Depth Base [m]:	Not Given
Sample Reference:	3	Sample Type:	D
Soil Description:	Brown gravelly slightly sandy CLAY		
Sample Preparation:	Tested after >425um removed by hand		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20	53	37	16	56



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

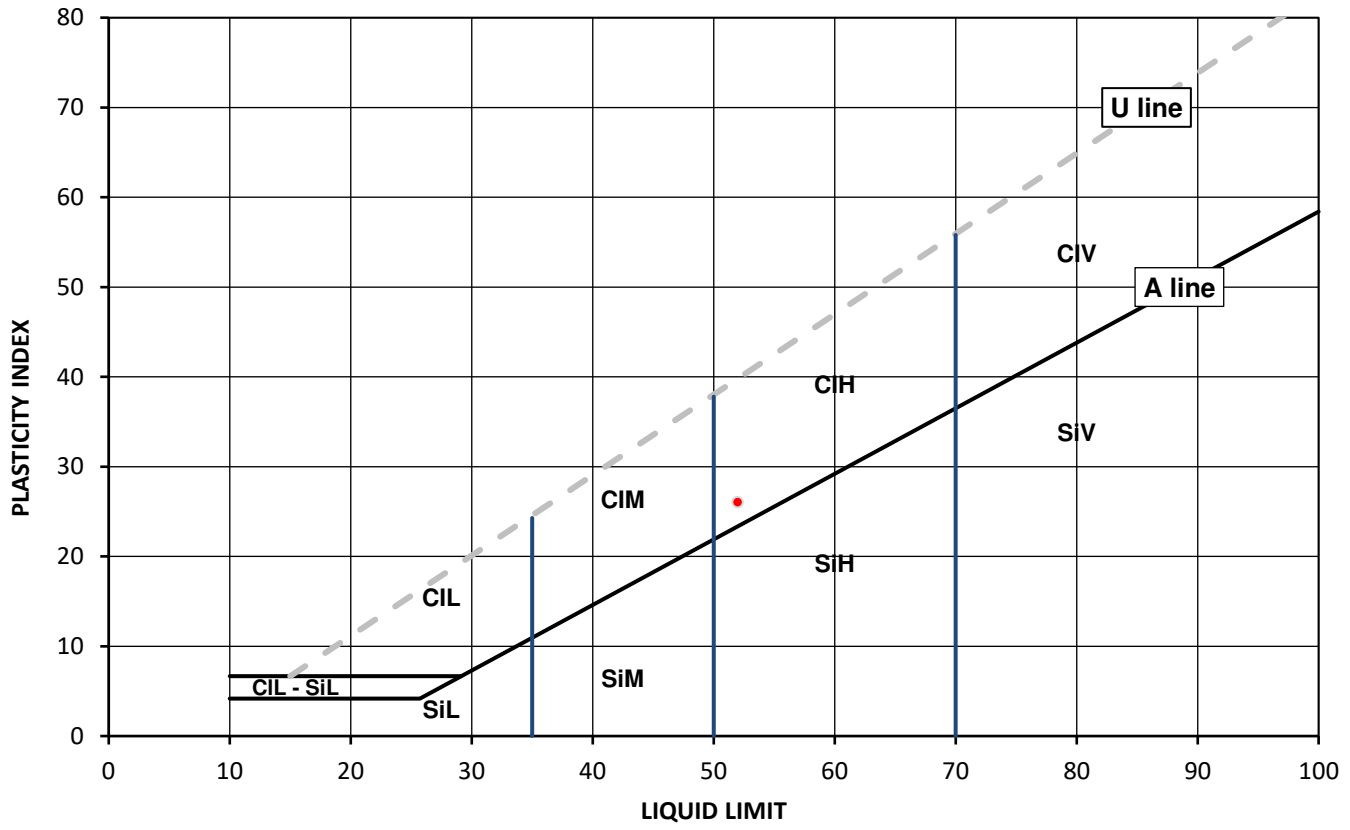
Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	18/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628356	Depth Top [m]:	3.60
Hole No.:	WS07	Depth Base [m]:	Not Given
Sample Reference:	5	Sample Type:	D
Soil Description:	Brown slightly sandy CLAY		
Sample Preparation:	Tested in natural condition		

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
22	52	26	26	100



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

TEST CERTIFICATE

Liquid and Plastic Limits

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Tested in Accordance with: BS 1377-2: 1990: Clause 4.4 and 5

Client:	Brownfield Solutions Ltd	Client Reference:	C3797
Client Address:	William Smith House, 173 - 183 Witton Street, Northwich, Cheshire, CW9 5LP	Job Number:	20-31569
		Date Sampled:	18/09/2020
		Date Received:	23/09/2020
Contact:	Jake Wheaton	Date Tested:	29/09/2020
Site Address:	Oxford Road, Bodicote	Sampled By:	Client- JW

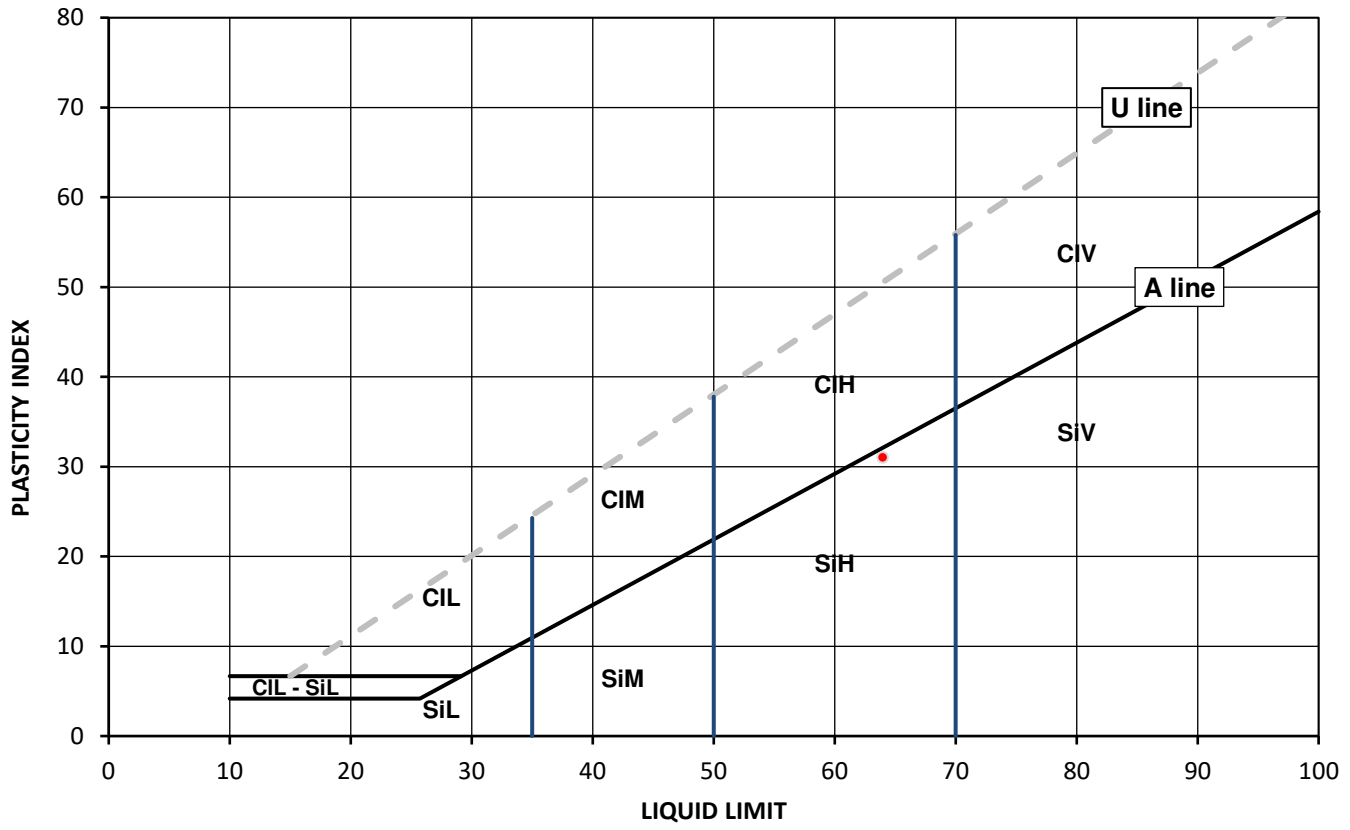
Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test Results:

