



**BROWNFIELD
SOLUTIONS LTD**

GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

MOSSCARE ST VINCENT'S HOUSING GROUP

Simister Street, Manchester

Phase II Geo-Environmental Assessment Report

PH/C4656/10673

February 2022

EXECUTIVE SUMMARY	
Location and Brief Site Description	The site is located in Harpurhey, 4km northeast of Manchester city centre. The northern section of the site is located off Jonas Steet, the southern section is accessed off Princedom Street. The site currently comprises of two separate parcels of land, both are mainly featureless and are mostly covered in grass, the two sections are bisected by Princedom Street.
Ground Conditions	Generalised ground conditions from the ground investigation comprise (top down): <i>Northern Section</i> <ul style="list-style-type: none"> • Made ground encountered from ground level to between 0.30m and 0.90m bgl. • Natural strata encountered from between 0.30m and 0.90m bgl to 4.45m bgl. • Groundwater recorded between 0.20m and 2.10m bgl. <i>South Section</i> <ul style="list-style-type: none"> • Made ground encountered from ground level to between 1.40m to 4.20m bgl. • Natural strata encountered from between 1.40m and 4.20m bgl to 5.45m bgl. • Groundwater recorded between 1.20m to 4.00m bgl.
Human Health - Soils Contamination	Testing of the made ground onsite revealed exceedances of heavy metals. Trace levels of asbestos fibres were found in one hole in the southern section (WS03).
Controlled Waters – Surface and Groundwater Contamination	The overall risk to controlled waters is considered to be low and no further action is required.
Ground Gas	Based on the monitoring to date, the site is classified as Green/CS1 under the NHBC traffic light classification system. Ground gas monitoring is ongoing, and a full assessment will be undertaken on completion of the scheduled monitoring.
Outline Remedial Strategy	Subject to regulatory approval, the following outline remedial strategy is recommended: <ul style="list-style-type: none"> • Removal of arsenic hotspot in the topsoil at WS09. • Adopt clean cover system in all garden areas and soft landscaping areas wherever made ground is present. Further confirmatory testing of the of the topsoil would be required to determine if these soils could be utilised as part of this cover system.
Waste	Based on the waste classification database assessment, the majority of soils are classed as non-hazardous. One of the made ground soil samples has been classified as hazardous (WS09).
Foundations and Floor Slabs	<i>North Section Foundations</i> The foundation recommendations are strip foundations in the northern section of the site, with a bearing capacity not exceeding 120 kN/m ² at a minimum depth of 0.90m bgl, increasing to 200 kN/m ² at 2.00m bgl. Foundations will need to be locally deepened in areas of soft cohesive material and in should be depending in accordance with NHBC standards. <i>South Section Foundations</i> The most suitable foundation solution for the south section of the site with the deep made ground is considered to be VSCs. Piles may also be a viable option for this section of the site. <i>Floor Slabs</i> Due to the presence of made ground onsite and the medium plasticity of the natural soils across the site, suspended floor slabs should be adopted.
Concrete Classification	DS-1 and ACEC Class AC-1 conditions prevail.
Highways Design	Made Ground CBR – 2% Superficial Strata CBR – cohesive/fine soils– 2% 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 unsuitable for this site as drainage conditions are poor. Indicative soil infiltration rates range from no infiltration to 7.9x10 ⁻⁷ m/s.
Further Work	The following further works will be required to progress to the construction phase: <ul style="list-style-type: none"> • Completion of ground gas monitoring programme. • Issue gas assessment / update gas assessment within this report. • Carry out confirmatory deeper cable percussive boreholes on the southern part of the site to obtain information for pile/VSC design. • Carry out further confirmatory testing on topsoil to confirm if it is acceptable for future re-use on site in private gardens.

EXECUTIVE SUMMARY

- Tree survey by qualified arboriculturist.
- Detailed foundation design by a structural engineer, including foundation zonation plan and depth schedule.
- Design of Remedial Strategy and confirmation with the Local Authority /EA / NHBC.
- 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 PH/C4656/10673 and not as a standalone document.

PROJECT QUALITY CONTROL DATA SHEET

Site Name:	Simister Street, Manchester		
Document Name:	Phase II Geo-Environmental Assessment Report		
Reference:	PH/C4656/10673		
Status:	-	03/02/2022	Interim – Pending completion of ground gas monitoring.

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DRAWINGS

Drawing Number	Rev	Title
12192-AEW-XX-XX-DR-A-00(P3	-	Site – Proposed – Option 2
C4656/01	-	Site Location Plan
C4656/02	-	Site Features Plan
C4656/03	-	Exploratory Hole Location Plan

APPENDICES

Appendix	Title
Appendix A	BSL Methodology and Guidance
Appendix B	Phase I Supporting Searches
Appendix C	Exploratory Hole Logs
Appendix D	Chemical Testing Results
Appendix E	Geotechnical Testing Results
Appendix F	Monitoring Results
Appendix G	Waste Assessment Report

1.0 INTRODUCTION

1.1 Context

This report describes a Phase II Geo-Environmental Assessment carried out by Brownfield Solutions Limited (BSL) for Mosscares St Vincent's Housing Group as instructed by Poole Dick Associates on a site off Simister Street and has been completed in general accordance with the following guidance:

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- Environment Agency guidance - Land Contamination: Risk Management (LCRM).
 - 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 22 residential houses with associated private gardens, highways and infrastructure as shown on the proposed development plan, drawing No. 12192-AEW-XX-XX-DR-A-000P(3 provided to BSL by the client.

1.3 Previous Reports.

This report should be read in conjunction with Sladen Associates Phase I Study Report (20 2276) issued in December 2020.

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 report has been produced in general accordance with the recommendations for a Tier 2 Generic Quantitative Risk Assessment as described in LCRM guidance. 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 intrusive 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 window sampling, gas monitoring, laboratory chemical and geotechnical testing and falling head infiltration tests, 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, Mosscares St Vincent's Housing Group. 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 split over two areas to the north and south of Princedom Street, Manchester, M9 4JR. It is situated approximately 4.5 Km north-east of Manchester City Centre, centred on National Grid Reference 386432, 401698 as shown on the Site Location Plan, Drawing No. C4656/01.

2.2 Site Description

The main site features and potential issues identified are detailed below and are shown on the Site Features Plan, Drawing No. C4656/02.

Feature	Description
Site Area	Approximately 0.52 hectares.
Site Access	Access to the northern parcel is gained off Jonas St to the west, whereas access to the southern parcel is gained off Princedom Street which lies between the northern and southern parcels.
Current Land Use and Site Features	<p>The site comprises two separate parcels of land which are bisected by Princedom Street which runs east to west.</p> <p><i>Area A (Northern Parcel)</i> Area A is a broadly square shaped parcel of land covered almost entirely in grass and is mostly featureless. A broadly circular patch of ash is present in the south-western corner and appears to have been created relatively recently by bonfires.</p> <p><i>Area B (Southern Parcel)</i> Area B is an irregular shaped parcel also covered in grass and is mostly featureless. A series of topographical depressions up to c. 1m deep were noted in the south-western corner of Area B.</p>
Potential Sources of Gross Contamination	The area of ash noted in Area A, which appears to be associated with a bonfire or similar, is a potential localised source of heavy metals and/or PAHs.
Vegetation	No trees or hedges were noted on the site itself, although a number of semi mature trees and bushes were present adjacent to the south-western boundary of Area B.
Topography	The site is generally flat, except for the topographical depressions noted in Area B.
Site Boundaries	<p>Area A is enclosed entirely with low metal fencing (circa 300mm high) and is therefore open to pedestrian access. A gated section of this fencing is present off Jonas Street to the west for vehicle access.</p> <p>Area B is enclosed to the north by low metal fencing (circa 300mm high) and is open to pedestrian access, with a gated section off Princedom Street providing vehicular access. Area B is enclosed to the west, south and east by circa 2m tall steel palisade fencing.</p>
Surrounding Area	The site is set within an established residential housing estate. A small service and repair garage is located to the south.

3.0 SUMMARY OF PREVIOUS REPORTS

3.1 Sladen Associates Desk Study

A summary of the relevant points from the Desk Study completed by Sladen Associates (reference 20 2276) is presented below:

- The site has had previous development since 1922 for residential end use which was present until 2005 and are no longer seen to be present onsite.
- The surrounding area of the site is almost entirely residential as seen from current aerial imaging.
- Geology comprises glacial Till deposits (Undifferentiated Secondary Aquifer) over Manchester Marls Formation (Secondary B Aquifer).
- The site is not in an area of former underground mining and is not designated as being in a high-risk area by the Coal Authority.
- Searches have revealed no evidence of current landfills within 250m of the site.
- Some made ground may be present due to the previous development onsite.
- Due to the relative age of the buildings formerly onsite, some asbestos containing materials may be present.
- The risk from ground gas is considered to be low and the site is not located in an area requiring radon protection measures.
- The risk to controlled waters is low.
- There are no nearby off-site land uses that have been identified that would potentially be associated with any significant risk of contamination of the site soils.
- Recommendations were for an appropriate Phase II ground investigation to be carried out to confirm the identified risks and obtain information for preliminary design.

3.2 Coal Mining

The site lies within a Coal Authority Reporting Area and therefore a mining search should be undertaken as part of the Phase 1 Desk Study to confirm risks to the proposed development from past or current coal mining.

It was noted that the Sladen report did not include a mining search and therefore BSL have procured one, the main findings of which are presented below:

Highlighted Evidence	Issue	Details
Past Underground Mining	No	No past mining recorded.
Probable Unrecorded Shallow workings	No	None.
Spine Roadways at Shallow Depth	No	No spine roadway recorded at shallow depth.
Future Underground Mining	No	None recorded.
Mine Entries	No	None recorded within 100 metres of the enquiry boundary.
Outcrops	No	No outcrops recorded.
Geological faults, fissures and breaklines	No	No faults, fissures or breaklines recorded.
Opencast Mines	No	None recorded within 500 metres of the enquiry boundary
Coal Authority Managed Tips	No	None recorded within 500 metres of the enquiry boundary.
Site Investigations	No	None recorded within 50 metres of the enquiry boundary.
Remediated Sites	No	None recorded within 50 metres of the enquiry boundary.
Coal mining subsidence	No	The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994. There is no current Stop Notice delaying the start of remedial works or repairs to the property. The Coal Authority is not aware

Highlighted Evidence	Issue	Details
		of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.
Mine gas	No	None recorded within 500 metres of the enquiry boundary.
Mine Water Treatment Schemes	No	None recorded within 500 metres of the enquiry boundary.
Coal Mining Licensing	No	None recorded within 200 metres of the enquiry boundary.
Court Orders	No	None recorded.
Withdrawal of support	No	The property is not in an area where a notice to withdraw support has been given. The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.
Payments to Owners of Former Copyhold Land	No	The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

A copy of the mining report can be found in Appendix B.

3.3 UXO Risk

The site lies within a moderate risk UXO zone, which was not considered as part of the Sladen Desk Study. Therefore, BSL commissioned a preliminary UXO Desk Study from 1st Line Defence, report reference PA14597-0, dated 17th November 2021, in accordance with CIRIA C681 guidance. The report is presented in Appendix B.

Based on further research carried out, the risk from UXO on site is not considered to be significantly elevated above the background level for the region. It is therefore recommended that no further research be undertaken for this site and there are no further requirements at the site.

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 and the potential need for detailed investigation.
- 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 8th and 10th of December 2021.

Method	No.	Range Depths (m bgl)	Purpose
Window sample boreholes – Tracked WS rig	11	4.44 – 5.45	Establish general ground conditions on site. Allow Standard Penetration Tests (SPTs) to be carried out and obtain samples for contamination and geotechnical and testing. Installation of ground gas and water monitoring wells.
Falling Head Infiltration tests	2	n/a	Obtain infiltration rates for drainage design.

The approximate locations of the exploratory holes are indicated on the Exploratory Hole Location Plan, Drawing No C4656/03. The exploratory hole logs are presented in Appendix C.

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.

4.3 Sampling

During the drilling of the exploratory holes, representative samples were taken at regular intervals to assist in the identification of the soils and to allow subsequent laboratory testing. 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)	20
Disturbed (D)	45

4.4 Laboratory Testing

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

The potential contaminative process on site were made ground, therefore the following suite of determinands were chosen to screen for potential site impacts 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.	6
Asbestos Screen & ID.	6
Asbestos Quantification	1

The Chemical Laboratory Testing Results are presented in Appendix D.

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
Atterberg Limits including moisture content.	3
pH and Water Soluble Sulphate (2:1 Extract)	3

The Geotechnical Laboratory Testing Results are presented in Appendix E.

4.5 Monitoring

Ground gas and ground water monitoring standpipes were installed in 4 boreholes and subsequently 4 monitoring visits have been undertaken out of 6 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 (O₂), carbon dioxide (CO₂) and methane (CH₄) 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
WS02	35mm PVC	1.00 – 3.00	Made Ground	Ground Gas

Location	Internal Diameter Pipe	Response Zone (m bgl)	Targeted Strata	Purpose
WS06	50mm HDPE	0.50 – 4.00	Natural Strata & Made Ground	Ground Gas & Groundwater Infiltration Testing
WS09	35mm PVC	1.00 – 3.00	Sandy Gravelly Clay	Ground Gas
WS10	50mm HDPE	2.00 – 4.00	Natural Strata	Ground Gas & Groundwater Infiltration Testing

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 F 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	0.30 – 4.20	0.30 – 4.20	Sandy CLAY to clayey SAND with gravel of brick, slate, glass, rare coal, and tile.
Natural Superficial Strata	0.30 – 4.20	4.44 – 5.45	1.25 – 4.15	Sandy CLAY, Sandy Gravelly CLAY, SAND & SILT

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

5.2 Made Ground

Made Ground – Topsoil

Made ground topsoil was encountered across the site in all locations with the exception of WS09 and was present from ground level to 0.20m bgl, generally comprising soft dark brown slightly gravelly sandy clay with rootlets. The gravel consisted of brick and mudstone.

Made Ground – General

Made ground was encountered within all of the exploratory holes across the site and varied in depth between the north and south sections of the site.

Made ground to the north of Princedom Street was recorded from 0.20m bgl to depths of between 0.30m and 0.90m bgl, whilst made ground in the south was recorded from ground level to depths of between 1.50m and 4.20m bgl.

The composition of the made ground across the site comprised either sandy clay or clayey sand with gravel that varies in size from fine to coarse of mudstone, brick, glass, slate, tile, and rare coal. The material encountered is typical of demolition rubble.

Made ground in WS09 from ground level to 0.05m bgl was noted as comprising black very gravelly sand with a mix of lithologies including ash. This material is associated with the remnants of a bonfire in this area.

5.3 Natural Superficial Strata

Natural strata underlying the site was present below the made ground in all of the exploratory holes.

North Section

The natural strata underlying the north section of the site was generally firm to stiff sandy gravelly clay, with gravel of mudstone and sandstone. This is interpreted to represent glacial Till and was encountered from 0.40m to 0.90m bgl.

A small band of clayey sand was encountered at 1.40m bgl in WS06 and 1.50m bgl in WS05 both of which extended to 1.60m bgl. Silt was encountered in WS09 at 2.10m and 3.20m bgl.

South Section

The natural strata underlying the south section of the site is encountered at a greater depth due to the greater thickness of made ground present in this area. The natural strata in this section was generally described as sandy clay and sandy gravelly clay.

The clay was present below the made ground from 1.40m bgl and was noted as having an increased gravel content with depth.

A dense light brown sand was encountered in WS03 at 4.30m bgl. This was the only hole that contained granular soils.

The natural strata generally started becoming stiff at depths from 3.00m, with all of the holes having SPTs recorded as being stiff or very stiff at 4.00m bgl.

5.4 Solid Geology

The solid geology of the Manchester Marls Formation Mudstone was not encountered in this investigation.

5.5 Groundwater

The depths to groundwater and locations present are shown in the table below:

Location	Depth During Site Works (m)	Depth During Monitoring Period (range) (m)
WS01	2.60 (1.80 after 30 mins)	n/a
WS02	4.00	1.20 – 1.67
WS04	2.60	n/a
WS05	1.40	n/a
WS06	1.50	0.20 – 0.70
WS09	2.10	1.57 – 1.74
WS10	2.30	1.46 – 1.56
WS11	2.00	n/a

The groundwater recorded is likely to be representative of perched groundwater present within the shallow superficial soils.

5.6 Observations

Contamination

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

The only contamination observed during the site works was the remains of a bonfire, located at WS09, which appeared to have been used to burn household waste and furniture, including plastics. The made ground beneath the bonfire included ash. With the exception of this area, no other evidence of contamination was observed at the site.

Stability of Excavations/Boreholes

The borehole sidewalls were generally stable and window sampling progressed without the need to install casing.

6.0 TEST RESULTS

6.1 Geotechnical Laboratory Testing

Plasticity Index Analysis

Plasticity index results ranged between 23% and 24% indicating the cohesive soils to be of medium plasticity. Associated water contents ranged between 19.7% and 21.7%.

After modification of particle size in accordance with NHBC Chapter 4.2 the modified plasticity indices are in the range 21% to 23% indicating the cohesive soils to be of 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 E. 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

Three hand shear vane tests were carried out on suitable cohesive soils recovered from the borehole samples recovered from service inspection 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 E.

In Situ Standard Penetration Tests

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

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.

Permeability Test Results (Boreholes)

The results of permeability testing in boreholes using falling head methods are presented in the table below. These were carried out in general accordance with BS 5930 & BS 22282.

Location	Response Zone (m)	Stratum Type	Hydraulic Conductivity (m/sec)
WS06	0.50 – 4.00	Sandy CLAY & Clayey SAND	n/a
WS10	2.00 – 4.00	Sandy CLAY & SILT	7.9 x 10 ⁻⁷

The full test results are presented in Appendix E.

6.4 Geo-Environmental Testing

Chemical Laboratory Testing

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

7.0 GEOTECHNICAL ASSESSMENT

7.1 Ground Model Summary

The site is currently disused and unoccupied with all previous buildings now demolished. The current site use has open access to the public and is used as a recreational area.

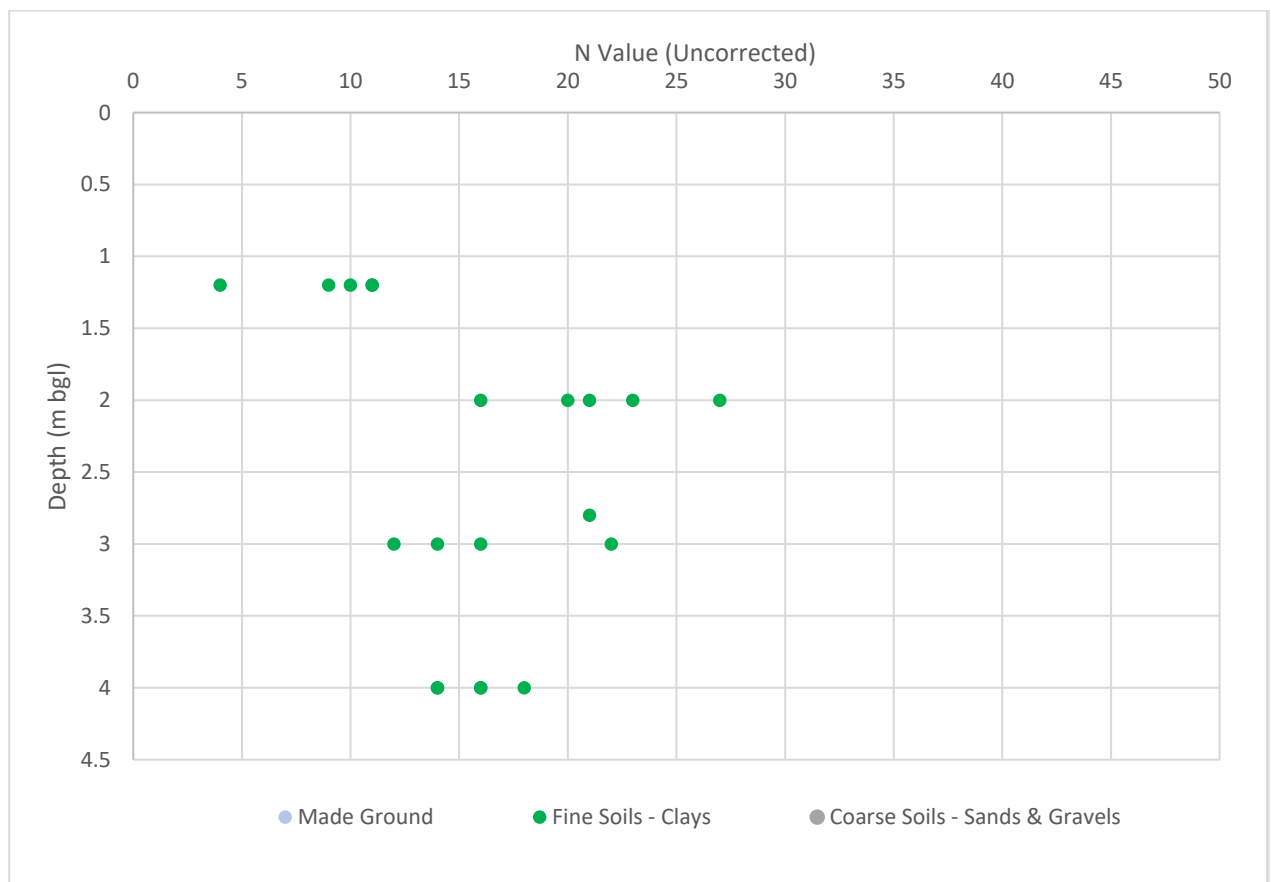
The ground conditions can be summarised as below (top down):

- Made ground generally comprising of gravelly clay and sand with gravel of mudstone, brick, glass, slate, tile, and rare coal from ground level to between 0.40m and 4.20m bgl, with greater thicknesses present in the south.
- Natural superficial deposits comprising of predominantly sandy clay with sporadic bands of clayey sand, proven to a maximum depth of 5.45m bgl.
- Groundwater levels ranging between 1.40m and 4.00m bgl during site works.
- Post site works monitoring levels ranging between 0.20m and 1.74m 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.