Laboratory Reference:	1628357	Depth Top [m]:	0.70
Hole No.:	WS08	Depth Base [m]:	Not Given
Sample Reference:	1	Sample Type:	D
Soil Description:	Brown gravelly CLAY		

Sample Preparation: Tested after washing to remove >425um

As Received Moisture Content [W] %	Liquid Limit [WL] %	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
24	64	33	31	59



Legend, based on BS EN ISO 14688 2:2018 Geotechnical investigation and testing – Identification and classification of soil

		Plasticity		Liquid Limit
Cl	Clay	L	Low	below 35
Si	Silt	M	Medium	35 to 50
		H	High	50 to 70
		V	Very high	exceeding 70
		O	Organic	append to classification for organic material (eg ClHO)

Note: Moisture Content by BS 1377-2: 1990: Clause 3.2

Remarks:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 232.10

SUMMARY REPORT

Summary of Classification Test Results

i2 Analytical Ltd
Unit 8 Harrowden Road
Brackmills Industrial Estate
Northampton NN4 7EB

4041

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP
Contact: Jake Wheaton
Site Address: Oxford Road, Bodicote

Tested in Accordance with:

Moisture Content by BS 1377-2: 1990: Clause 3.2; Water Content by BS EN 17892-1: 2014; Atterberg by BS 1377-2: 1990: Clause 4.3 (4 Point Test), Clause 4.4 (1 Point Test) and 5; PD by BS 1377-2: 1990: Clause 8.2

Client Reference: C3797
Job Number: 20-31569
Date Sampled: 16/09 - 18/09/2020
Date Received: 23/09/2020
Date Tested: 29/09/2020
Sampled By: Client- JW

Testing carried out at i2 Analytical Limited, ul. Pionierow 39, 41-711 Ruda Slaska, Poland

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	Moisture Content [W]	Water Content [W]	Atterberg				Density			Total Porosity#		
		Reference	Depth Top	Depth Base	Type					% Passing 425um	WL	Wp	Ip	bulk	dry	PD			
			m	m				%	%	%	%	%	%	Mg/m3	Mg/m3	Mg/m3	%		
1628348	SA01	2	0.90	Not Given	D	Reddish brown slightly gravelly sandy CLAY	Atterberg 1 Point	20		82	43	27	16						
1628349	TP02	3	0.85	Not Given	D	Brown slightly gravelly CLAY	Atterberg 1 Point	32		89	60	38	22						
1628350	TP05	3	0.70	Not Given	D	Brown slightly gravelly CLAY	Atterberg 1 Point	35		86	75	40	35						
1628351	TP06	3	0.60	Not Given	D	Brown slightly gravelly CLAY	Atterberg 1 Point	36		92	71	42	29						
1628352	WS01	3	0.90	Not Given	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	33		80	53	31	22						
1628353	WS02	2	0.70	Not Given	D	Brown slightly gravelly CLAY	Atterberg 1 Point	32		87	60	35	25						
1628354	WS02	4	1.80	Not Given	D	Brown slightly gravelly CLAY	Atterberg 1 Point	48		76	63	35	28						
1628355	WS07	3	0.90	Not Given	D	Brown gravelly slightly sandy CLAY	Atterberg 1 Point	20		56	53	37	16						
1628356	WS07	5	3.60	Not Given	D	Brown slightly sandy CLAY	Atterberg 1 Point	22		100	52	26	26						
1628357	WS08	1	0.70	Not Given	D	Brown gravelly CLAY	Atterberg 1 Point	24		59	64	33	31						

Note: # Non accredited; NP - Non plastic

Comments:

Signed:

Szczepan Bielatowicz
PL Deputy of Head of Geotechnical Section
for and on behalf of i2 Analytical Ltd

Date Reported: 06/10/2020

GF 234.12

Jake Wheaton
Brownfield Solutions Ltd
William Smith House
173 - 183 Witton Street
Northwich
Cheshire
CW9 5LP

e: j.wheaton@brownfield-solutions.co.uk

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 : 20-31555

Project / Site name:	Oxford Road, Bodicote	**Samples received on:**	23/09/2020
Your job number:	C3797	**Samples instructed on/ Analysis started on:**	23/09/2020
Your order number:	C3797 1283 WG	**Analysis completed by:**	07/10/2020
Report Issue Number:	1	**Report issued on:**	07/10/2020
Samples Analysed:	10 soil samples		

Signed: A. Czerwińska

Agnieszka Czerwińska
Technical Reviewer (Reporting Team)
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.

Any assessments of compliance with specifications are based on actual analytical results with no contribution from uncertainty of measurement.
Application of uncertainty of measurement would provide a range within which the true result lies.
An estimate of measurement uncertainty can be provided on request.

Analytical Report Number: 20-31555
Project / Site name: Oxford Road, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1628300	1628301	1628302	1628303
Sample Reference				SA01	TP02	TP02	TP03
Sample Number				2	3	4	3
Depth (m)				0.90	0.85	2.10	1.30
Date Sampled				16/09/2020	16/09/2020	16/09/2020	16/09/2020
Time Taken				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
Moisture Content	%	N/A	NONE	12	18	18	11
Total mass of sample received	kg	0.001	NONE	0.4	0.37	0.51	0.56
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.6	7.6	7.8	7.9
Total Sulphate as SO4	%	0.005	MCERTS	-	0.028	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.027	0.038	0.026	0.011
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	0.6	-	-
Total Sulphur	%	0.005	MCERTS	-	0.017	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	< 2.0	-	-
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	-	6.5	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	3.2	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-31555
Project / Site name: Oxford Road, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1628304	1628305	1628306	1628307
Sample Reference				TP05	TP07	WS02	WS03
Sample Number				3	3	4	3
Depth (m)				0.70	1.60	1.80	0.70
Date Sampled				16/09/2020	16/09/2020	18/09/2020	18/09/2020
Time Taken				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
Moisture Content	%	N/A	NONE	21	13	25	8.9
Total mass of sample received	kg	0.001	NONE	0.39	0.52	0.36	0.56
General Inorganics							
pH - Automated	pH Units	N/A	MCERTS	7.9	8.1	8.2	8
Total Sulphate as SO4	%	0.005	MCERTS	-	-	-	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.01	0.018	0.016	0.0093
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	-	-	-	-
Total Sulphur	%	0.005	MCERTS	-	-	-	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	-	-	-	-
Heavy Metals / Metalloids							
Magnesium (water soluble)	mg/kg	5	NONE	-	-	-	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	-	-	-	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number: 20-31555
Project / Site name: Oxford Road, Bodicote
Your Order No: C3797 1283 WG