A depth (m bgl) vs SPT N value graph is provided below to provide a profile of the cohesive materials underlying the north of the site. Results from the southern area have been omitted given the significant depths of made ground.



The above graph shows a general increase in soils density and strength as depth increases in the north of the site.

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.

Made ground is not considered to be a suitable founding medium, therefore no characteristic values have been interpreted for this stratum; foundations will need to be extended below the made ground present to depths between 0.30 and 0.90m bgl in the north of the site, and to depths of between 1.50m and 4.20m bgl in the south.

In the north of the site, (WS05 to WS09) the characteristic SPT N value in the cohesive deposits at 1.00mbgl is interpreted to be 10 and 20 at 2.00m bgl. Based on the correlation of Stroud (1975) based on 'average' plasticity and adopting an f_1 value of 5, this gives a characteristic shear strength (C_u) of 50kN/m², increasing to 100kN/m² at 2.00mbgl.

Characteristic values for undrained shear strength (C_u) of natural deposits in the south of the site have not been calculated due to the significant thicknesses of made ground present, where a deep foundation solution will be required, and a more detailed profile of soils strengths is typically utilised for design.

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.

Due to the differing nature of the ground conditions within the north and south sections of the site, the recommended foundations for these sections will be different.

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.

The variance of existing levels and proposed levels will likely influence founding depths and should be considered at the detailed design stage.

Northern Section

Shallow Foundations – Strip

The most suitable foundations for the proposed residential homes in the north of the site are considered to be strip foundations taken through the base of the made ground at a minimum depth of 0.90m bgl, based on the low volume change potential clays, although they will need to be locally deepened through sand bands or through soft cohesive strata into firm to stiff clays. From the information to date, deepening would be required in the localities of WS05 and WS09. The foundations will also need to be deepened near trees and hedges in accordance with NHBC Chapter 4.2.

At circa 0.90-1.00m bgl, an allowable bearing capacity not exceeding 120 kN/m², increasing to 200kN/m² at 2.00m bgl, may be assumed. This adopts a factor of safety of 3 which should limit settlements to within acceptable limits.

General Advice for Shallow Foundations

The bearing stratum should be inspected for 'soft spots' within the natural clay strata, resulting for instance from localised groundwater perched within the overlying fill materials or localised bands of silt. If soft soils are encountered, then 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.

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

Trees were not noted in close proximity to the northern part of the site, however if present the depending on their size, type and maturity, the required depth of founding based on the recommendations of NHBC Chapter 4.2 may exceed 2.5m. Should this prove to be the case, then piled foundations should be considered as a potentially more economical solution, unless it can be proven that the soils are not desiccated.

Southern Section

VSCs

Significant thicknesses of made ground were noted in the south of the site which preclude the use of shallow foundations in this area.

Ground improvement by vibro stone columns (VSCs) could be considered to provide a suitable platform for the development. This will create a stiffened layer which will help to spread the building loads and thus minimise differential settlement. Further guidance is provided in BRE 391 "Specifying vibro stone columns".

The vibro stone columns would need to penetrate through the made ground and underlying any soft cohesive natural strata, down to a competent horizon. Dependent on the degree and nature of the basement structure removal and backfill, this may involve pre-excavation to remove obstructions and replacement with suitable material.

Highly organic soils are considered unsuitable for VSCs and an appropriate contractor should be contacted to confirm suitability.

Following ground improvement, pad foundations could be used bearing onto the improved ground over the VSCs. Typically, allowable bearing capacities of the order of 150kN/m² – 200kN/m² can be achieved, keeping total and differential settlements within tolerable limits, although this should be discussed with specialist VSC contractors.

Discussions will also be required with the ground improvement contractor due to the suitability of this technique due to existing groundwater contamination at the site.

Due to the nature of VSCs and their sensitivity to tree influence, deepening of foundations may still be needed in the south section even if VSCs are implemented, and the economics of installing VSCs vs piles should be considered during the detailed design stage.

Piles

Piles may also be considered a suitable foundations option, extending through the made ground and terminating within the clay superficial deposits where sufficient skin friction can be generated to support the proposed loads.

The choice of piling system and the detailed design of piles are beyond the scope of this report and should be undertaken by a piling specialist.

Limitations and Further Requirements

Due to the lack of data on deeper strata available in this area of the site, further investigation is needed to confirm ground conditions for VSCs and Piles. Therefore, it is recommended that two confirmatory cable percussive boreholes should be undertaken in the southern area to obtain information for detailed foundation design.

VSC / Piling Risk Assessment

A risk assessment is likely to be necessary for piling and/or the installation of VSCs, as there is a possibility that this could lead to creation of new pathways for migration of contamination.

7.4 Building Near Trees

The clay soils on site are of 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.

7.5 Floor Slabs

Given the general thickness of made ground present across the wider site (generally >600mm) and medium volume change potential clays, suspended floor slabs should be 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.

7.6 Site Preparation and Construction

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

There are a number of services crossing the site. To allow construction, all services will need to be disconnected and any suspected dead services are confirmed as dead by testing.

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

Excavation depths should generally be readily achieved using conventional plant (JCB or similar) although high specification plant (tracked 360° or similar) is recommended to maintain the build programme. Breaking equipment may also be required locally to penetrate old foundations associated with former construction.

To protect against the effects of heave, 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 medium and the potential ground movements that need to be considered for design are 100mm.

Recorded post site works groundwater levels ranged between 0.20m and 1.73m bgl therefore will be encountered within likely excavation depths. Although it should be noted that the borehole with a groundwater level of 0.20m bgl is one of locations where the falling head test was carried out and therefore was filled with water. In subsequent monitoring visits this hole will be bailed to see the true level of the groundwater. If the groundwater does not change it is likely to be perched and not a representation of the natural groundwater table.

Any water pumped from excavations is likely to need to be passed via settlement tanks and treated before being discharged to the sewer; discharge consents/permits will also be required.

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, the groundwater has been classified as mobile as, despite the presence of low permeability deposits, groundwater was encountered within the boreholes during drilling and has been present during subsequent monitoring visits.

Stratum	No. Samples	Characteristic SO ₄ (g/l)	Characteristic pH	DS Class	ACEC Class
Natural Superficial Strata	3	0.11	7.5	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 2% are likely to be achieved in natural clays soils and made ground for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer.

Where the CBR is found to be less than 2%, the sub-grade is unlikely to be suitable for both the trafficking of site plant and as a permanent highway foundation without improvement of the soils.

To achieve the required design CBR value, improvement works should be carried out in accordance with DMRB IAN 73/06 Rev 1 Chapter 5 and may include proof rolling, excavation and re-engineering / replacement of weaker soils, the inclusion of a geogrid or use of stabilisation techniques such as the addition of hydraulic binders (e.g. cement/lime).

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 use of sustainable drainage systems, such as traditional soakaways within the natural ground, is not likely to be feasible due to the presence of low permeability cohesive strata underlying the site, as indicated by falling head testing undertaken as part of the intrusive investigation works.

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 D 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

The following elevated metals were detected:

Exploratory Hole	Depth (m)	Metal	Concentration (mg/kg)	Adopted Screening Value (mg/kg)
WS03	0.20	Lead	280	210
WS04	0.90	Arsenic	47	37
WS05	0.20 – 0.40	Lead	220	210
WS09	0.00 – 0.05	Arsenic	230	37
WS09	0.00 – 0.05	Cadmium	11	11
WS11	0.30	Lead	320	210

Asbestos

The locations where asbestos has been detected, alongside the results of quantification (where carried out) are summarised in the table below:

Exploratory Hole	Depth (m)	Asbestos ID	Concentration by Weight (%)
WS03	0.20	Chrysotile loose fibres	< 0.001

No visual evidence of asbestos contamination was noted during the investigation, which was undertaken by an engineer with asbestos awareness and>NNLW qualifications.

Poly Aromatic Hydrocarbons (PAHs)

BSL consider the main risk drivers for PAHs to be benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P being one of the most toxic of the PAHs, and naphthalene the most volatile and soluble. Category 4 Screening Levels (C4SLs) indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible. Given the difference in chemical properties between the two, naphthalene will be treated separately using the LQM S4ULs.

PAHs and B(a)P as a Surrogate Marker

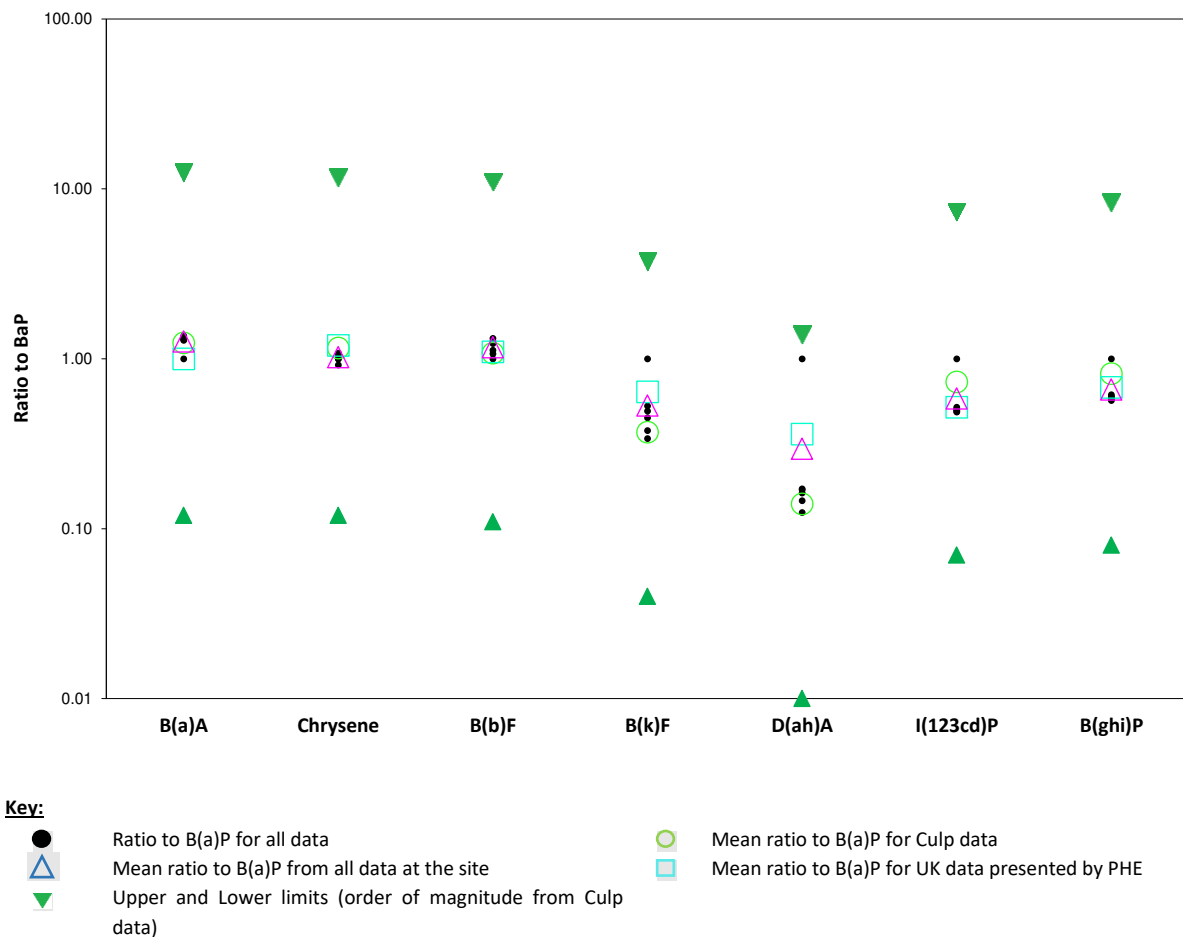
In line with CL:AIRE and Public Health England (PHE) guidance, benzo(a)pyrene is considered to be one of the most potent PAHs, and it would be appropriate to assume the cancer risk in a mixture is proportional to the concentration of a surrogate marker PAH (benzo(a)pyrene) in the mixture. The ratio of PAHs within the mixture can be assessed to ensure that the profile is similar to that seen for the test material (coal tar

mixtures) in the toxicological study by Culp et al. The International Programme on Chemical Safety (IPCS) considered that the PAH profile of the soil sample may deviate from the average profile by about an order of magnitude (up or down).

A more recent study by Bull et al (2013) which analysed PAH concentrations in soil samples from 274 sites, showed that the levels of PAH relative to B(a)P showed little variability and were similar to that recorded for the coal tar mix used in the Culp et al study. Given this, it was concluded that benzo(a)pyrene is a suitable surrogate marker to represent mixtures of PAH in soil.

In order to risk assess the PAH mixture in the site soil samples using human health guideline values, notably C4SLs, the PAH profile in the soil samples, the ratio of the seven genotoxic PAHs shown below, relative to B(a)P, should be calculated to ensure it is similar to the test material used in the Culp study (PHE 2010). To be considered sufficiently similar, the ratio relative to B(a)P should fit within the upper and lower limits (representing an order of magnitude above and below the mean ratio to B(a)P of test material used in the Culp et al study). In such cases B(a)P is considered an adequate surrogate marker and the Low Levels of Toxicological concern (LLTC) for B(a)P may be used in the risk assessment.

The graph below summarises the site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the PHE documents.



Based on the above, elevated PAHs were not recorded above the C4SL value of 5mg/kg for benzo(a)pyrene in any of the samples tested. Therefore, these soils do not pose a risk to human health on site.

8.3 Summary – Human Health Risk Assessment

Based on the testing and assessment undertaken it would appear that there is localised contamination within the made ground in the southern part of the site in the form of metals.

Chrysotile asbestos fibres have been detected in one sample of made ground taken from WS03 at trace levels (<0.001 %). WS03 is also noted as being located in the southern part of the site.

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

It should be noted that the northern site does contains significantly less made ground compared to the south section and that contaminant levels were found to be generally below acceptable values for human health, with the exception of slightly elevated concentrations of lead within WS05 at 0.20 – 0.40m bgl and arsenic and cadmium in WS09 at 0.00 – 0.05m bgl.

The lead identified in WS05 was recorded at concentrations of 220 mg/kg comparative to the Adopted Screening Value of 210 mg/kg. Given the relatively minor exceedance, the depth at which the sample was retrieved from and the likely requirement for topsoil to be placed in the new garden areas due to the anthropogenic nature of the underlying made ground, the presence of lead in this area is considered to pose a low risk to future site users.

Significantly elevated concentrations of arsenic and cadmium were identified in WS09 at 0.00 – 0.05m bgl in the north of the site. This exploratory hole was in the location of visibly charred soils where a suspected bonfire was located. Contamination in this location is likely limited to the very shallow soils affected by the bonfire.

8.4 Controlled Waters Risk Assessment

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 waters for the following reasons:

- 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.
- The Sladen Desk Study report indicates that there may be a culverted stream following the southern site boundary shown as a stream is shown here flowing from east to west on historic mapping from 1893, though this is not confirmed and the associated groundsure report does not record any surface water features within 250m of the site.
- Given that the nearest confirmed watercourse is over 250m away, this provides considerable distance for attenuation and contaminant degradation.
- The site is underlain by low permeability clays which will inhibit lateral and vertical contaminant migration.
- The site does not lie within 500m of an SPZ.
- There are no groundwater abstractions within 1500m.
- There are no potable (sensitive) water abstractions within 2000m.

Based on the above, the risks posed to nearby surface waters and the underlying aquifers is considered to be low.

8.5 Permanent Ground Gas and Vapours Results

Four ground gas monitoring visits have been carried out between the dates of 13th December and 20th January 2022. A further two visits are scheduled. Results are summarised in the table below:

	CH ₄ (%)		CO ₂ (%)		O ₂ (%)		CO (ppm)		H ₂ S (ppm)		TVOC (ppm)		Flow	
	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max
Peak	0.0	0.1	0.1	2.3	7.4	20.7	0.0	0.0	0.0	0.0	0.0	0.0	-3.2	103
Steady	0.1	0.1	0.1	0.8	19.4	21.0	0.0	0.0					-4.2	0.6

Notes: CH₄ = Methane; CO₂= Carbon dioxide; O₂= Oxygen; CO= Carbon Monoxide; H₂S= Hydrogen Sulphide; TVOC (PID)= Total Volatile Organic Compounds (as measured with Photo Ionisation Detector); ppm= Parts Per Million.

The highest carbon dioxide concentrations were recorded within WS10 (2.3% v/v) on the third visit. The maximum flow of 103.2 l/hr was recorded in WS06 on the first visit, it should be noted on the following two visits, the flow level for this hole did not reach this level and was recorded as a negative value on the second visit. This can be attributed to the borehole levels balancing out due to the ground disturbance during installation.

Therefore, the gas flows used to calculate the GSVs are from the steady flow, not the peak flow.

The atmospheric pressure ranged between 1003mb and 1015mb over the monitoring period, of which visits were conducted over a range of falling and rising pressure trends.

Groundwater levels were recorded above the response zones in WS06 on 3 out of 4 visits and WS10 on 4 out of 3 of the visits.

8.6 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 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'.

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.

A maximum positive flow of 0.6l/hr, the maximum steady state flow recorded, has been used to derive the GSVs. The GSV's for the site are presented below.

Gas	GSV (l/h)	Typical Threshold Concentration Exceeded	Classification
Carbon Dioxide	0.0138	No	Green
Methane	0.0006	No	Green

The GSVs for carbon dioxide and methane place the site the site into Green classification of the Boyle and Witherington Traffic Light System as outlined in CIRIA C665.

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

8.7 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.

As the site is brownfield, there is the assumption that barrier pipe would be utilised, although requirements should be confirmed by risk assessment and with the water supply company.

8.8 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 Metals, PAH's, asbestos	Root uptake, ingestion, direct contact, inhalation of dusts	End-users	Likely	Medium	Moderate	Elevations in heavy metals have been detected in the made ground soils and in the made ground topsoil, close to the surface of the site. In the north section of the site, one of the samples showed high levels of contaminants in the made ground topsoil, this is likely attributed to a bonfire. One other sample (WS05) in the north section detected elevated levels of lead in the made ground topsoil, but only exceeded the GAC by a small margin (by 10 mg/kg). Elevated concentrations of heavy metals were present in the deep made ground in the south section of the site, as well as asbestos fibres. The current risk is considered to be moderate and remedial measures will be required in areas of gardens and soft landscaping.
On site Made Ground Metals and organic contamination	Migration into/chemical attack of water supply pipelines	Water Pipelines / End users	Low Likelihood	Mild	Very low	Contaminants within the soil/groundwater could potentially attack the clean potable water supply pipe, 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	Unlikely	Medium	Low	Ground gas monitoring to date does not indicate significantly elevated concentrations of hazardous ground gas are present which would be capable of harming future site users / buildings, hence the classification of severity as medium. Currently the site can be classified as NHBC Green, whereby gas protection measures are not required. The risk to site end-users from ground gas is considered low at this time, although further assessment will be needed once the full monitoring programme has been completed.

8.9 Outline Remedial Measures

To date, only limited testing of the topsoil has been carried out as part of this initial site assessment. Exceedances of contaminants were identified in these soils. It would be prudent to carry out further confirmatory testing and assessment on the topsoil across the site to see what volume of the material, if any, could potentially be re-used in garden areas. The soils may also potentially be suitable in POS areas, where less stringent screening criteria apply.

In the northern section of the site elevated concentrations of arsenic were encountered in the topsoil close to the surface in WS09 attributed to a bonfire in this area. The affected topsoil in the area of WS09 will need to be removed, undertaken under a watching brief by a suitably qualified engineer (such as BSL).

Elsewhere, to mitigate the identified contamination within the made ground, a clean cover system comprising 600mm of clean topsoil and subsoil should be implemented to break the pathway to site end users. This will allow plants to be grown and prevent undesirable soils being brought to the surface. Elsewhere, hardstanding will break the pathway to site end users. Given the presence of asbestos, the inclusion of a hard dig layer (100mm thickness with 500mm topsoil above) or a warning membrane at the base of the clean soil should also be included.

This cover system may be reduced to 450mm in soft landscaping areas (Public Open Space – POS) where it is less likely that soil mixing will take place with contaminated soil at depth.

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.

Ground Gas Protection Systems

Based on the ground gas monitoring results to date, no mitigation measures are required, subject to ongoing monitoring and no radon protection is required for new buildings at this location.

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.

Once the above bodies have approved the above outline remedial proposals, a Remedial Strategy 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.

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.

8.10 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	Mild	Moderate/low
Asbestos	Ingestion, direct contact, inhalation of dusts.	Construction Workers	Likely	Medium	Moderate
Ground gas	Inhalation in confined spaces/trenches	Construction Workers	Unlikely	Medium	Low

Trace levels of Chrysotile asbestos have been identified in one sample to date and trace levels of asbestos are assumed across the south section of the site. The risk from asbestos should be highlighted in the method statements and site induction. If further evidence of asbestos is encountered in the soils, work should cease until asbestos control measures have been agreed and put in place. Asbestos is further discussed in Section 8.11 below.

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.

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.

8.11 Asbestos

Asbestos fibres have been identified in one sample at the site with quantification analysis identifying this to be trace amounts. At these concentrations the liberation of fibres is considered to be unlikely and no specific precautionary measures with regards to asbestos are likely to be required at the site. The level of precautions required are at the discretion of the principal contractor on site however good site practices including minimising the generation of dusts should be adhered to and sufficient to mitigate against the risk from asbestos. In addition, site personnel should have the risk communicated at the induction stage. It is recommended that the asbestos in construction materials assessment tool is used at the site to inform asbestos licensing and control measures.

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:

Classification based on Total Concentrations ¹	PRIOR TO LEAVING SITE			
	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”).

Six 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 and WAC testing results are presented in Appendix G The results of the waste assessment based on total concentrations are presented in the table below.

Location	Depth (m)	Stratum	Waste Classification	WAC Analysis	Landfill	Comments
WS03	0.20	MADE GROUND	Non-hazardous	n/a	n/a	-
WS04	0.90	MADE GROUND	Non-hazardous	n/a	n/a	-
WS11	0.30	MADE GROUND	Non-hazardous	n/a	n/a	-
WS05	0.20-0.40	MADE GROUND	Non-hazardous	n/a	n/a	-
WS08	0.00-0.20	MADE GROUND	Non-hazardous	n/a	n/a	-
WS09	0.00-0.50	MADE GROUND	Hazardous	n/a	n/a	HP7

Based on the waste classification database assessment, one area of the made ground soils has been classified as **hazardous**. The rest if the made ground soils have been classified as **non-hazardous**.

It should be noted that the sample that is classified as hazardous is from WS09, which is the area of the bonfire, and it has been recommended for hotspot removal in the remedial measures.

Note that further testing of the soils (WAC testing) may be required on the actual arisings in order to satisfactorily categorise the soil for its suitability for disposal to landfill.

Waste Containing Asbestos

Should soils contain asbestos, the concentration and type of asbestos identified, in addition to the chemical composition (i.e. hazardous or non-hazardous detailed above), will determine which waste code is applicable to the soils and which landfill will accept it.

Waste	Conc. by Weight (%)	EWC 2002 Catalogue Entry Code	Waste Disposal Route
Non-hazardous containing asbestos fibres	<0.001 - <0.1%	17 05 04 (soil and stones other than those mentioned in 17 05 03*)	Non-hazardous landfill subject to achieving Waste Acceptance Criteria (WAC) for a stable non-reactive hazardous landfill site.

One of the samples tested for asbestos indicate that the soils are classified as non-hazardous, this is due to the sample only containing a trace amount of asbestos as detailed below:

Location	Depth (m)	ACM	Conc. by Weight (%)	Waste Disposal Route
WS03	0.20m	Free Fibres	<0.001	Non-hazardous

A watching brief should be maintained for evidence of Asbestos Containing Materials (ACMs), any ACMs observed should be handpicked and disposed of in accordance with current asbestos disposal regulations.

9.4 Options Assessment

Following the classification of waste materials, the options available for the waste can be considered in the context of the waste hierarchy as below:

- Onsite re-use (with or without prior treatment) under suitable exceptions/permits.
- Offsite processing for recycling or recovery e.g. screening.
- Offsite disposal (with or without prior treatment) i.e. landfill.

Where feasible, efforts should be made to retain soils for onsite re-use to minimise costs and maximise the sustainability of projects.

Based on the above, the possible options for the generation of waste soils at the site are described in the table below:

Waste Generation Source	Comments
Made Ground from site levelling/foundations excavations/services excavations	Samples of made ground from across the site have been classified as non-hazardous and hazardous for off-site disposal purposes, although should be suitable for re-use on site if required under suitable exemptions/permits.
Natural ground from site levelling/foundations excavations/services excavations	The Till may be considered suitable for re-use onsite as fill where the criteria of the WFD exception for re-use of naturally occurring soils can be met. Naturally occurring clean materials could also be exported to another site under the direct transfer scenario of the DoWCoP. Classified as non-hazardous and below inert WAC testing criteria for off-site disposal purposes.

General

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.

9.5 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.

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-compliant 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.

Re-use of soils containing asbestos should comply with the CL:AIRE publication 'Interpretation for Managing and working with Asbestos in Soil and Construction and Demolition Materials' (CAR-SOILTM) and CAR 2012.

In terms of the re-use of brick/concrete crush materials, 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

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: <ul style="list-style-type: none"> • 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.

Re-use Mechanism	Description
T5 Screening and blending of waste	<p>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:</p> <ul style="list-style-type: none"> • 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	<p>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.</p>
Other Permitting Routes	<p>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.</p>

10.0 CONCLUSIONS

10.1 Geo-Environmental

Geo-Environmental – Human Health

Testing of the made ground onsite revealed some exceedances of heavy metals and detection of asbestos fibres within the made ground.

The above is considered to pose a risk to human health and remedial measures are required in the form of hotspot removal in the northern section in the area of WS09 and a clean cover system across the site comprising 600mm clean soils in private gardens with a hard dig layer/warning membrane and 450mm in soft landscaping areas. Further confirmatory testing of the topsoil would be prudent to determine what volume of these soils, if any, could be re-used as part of the development.

Ground gas monitoring undertaken to date has revealed a maximum carbon dioxide concentration of 2.3%v/v and maximum methane concentration of 0.1% v/v. At this stage the site is classified as Green, where gas protection measures are not required. However; it is considered prudent to make an allowance for installation of gas protection measures should this assessment change following completion of the ground gas monitoring.

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 at the site has revealed the majority of the soils to be non-hazardous. However, one of the sample tested confirmed the presence of elevated levels of zinc in WS09 and was classified as Hazardous waste. It should be noted that this sample is taken from the area of the bonfire, and it has been recommended that this area should be subject to a hotspot removal as a remedial measure.

One of the samples tested for identification confirmed the presence of asbestos trace fibres associated within the made ground in the south section of the site. As the asbestos was detected in trace amounts, it is classified as non-hazardous.

10.2 Geotechnical

Foundations

Northern Section

The foundation recommendations are strip foundations in the northern section of the site, with a bearing capacity not exceeding 120 kN/m² at a minimum depth of 0.90m bgl, increasing to 200 kN/m² at 2.00m bgl. Local deepening is likely to be required in areas of soft cohesive soils, sands and due to trees.

South Section

The most suitable foundation solution for the south section of the site with the deep made ground is considered to be VSCs due to the depth of the made ground up to 4.20m bgl.

Piles may also be a viable option for this section of the site, however, further investigation works will be required at this stage to obtain information for detailed pile or VSC design.

Floor slabs

Due to the presence of made ground onsite and the medium plasticity of the natural soils across the site, suspended floor slabs should be adopted.

Concrete classification

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.

Highways

Based on Table 5.1 from DMRB IAN 73/06 Rev 1 equilibrium CBR values of 2% are likely to be achieved in natural clays soils and made ground for pavement design purposes, unless proven otherwise by in-situ testing at formation level by a specialist geotechnical engineer.

Drainage (SUDS)

The use of sustainable drainage systems, such as traditional soakaways within the natural ground, is not likely to be feasible due to the presence of low permeability cohesive strata underlying the site, as indicated by falling head testing undertaken as part of the intrusive investigation works.

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.
 - Carry out confirmatory deeper cable percussive boreholes on the southern part of the site to obtain information for pile/VSC design.
 - Carry out further confirmatory testing on topsoil to confirm if it is acceptable for future re-use.
 - Tree survey by qualified arboriculturist.
 - Detailed foundation design by a structural engineer, including foundation zonation plan and depth schedule.
 - Design of Remedial Strategy and confirmation with the Local Authority /EA / NHBC.
 - Production of Materials Management Plan (MMP) under the CL:AIRE DoWCoP, if required.
 - Implementation of the Remedial Strategy and verification of the remedial works.
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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	<p>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.</p> <p>Naturally enhanced concentrations of harmful substances can fall within this definition of contamination.</p> <p>Contamination may relate to soils, surface water, groundwater or ground gas.</p>
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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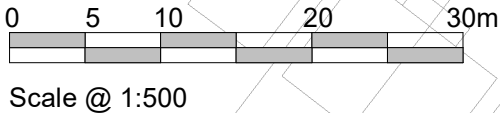
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DRAWINGS



House Type Schedule Option 3		
Key	Name	Count
	Dallington - 3B5P - NDSS	22

- Boundary Key**
- 1800mm - 600mm Masonry dwarf wall, with piers and timber
 - 1800mm - Timber fence with timber gates
 - 900mm - Metal powder coated railings
 - 900mm - Masonry dwarf wall, with piers and metal powder coated railing infills

NOTES

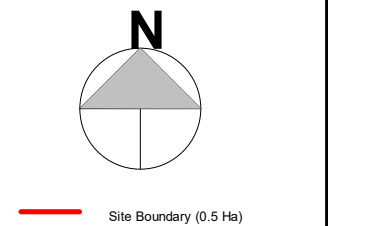
- All dimensions and levels are to be checked on site.
- Any discrepancies are to be reported to the architect before any work commences
- This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
- This drawing shall not be reproduced without express written permission from AEW.
- Title overlay drawings and ownership boundaries are produced using all reasonable endeavors. AEW cannot be responsible for the accuracy or scale discrepancy of base plans supplied to them.
- All works are to be undertaken in accordance with Building Regulations and the latest British Standards.

This drawing and its contents are to be used strictly in accordance with the manufacturers 12192-AEW-XX-XX-M3-A-0001 [P0.1] [S0]

CDM 2015

Client notified of duties:
Principal Designer:
Unless noted below, all known hazards have been highlighted on the drawing:

- Layout subject to comments by LPA, topographical line and level survey, acoustic consultant design, tree survey, ecological surveys, statutory infrastructure layouts, title deeds etc.
- Site boundary indicative and to be confirmed



P3	11.12.2020	DAL	CK
Boundary Treatment Shown, Site boundary omitted for clarity			
P2	09.12.2020	DAL	CK
Amended to all three beds and reduced parking			
P1	19.11.2020	DAL	CK
Initial Issue			

REV	Date	Drawn by:-	Checked by:-
S2			

drawing stage **Stage 3**

client **Mosscares St Vincents**

project **Princedom Road, Harpurhey**

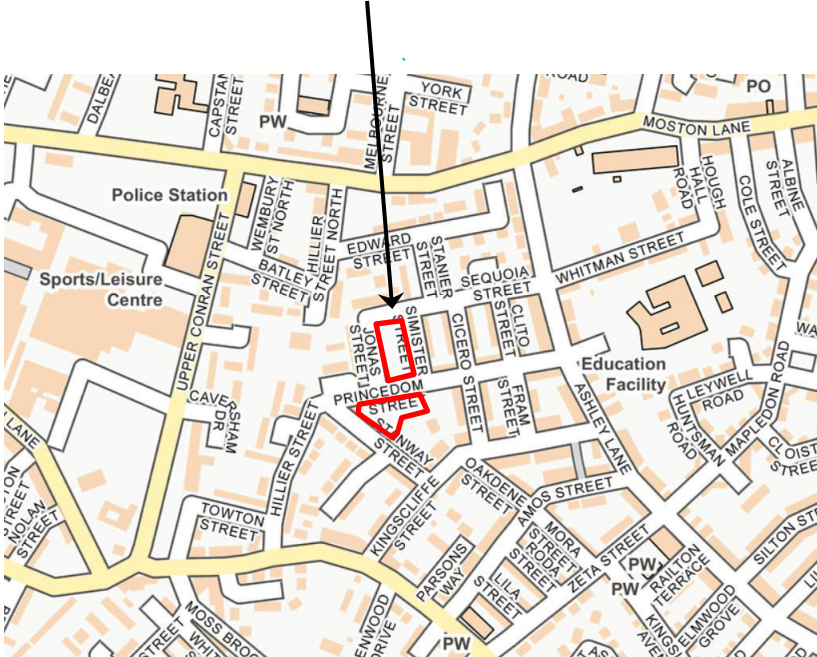
drawing title **Site - Proposed - Option 2**

date	19.11.2020	drawn	DAL
scale @ A3	1 : 500	checked	CK



SITE LOCATION

NEAREST POSTCODE: M9 4GQ



REV	DATE	DESCRIPTION	BY	CKD
<div><div>BROWNFIELD SOLUTIONS LTD <small>CEO ENVIRONMENTAL ENGINEERING EXCELLENCE</small></div></div>				
CLIENT				
CLIENT				
PROJECT TITLE				
SIMISTER STREET, MANCHESTER				
DRAWING TITLE				
SITE LOCATION PLAN				
DRAWING No.	REVISION	SCALE	DATE	
C4656/01	-	NTS	11/11/21	
DRAWN BY		CHECKED BY		
SD		LC		



AREA A (NORTH)

VEHICULAR
SITE ACCESS

EVIDENCE OF
BONFIRES / ASH



KEY

REV	DATE	DESCRIPTION	BY	CKD



CLIENT
**MOSSCARE ST VINCENT'S
HOUSING GROUP**

PROJECT TITLE
SIMISTER STREET, MANCHESTER

DRAWING TITLE
SITE FEATURES PLAN 1 of 2

DRAWING No.	REVISION	SCALE	DATE
C4656/02		NTS	17/11/21
DRAWN BY TM		CHECKED BY LC	



AREA B (SOUTH)