Lab Sample Number				1628308	1628309
Sample Reference				WS05	WS06
Sample Number				2	2
Depth (m)				0.50	0.90
Date Sampled				18/09/2020	18/09/2020
Time Taken				None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	**Units**	**Limit of detection**	**Accreditation Status**		
Stone Content	%	0.1	NONE	< 0.1	< 0.1
Moisture Content	%	N/A	NONE	19	19
Total mass of sample received	kg	0.001	NONE	0.6	0.59
General Inorganics					
pH - Automated	pH Units	N/A	MCERTS	7.6	7.8
Total Sulphate as SO4	%	0.005	MCERTS	0.034	-
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.013	0.015
Water Soluble Chloride (2:1) (leachate equivalent)	mg/l	0.5	MCERTS	< 0.5	-
Total Sulphur	%	0.005	MCERTS	0.016	-
Water Soluble Nitrate (2:1) as N (leachate equivalent)	mg/l	2	NONE	< 2.0	-
Heavy Metals / Metalloids					
Magnesium (water soluble)	mg/kg	5	NONE	< 5.0	-
Magnesium (leachate equivalent)	mg/l	2.5	NONE	< 2.5	-

U/S = Unsuitable Sample I/S = Insufficient Sample

Analytical Report Number : 20-31555
Project / Site name: Oxford Road, Bodicote

* 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 loam (MCERTS) 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 *
1628300	SA01	2	0.9	Brown loam and clay with gravel.
1628301	TP02	3	0.85	Brown loam and clay with gravel.
1628302	TP02	4	2.1	Brown loam and clay with gravel.
1628303	TP03	3	1.3	Brown loam and clay with gravel.
1628304	TP05	3	0.7	Brown loam and clay with gravel.
1628305	TP07	3	1.6	Brown loam and clay with gravel.
1628306	WS02	4	1.8	Brown loam and clay with gravel.
1628307	WS03	3	0.7	Brown loam and clay with gravel.
1628308	WS05	2	0.5	Brown loam and clay with gravel.
1628309	WS06	2	0.9	Brown loam and clay with gravel.

Analytical Report Number : 20-31555
Project / Site name: Oxford Road, Bodicote

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
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.	L038-PL	D	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
Moisture Content	Moisture content, determined gravimetrically. (30 oC)	In house method.	L019-UK/PL	W	NONE
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement.	In house method.	L099-PL	D	MCERTS
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
Total Sulphate in soil as %	Determination of total sulphate in soil by extraction with 10% HCl followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Total Sulphur in soil as %	Determination of total sulphur in soil by extraction with aqua-regia, potassium bromide/bromate followed by ICP-OES.	In house method.	L038-PL	D	MCERTS
Water Soluble Nitrate (2:1) as N 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	W	NONE
Chloride, water soluble, in soil	Determination of Chloride colorimetrically by discrete analyser.	In house method.	L082-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.

APPENDIX E

Monitoring Results

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD

CLIENT:	Date	Operator	Analsyer	Weather Observations			Temp (°C)	Pressure Trend	Notes
HOLLINS STRATEGIC LAND	01/10/2020	JW	GFM436	Overcast	Light breeze	Cool	11	Steady	
JOB NO.	08/10/2020	AT	GFM436	Intermittent cloud	Light breeze	Cool	13	Steady	
C3797	22/10/2020	JW	GFM436	Intermittent cloud	Windy	Cool	13	Falling	
SITE:	05/11/2020	AH	GFM436	Intermittent cloud	Light breeze	Cool	11	Falling	
OXFORD ROAD, BODICOTE	18/11/2020	AH	GFM436	Light rain	Light breeze	Cool	12	Falling	

Notes: mb = milibars; CH_4 = methane; LEL = lower explosive limit = 5%v/v; CO_2 = carbon dioxide; O_2 = oxygen; CO=carbon monoxide; H_2S = hydrogen sulphide; TVOC= Total volatile organic compounds; PPM = parts per million. Where the flow is less than the limit of detection of the instrument, the detection limit is reported (Highlighted in green). Gas Screening Values (GSVs) are rounded to 3 decimal places. Calibration Records for analysers used availble on request.