VEHICULAR SITE ACCESS

PRINCEDOM STREET

TREET

SERIES OF TOPOGRAPHICAL DEPRESSIONS

KEY

REV	DATE	DESCRIPTION	BY	CKD

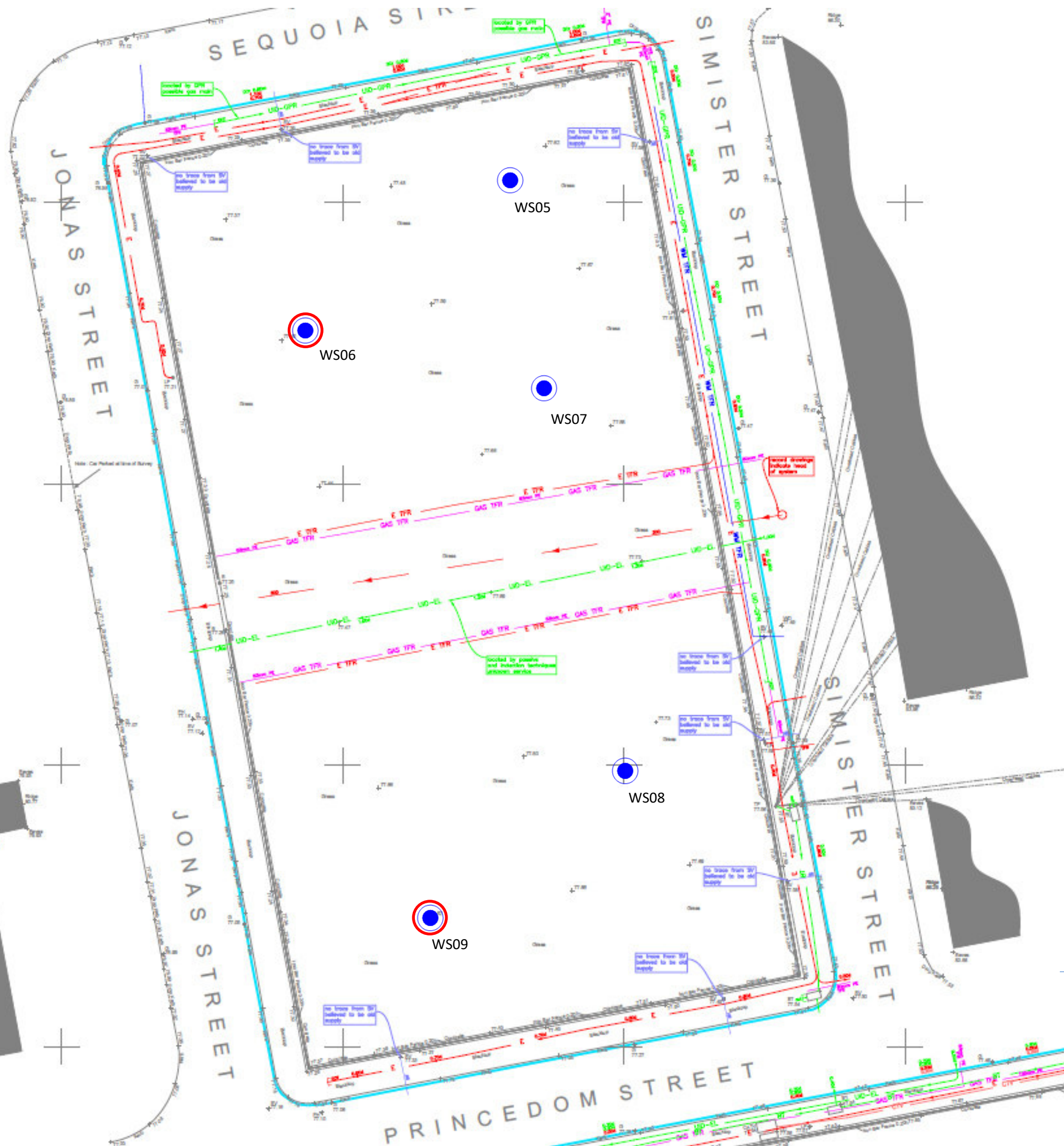


CLIENT
MOSSCARE ST VINCENT'S HOUSING GROUP

PROJECT TITLE
SIMISTER STREET, MANCHESTER

DRAWING TITLE
SITE FEATURES PLAN 2 of 2

DRAWING No. C4656/02	REVISION	SCALE NTS	DATE 17/11/21
DRAWN BY TM		CHECKED BY LC	



KEY

- WINDOW SAMPLE BOREHOLE
- BOREHOLE INSTALLATION

REV	DATE	DESCRIPTION	BY	CKD

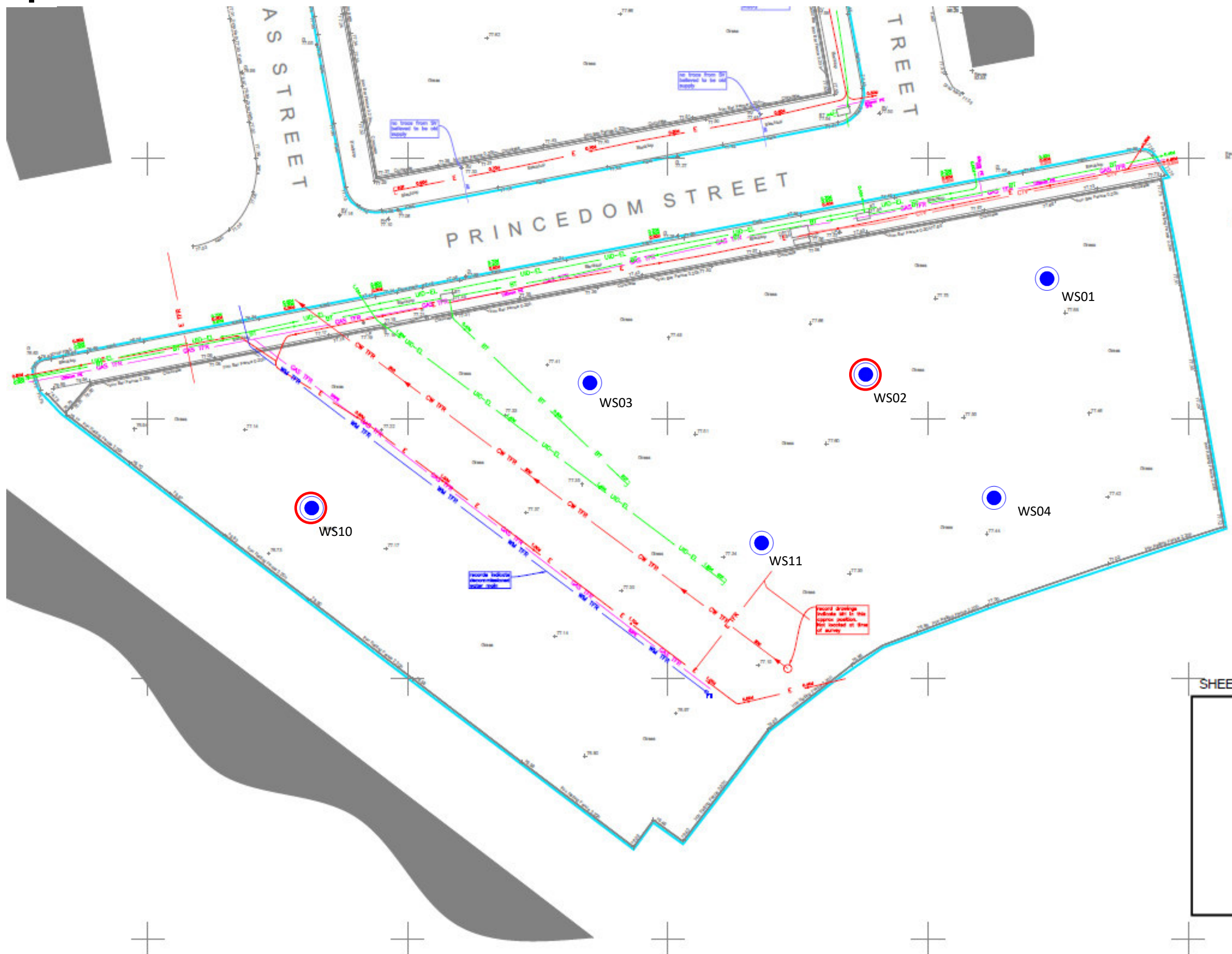


CLIENT
MOSSCARE ST VINCENT'S HOUSING GROUP

PROJECT TITLE
SIMISTER STREET, MANCHESTER

DRAWING TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWING No. C4656/03	1 OF 2	SCALE NTS	DATE 17/11/21
DRAWN BY LC		CHECKED BY MS	



KEY

- WINDOW SAMPLE BOREHOLE
- BOREHOLE INSTALLATION

REV	DATE	DESCRIPTION	BY	CKD



CLIENT
MOSSCARE ST VINCENT'S HOUSING GROUP

PROJECT TITLE
SIMISTER STREET, MANCHESTER

DRAWING TITLE
EXPLORATORY HOLE LOCATION PLAN

DRAWING No. C4656/02	2 of 2	SCALE NTS	DATE 17/11/21
DRAWN BY LC		CHECKED BY MS	

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 impact 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 SOM (%)	Proposed End Use														
			Residential <u>with</u> Homegrown Produce			Residential <u>without</u> Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
			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	Benzo(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

Source	Contaminant	Unit SOM (%)	Proposed End Use														
			Residential <u>with</u> Homegrown Produce			Residential <u>without</u> Homegrown Produce			Commercial			Public Open Space (POS) resi			Public Open Space (POS) park		
			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

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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 if 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	<ul style="list-style-type: none"> 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).

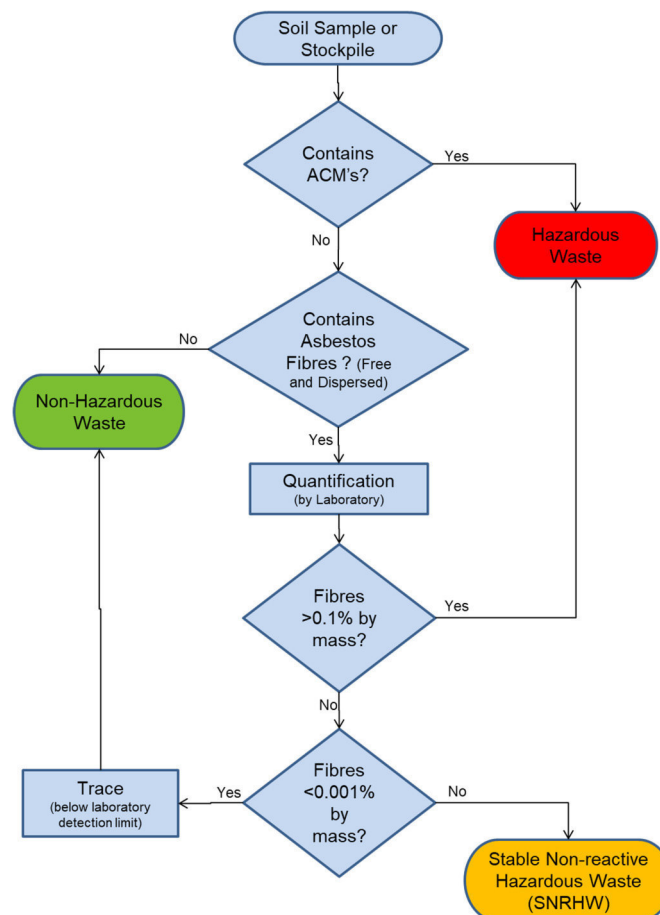
Additional Asbestos Guidance Notes

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 site¹. 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/m³.
- 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: <ul style="list-style-type: none"> • Ensuring soils do not dry out to become dusty. • Site personnel have the risk communicated at induction stage. 	Yes	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: <ul style="list-style-type: none"> • 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	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: <ul style="list-style-type: none"> • 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.

- 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.
- 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

Phase I Supporting Searches



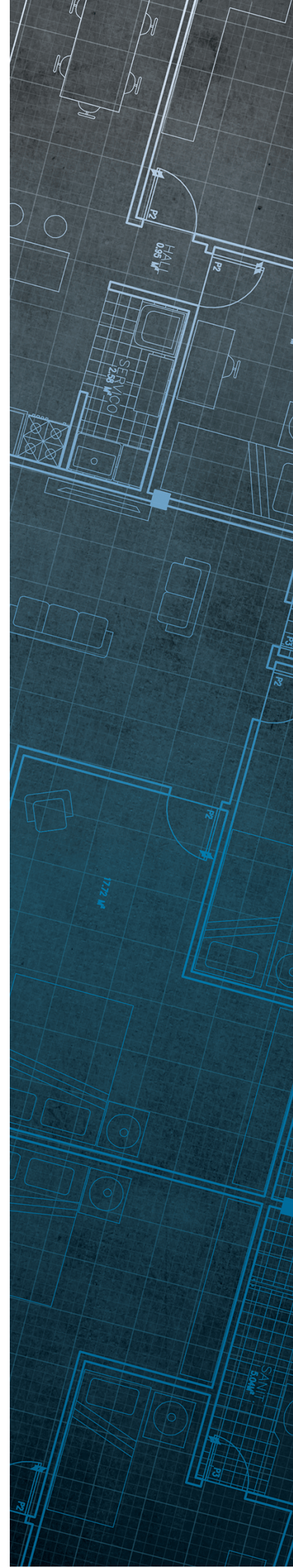
The Coal
Authority

Consultants Coal Mining Report

35 Princedom Street
Manchester
M9 4GQ

Date of enquiry:	11 November 2021
Date enquiry received:	11 November 2021
Issue date:	11 November 2021

Our reference:	51002682643001
Your reference:	C4656/2614/SD



Consultants

Coal Mining Report

This report is based on and limited to the records held by the Coal Authority at the time the report was produced.

Client name

BROWNFIELD SOLUTIONS LIMITED

Enquiry address

35 Princedom Street
Manchester
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How to contact us

0345 762 6848 (UK)
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200 Lichfield Lane
Mansfield
Nottinghamshire
NG18 4RG

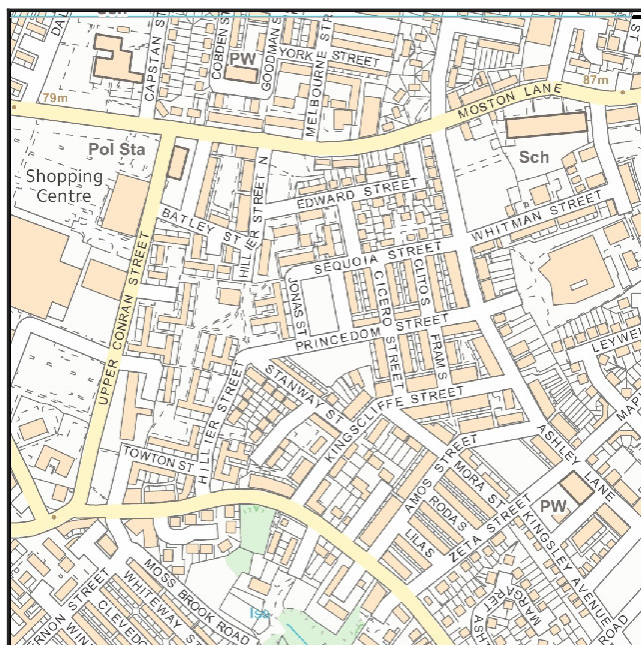
www.groundstability.com

 @coalauthority

 /company/the-coal-authority

 /thecoalauthority

 /thecoalauthority



Approximate position of property



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Section 1 – Mining activity and geology

Past underground mining

No past mining recorded.

Probable unrecorded shallow workings

None.

Spine roadways at shallow depth

No spine roadway recorded at shallow depth.

Mine entries

None recorded within 100 metres of the enquiry boundary.

Abandoned mine plan catalogue numbers

The following abandoned mine plan catalogue numbers intersect with some, or all, of the enquiry boundary:

16820		
-------	--	--

Please contact us on 0345 762 6848 to determine the exact abandoned mine plans you require based on your needs.

Outcrops

No outcrops recorded.

Geological faults, fissures and breaklines

No faults, fissures or breaklines recorded.

Opencast mines

None recorded within 500 metres of the enquiry boundary.

Coal Authority managed tips

None recorded within 500 metres of the enquiry boundary.

Section 2 – Investigative or remedial activity

Please refer to the 'Summary of findings' map (on separate sheet) for details of any activity within the area of the site boundary.

Site investigations

None recorded within 50 metres of the enquiry boundary.

Remediated sites

None recorded within 50 metres of the enquiry boundary.

Coal mining subsidence

The Coal Authority has not received a damage notice or claim for the subject property, or any property within 50 metres of the enquiry boundary, since 31 October 1994.

There is no current Stop Notice delaying the start of remedial works or repairs to the property.

The Coal Authority is not aware of any request having been made to carry out preventive works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991.

Mine gas

None recorded within 500 metres of the enquiry boundary.

Mine water treatment schemes

None recorded within 500 metres of the enquiry boundary.

Section 3 – Licensing and future mining activity

Future underground mining

None recorded.

Coal mining licensing

None recorded within 200 metres of the enquiry boundary.

Court orders

None recorded.

Section 46 notices

No notices have been given, under section 46 of the Coal Mining Subsidence Act 1991, stating that the land is at risk of subsidence.

Withdrawal of support notices

The property is not in an area where a notice to withdraw support has been given.

The property is not in an area where a notice has been given under section 41 of the Coal Industry Act 1994, cancelling the entitlement to withdraw support.

Payments to owners of former copyhold land

The property is not in an area where a relevant notice has been published under the Coal Industry Act 1975/Coal Industry Act 1994.

Section 4 – Further information

Based on the responses in this report, no further information has been highlighted.

Section 5 – Data definitions

The datasets used in this report have limitations and assumptions within their results. For more guidance on the data and the results specific to the enquiry boundary, please **call us on 0345 762 6848** or **email us at groundstability@coal.gov.uk**.

Past underground coal mining

Details of all recorded underground mining relative to the enquiry boundary. Only past underground workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination, will be included.

Probable unrecorded shallow workings

Areas where the Coal Authority believes there to be unrecorded coal workings that exist at or close to the surface (less than 30 metres deep).

Spine roadways at shallow depth

Connecting roadways either, working to working, or, surface to working, both in-seam and cross measures that exist at or close to the surface (less than 30 metres deep), either within or within 10 metres of the enquiry boundary.

Mine entries

Details of any shaft or adit either within, or within 100 metres of the enquiry boundary including approximate location, brief treatment details where known, the mineral worked from the mine entry and conveyance details where the mine entry has previously been sold by the Authority or its predecessors British Coal or the National Coal Board.

Abandoned mine plan catalogue numbers

Plan numbers extracted from the abandoned mines catalogue containing details of coal and other mineral abandonment plans deposited via the Mines Inspectorate in accordance with the Coal Mines Regulation Act and Metalliferous Mines Regulation Act 1872. A maximum of 9 plan extents that intersect with the enquiry boundary will be included. This does not infer that the workings and/or mine entries shown on the abandonment plan will be relevant to the site/property boundary.

Outcrops

Details of seam outcrops will be included where the enquiry boundary intersects with a conjectured or actual seam outcrop location (derived by either the British Geological Survey or the Coal Authority) or intersects with a defined 50 metres buffer on the coal (dip) side of the outcrop. An indication of whether the Coal Authority believes the seam to be of sufficient thickness and/or quality to have been worked will also be included.

Geological faults, fissures and breaklines

Geological disturbances or fractures in the bedrock. Surface fault lines (British Geological Survey derived data) and fissures and breaklines (Coal Authority derived data) intersecting with the enquiry boundary will be included. In some circumstances faults, fissures or breaklines have been known to contribute to surface subsidence damage as a consequence of underground coal mining.

Opencast mines

Opencast coal sites from which coal has been removed in the past by opencast (surface) methods and where the enquiry boundary is within 500 metres of either the licence area, site boundary, excavation area (high wall) or coaling area.

Coal Authority managed tips

Locations of disused colliery tip sites owned and managed by the Coal Authority, located within 500 metres of the enquiry boundary.

Site investigations

Details of site investigations within 50 metres of the enquiry boundary where the Coal Authority has received information relating to coal mining risk investigation and/or remediation by third parties.

Remediated sites

Sites where the Coal Authority has undertaken remedial works either within or within 50 metres of the enquiry boundary following report of a hazard relating to coal mining under the Coal Authority's Emergency Surface Hazard Call Out procedures.

Coal mining subsidence

Details of alleged coal mining subsidence claims made since 31 October 1994 either within or within 50 metres of the enquiry boundary. Where the claim relates to the enquiry boundary confirmation of whether the claim was accepted, rejected or whether liability is still being determined will be given. Where the claim has been discharged, whether this was by repair, payment of compensation or a combination of both, the value of the claim, where known, will also be given.

Details of any current 'Stop Notice' deferring remedial works or repairs affecting the property/site, and if so the date of the notice.

Details of any request made to execute preventative works before coal is worked under section 33 of the Coal Mining Subsidence Act 1991. If yes, whether any person withheld consent or failed to comply with any request to execute preventative works.

Mine gas

Reports of alleged mine gas emissions received by the Coal Authority, either within or within 500 metres of the enquiry boundary that subsequently required investigation and action by the Coal Authority to mitigate the effects of the mine gas emission.

Mine water treatment schemes

Locations where the Coal Authority has constructed or operates assets that remove pollutants from mine water prior to the treated mine water being discharged into the receiving water body.

These schemes are part of the UK's strategy to meet the requirements of the Water Framework Directive. Schemes fall into 2 basic categories: Remedial – mitigating the impact of existing pollution or Preventative – preventing a future pollution incident.

Mine water treatment schemes generally consist of one or more primary settlement lagoons and one or more reed beds for secondary treatment. A small number are more specialised process treatment plants.

Future underground mining

Details of all planned underground mining relative to the enquiry boundary. Only those future workings where the enquiry boundary is within 0.7 times the depth of the workings (zone of likely physical influence) allowing for seam inclination will be included.

Coal mining licensing

Details of all licenses issued by the Coal Authority either within or within 200 metres of the enquiry boundary in relation to the under taking of surface coal mining, underground coal mining or underground coal gasification.

Court orders

Orders in respect of the working of coal under the Mines (Working Facilities and Support) Acts of 1923 and 1966 or any statutory modification or amendment thereof.

Section 46 notices

Notice of proposals relating to underground coal mining operations that have been given under section 46 of the Coal Mining Subsidence Act 1991.

Withdrawal of support notices

Published notices of entitlement to withdraw support and the date of the notice. Details of any revocation notice withdrawing the entitlement to withdraw support given under Section 41 of the Coal Industry Act 1994.

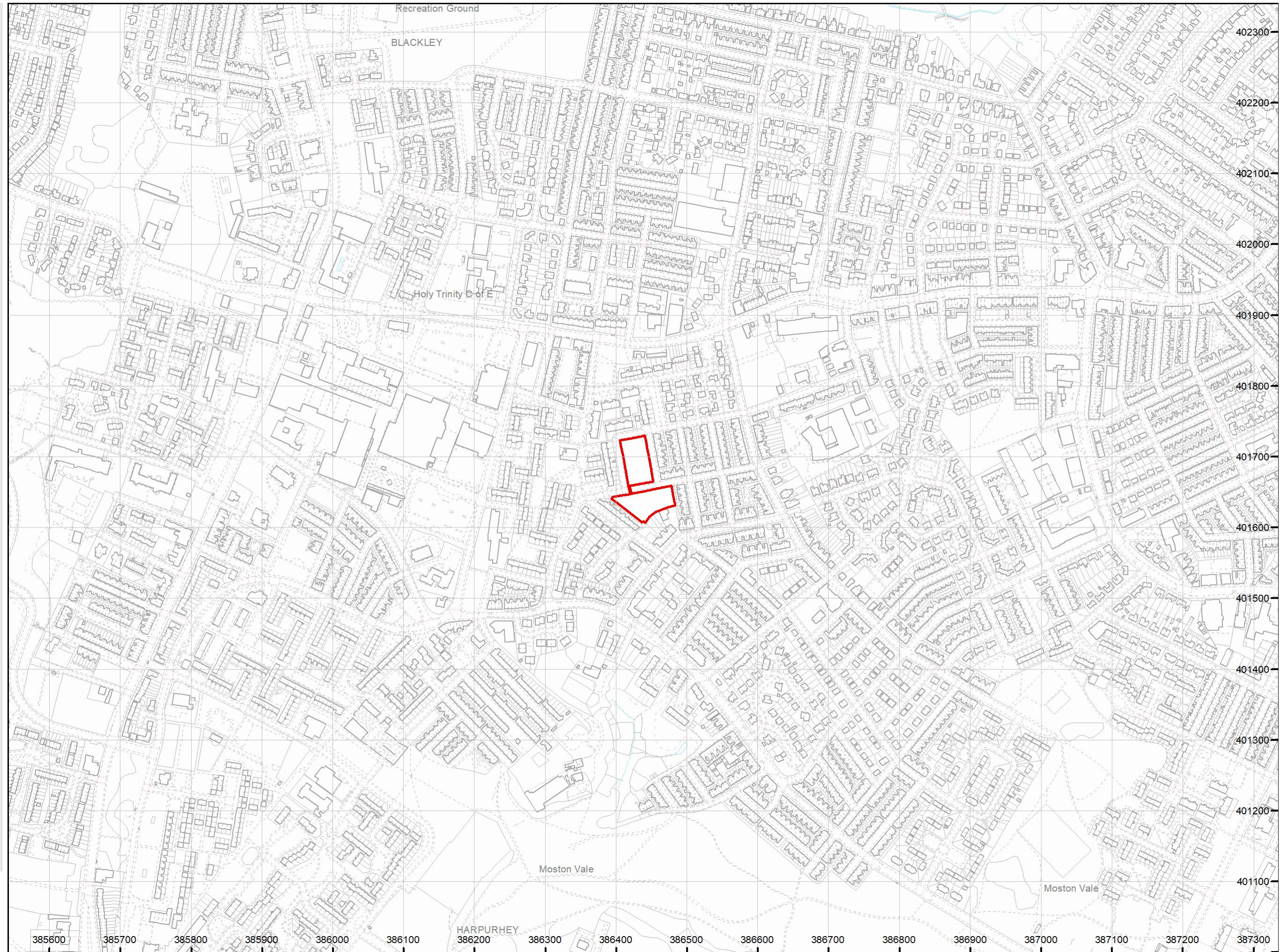
Payment to owners of former copyhold land

Relevant notices which may affect the property and any subsequent notice of retained interests in coal and coal mines, acceptance or rejection notices and whether any compensation has been paid to a claimant.

The map highlights any specific surface or subsurface features within or near to the boundary of the site.

Key

Approximate position of the enquiry
boundary shown

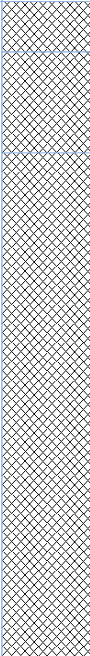
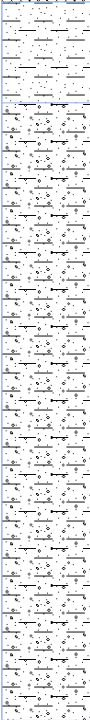


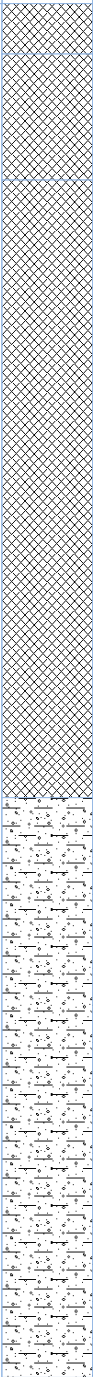
How to contact us

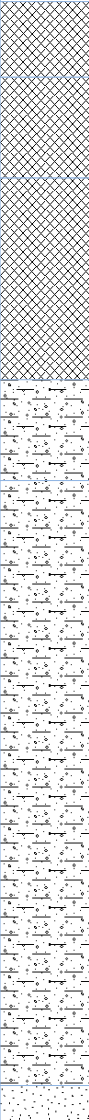
0345 762 6848 (UK)
+44 (0)1623 637 000 (International)
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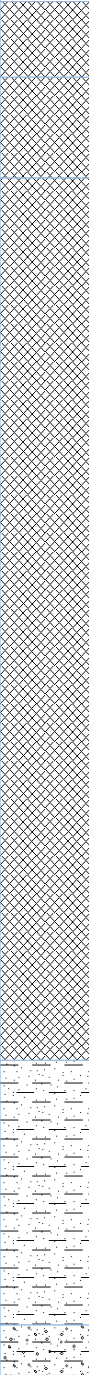
APPENDIX C

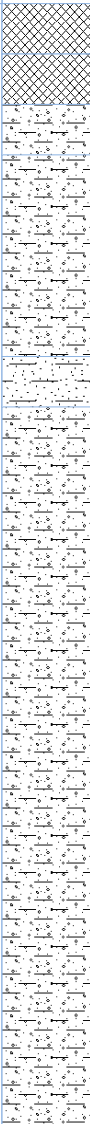
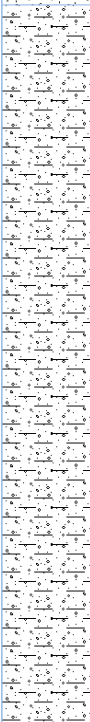
Exploratory Hole Logs

BROWNFIELD SOLUTIONS LTD							Borehole Log		Window Sampler No.	
									WS01	
PROJECT NO: C4656							CO-ORDS:		Sheet 1 of 1	
PROJECT NAME: SIMISTER STREET							LEVEL:		Hole Type	
									WS	
CLIENT: MSV HOUSING							DATES: 10/12/21		Scale	
									1:30	
									Logged	Checked
									TM	NS
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.30	ES		0.20			MADE GROUND: Grass over soft dark brown slightly gravelly fine to coarse sand TOPSOIL with rootlets. Gravel is subangular to subrounded fine to medium of mudstone and rare brick.		1.0
					0.60			MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of brick, slate, glass, rare coal and tile.		
	0.80	ES				From 0.40m bgl: Low cobble content of subangular brick up to 80mm in diameter.				
	1.20	SPT	N=5 (1,1/1,1,1,2)			MADE GROUND: Soft dark brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, tile, coal and rare glass.				
	1.50	D							2.0	
	2.00	SPT	N=3 (1,0/1,0,1,1)							
				2.60			Soft light brown mottled orange sandy CLAY. Sand is fine to coarse.			
	2.80	D								
	3.00	SPT	N=12 (1,2/2,3,3,4)	3.00			Firm dark brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone, sandstone and rare coal.			
	3.50	D								
4.00	SPT	N=29 (4,4/5,7,8,9)			Becoming stiff from 4.00m bgl.		4.0			
5.00	SPT	N=29 (3,5/7,7,7,8)					5.0			
				5.45			End of Borehole at 5.45m		6.0	
Remarks		1. Hand excavated pit to 1.20m bgl. 2. Groundwater encountered at 2.60m bgl, rising to 1.80m bgl after 30 minutes. 3. Backfilled with arisings on completion.							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	

Borehole Log							Window Sampler No.		
							WS02		
							Sheet 1 of 1		
PROJECT NO: C4656							Hole Type		
							WS		
PROJECT NAME: SIMISTER STREET							Scale		
							1:30		
CLIENT: MSV HOUSING							Logged		
							Checked		
							TM		
							NS		
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			MADE GROUND: Grass over soft dark brown slightly gravelly fine to coarse sand TOPSOIL with rootlets. Gravel is subangular to subrounded fine to medium of mudstone and rare brick.	
		0.40	ES		0.70			MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of brick, slate, glass, rare coal and tile. <i>From 0.40m bgl: Low cobble content of subangular brick up to 80mm in diameter.</i>	
		1.20	D SPT	N=2 (1,0/0,1,0,1)				MADE GROUND: Soft dark brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, tile, coal and rare glass.	1.0
		2.00	D SPT	N=8 (1,1/2,2,2,2)				<i>From 2.30m bgl: Gravel becoming rare.</i>	2.0
		3.00	SPT	N=15 (2,3/3,4,4,4)	3.15			<i>Becoming stiff from 3.00m bgl.</i>	3.0
		3.20	D					Firm reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone, sandstone and rare coal.	
		4.00	SPT	N=28 (4,5/6,7,7,8)					4.0
		4.30	D						
		5.00	SPT	N=15 (2,3/3,4,4,4)					5.0
					5.45			End of Borehole at 5.45m	
									6.0
	Remarks							1. Hand excavated pit to 1.20m bgl. 2. Groundwater encountered at 4.00m bgl. 3. Borehole installed; GL to 1.00mbgl plain, 1.00m to 3.00m 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		

<div><div>BROWNFIELD SOLUTIONS LTD</div></div>							Borehole Log		Window Sampler No.
									WS03
									Sheet 1 of 1
PROJECT NO: C4656							CO-ORDS:		Hole Type
									WS
PROJECT NAME: SIMISTER STREET							LEVEL:		Scale
									1:30
CLIENT: MSV HOUSING							DATES: 10/12/21		Logged
									Checked
									TM
									NS
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20	ES		0.30			MADE GROUND: Grass over soft dark brown slightly gravelly fine to coarse sand TOPSOIL with rootlets. Gravel is subangular to subrounded fine to medium of mudstone and rare brick.	1.0
		0.50	ES		0.70			MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of brick, slate, glass, rare coal and tile. <i>From 0.50m bgl: Low cobble content of subangular brick up to 80mm in diameter.</i>	
		1.00	ES					MADE GROUND: Soft to firm dark brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, tile, coal and rare glass.	
		1.20	SPT	N=4 (1,2/1,1,1,1)	1.50				
		1.80	D		1.90			Firm brown mottled orange and grey slightly gravelly slightly sandy CLAY. Gravel is subangular to subrounded fine of mudstone.	
		2.00	SPT	N=6 (1,1/1,1,2,2)				Soft reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone, sandstone and rare coal.	
		2.50	D						
		3.00	SPT	N=15 (2,2/3,4,4,4)				<i>Becoming firm from 3.00m bgl.</i>	
		3.90	D						
		4.00	SPT	N≥50 (7,9/50 for 290mm)	4.30				
					4.44			Dense light brown fine to medium SAND.	
								End of Borehole at 4.44m	
Remarks		1. Hand excavated pit to 1.20m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion.						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	

Borehole Log							Window Sampler No.		
							WS04		
							Sheet 1 of 1		
PROJECT NO: C4656							CO-ORDS:		
PROJECT NAME: SIMISTER STREET							Hole Type		
							WS		
CLIENT: MSV HOUSING							Scale		
							1:30		
DATES: 10/12/21							Logged	Checked	
							TM	NS	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.40	ES		0.30			MADE GROUND: Grass over soft dark brown slightly gravelly fine to coarse sand TOPSOIL with rootlets. Gravel is subangular to subrounded fine to medium of mudstone and rare brick.	1.0
					0.70			MADE GROUND: Dark brown gravelly fine to coarse sand. Gravel is subangular to subrounded fine to coarse of brick, slate, glass, rare coal and tile. <i>From 0.50m bgl: Low cobble content of subangular brick up to 80mm in diameter.</i>	
		0.90	ES					MADE GROUND: Soft dark brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, tile, coal and rare glass. <i>1.00-2.00m bgl: Locally very soft with rare gravel.</i>	
		1.20	SPT	N=3 (1,0/1,0,1,1)					
		1.50	D						
		2.00	SPT	N=3 (1,0/0,1,1,1)					
		2.50	D					2.60-2.70m bgl: Locally very gravelly and saturated in groundwater.	
		3.00	SPT	N=6 (1,1/1,1,2,2)					
		4.00-4.45 4.00	D SPT	N=9 (2,2/2,2,2,3)	4.20			Soft to firm brown mottled black sandy CLAY. Sand is fine to coarse. <i>4.30-4.40m bgl: Locally very sandy.</i>	
		5.00	SPT	N=32 (4,4/5,6,9,12)	5.25				
					5.45			Stiff reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone, sandstone and rare coal. End of Borehole at 5.45m	
Remarks							1. Hand excavated pit to 1.20m bgl. 2. Groundwater encountered at 2.60m bgl. 3. Backfilled with arisings on completion.		
							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		

<div>BROWNFIELD SOLUTIONS LTD</div>							Borehole Log		Window Sampler No.
									WS05
									Sheet 1 of 1
PROJECT NO: C4656							CO-ORDS:		Hole Type
									WS
PROJECT NAME: SIMISTER STREET							LEVEL:		Scale
									1:30
CLIENT: MSV HOUSING							DATES: 10/12/21		Logged
									Checked
									MS
									NS
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20-0.40	ES		0.20			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay TOPSOIL with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and brick.	1.0
		0.60	D		0.60			MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, glass, ceramic and mudstone.	
		1.20	D SPT	N=9 (2,2/2,2,3,2)	1.40			Soft brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	
		2.00	D SPT	N=23 (3,4/4,5,6,8)	1.60			Loose brown slightly clayey fine to coarse SAND.	
		3.00	D SPT	N=16 (3,3/3,4,4,5)				Stiff light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	
		4.00	D SPT	N=14 (3,3/3,3,4,4)					2.0
					4.45				
Remarks		1. Hand excavated pit to 1.20m bgl. 2. Groundwater encountered at 1.40m bgl. 3. Backfilled with arisings on completion.						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	



Window Sampler No.

WS06

Sheet 1 of 1

CO-ORDS:

LEVEL:

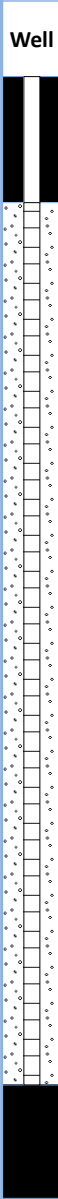
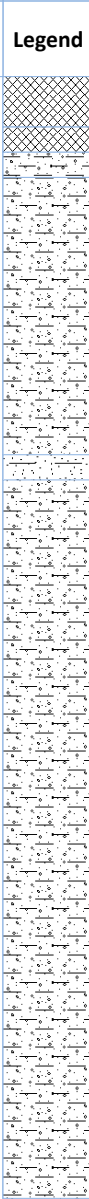
DATES: 10/12/21

Logged

Checked

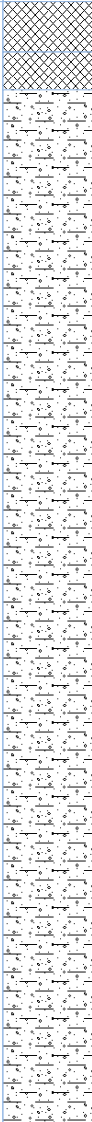
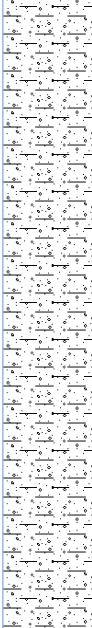
MS

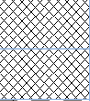
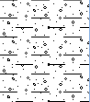
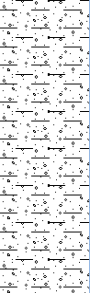
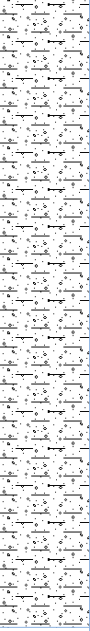
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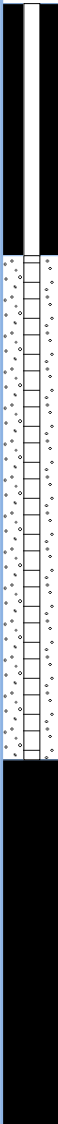
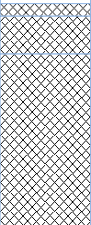
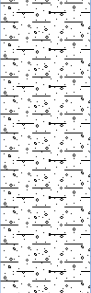
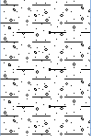
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.20-0.30	ES	N=10 (3,2/2,2,3,3)	0.20 0.30 0.40		MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay TOPSOIL with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and brick.	1.0	
		0.50	D		MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, glass, ceramic and mudstone.				
		1.20	D SPT		Firm brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.				
		1.50	D	N=27 (4,4/6,6,6,9)	1.50 1.60		Firm brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	2.0	
		2.00	D SPT		Medium dense drown slightly clayey fine to coarse SAND. Stiff light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.				
		2.80	D SPT		N=21 (4,4/4,5,5,7)		3.0		
		4.00	D SPT	N=16 (3,3/3,4,4,5)				4.0	
									4.45
					6.0				

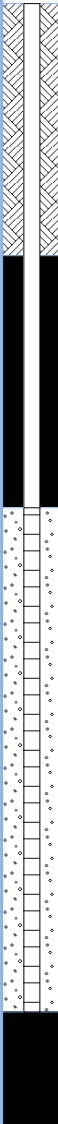
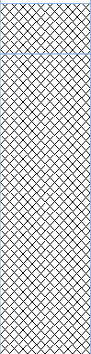
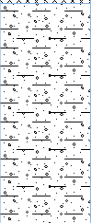
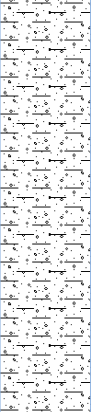
1. Hand excavated pit to 1.20m bgl.
2. Groundwater encountered at 1.50m bgl.
3. Borehole installed; GL to 0.50mbgl plain, 0.50m to 4.00m bgl slotted.

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

<div>BROWNFIELD SOLUTIONS LTD</div>						Borehole Log		Window Sampler No.		
PROJECT NO: C4656		CO-ORDS:		WS07						
				Sheet 1 of 1						
PROJECT NAME: SIMISTER STREET		LEVEL:		Hole Type						
				WS						
CLIENT: MSV HOUSING		DATES: 10/12/21		Scale						
				1:30						
				Logged	Checked					
				MS	NS					
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.20-0.35	ES		0.20			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay TOPSOIL with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and brick. MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, glass, ceramic and mudstone. Firm light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	1.0	
		0.50	D		0.35					
		1.20	D SPT	N=11 (2,2/2,2,3,4)						
		2.00	D SPT	N=21 (4,4/4,5,5,7)						
		3.00	D SPT	N=22 (4,4/5,5,5,7)						
		4.00	D SPT	N=16 (3,3/3,4,4,5)			Becoming stiff from 2.00m bgl.	2.0		
					4.45					
End of Borehole at 4.45m									3.0	
									4.0	
									5.0	
									6.0	
Remarks		1. Hand excavated pit to 1.20m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion.						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		

<div><div>BROWNFIELD SOLUTIONS LTD</div></div>							<div>Borehole Log</div>		<div>Window Sampler No.</div> <div>WS08</div> <div>Sheet 1 of 1</div>	
<div>PROJECT NO: C4656</div>							<div>CO-ORDS:</div>		<div>Hole Type</div> <div>WS</div>	
<div>PROJECT NAME: SIMISTER STREET</div>							<div>LEVEL:</div>		<div>Scale</div> <div>1:30</div>	
<div>CLIENT: MSV HOUSING</div>							<div>DATES: 10/12/21</div>		<div>Logged</div> <div>MS</div>	<div>Checked</div> <div>NS</div>
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description		
		Depth (m)	Type	Results						
		0.00-0.20	ES		0.20		MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay TOPSOIL with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and brick.	1.0		
		0.20-0.40	ES							
		0.50	D HSV	92kPa	0.40		MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, glass, ceramic and mudstone.			
		0.80	HSV	96kPa						
		1.20	D SPT	N=11 (1,2/3,2,3,3)		Firm to stiff light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.				
		2.00	D SPT	N=16 (3,3/4,4,4,4)						
		3.00	D SPT	N=12 (2,2/2,3,3,4)						
		4.00	D SPT	N=14 (2,2/3,3,4,4)	4.45		End of Borehole at 4.45m	4.0		
									5.0	
									6.0	
Remarks		1. Hand excavated pit to 1.20m bgl. 2. No groundwater encountered. 3. Backfilled with arisings on completion.						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		

Borehole Log							Window Sampler No.		
							WS09		
							Sheet 1 of 1		
PROJECT NO: C4656							CO-ORDS:		
PROJECT NAME: SIMISTER STREET							Hole Type		
							WS		
CLIENT: MSV HOUSING							Scale		
							1:30		
DATES: 10/12/21							Logged	Checked	
							MS	NS	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.00-0.05	ES		0.05			MADE GROUND: Black very gravelly fine to coarse sand of mixed lithologies including ash. Gravel is angular to subrounded fine to coarse of glass, wood, metal and brick.	1.0
		0.30-0.60	ES		0.20			MADE GROUND: Dark brown slightly gravelly slightly sandy clay TOPSOIL with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and brick.	
		0.90	HSV	58kPa	0.90			MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand. Gravel is angular to subrounded fine to coarse of brick, glass, ceramic and mudstone.	
		1.20	D SPT	N=4 (1,1/1,1,1,1)				Soft to firm light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	2.0
		2.00	D SPT	N=20 (3,4/5,6,5,4)	2.10			Firm brown SILT.	
					2.50			Firm light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	
		3.00	D SPT	N=14 (2,2/3,3,4,4)	3.20			Firm brown SILT.	
					3.90			Firm light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	
		4.00	D SPT	N=18 (3,3/4,4,5,5)				End of Borehole at 4.45m	6.0
					4.45				
Remarks		1. Hand excavated pit to 1.20m bgl. 2. Groundwater encountered at 2.10m bgl. 3. Borehole installed; GL to 1.00m bgl plain, 1.00m to 3.00m 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.		
									WS10		
									Sheet 1 of 1		
PROJECT NO: C4656							CO-ORDS:		Hole Type		
									WS		
PROJECT NAME: SIMISTER STREET							LEVEL:		Scale		
									1:30		
CLIENT: MSV HOUSING							DATES: 10/12/21		Logged	Checked	
									MS	NS	
Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description			
		Depth (m)	Type	Results							
		0.30-0.50	ES		0.20			MADE GROUND: Grass over soft dark brown slightly gravelly slightly sandy clay TOPSOIL with rootlets. Sand is fine to coarse. Gravel is angular to subrounded fine to medium of mudstone and brick.	1.0		
		1.00-1.20	ES					MADE GROUND: Dark brown slightly gravelly clayey fine to coarse sand with low cobble content. Gravel is angular to subrounded fine to coarse of brick, glass, tile and mudstone. Cobbles are angular of brick up to 150mm in diameter.			
		1.20	SPT	N=10 (1,2/2,2,3,3)				Becoming loose at 1.20m bgl.			
		1.50	D		1.40			Firm light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.	2.0		
		2.00	D SPT	N=12 (2,2/2,3,3,4)							
		2.30			2.30						
		2.50	D					Firm brown SILT.	3.0		
		2.80			2.80						
		3.00	SPT	N=16 (2,3/3,4,4,5)				Stiff light brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone and sandstone.			
		4.00	D SPT	N=20 (3,3/4,4,6,6)					4.0		
		4.45			4.45			End of Borehole at 4.45m			



Window Sampler No.