Date	Time	Location	Response zone (m)	Pressures (mb)		Gas flows (l/hr)		CH_4 (%v/v)		CH_4 (%LEL)		CO_2 (%v/v)		O_2 (%v/v)		Other Gases (PPM)			Depth to Water (m)	Well Base (m)	Gas Screening Value (CH_4) (l/hr)	Gas Screening Value (CO_2) (l/hr)	Notes
				Atmospheric Pressure	Relative Well Pressure	Initial	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	CO	H_2S	TVOC (PID)					
				Summary Statistcs																			
			Max. values:	1022	1.0	0.4	0.2	0.1	0.1	2.0	2.0	5.8	5.2	19.7	20.5	0.0	0.0	0.0	3.4	4.1	0.000	0.010	
			Min. values:	982	-1.0	0.1	0.1	0.1	0.1	0.0	2.0	0.9	0.2	11.8	11.8	0.0	0.0	0.0	2.5	1.3	0.000	0.001	
				Worst-case GSVs based on maximum recorded steady flow and maximum individual peak concentrations:																	0.000	0.012	
01/10/2020	AM	Ambient	X.00 - X.00	982	0.2	NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.3	0.0	0.0	NA	NA	NA	NA	NA	
		WS01	0.70 - 2.70	982	-1.0	0.2	0.1	0.1	0.1	2.0	2.0	5.5	3.6	13.1	13.8	0.0	0.0	NA	NGW	2.75	0.000	0.006	
		WS02	1.00 - 4.00	982	0.0	0.1	0.1	0.1	0.1	2.0	2.0	2.0	1.9	19.3	19.2	0.0	0.0	NA	NGW	4.03	0.000	0.002	
		WS04	0.50 - 1.00	982	1.0	0.2	0.1	0.1	0.1	2.0	2.0	1.5	1.4	19.4	19.4	0.0	0.0	NA	NGW	1.39	0.000	0.002	
		WS05	0.50 - 1.70	983	0.0	0.1	0.1	0.1	0.1	2.0	2.0	2.3	2.3	19.2	19.2	0.0	0.0	NA	NGW	2.03	0.000	0.002	
		WS06	1.00 - 2.00	982	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.8	1.8	19.3	19.2	0.0	0.0	NA	NGW	2.38	0.000	0.002	
		WS07	1.00 - 4.00	982	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.8	1.8	19.7	19.7	0.0	0.0	NA	NGW	3.98	0.000	0.002	
01/10/2020	AM	Ambient	X.00 - X.00	982	0.0	NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.5	0.0	0.0	NA	NA	NA	NA	NA	
08/10/2020	PM	Ambient	X.00 - X.00	995		NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.3	0.0	0.0	NA	NA	NA	NA	NA	
		WS01	0.70 - 2.70	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	Could not locate
		WS02	1.00 - 4.00	995	0.0	0.4	0.1	0.1	0.1	2.0	2.0	1.9	1.8	18.3	18.4	0.0	0.0	NA	2.70	4.08	0.000	0.002	
		WS04	0.50 - 1.00	995	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.4	1.2	17.7	18.1	0.0	0.0	NA	NGW	1.33	0.000	0.001	
		WS05	0.50 - 1.70	995	0.0	0.1	0.1	0.1	0.1	0.0	2.0	2.2	2.0	18.3	18.5	0.0	0.0	NA	NGW	1.97	0.000	0.002	
		WS06	1.00 - 2.00	995	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.7	1.6	19.2	20.0	0.0	0.0	NA	NGW	2.33	0.000	0.002	
		WS07	1.00 - 4.00	995	0.0	0.2	0.1	0.1	0.1	0.0	2.0	1.3	0.6	19.2	20.0	0.0	0.0	NA	3.03	3.83	0.000	0.001	
08/10/2020	PM	Ambient	X.00 - X.00	994		NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.2	0.0	0.0	NA	NA	NA	NA	NA	
22/10/2020	PM	Ambient	X.00 - X.00	992		NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.5	0.0	0.0	NA	NA	NA	NA	NA	
		WS01	0.70 - 2.70	992	0.0	0.1	0.1	0.1	0.1	2.0	2.0	5.8	4.8	12.1	13.1	0.0	0.0	NA	NGW	2.70	0.000	0.006	
		WS02	1.00 - 4.00	992	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.9	1.7	17.5	18.0	0.0	0.0	NA	3.15	4.08	0.000	0.002	
		WS04	0.50 - 1.00	991	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.3	1.3	18.4	18.4	0.0	0.0	NA	NGW	1.33	0.000	0.001	
		WS05	0.50 - 1.70	990	0.0	0.1	0.1	0.1	0.1	2.0	2.0	2.1	1.7	18.0	18.7	0.0	0.0	NA	NGW	1.97	0.000	0.002	
		WS06	1.00 - 2.00	990	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.7	1.2	18.4	19.2	0.0	0.0	NA	NGW	2.34	0.000	0.002	
		WS07	1.00 - 4.00	990	0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.6	1.4	18.8	18.9	0.0	0.0	NA	3.41	3.83	0.000	0.002	
22/10/2020	PM	Ambient	X.00 - X.00	990		NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.5	0.0	0.0	NA	NA	NA	NA	NA	
05/11/2020	PM	Ambient	X.00 - X.00	1022		NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.1	0.0	0.0	NA	NA	NA	NA	NA	
		WS01	0.70 - 2.70		0.0	0.2	0.1	0.1	0.1	2.0	2.0	5.2	5.2	11.8	11.8	0.0	0.0	NA	2.53	2.70	0.000	0.005	
		WS02	1.00 - 4.00		0.1	0.2	0.1	0.1	0.1	2.0	2.0	1.8	1.8	17.0	17.0	0.0	0.0	NA	2.71	4.08	0.000	0.002	
		WS04	0.50 - 1.00		0.0	0.4	0.2	0.1	0.1	2.0	2.0	1.2	1.2	18.0	18.0	0.0	0.0	NA	NGW	1.33	0.000	0.002	
		WS05	0.50 - 1.70		0.0	0.1	0.1	0.1	0.1	2.0	2.0	2.1	2.1	16.9	16.9	0.0	0.0	NA	NGW	1.97	0.000	0.002	
		WS06	1.00 - 2.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.7	1.7	17.7	17.7	0.0	0.0	NA	NGW	2.34	0.000	0.002	
		WS07	1.00 - 4.00		0.0	0.1	0.1	0.1	0.1	2.0	2.0	1.1	1.1	19.0	19.0	0.0	0.0	NA	2.97	3.83	0.000	0.001	
05/11/2020	PM	Ambient	X.00 - X.00	1019		NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.3	0.0	0.0	NA	NA	NA	NA	NA	