WS11

Sheet 1 of 1

PROJECT NO: C4656

CO-ORDS:

Hole Type

Hole Type

PROJECT NAME: SIMISTER STREET

LEVEL:

Scale

1.30

CLIENT: MSV HOUSING

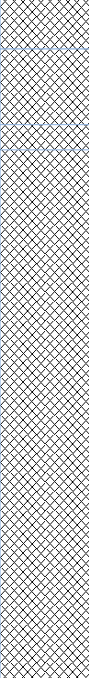
DATES: 10/12/21

Logged

Checked

TM

NS

Well	Water Strikes	Sample and In Situ Testing			Depth (m)	Level (m OD)	Legend	Stratum Description	
		Depth (m)	Type	Results					
		0.30	ES		0.20			MADE GROUND: Grass over soft dark brown slightly gravelly fine to coarse sand TOPSOIL with rootlets. Gravel is subangular to subrounded fine to medium of mudstone and rare brick.	
					0.50 0.60			MADE GROUND: Dark brown gravelly fine to coarse sand with low cobble content. Gravel is subangular to subrounded fine to coarse of brick, slate, glass, rare coal and tile. Cobbles are subangular up to 80mm in diameter of brick.	
		0.80	ES					MADE GROUND: Light grey subangular medium to coarse gravel of limestone.	
		1.20	SPT	N=5 (1,1/1,1,1,2)		MADE GROUND: Soft dark brown slightly gravelly slightly sandy clay. Sand is fine to coarse. Gravel is subangular to subrounded fine to coarse of brick, tile, coal and rare glass.		1.0	
		1.80	D						
		2.00	SPT	N=4 (1,1/1,1,1,1)		2.00-2.70m bgl: Locally soft with rare gravel.		2.0	
						2.70		Soft brown mottled black sandy CLAY. Sand is fine to coarse.	3.0
						3.20		Stiff reddish brown slightly gravelly slightly sandy CLAY. Sand is fine to coarse. Gravel is subangular to subrounded fine to medium of mudstone, sandstone and rare coal.	4.0
		4.00	SPT	N=45 (5,7/9,11,12,13)				4.0	
		4.60	SPT	N≥50 (7,10/50 for 275mm)			Becoming very stiff from 4.60m bgl.		
					5.03		End of Borehole at 5.03m	5.0	
								6.0	

Remarks

1. Hand excavated pit to 1.20m bgl.
2. Groundwater encountered at 2.00m bgl.
3. Backfilled with arisings on completion.

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 D

Chemical Testing Results

Human Health Assessment Summary			Soil Type: Location: Depth:			MADE GROUND TOPSOIL WS03 0.20	MADE GROUND WS04 0.90	MADE GROUND WS11 0.30	MADE GROUND WS05 0.20-0.40	MADE GROUND TOPSOIL WS08 0.00-0.20	MADE GROUND WS09 0.00-0.05
Contaminant	GAC (mg/kg)	No. Samples	Min. Value	Max. Value	No. Samples ≥GAC						
Moisture Content	-	6	13.00	40.00	-	24	24	13	19	21	40
Soil Organic Matter	-	6	2.70	8.50	-	5.3	3.2	2.7	4.8	5.1	8.5
pH	-	6	7.70	8.20	-	8.1	7.9	8.2	7.9	7.7	7.8
Water Soluble Sulphate (2:1 Leachate Equivalent)	-	0	0.00	<LOD	-						
Arsenic	37	6	15.00	230.00	2	17.0	47	15	17	15	230
Cadmium	11	6	0.20	11.00	1	1.3	0.20	0.80	0.20	0.20	11.00
Chromium (III)	910	6	17.00	160.00	0	20.0	24	21	18	17	160
Hexavalent Chromium (VI)	6	6	1.20	1.20	0		1.2	1.2	1.2	1.2	1.2
Copper	2400	6	58.00	360.00	0	97.0	58	110	76	59	360
Lead	210	6	130.00	320.00	3	280.0	130	320	220	200	170
Mercury	1.2	6	0.30	0.40	0	0.3	0.3	0.3	0.4	0.3	0.3
Nickel	130	6	17.00	23.00	0	23.0	23	18	18	17	20
Selenium	250	6	1.00	1.00	0	1.0	1.0	1.0	1.0	1.0	1.0
Zinc	3700	6	94.00	1500.00	0	300.0	94	220	150	120	1500
Cyanide (free)	26	0	0.00	<LOD	0						
Phenol (total)	550	0	0.00	<LOD	0						
Naphthalene	5.6	6	0.24	0.90	0	0.35	0.78	0.58	0.24	0.25	0.90
Acenaphthylene	420	6	0.05	0.54	0	0.05	0.54	0.23	0.05	0.05	0.05
Acenaphthene	510	6	0.05	1.60	0	0.94	1.60	1.20	0.05	0.23	0.05
Fluorene	400	6	0.05	1.80	0	0.56	1.80	1.00	0.05	0.05	0.05
Phenanthrene	220	6	0.25	13.00	0	5.40	13.0	9.2	1.6	1.8	0.3
Anthracene	5400	6	0.05	3.10	0	1.40	3.10	2.20	0.38	0.40	0.05
Fluoranthene	560	6	0.40	13.00	0	9.10	13.0	12.0	3.0	2.9	0.4
Pyrene	1200	6	0.40	13.00	0	8.30	13.0	12.0	2.9	2.9	0.4
Benzo(a)anthracene	11.0	6	0.05	6.70	0	4.90	6.7	6.5	1.7	1.8	0.1
Chrysene	22	6	0.05	5.40	0	3.40	5.1	5.4	1.4	1.4	0.1
Benzo(b)fluoranthene	3.3	6	0.05	6.60	3	4.70	5.5	6.6	1.6	1.5	0.1
Benzo(k)fluoranthene	93	6	0.05	2.20	0	1.40	2.20	1.70	0.64	0.74	0.05
Benzo(a)pyrene	2.7	6	0.05	5.00	3	3.70	4.9	5.0	1.3	1.4	0.1
Indeno(1,2,3-cd)pyrene	36	6	0.05	2.60	0	1.80	2.40	2.60	0.66	0.70	0.05
Dibenz(a,h)anthracene	0.28	6	0.05	0.81	3	0.54	0.61	0.81	0.22	0.24	0.05
Benzo(ghi)perylene	340	6	0.05	3.00	0	2.10	2.90	3.00	0.80	0.81	0.05
Asbestos Detected (Detected or Not-Detected)	Y	6	-	0.00	1	Y	N	N	N	N	N
Asbestos Quantification (% w/w)	0	1	0.05	<LOD	0	<0.001	N	N	N	N	N
Petroleum Hydrocarbons Aliphatic >EC5-EC6	78	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC6-EC8	230	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC8-EC10	65	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC10-EC12	330	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC12-EC16	2400	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aliphatic >EC16-EC35	92000	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC5-EC7	140	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC7-EC8	290	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC8-EC10	83	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC10-EC12	180	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC12-EC16	330	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC16-EC21	540	0	0.00	<LOD	0						
Petroleum Hydrocarbons Aromatic >EC21-EC35	1500	0	0.00	<LOD	0						
Benzene	0.170	0	0.00	<LOD	0						
Toluene	290	0	0.00	<LOD	0						
Ethyl benzene	110	0	0.00	<LOD	0						
o-Xylene	140	0	0.00	<LOD	0						
m- & p-Xylene	270	0	0.00	<LOD	0						
MTBE	84	0	0.00	<LOD	0						
Mean Average SOM			4.9								
Mean Average pH			7.9								
Residential with Homegrown Produce 2.5% SOM						Values in RED are > the relevant GAC (Generic Assessment Criteria).					
Job Number: C4656											
Client: Mosscafe St Vincent's Housing Group											
Site: Simister Street											
Soil Group Type MADE GROUND											

Concrete Classification Assessment

In accordance with BRE Special Digest 1, 2005



**BROWNFIELD
SOLUTIONS LTD**
GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Client: Mosscaire St Vincents Housing
Site Name: Simister Street
Job Number: C4656
Soil Type: NATURAL

Soils Results

	Water soluble sulphate (mg/l)	Total potential sulphate (%)	Water soluble magnesium (mg/l)
Number of tests	3	0	0
No. tests in 20% data set	1		
No. tests with suspected pyrite		0	
Maximum value	0.11		
Mean of highest two values	0		
Mean of highest 20%			
Characteristic Value	0.11		
	1	1	Mg not required
	[no pyrite]	[pyrite suspected]	
DS Class	DS-1		
If pyrite suspected, DS Class limited to		1	
If pyrite suspected, DS Class limited to			
Is pyrite assumed to be present?	No	Adopted DC Class =	DS-1

pH Results

	Soils	Water
Number of tests	3	2
No. tests in 20% data set	1	0
Lowest pH	6.9	12.0
Mean of lowest 20%	6.9	
Characteristic value	6.9	12.0
Design value	6.9	
Number of soil pH results less than 5.5	0	

DS Class Design Value

ACEC Class Design Value

Based on higher of soil and water data	DS-1	Brownfield Static groundwater	AC-1s

**Peter Holland**

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William Smith House
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Analytical Report Number : 21-29338

Replaces Analytical Report Number: 21-29338, issue no. 1
Additional analysis undertaken.

Project / Site name:	Simister Street Manchester	Samples received on:	15/12/2021
Your job number:	C656	Samples instructed on/ Analysis started on:	15/12/2021
Your order number:	C4056 2701 TM	Analysis completed by:	11/01/2022
Report Issue Number:	2	Report issued on:	11/01/2022
Samples Analysed:	6 soil samples		

Signed: *Karolina Marek*

Karolina Marek
PL Head of 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: 21-29338
Project / Site name: Simister Street Manchester
Your Order No: C4056 2701 TM

Lab Sample Number				2117853	2117854	2117855	2117856	2117857
Sample Reference				WS03	WS04	WS11	WS05	WS08
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.90	0.30	0.20-0.40	0.00-0.20
Date Sampled				10/12/2021	10/12/2021	10/12/2021	10/12/2021	10/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status					
Stone Content	%	0.1	NONE	< 0.1	< 0.1	< 0.1	< 0.1	< 0.1
Moisture Content	%	0.01	NONE	24	24	13	19	21
Total mass of sample received	kg	0.001	NONE	0.40	1.0	0.40	0.40	0.40

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	Crocidolite	-	-	-	-
Asbestos in Soil	Type	N/A	ISO 17025	Detected	Not-detected	Not-detected	Not-detected	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	< 0.001	-	-	-	-
Asbestos Quantification Total	%	0.001	ISO 17025	< 0.001	-	-	-	-
Asbestos Analyst ID	N/A	N/A	N/A	SZS	DSA	DSA	DSA	DSA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	8.1	7.9	8.2	7.9	7.7
Water Soluble Sulphate as SO4 16hr extraction (2:1)	mg/kg	2.5	MCERTS	130	290	65	41	46
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.067	0.14	0.033	0.020	0.023
Water Soluble SO4 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	67.4	143	32.7	20.4	23.0
Organic Matter (automated)	%	0.1	MCERTS	5.3	3.2	2.7	4.8	5.1

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.35	0.78	0.58	0.24	0.25
Acenaphthylene	mg/kg	0.05	MCERTS	< 0.05	0.54	0.23	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.94	1.6	1.2	< 0.05	0.23
Fluorene	mg/kg	0.05	MCERTS	0.56	1.8	1.0	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	5.4	13	9.2	1.6	1.8
Anthracene	mg/kg	0.05	MCERTS	1.4	3.1	2.2	0.38	0.40
Fluoranthene	mg/kg	0.05	MCERTS	9.1	13	12	3.0	2.9
Pyrene	mg/kg	0.05	MCERTS	8.3	13	12	2.9	2.9
Benzo(a)anthracene	mg/kg	0.05	MCERTS	4.9	6.7	6.5	1.7	1.8
Chrysene	mg/kg	0.05	MCERTS	3.4	5.1	5.4	1.4	1.4
Benzo(b)fluoranthene	mg/kg	0.05	MCERTS	4.7	5.5	6.6	1.6	1.5
Benzo(k)fluoranthene	mg/kg	0.05	MCERTS	1.4	2.2	1.7	0.64	0.74
Benzo(a)pyrene	mg/kg	0.05	MCERTS	3.7	4.9	5.0	1.3	1.4
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	1.8	2.4	2.6	0.66	0.70
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.54	0.61	0.81	0.22	0.24
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	2.1	2.9	3.0	0.80	0.81

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	MCERTS	48.5	77.7	70.0	16.4	17.0
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Analytical Report Number: 21-29338
 Project / Site name: Simister Street Manchester
 Your Order No: C4056 2701 TM

Lab Sample Number				2117853	2117854	2117855	2117856	2117857
Sample Reference				WS03	WS04	WS11	WS05	WS08
Sample Number				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Depth (m)				0.20	0.90	0.30	0.20-0.40	0.00-0.20
Date Sampled				10/12/2021	10/12/2021	10/12/2021	10/12/2021	10/12/2021
Time Taken				None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)				Units	Limit of detection	Accreditation Status		

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	17	47	15	17	15
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	1.3	< 0.2	0.8	< 0.2	< 0.2
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2	< 1.2	< 1.2	< 1.2	< 1.2
Chromium (III)	mg/kg	1	NONE	20	24	21	18	17
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	20	24	21	19	18
Copper (aqua regia extractable)	mg/kg	1	MCERTS	97	58	110	76	59
Lead (aqua regia extractable)	mg/kg	1	MCERTS	280	130	320	220	200
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	0.3	0.3	0.3	0.4	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	23	23	18	18	17
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	300	94	220	150	120

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

Analytical Report Number: 21-29338
Project / Site name: Simister Street Manchester
Your Order No: C4056 2701 TM

Lab Sample Number				2117858
Sample Reference				WS09
Sample Number				None Supplied
Depth (m)				0.00-0.05
Date Sampled				10/12/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Stone Content	%	0.1	NONE	< 0.1
Moisture Content	%	0.01	NONE	40
Total mass of sample received	kg	0.001	NONE	0.40

Asbestos in Soil Screen / Identification Name	Type	N/A	ISO 17025	-
Asbestos in Soil	Type	N/A	ISO 17025	Not-detected
Asbestos Quantification (Stage 2)	%	0.001	ISO 17025	-
Asbestos Quantification Total	%	0.001	ISO 17025	-
Asbestos Analyst ID	N/A	N/A	N/A	DSA

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.8
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	130
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.065
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	65.0
Organic Matter (automated)	%	0.1	MCERTS	8.5

Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.90
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	0.25
Anthracene	mg/kg	0.05	MCERTS	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	0.40
Pyrene	mg/kg	0.05	MCERTS	0.40
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	1.95
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Analytical Report Number: 21-29338

Project / Site name: Simister Street Manchester

Your Order No: C4056 2701 TM

Lab Sample Number				2117858
Sample Reference				WS09
Sample Number				None Supplied
Depth (m)				0.00-0.05
Date Sampled				10/12/2021
Time Taken				None Supplied
Analytical Parameter (Soil Analysis)	Units	Limit of detection	Accreditation Status	
Heavy Metals / Metalloids				
Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	230
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	11
Chromium (hexavalent)	mg/kg	1.2	MCERTS	< 1.2
Chromium (III)	mg/kg	1	NONE	160
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	160
Copper (aqua regia extractable)	mg/kg	1	MCERTS	360
Lead (aqua regia extractable)	mg/kg	1	MCERTS	170
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	20
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	< 1.0
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	1500

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



Analytical Report Number: 21-29338
Project / Site name: Simister Street Manchester
Your Order No: C4056 2701 TM

Certificate of Analysis - Asbestos Quantification

Methods:

Qualitative Analysis

The samples were analysed qualitatively for asbestos by polarising light and dispersion staining as described by the Health and Safety Executive in HSG 248.

Quantitative Analysis

The analysis was carried out using our documented in-house method A006-PL based on HSE Contract Research Report No: 83/1996: Development and Validation of an analytical method to determine the amount of asbestos in soils and loose aggregates (Davies et al, 1996) and HSG 248. Our method includes initial examination of the entire representative sample, then fractionation and detailed analysis of each fraction, with quantification by hand picking and weighing.

The limit of detection (reporting limit) of this method is 0.001 %.

The method has been validated using samples of at least 100 g, results for samples smaller than this should be interpreted with caution.

Both Qualitative and Quantitative Analyses are UKAS accredited.

Sample Number	Sample ID	Sample Depth (m)	Sample Weight (g)	Asbestos Containing Material Types Detected (ACM)	PLM Results	Asbestos by hand picking/weighing (%)	Total % Asbestos in Sample
2117853	WS03	0.20	115	Loose Fibres	Crocidolite	< 0.001	< 0.001

Opinions and interpretations expressed herein are outside the scope of UKAS accreditation.

Analytical Report Number : 21-29338

Project / Site name: Simister Street Manchester

* 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 *
2117853	WS03	None Supplied	0.2	Brown loam and clay with gravel and vegetation.
2117854	WS04	None Supplied	0.9	Brown clay and sand with gravel.
2117855	WS11	None Supplied	0.3	Brown loam and clay with gravel and vegetation.
2117856	WS05	None Supplied	0.20-0.40	Brown clay and loam with gravel and vegetation.
2117857	WS08	None Supplied	0.00-0.20	Brown loam and clay with gravel and vegetation.
2117858	WS09	None Supplied	0.00-0.05	Brown loam and sand with gravel and vegetation.