Ground Gas Monitoring Results

BROWNFIELD SOLUTIONS LTD

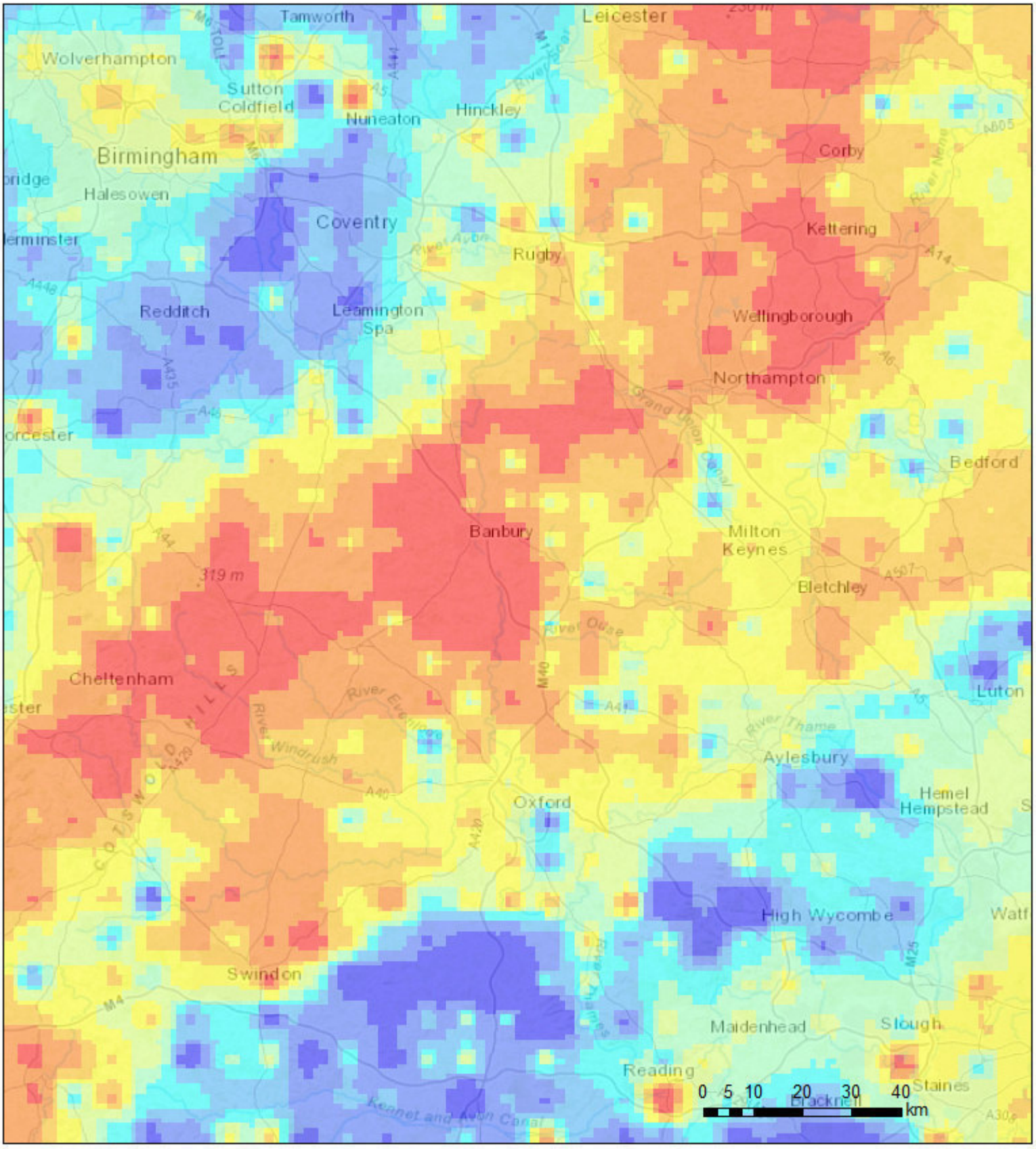
Date	Time	Location	Response zone (m)	Pressures (mb)		Gas flows (l/hr)		CH_4 (%v/v)		CH_4 (%LEL)		CO_2 (%v/v)		O_2 (%v/v)		Other Gases (PPM)			Depth to Water (m)	Well Base (m)	Gas Screening Value (CH_4) (l/hr)	Gas Screening Value (CO_2) (l/hr)	Notes
				Atmospheric Pressure	Relative Well Pressure	Initial	Steady	Peak	Steady	Peak	Steady	Peak	Steady	Peak	Steady	CO	H_2S	TVOC (PID)					
18/11/2020	AM	Ambient	X.00 - X.00	997	NA	NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.3	0.0	0.0	NA	NA	NA	NA	NA	
		WS01	0.70 - 2.70		0.0	0.2	0.2	0.1	0.1	2.0	2.0	4.9	4.9	12.5	12.5	0.0	0.0	NA	NGW	2.70	0.000	0.010	
		WS02	1.00 - 4.00		0.0	0.4	0.2	0.1	0.1	2.0	2.0	1.7	1.7	17.1	17.1	0.0	0.0	NA	2.87	4.08	0.000	0.003	
		WS04	0.50 - 1.00		0.0	0.4	0.2	0.1	0.1	2.0	2.0	1.2	1.2	17.8	17.8	0.0	0.0	NA	NGW	1.33	0.000	0.002	
		WS05	0.50 - 1.70		0.0	0.4	0.2	0.1	0.1	2.0	2.0	2.1	2.1	16.7	16.7	0.0	0.0	NA	NGW	1.97	0.000	0.004	
		WS06	1.00 - 2.00		0.0	0.2	0.1	0.1	0.1	2.0	2.0	1.6	1.6	17.1	17.1	0.0	0.0	NA	NGW	2.34	0.000	0.002	
		WS07	1.00 - 4.00		0.0	0.4	0.2	0.1	0.1	2.0	2.0	0.9	0.9	19.3	19.3	0.0	0.0	NA	NGW	3.83	0.000	0.002	Dip meter did not measure water depth in this location (at least 150mm of head present)
18/11/2020	AM	Ambient	X.00 - X.00	993	NA	NA	NA	NA	0.1	NA	2.0	NA	0.2	NA	20.3	0.0	0.0	NA	NA	NA	NA	NA	