Analytical Report Number : 21-29338

Project / Site name: Simister Street Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

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
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
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 diphenylcarbazine 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
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
Cr (III) in soil	In-house method by calculation from total Cr and Cr VI.	In-house method by calculation	L080-PL	W	NONE
Asbestos Quantification - Gravimetric	Asbestos quantification by gravimetric method - in house method based on references.	HSE Report No: 83/1996, HSG 248, HSG 264 & SCA Blue Book (draft).	A006-PL	D	ISO 17025
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
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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

APPENDIX E

Geotechnical Testing Results

4041

Client: Brownfield Solutions Ltd
 Client Address: William Smith House, 173 - 183 Witton Street,
 Northwich, Cheshire,
 CW9 5LP
 Contact: Peter Holland
 Site Address: Simister Street Manchester

Client Reference: C4656
 Job Number: 21-29707
 Date Sampled: 10/12/2021
 Date Received: 14/12/2021
 Date Tested: 29/12/2021
 Sampled By: Client - TM/MS

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

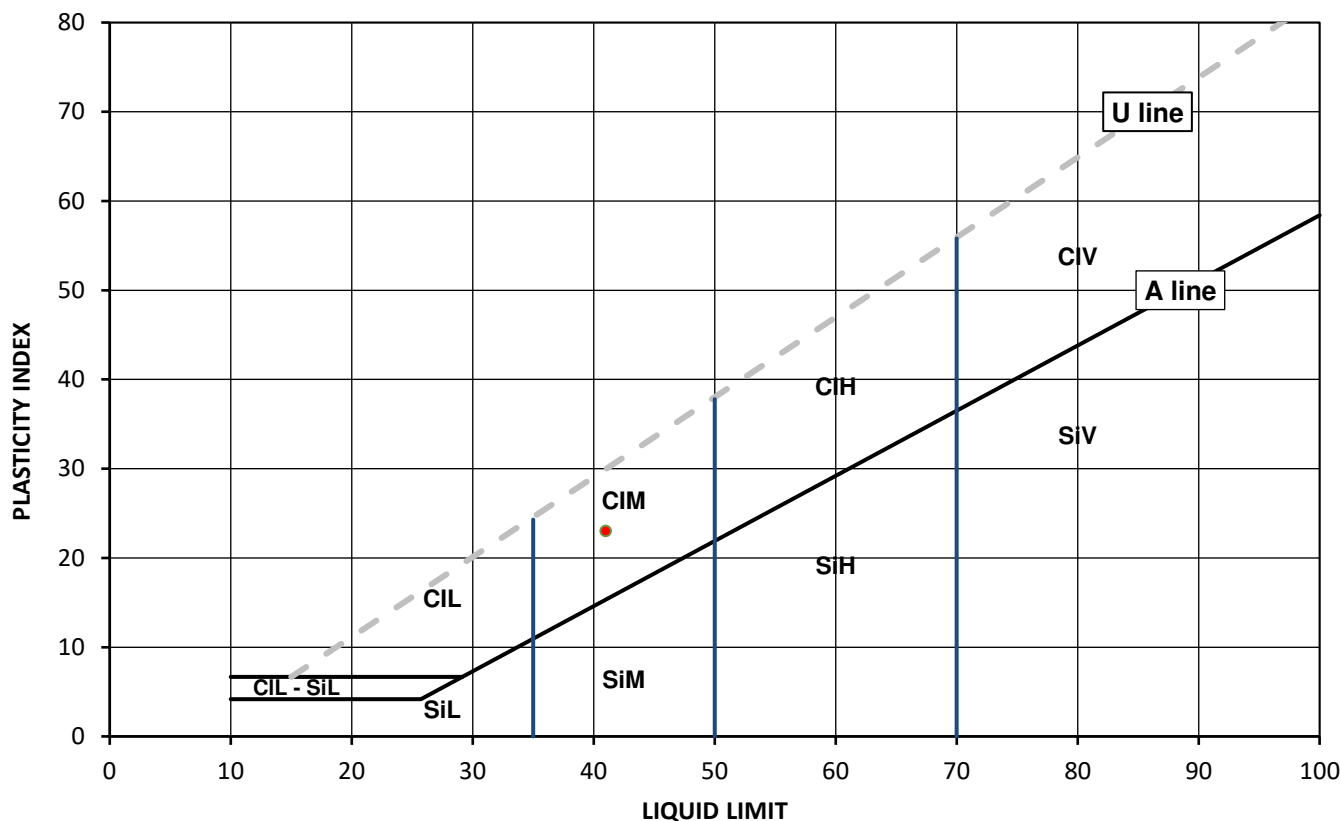
Test Results:

Laboratory Reference: 2119964
 Hole No.: WS03
 Sample Reference: Not Given
 Sample Description: Brown slightly gravelly slightly sandy CLAY

Depth Top [m]: 1.80
 Depth Base [m]: 1.80
 Sample Type: D

Sample Preparation: Tested after washing to remove >0.425mm;
 Cone Type: 80g/30deg

As Received Water Content [W] %	Corrected Liquid Limit [WL] %	Correlation Factor	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
20.8	41	1.020	18	23	91



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

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

Note: Water Content by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Remarks:

Signed:

Monika Janoszek
 PL Deputy Geotechnical Laboratory Manager
 for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Monika Janoszek
 Page 1 of 1

Date Reported: 10/01/2022

GF 360.10

4041

Client: Brownfield Solutions Ltd
 Client Address: William Smith House, 173 - 183 Witton Street,
 Northwich, Cheshire,
 CW9 5LP
 Contact: Peter Holland
 Site Address: Simister Street Manchester

Client Reference: C4656
 Job Number: 21-29707
 Date Sampled: 10/12/2021
 Date Received: 14/12/2021
 Date Tested: 29/12/2021
 Sampled By: Client - TM/MS

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

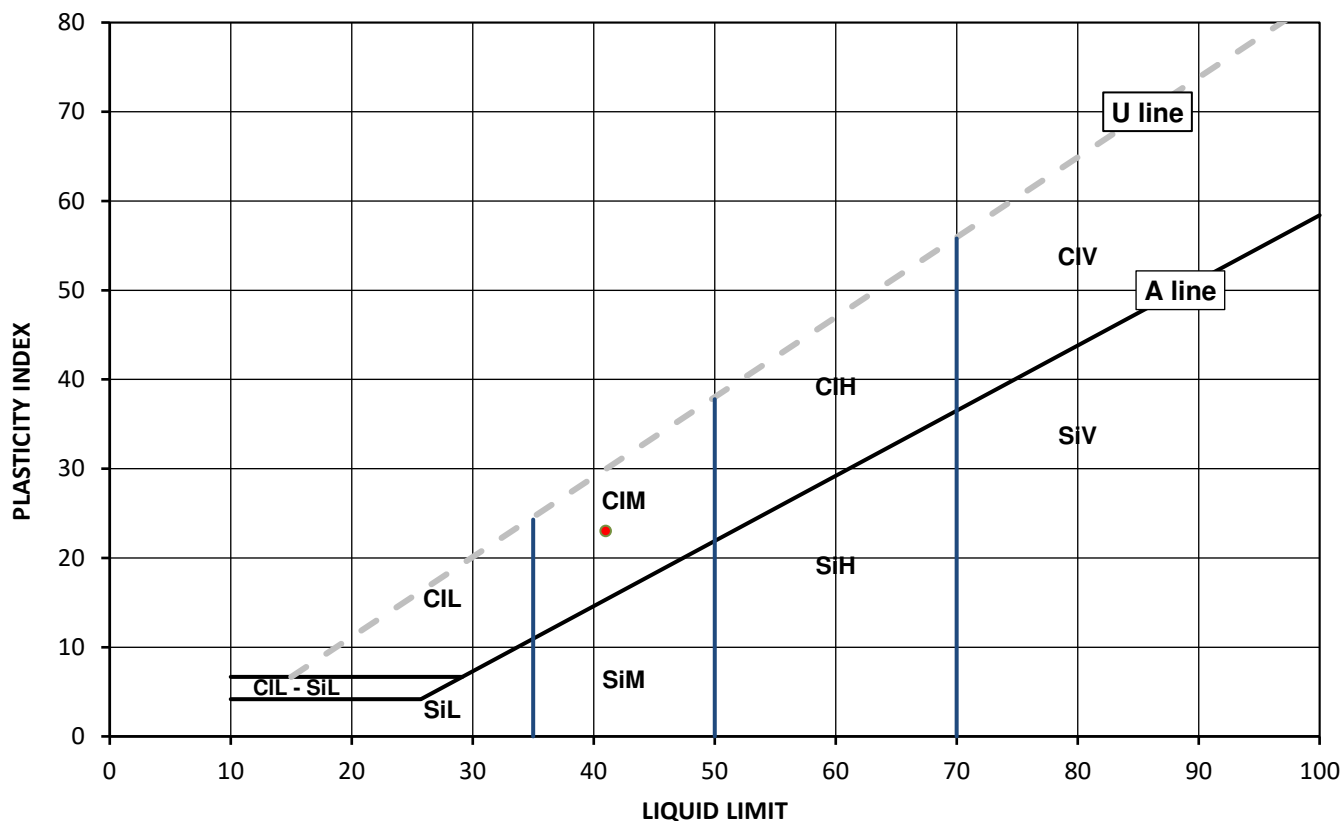
Test Results:

Laboratory Reference: 2119965
 Hole No.: WS05
 Sample Reference: Not Given
 Sample Description: Multicolour slightly sandy CLAY

Depth Top [m]: 0.60
 Depth Base [m]: 0.60
 Sample Type: D

Sample Preparation: Tested in natural condition;
 Cone Type: 80g/30deg

As Received Water Content [W] %	Corrected Liquid Limit [WL] %	Correlation Factor	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
21.7	41	1.000	18	23	100



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

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

Note: Water Content by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Remarks:

Signed:

Monika Janoszek
 PL Deputy Geotechnical Laboratory Manager
 for and on behalf of i2 Analytical Ltd

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4041

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP
Contact: Peter Holland
Site Address: Simister Street Manchester

Client Reference: C4656
Job Number: 21-29707
Date Sampled: 10/12/2021
Date Received: 14/12/2021
Date Tested: 29/12/2021
Sampled By: Client - TM/MS

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

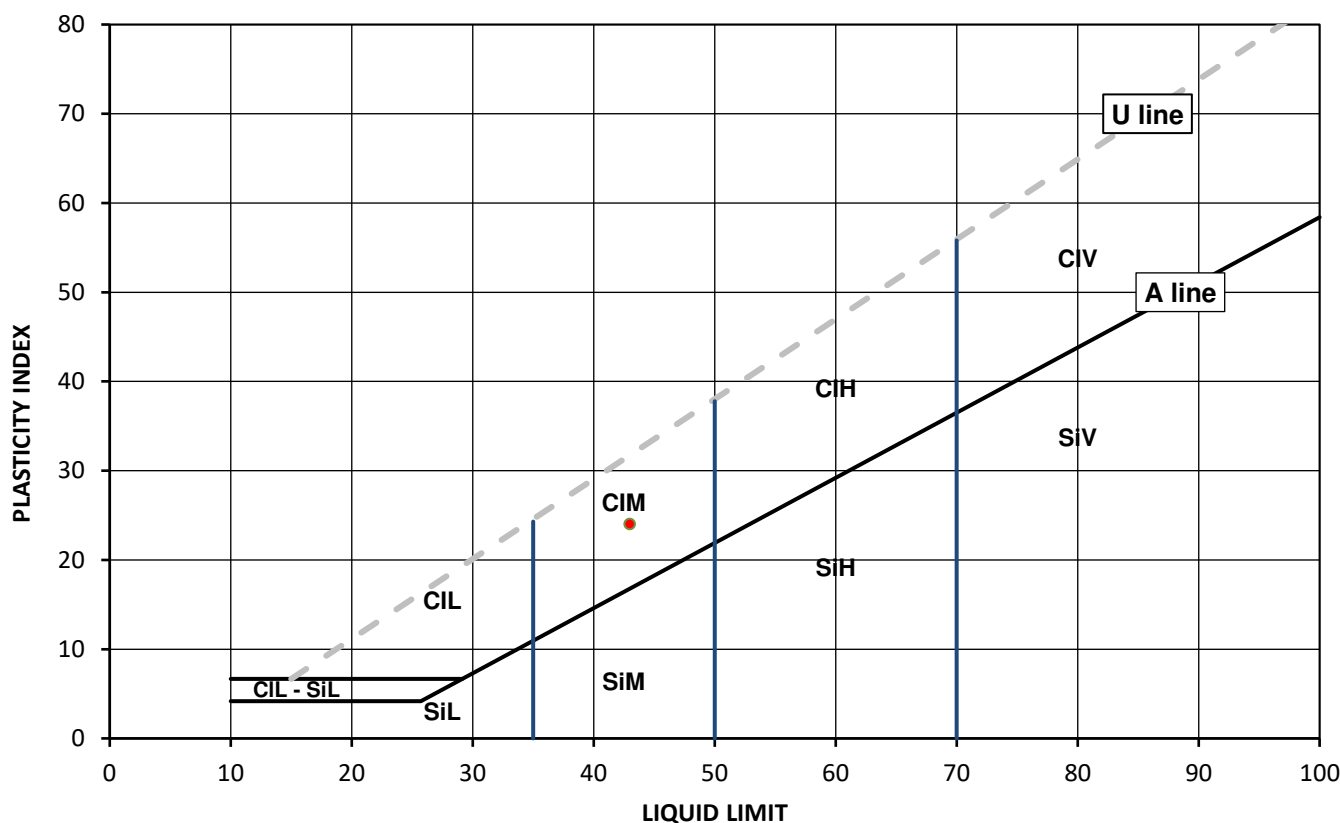
Test Results:

Laboratory Reference: 2119966
Hole No.: WS09
Sample Reference: Not Given
Sample Description: Multicolour slightly gravelly slightly sandy CLAY

Depth Top [m]: 1.20
Depth Base [m]: 1.20
Sample Type: D

Sample Preparation: Tested after washing to remove >0.425mm;
Cone Type: 80g/30deg

As Received Water Content [W] %	Corrected Liquid Limit [WL] %	Correlation Factor	Plastic Limit [Wp] %	Plasticity Index [Ip] %	% Passing 425µm BS Test Sieve
19.7	43	1.000	19	24	91



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

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

Note: Water Content by BS EN 17892-1: 2014; Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Remarks:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

Opinions and interpretations expressed herein are outside of the scope of the UKAS Accreditation. This report may not be reproduced other than in full without the prior written approval of the issuing laboratory. The results included within the report relate only to the sample(s) submitted for testing.

Monika Janoszek

Page 1 of 1

Date Reported: 10/01/2022

GF 360.10



SUMMARY REPORT

SUMMARY OF CLASSIFICATION TEST RESULTS

Tested in Accordance with:

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



Environmental Science

4041

Client: Brownfield Solutions Ltd
Client Address: William Smith House, 173 - 183 Witton Street,
Northwich, Cheshire,
CW9 5LP
Contact: Peter Holland
Site Address: Simister Street Manchester

W by BS EN 17892-1: 2014; Liquid and Plastic Limit by BS EN ISO 17892-12:2018+A1:2021: Clause 5.3 (4 Point Test), Clause 5.3.14 (1 Point Test) and 5.5; Correlation Factor by Clayton C.R.I and Jukes A.W (1978); PD by BS 1377-2: 1990: Clause 8.2

Client Reference: C4656
Job Number: 21-29707
Date Sampled: 10/12/2021
Date Received: 14/12/2021
Date Tested: 21/12/2021
Sampled By: Client - TM/MS

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

Test results

Laboratory Reference	Hole No.	Sample				Description	Remarks	W	Liquid & Plastic Limit								Density		
		Reference	Depth Top	Depth Base	Type				% Passing 425um	WL*	Correlation Factor	Wp	Ip	Cone type	Sample Preparation	bulk	dry	PD	
			m	m					%	%		%	%			Mg/m3	Mg/m3	Mg/m3	
2119964	WS03	Not Given	1.80	1.80	D	Brown slightly gravelly slightly sandy CLAY	Atterberg 1 Point	20.8	91	41	1.020	18	23	80g/30 deg	N/A				
2119965	WS05	Not Given	0.60	0.60	D	Multicolour slightly sandy CLAY	Atterberg 1 Point	21.7	100	41	1.000	18	23	80g/30 deg	N/A				
2119966	WS09	Not Given	1.20	1.20	D	Multicolour slightly gravelly slightly sandy CLAY	Atterberg 1 Point	19.7	91	43	1.000	19	24	80g/30 deg	N/A				

Note: # Non accredited; NP - Non plastic; I - The water content in the sample was increased ; D - The water content in the sample was decreased; * - One point liquid limit corrected as per the report Correlation Factor by Clayton C.R.I and Jukes A.W (1978)

Comments:

Signed:

Monika Janoszek
PL Deputy Geotechnical Laboratory Manager
for and on behalf of i2 Analytical Ltd

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**Peter Holland**

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

i2 Analytical Ltd.
7 Woodshots Meadow,
Croxley Green
Business Park,
Watford,
Herts,
WD18 8YS

t: 01923 225404

f: 01923 237404

e: reception@i2analytical.com

e: p.holland@brownfield-solutions.co.uk

Analytical Report Number : 21-29708

Project / Site name:	Simister Street Manchester	Samples received on:	14/12/2021
Your job number:	C4656	Samples instructed on/ Analysis started on:	15/12/2021
Your order number:	C4656 2702 TM	Analysis completed by:	28/12/2021
Report Issue Number:	1	Report issued on:	28/12/2021
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: 21-29708

Project / Site name: Simister Street Manchester

Your Order No: C4656 2702 TM

Lab Sample Number				2119967	2119968	2119969
Sample Reference				WS05	WS09	WS01
Sample Number				None Supplied	None Supplied	None Supplied
Depth (m)				0.60-0.60	1.20-1.20	2.80-2.80
Date Sampled				10/12/2021	10/12/2021	10/12/2021
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	18	14	18
Total mass of sample received	kg	0.001	NONE	0.60	0.60	0.60

General Inorganics

pH - Automated	pH Units	N/A	MCERTS	7.5	7.5	6.9
Water Soluble SO ₄ 16ml extraction (2:1 Leachate Equivalent)	g/l	0.00125	MCERTS	0.017	0.033	0.11

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



Analytical Report Number : 21-29708
Project / Site name: Simister Street Manchester

* 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 *
2119967	WS05	None Supplied	0.60-0.60	Brown clay.
2119968	WS09	None Supplied	1.20-1.20	Brown clay.
2119969	WS01	None Supplied	2.80-2.80	Brown clay.

Analytical Report Number : 21-29708

Project / Site name: Simister Street Manchester

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters (PrW) Final Sewage Effluent (FSE) Landfill Leachate (LL)

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
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

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.

Unless otherwise indicated, site information, order number, project number, sampling date, time, sample reference and depth are provided by the client. The instructed on date indicates the date on which this information was provided to the laboratory.