APPENDIX F

UKSO Geochemistry Maps

UKSO

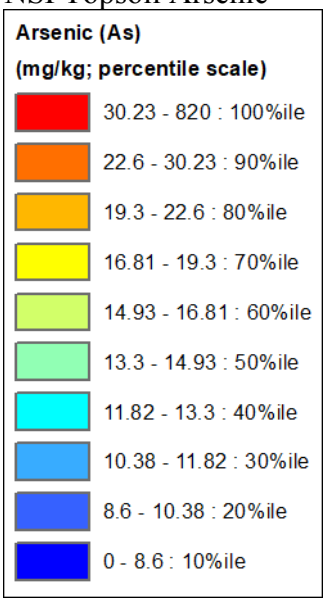
UK Soil Observatory



Source: USGS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

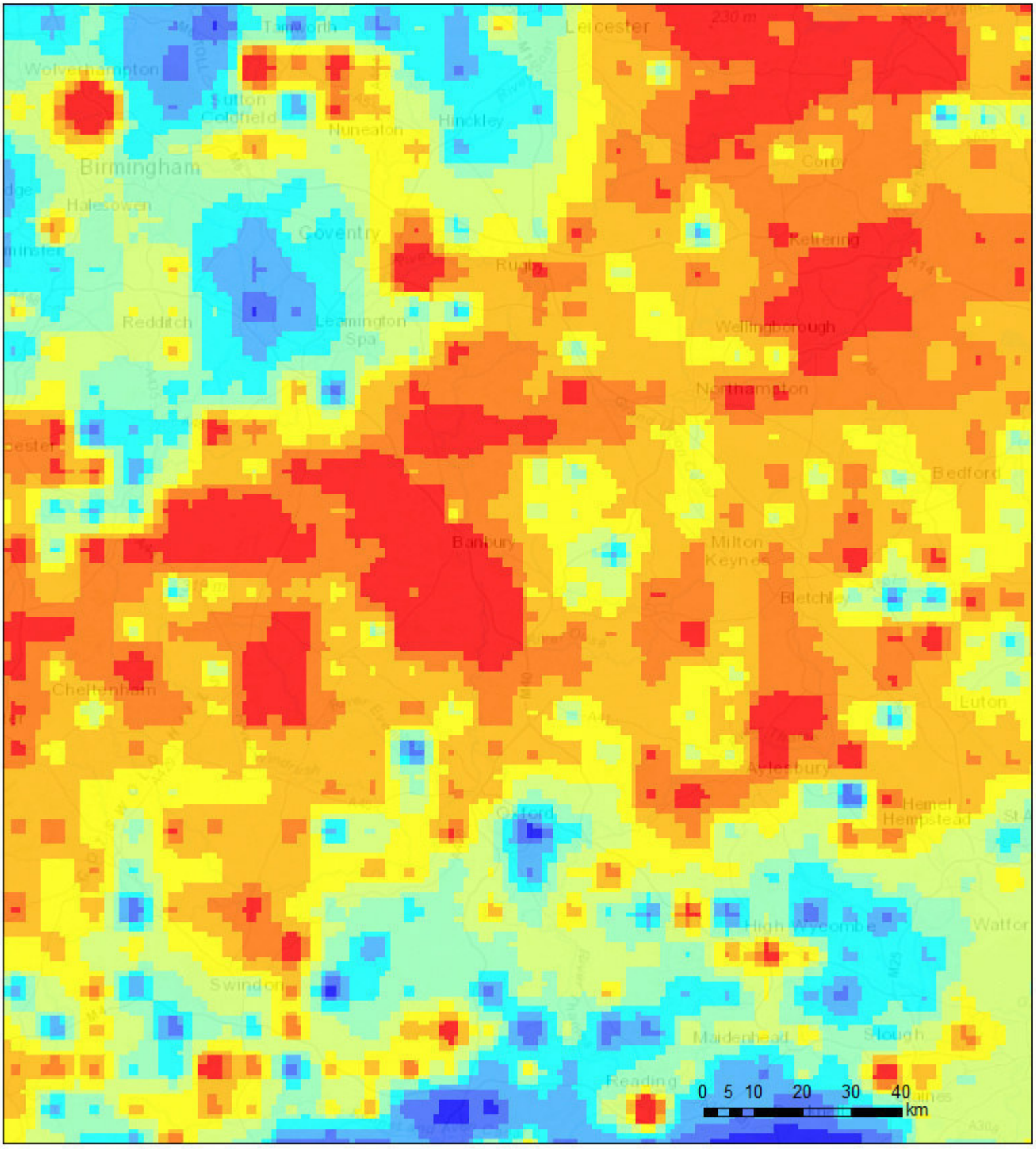
Map Key

NSI Topsoil Arsenic



UKSO

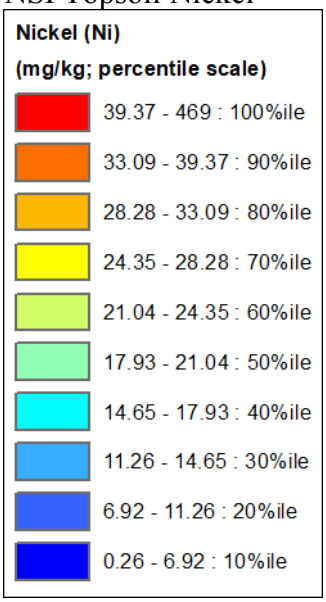
UK Soil Observatory



Source: USGS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

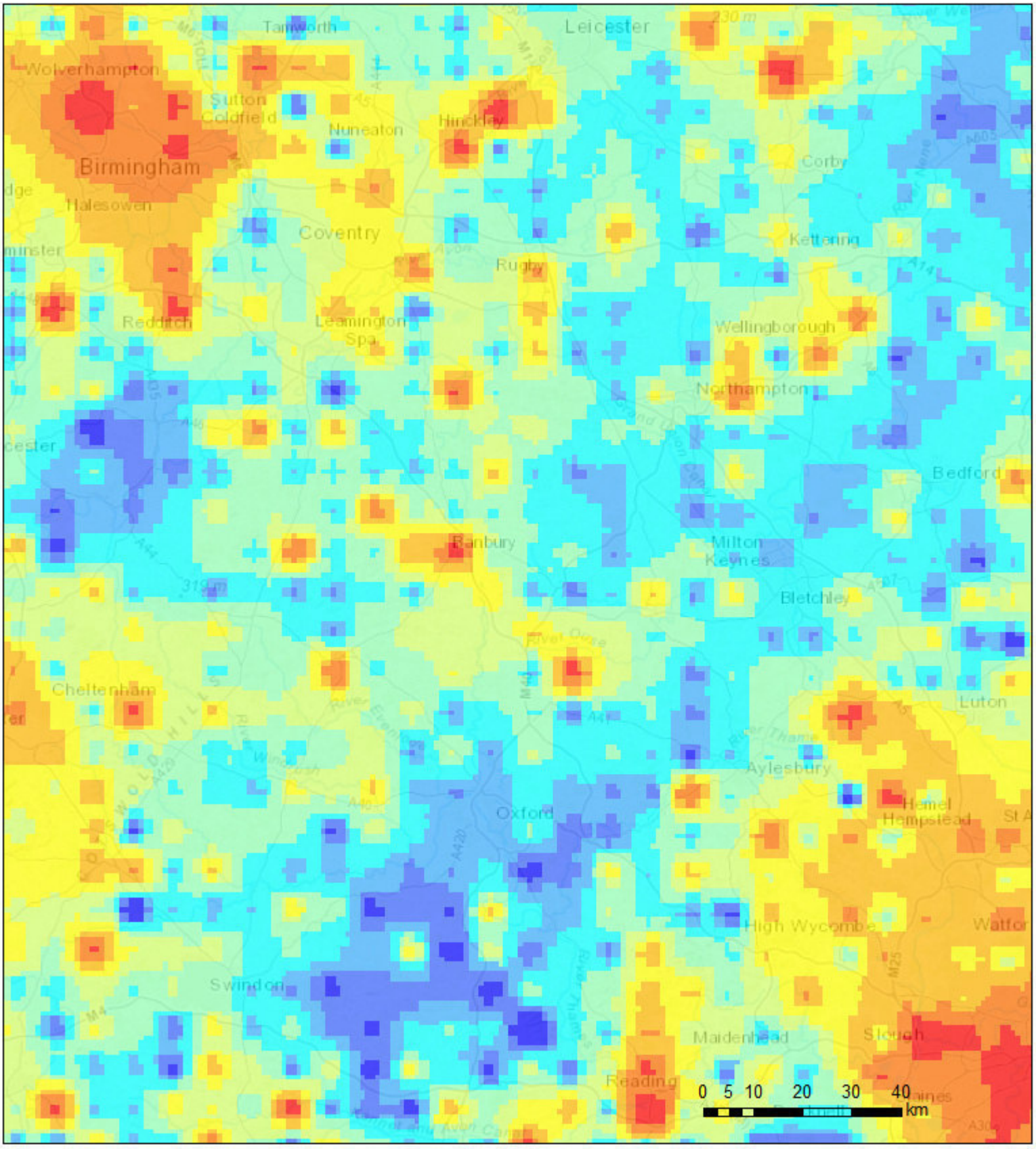
Map Key

NSI Topsoil Nickel



UKSO

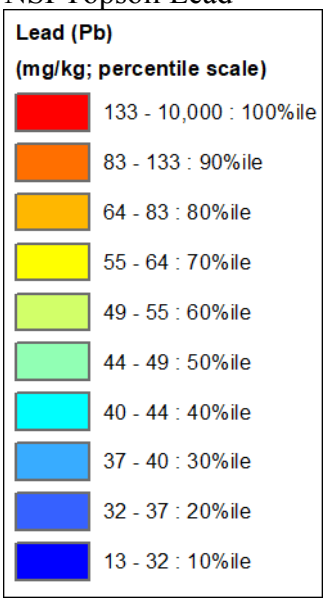
UK Soil Observatory



Source: USGS, NGA, NASA, CGIAR, GEBCO,N Robinson,NCEAS,NLS,OS,NMA,Geodatastyrelsen and the GIS User Community

Map Key

NSI Topsoil Lead



APPENDIX G

Waste Assessment Report

Waste Classification Report

YAD9Y-HLBYC-LBQS5

Job name

Oxford Road, Bodicote

Description/Comments

Project

C3797

Site

Oxford Road, Bodicote

Related Documents

#	Name	Description
None		

Waste Stream Template

BSL Suite

Classified by

Name:
Nicola Swallow
Date:
20 Oct 2020 15:36 GMT
Telephone:
01606 334 844

Company:
Brownfield Solutions Ltd
William Smith House
173 – 183 Witton Street
Northwich
CW9 5LP

HazWasteOnline™ Training Record:

Course	Date
Hazardous Waste Classification	-
Advanced Hazardous Waste Classification	-

Report

Created by: Nicola Swallow
Created date: 20 Oct 2020 15:36 GMT

Job summary

#	Sample Name	Depth [m]	Classification Result	Hazard properties	Page
1	TP02	0.1	Non Hazardous		3
2	TP02[2]	0.5	Non Hazardous		5
3	TP03	0.2	Non Hazardous		7
4	TP03[2]	0.4	Non Hazardous		9
5	TP04	0.7	Non Hazardous		11
6	TP05	0.1	Non Hazardous		13
7	TP06	0.1	Non Hazardous		15
8	TP06[2]	0.6	Non Hazardous		17
9	WS01	0.2	Non Hazardous		19
10	WS07	0.1	Non Hazardous		21

Classification of sample: TP02

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP02
Sample Depth:
0.1 m
Moisture content:
16%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 16% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		8	pH		8	pH	8pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		93	mg/kg	1.32	103.144	mg/kg	0.0103 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		130	mg/kg	1.462	159.602	mg/kg	0.016 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		17	mg/kg	1.126	16.078	mg/kg	0.00161 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	60	mg/kg		50.4	mg/kg	0.00504 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		56	mg/kg	1.579	74.3	mg/kg	0.00743 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		300	mg/kg	2.774	699.085	mg/kg	0.0699 %	✓	
12	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4		<			<		<		**ND**

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
				77536-68-6 77536-67-5 12001-29-5							
								Total:	0.111 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP02[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP02[2]
Sample Depth:
0.5 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		7.9	pH		7.9	pH	7.9 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		170	mg/kg	1.32	190.787	mg/kg	0.0191 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		310	mg/kg	1.462	385.12	mg/kg	0.0385 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		9	mg/kg	1.126	8.613	mg/kg	0.000861 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	43	mg/kg		36.55	mg/kg	0.00366 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		110	mg/kg	1.579	147.683	mg/kg	0.0148 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		220	mg/kg	2.774	518.765	mg/kg	0.0519 %	✓	
										Total:	0.129 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP03

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP03
Sample Depth:
0.2 m
Moisture content:
16%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 16% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		7.1	pH		7.1	pH	7.1 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		130	mg/kg	1.32	144.18	mg/kg	0.0144 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		230	mg/kg	1.462	282.373	mg/kg	0.0282 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		20	mg/kg	1.126	18.915	mg/kg	0.00189 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	81	mg/kg		68.04	mg/kg	0.0068 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		94	mg/kg	1.579	124.717	mg/kg	0.0125 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		250	mg/kg	2.774	582.571	mg/kg	0.0583 %	✓	
12	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
13	acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14	●	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			201-469-6	83-32-9									
15	●	fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			201-695-5	86-73-7									
16	●	phenanthrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			201-581-5	85-01-8									
17	●	anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			204-371-1	120-12-7									
18	●	fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-912-4	206-44-0									
19	●	pyrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			204-927-3	129-00-0									
20		benzo[a]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<LOD
			205-883-8	191-24-2									
28	●	TPH (C6 to C40) petroleum group				<20	mg/kg		<20	mg/kg	<0.002 %		<LOD
				TPH									
29		benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		601-020-00-8	200-753-7	71-43-2									
30		toluene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		601-021-00-3	203-625-9	108-88-3									
31	●	ethylbenzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		601-023-00-4	202-849-4	100-41-4									
32		xylene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		<LOD
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
33		asbestos				<			<		<		ND
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.125 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP03[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP03[2]
Sample Depth:
0.4 m
Moisture content:
13%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		8.9	pH		8.9	pH	8.9 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		150	mg/kg	1.32	172.302	mg/kg	0.0172 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		280	mg/kg	1.462	356.035	mg/kg	0.0356 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		6.7	mg/kg	1.126	6.563	mg/kg	0.000656 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	41	mg/kg		35.67	mg/kg	0.00357 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		110	mg/kg	1.579	151.158	mg/kg	0.0151 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		260	mg/kg	2.774	627.512	mg/kg	0.0628 %	✓	
										Total:	0.135 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP04

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP04
Sample Depth:
0.7 m
Moisture content:
11%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		10.2	pH		10.2	pH	10.2 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		210	mg/kg	1.32	246.769	mg/kg	0.0247 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		360	mg/kg	1.462	468.282	mg/kg	0.0468 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		3.9	mg/kg	1.126	3.908	mg/kg	0.000391 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	34	mg/kg		30.26	mg/kg	0.00303 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		120	mg/kg	1.579	168.691	mg/kg	0.0169 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		240	mg/kg	2.774	592.558	mg/kg	0.0593 %	✓	
										Total:	0.151 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP05

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP05
Sample Depth:
0.1 m
Moisture content:
15%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 15% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		7.8	pH		7.8	pH	7.8 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		120	mg/kg	1.32	134.673	mg/kg	0.0135 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		220	mg/kg	1.462	273.311	mg/kg	0.0273 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		18	mg/kg	1.126	17.226	mg/kg	0.00172 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	56	mg/kg		47.6	mg/kg	0.00476 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		90	mg/kg	1.579	120.832	mg/kg	0.0121 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		240	mg/kg	2.774	565.926	mg/kg	0.0566 %	✓	
12	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4		<			<		<		**ND**

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
				77536-68-6 77536-67-5 12001-29-5							
								Total:	0.116 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP06

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP06
Sample Depth:
0.1 m
Moisture content:
13%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		7.3	pH		7.3	pH	7.3 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		130	mg/kg	1.32	149.329	mg/kg	0.0149 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		280	mg/kg	1.462	356.035	mg/kg	0.0356 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		11	mg/kg	1.126	10.775	mg/kg	0.00108 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	52	mg/kg		45.24	mg/kg	0.00452 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		120	mg/kg	1.579	164.9	mg/kg	0.0165 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		230	mg/kg	2.774	555.107	mg/kg	0.0555 %	✓	
12	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4		<			<		<		**ND**

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
				77536-68-6 77536-67-5 12001-29-5							
								Total:	0.129 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: TP06[2]

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
TP06[2]
Sample Depth:
0.6 m
Moisture content:
26%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 26% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		7.3	pH		7.3	pH	7.3 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		310	mg/kg	1.32	302.883	mg/kg	0.0303 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		500	mg/kg	1.462	540.776	mg/kg	0.0541 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		<1	mg/kg	1.126	<1.126	mg/kg	<0.000113 %		<**LOD**
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	58	mg/kg		42.92	mg/kg	0.00429 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		170	mg/kg	1.579	198.701	mg/kg	0.0199 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		300	mg/kg	2.774	615.861	mg/kg	0.0616 %	✓	
										Total:	0.171 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS01

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS01
Sample Depth:
0.2 m
Moisture content:
11%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		7.6	pH		7.6	pH	7.6 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		92	mg/kg	1.32	108.108	mg/kg	0.0108 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		170	mg/kg	1.462	221.133	mg/kg	0.0221 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		18	mg/kg	1.126	18.037	mg/kg	0.0018 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	1700	mg/kg		1513	mg/kg	0.151 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		67	mg/kg	1.579	94.186	mg/kg	0.00942 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		200	mg/kg	2.774	493.798	mg/kg	0.0494 %	✓	
12	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**
13	acenaphthylene		205-917-1	208-96-8		<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		<**LOD**

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14	●	acenaphthene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			201-469-6	83-32-9									
15	●	fluorene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			201-695-5	86-73-7									
16	●	phenanthrene				0.34	mg/kg		0.303	mg/kg	0.0000303 %	✓	
			201-581-5	85-01-8									
17	●	anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
			204-371-1	120-12-7									
18	●	fluoranthene				0.91	mg/kg		0.81	mg/kg	0.000081 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				0.9	mg/kg		0.801	mg/kg	0.0000801 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				0.71	mg/kg		0.632	mg/kg	0.0000632 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				0.52	mg/kg		0.463	mg/kg	0.0000463 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				0.58	mg/kg		0.516	mg/kg	0.0000516 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.54	mg/kg		0.481	mg/kg	0.0000481 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				0.59	mg/kg		0.525	mg/kg	0.0000525 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				0.38	mg/kg		0.338	mg/kg	0.0000338 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				<0.05	mg/kg		<0.05	mg/kg	<0.000005 %		**<LOD**
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				0.51	mg/kg		0.454	mg/kg	0.0000454 %	✓	
			205-883-8	191-24-2									
28	●	TPH (C6 to C40) petroleum group				<20	mg/kg		<20	mg/kg	<0.002 %		**<LOD**
				TPH									
29		benzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-020-00-8	200-753-7	71-43-2									
30		toluene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-021-00-3	203-625-9	108-88-3									
31	●	ethylbenzene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-023-00-4	202-849-4	100-41-4									
32		xylene				<0.001	mg/kg		<0.001	mg/kg	<0.0000001 %		**<LOD**
		601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]									
33		asbestos				<			<		<		**ND**
		650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5									
										Total:	0.248 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
●	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS07

Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample Name:
WS07
Sample Depth:
0.1 m
Moisture content:
13%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	pH			PH		6.9	pH		6.9	pH	6.9 pH		
2	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		140	mg/kg	1.32	160.816	mg/kg	0.0161 %	✓	
3	cadmium { cadmium sulfide }	048-010-00-4	215-147-8	1306-23-6	1	<0.2	mg/kg	1.285	<0.257	mg/kg	<0.00002 %		<**LOD**
4	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0		<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<**LOD**
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		240	mg/kg	1.462	305.173	mg/kg	0.0305 %	✓	
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		10	mg/kg	1.126	9.795	mg/kg	0.00098 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			1	74	mg/kg		64.38	mg/kg	0.00644 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.3	mg/kg	1.353	<0.406	mg/kg	<0.0000406 %		<**LOD**
9	nickel { nickel dihydroxide }	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]		97	mg/kg	1.579	133.294	mg/kg	0.0133 %	✓	
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }	034-002-00-8				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<**LOD**
11	zinc { zinc chromate }	024-007-00-3	236-878-9	13530-65-9		270	mg/kg	2.774	651.647	mg/kg	0.0652 %	✓	
12	asbestos	650-013-00-6	- - - - - - -	12001-28-4 132207-32-0 12172-73-5 77536-66-4		<			<		<		**ND**

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
				77536-68-6 77536-67-5 12001-29-5							
								Total:	0.133 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Appendix A: Classifier defined and non CLP determinands

pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

chromium(III) oxide (worst case) (EC Number: 215-160-9, CAS Number: 1308-38-9)

Conversion factor: 1.462
Description/Comments: Data from C&L Inventory Database
Data source: https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H332 , Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Resp. Sens. 1 H334 , Skin Sens. 1 H317 , Repr. 1B H360FD , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

lead compounds with the exception of those specified elsewhere in this Annex

CLP index number: 082-001-00-6
Description/Comments: Least-worst case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following CLP protocols, considers many simple lead compounds to be Carcinogenic category 2
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2A (Sup 7, 87) 2006; Lead REACH Consortium www.reach-lead.eu/substanceinformation.html. Review date 29/09/2015

acenaphthylene (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4 H302 , Acute Tox. 1 H330 , Acute Tox. 1 H310 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315

acenaphthene (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Aquatic Chronic 2 H411

fluorene (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

phenanthrene (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Carc. 2 H351 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410 , Skin Irrit. 2 H315

anthracene (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2 H319 , STOT SE 3 H335 , Skin Irrit. 2 H315 , Skin Sens. 1 H317 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

fluoranthene (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4 H302 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2 H315 , Eye Irrit. 2 H319 , STOT SE 3 H335 , Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2 H351

- **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1 H400 , Aquatic Chronic 1 H410

- **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3 H226 , Asp. Tox. 1 H304 , STOT RE 2 H373 , Muta. 1B H340 , Carc. 1B H350 , Repr. 2 H361d , Aquatic Chronic 2 H411

- **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Worst case species based on hazard statements

cadmium {cadmium sulfide}

Worst case species based on hazard statements

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case species based on hazard statements

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Worst case species based on hazard statements

copper {dicopper oxide; copper (I) oxide}

Most likely common species

lead {lead compounds with the exception of those specified elsewhere in this Annex}

The absence of chromium VI within the soil samples indicates that lead chromate could not be present within the site soils. The samples were generally collected from areas which were not overlain with hardstanding suggesting that soluble lead form will likely have leached from the site soils. Given this, the next most conservative insoluble lead species has been selected.

mercury {mercury dichloride}

Worst case species based on hazard statements

nickel {nickel dihydroxide}

Worst case species based on hazard statements

selenium {selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex}

Worst case species based on hazard statements

zinc {zinc chromate}

Worst case species based on hazard statements

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2020.289.4500.8764 (15 Oct 2020)
HazWasteOnline Database: 2020.290.4501.8765 (16 Oct 2020)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
CLP Regulation - Regulation 1272/2008/EC of 16 December 2008
1st ATP - Regulation 790/2009/EC of 10 August 2009
2nd ATP - Regulation 286/2011/EC of 10 March 2011
3rd ATP - Regulation 618/2012/EU of 10 July 2012
4th ATP - Regulation 487/2013/EU of 8 May 2013
Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
5th ATP - Regulation 944/2013/EU of 2 October 2013
6th ATP - Regulation 605/2014/EU of 5 June 2014
WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
7th ATP - Regulation 2015/1221/EU of 24 July 2015
8th ATP - Regulation (EU) 2016/918 of 19 May 2016
9th ATP - Regulation (EU) 2016/1179 of 19 July 2016
10th ATP - Regulation (EU) 2017/776 of 4 May 2017
HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017
13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
14th ATP - Regulation (EU) 2020/217 of 4 October 2019
15th ATP - Regulation (EU) 2020/1182 of 19 May 2020
POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
1st ATP to POPs Regulation - Regulation 756/2010/EU of 24 August 2010
2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

North West

William Smith House
173 – 183 Witton Street
Northwich
Cheshire
CW9 5LP

Tel: 01606 334 844

Midlands

Unit 5, Alfred Court
Saxon Business Park
Stoke Prior
Bromsgrove
Worcestershire
B60 4AD

Tel: 01215 729 014

www.brownfield-solutions.com