WS10
Test 1

MSV HOUSING

SIMISTER STREET, MANCHESTER

C4656



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GEO-ENVIRONMENTAL ENGINEERING EXCELLENCE

Falling Head Permeability Test

(a) bottom of borehole:	4.45	m
(b) bottom of casing:		m
(c) top of filter material:		m
(d) initial groundwater level or base of hole:	1.46	m
(e) centre of piezometer tip:		m
Height of casing/standpipe above surface	0.00	m
Diameter of casing/standpipe	50	mm
Length of filter (above GW table or base of hole)	1.46	m

Date of Test:
10/01/2022

Logged By:
PH

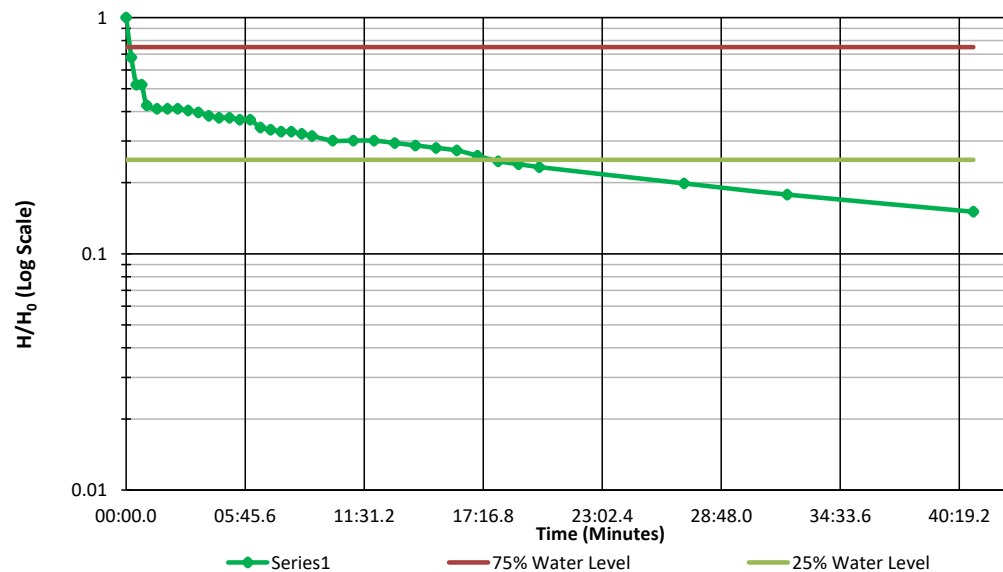
Checked By:
DMG

Site Recorded Data

Time (mm:ss.0)	Depth to water (m)	Head of water (m)	Head Ratio H/H ₀	Time (mm:ss.0)	Depth to water (mm)	Head of water (m)	Head Ratio H/H ₀
00:00.0	0.00	1.46	1.00	10:00.0	1.02	0.44	0.30
00:15.0	0.47	0.99	0.68	11:00.0	1.02	0.44	0.30
00:30.0	0.70	0.76	0.52	12:00.0	1.02	0.44	0.30
00:45.0	0.70	0.76	0.52	13:00.0	1.03	0.43	0.29
01:00.0	0.84	0.62	0.42	14:00.0	1.04	0.42	0.29
01:30.0	0.86	0.60	0.41	15:00.0	1.05	0.41	0.28
02:00.0	0.86	0.60	0.41	16:00.0	1.06	0.40	0.27
02:30.0	0.86	0.60	0.41	17:00.0	1.08	0.38	0.26
03:00.0	0.87	0.59	0.40	18:00.0	1.10	0.36	0.25
03:30.0	0.88	0.58	0.40	19:00.0	1.11	0.35	0.24
04:00.0	0.90	0.56	0.38	20:00.0	1.12	0.34	0.23
04:30.0	0.91	0.55	0.38	27:00.0	1.17	0.29	0.20
05:00.0	0.91	0.55	0.38	32:00.0	1.20	0.26	0.18
05:30.0	0.92	0.54	0.37	41:00.0	1.24	0.22	0.15
06:00.0	0.92	0.54	0.37	END			
06:30.0	0.96	0.50	0.34				
07:00.0	0.97	0.49	0.34				
07:30.0	0.98	0.48	0.33				
08:00.0	0.98	0.48	0.33				
08:30.0	0.99	0.47	0.32				
09:00.0	1.00	0.46	0.32				

Data Analysis

Head Ratio Vs Time



WS10
Test 1

MSV HOUSING

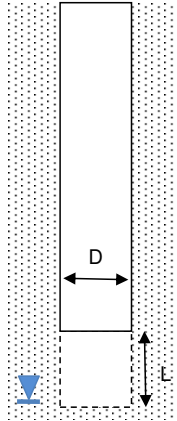
SIMISTER STREET, MANCHESTER

C4656



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Calculation of Intake Factor (F)



X-sectional area of base

$$A = 0.001963495 \text{ m}^2$$

Diameter

$$D = 0.05 \text{ m}$$

Length

$$L = 1.46 \text{ m}$$

$$F = \frac{2\pi L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\frac{L}{D}\right)^2 + 1}\right)}$$

$$F = \frac{9.173}{3.409}$$

$$F = 2.691$$

Calculation

	Head (m)	Depth (m bgl)	Time (s)
75% effective level	1.095	0.365	30.0
25% effective level	0.365	1.095	1036.0

At time (t_1) Depth to water = 0.365 $t_1 = 30.0$ sec

Initial groundwater level = 1.46

Depth of Water (H_1) = 1.095

At time (t_2) Depth to water = 1.095 $t_2 = 1036.0$ sec

Initial groundwater level = 1.46

Depth of Water (H_2) = 0.365

$$\text{Permeability} = k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

$$k = \frac{0.0020}{2707.12} \ln \frac{1.095}{0.365}$$

$$k = 7.97\text{E-}07 \text{ m/s}$$



Falling Head Permeability Test

(a) bottom of borehole:	3.98	m
(b) bottom of casing:		m
(c) top of filter material:	0.50	m
(d) initial groundwater level or base of hole:	0.70	m
(e) centre of piezometer tip:		m
Height of casing/standpipe above surface	0.00	m
Diameter of casing/standpipe	50	mm
Length of filter (above GW table or base of hole)	0.20	m

Date of Test:

10/01/2022

Logged By:

PH

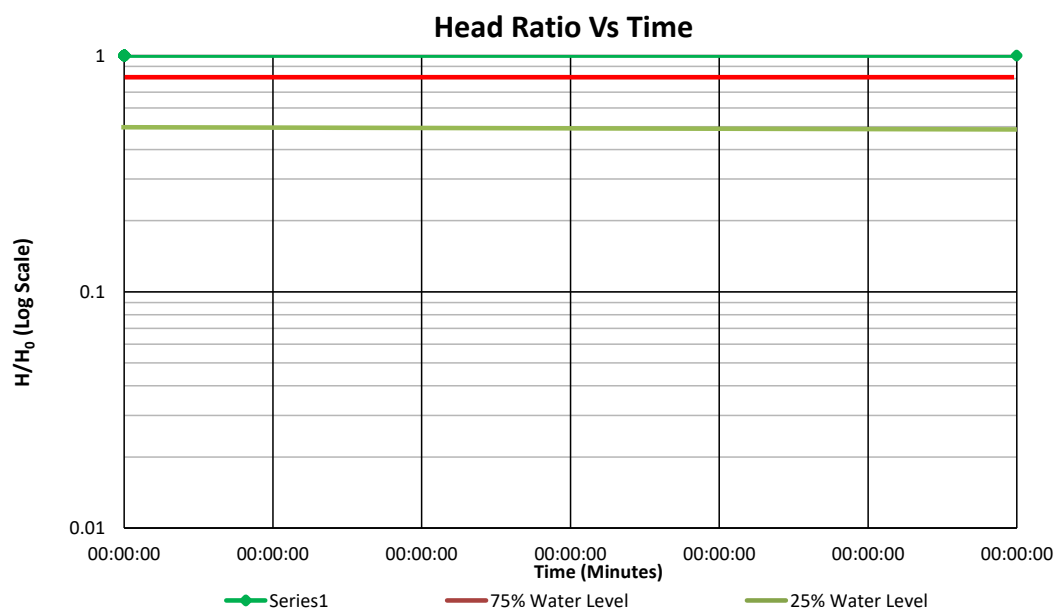
Checked By:

DMG

Site Recorded Data

Time (mm:ss.0)	Depth to water (m)	Head of water (m)	Head Ratio H/H ₀	Time (mm:ss.0)	Depth to water (mm)	Head of water (m)	Head Ratio H/H ₀
00:00.0	0.00	0.70	1.00	10:00.0	0.00	0.70	1.00
00:15.0	0.00	0.70	1.00	10:30.0	0.00	0.70	1.00
00:30.0	0.00	0.70	1.00	11:00.0	0.00	0.70	1.00
00:45.0	0.00	0.70	1.00	11:30.0	0.00	0.70	1.00
01:00.0	0.00	0.70	1.00	12:00.0	0.00	0.70	1.00
01:30.0	0.00	0.70	1.00	12:30.0	0.00	0.70	1.00
02:00.0	0.00	0.70	1.00	13:00.0	0.00	0.70	1.00
02:30.0	0.00	0.70	1.00	13:30.0	0.00	0.70	1.00
03:00.0	0.00	0.70	1.00	14:00.0	0.00	0.70	1.00
03:30.0	0.00	0.70	1.00	15:00.0	0.00	0.70	1.00
04:00.0	0.00	0.70	1.00	18:30.0	0.00	0.70	1.00
04:30.0	0.00	0.70	1.00	19:00.0	0.00	0.70	1.00
05:00.0	0.00	0.70	1.00	20:00.0	0.00	0.70	1.00
05:30.0	0.00	0.70	1.00	25:00.0	0.00	0.70	1.00
06:00.0	0.00	0.70	1.00	30:00.0	0.00	0.70	1.00
06:30.0	0.00	0.70	1.00	END			
07:00.0	0.00	0.70	1.00				
07:30.0	0.00	0.70	1.00				
08:00.0	0.00	0.70	1.00				
08:30.0	0.00	0.70	1.00				
09:00.0	0.00	0.70	1.00				

Data Analysis



WS06
Test 1

MSV HOUSING

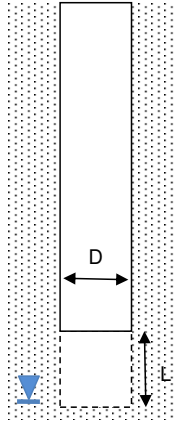
SIMISTER STREET, MANCHESTER

C4656



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Calculation of Intake Factor (F)



X-sectional area of base

$$A = 0.001963495 \text{ m}^2$$

Diameter

$$D = 0.05 \text{ m}$$

Length

$$L = 0.20 \text{ m}$$

$$F = \frac{2\pi L}{\ln\left(\left(\frac{L}{D}\right) + \sqrt{\left(\frac{L}{D}\right)^2 + 1}\right)}$$

$$F = \frac{1.257}{1.658}$$

$$F = 0.758$$

Calculation

	Head (m)	Depth (m bgl)	Time (s)
75% effective level	0.525	0.175	n/a
25% effective level	0.175	0.525	n/a

At time (t_1) Depth to water = 0.175 $t_1 =$ n/a sec

Initial groundwater level = 0.70

Depth of Water (H_1) = 0.525

At time (t_2) Depth to water = 0.525 $t_2 =$ n/a sec

Initial groundwater level = 0.70

Depth of Water (H_2) = 0.175

$$\text{Permeability} = k = \frac{A}{F(t_2 - t_1)} \log_e \frac{H_1}{H_2}$$

$$k = \frac{0.0020}{\text{\#VALUE!}} \ln \frac{0.525}{0.175}$$

k = No Infiltration - rate unable to be calculated

APPENDIX F

Monitoring Results

Ground Gas Monitoring Results



CLIENT:	Date	Operator	Analysar	Weather Observations			Temp (°C)	Pressure Trend	Min Barometric Pressure (mb)	Notes
MOSSCARE ST VINCENT'S HOUSING GROUP	13/12/2021	PG	GFM436	Overcast	No wind	Cool	8	Rising	1015	
JOB NO.	22/12/2021	PG	GFM436	Overcast	No wind	Cold	3	Falling	1005	
C4656	10/01/2022	PG	GFM436	Overcast	No wind	Cool	8	Rising	1003	
SITE:	20/01/2022	PG	GFM436	Sunny	Light breeze	Cold	4	Steady	1025	
SIMISTER STREET, MANCHESTER										

Notes: mb = milibars; CH₄ = methane; LEL = lower explosive limit = 5%v/v; CO₂ = carbon dioxide; O₂ = oxygen; CO=carbon monoxide; H₂S = 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 available 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 ₂ S	TVOC (PID)					
				Summary Statistics																			
Max. values:				1026	1.1	103.1	0.6	0.1	0.1	2.0	2.0	2.3	0.8	20.7	21.0	0.0	0.0	0.0	1.7	4.0	0.004	0.008	
Min. values:				1003	-36.0	-3.6	-4.2	0.0	0.1	0.0	2.0	0.1	0.1	7.4	19.4	0.0	0.0	0.0	0.2	2.2	0.000	0.000	
				Worst-case GSVs based on maximum recorded steady flow and maximum individual peak concentrations:																		0.001	
13/12/2021	PM	Ambient	X.00 - X.00	1009			0.1		0.1		2.0		0.1		20.5		0.0	0.0	NA				
		WS02	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.4	20.5	0.0	0.0	NA	1.30	2.90	0.000	0.000
		WS06	0.50 - 4.00		1.1		103.1	0.6	0.1	0.1	2.0	2.0	0.9	0.4	19.6	20.2	0.0	0.0	NA	0.70	3.98	0.001	0.005
		WS09	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	1.7	0.8	18.0	19.5	0.0	0.0	NA	1.58	2.37	0.000	0.002
		WS10	2.00 - 4.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	2.0	0.5	18.8	20.2	0.0	0.0	NA	1.46	3.07	0.000	0.002
13/12/2021	PM	Ambient	X.00 - X.00	1008			0.1		0.1		2.0		0.1		20.5		0.0	0.0	NA				
22/12/2021	PM	Ambient	X.00 - X.00	1009			0.1		0.1		2.0		0.1		20.6		0.0	0.0	NA				
		WS02	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.2	20.4	0.0	0.0	NA	1.58	2.90	0.000	0.000
		WS06	0.50 - 4.00		-36.0		-2.5	-4.2	0.0	0.1	0.0	2.0	0.2	0.1	19.0	19.9	0.0	0.0	NA	0.21	4.00	0.000	0.008
		WS09	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	0.3	0.2	20.1	20.3	0.0	0.0	NA	1.73	2.31	0.000	0.000
		WS10	2.00 - 4.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	2.1	0.8	18.9	19.7	0.0	0.0	NA	1.49	3.03	0.000	0.002
22/12/2021	PM	Ambient	X.00 - X.00	1008			0.1		0.1		2.0		0.1		20.6		0.0	0.0	NA				
10/01/2022	PM	Ambient	X.00 - X.00	1003			0.1		0.1		2.0		0.1		20.7		0.0	0.0	NA				
		WS02	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.7	21.0	0.0	0.0	NA	1.20	2.93	0.000	0.000
		WS06	0.50 - 4.00		-1.0		-0.4	-0.4	0.1	0.1	2.0	2.0	1.8	0.1	7.4	19.6	0.0	0.0	NA	0.20	3.95	0.000	0.007
		WS09	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	1.3	0.4	19.6	20.5	0.0	0.0	NA	1.57	2.25	0.000	0.001
		WS10	2.00 - 4.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	2.3	0.5	19.3	20.6	0.0	0.0	NA	1.46	3.01	0.000	0.002
10/01/2022	PM	Ambient	X.00 - X.00	1003			0.1		0.1		2.0		0.1		20.7		0.0	0.0	NA				
20/01/2022	PM	Ambient	X.00 - X.00	1026			0.1		0.1		2.0		0.1		20.1		0.0	0.0	NA				
		WS02	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	0.1	0.1	20.2	20.4	0.0	0.0	NA	1.67	2.94	0.000	0.000
		WS06	0.50 - 4.00		-30.0		-3.6	-3.6	0.1	0.1	2.0	2.0	0.1	0.1	12.0	19.4	0.0	0.0	NA	0.20	3.95	0.004	0.004
		WS09	1.00 - 3.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	0.2	0.1	19.9	20.3	0.0	0.0	NA	1.74	2.23	0.000	0.000
		WS10	2.00 - 4.00		0.0		0.1	0.1	0.1	0.1	2.0	2.0	1.9	0.7	19.2	19.8	0.0	0.0	NA	1.56	3.01	0.000	0.002
20/01/2022	PM	Ambient	X.00 - X.00	1025			0.1		0.1		2.0		0.1		20.1		0.0	0.0	NA				

APPENDIX G

Waste Assessment Report

Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



SYT49-BUXLH-PAZEQ

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in **pale yellow**.

Job name

Simister Street, Manchester

Description/Comments

Project

C4656

Site

Simister Street, Manchester

Classified by

Name: **Jake Wheaton**
 Date: **27 Jan 2022 11:53 GMT**
 Telephone: **01606334844**
 Company: **Brownfield Solutions Limited**
Brownfield Solutions Ltd
173-183 Witton Street
Northwich
CW9 5LP

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

CERTIFIED

Course
Hazardous Waste Classification

Date
07 Oct 2021

Next 3 year Refresher due by Oct 2024

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS03	0.20	Non Hazardous		2
2	WS04	0.90	Non Hazardous		4
3	WS11	0.30	Non Hazardous		6
4	WS05	0.20-0.40	Non Hazardous		8
5	WS08	0.00-0.20	Non Hazardous		10
6	WS09	0.00-0.05	Hazardous	HP 7	12

Related documents

#	Name	Description
1	BSL Suite	waste stream template used to create this Job

Report

Created by: Jake Wheaton

Created date: 27 Jan 2022 11:53 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	14
Appendix B: Rationale for selection of metal species	15
Appendix C: Version	15

Classification of sample: WS03


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

Sample details

Sample name:	LoW Code:
WS03	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.20 m	
Moisture content:	
24%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 24% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				8.1	pH		8.1	pH	8.1 pH		
2	arsenic { arsenic trioxide }				17	mg/kg	1.32	17.059	mg/kg	0.00171 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	1.3	mg/kg	1.285	1.27	mg/kg	0.0000988 %	✓	
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				20	mg/kg	1.462	22.216	mg/kg	0.00222 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				97	mg/kg	1.126	83	mg/kg	0.0083 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	280	mg/kg	1.56	331.929	mg/kg	0.0213 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				0.3	mg/kg	1.353	0.309	mg/kg	0.0000309 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				23	mg/kg	1.579	27.61	mg/kg	0.00276 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				1	mg/kg	1.405	1.068	mg/kg	0.000107 %	✓	
	034-002-00-8											
11	zinc { zinc chromate }				300	mg/kg	2.774	632.505	mg/kg	0.0633 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	naphthalene				0.35	mg/kg		0.266	mg/kg	0.0000266 %	✓	
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				0.05	mg/kg		0.038	mg/kg	0.0000038 %	✓	
		205-917-1	208-96-8									
14	acenaphthene				0.94	mg/kg		0.714	mg/kg	0.0000714 %	✓	
		201-469-6	83-32-9									
15	fluorene				0.56	mg/kg		0.426	mg/kg	0.0000426 %	✓	
		201-695-5	86-73-7									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		5.4 mg/kg		4.104 mg/kg	0.00041 %	✓	
17	anthracene	204-371-1	120-12-7		1.4 mg/kg		1.064 mg/kg	0.000106 %	✓	
18	fluoranthene	205-912-4	206-44-0		9.1 mg/kg		6.916 mg/kg	0.000692 %	✓	
19	pyrene	204-927-3	129-00-0		8.3 mg/kg		6.308 mg/kg	0.000631 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		4.9 mg/kg		3.724 mg/kg	0.000372 %	✓	
21	chrysene	601-048-00-0	205-923-4		3.4 mg/kg		2.584 mg/kg	0.000258 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		4.7 mg/kg		3.572 mg/kg	0.000357 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		1.4 mg/kg		1.064 mg/kg	0.000106 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		3.7 mg/kg		2.812 mg/kg	0.000281 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		1.8 mg/kg		1.368 mg/kg	0.000137 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.54 mg/kg		0.41 mg/kg	0.000041 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		2.1 mg/kg		1.596 mg/kg	0.00016 %	✓	
28	asbestos	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		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
Total:								0.104 %		

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 Determinand - 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: WS04



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

Sample details

Sample name:	LoW Code:
WS04	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.90 m	
Moisture content:	
24%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 24% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				7.9 pH		7.9	pH	7.9 pH		
2	arsenic { arsenic trioxide }				47 mg/kg	1.32	47.162	mg/kg	0.00472 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	0.2 mg/kg	1.285	0.195	mg/kg	0.0000152 %	✓	
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				24 mg/kg	1.462	26.659	mg/kg	0.00267 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				58 mg/kg	1.126	49.629	mg/kg	0.00496 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	130 mg/kg	1.56	154.11	mg/kg	0.00988 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				0.3 mg/kg	1.353	0.309	mg/kg	0.0000309 %	✓	
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				23 mg/kg	1.579	27.61	mg/kg	0.00276 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				1 mg/kg	1.405	1.068	mg/kg	0.000107 %	✓	
	034-002-00-8										
11	zinc { zinc chromate }				94 mg/kg	2.774	198.185	mg/kg	0.0198 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				0.78 mg/kg		0.593	mg/kg	0.0000593 %	✓	
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				0.54 mg/kg		0.41	mg/kg	0.000041 %	✓	
		205-917-1	208-96-8								
14	acenaphthene				1.6 mg/kg		1.216	mg/kg	0.000122 %	✓	
		201-469-6	83-32-9								
15	fluorene				1.8 mg/kg		1.368	mg/kg	0.000137 %	✓	
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		13 mg/kg		9.88 mg/kg	0.000988 %	✓	
17	anthracene	204-371-1	120-12-7		3.1 mg/kg		2.356 mg/kg	0.000236 %	✓	
18	fluoranthene	205-912-4	206-44-0		13 mg/kg		9.88 mg/kg	0.000988 %	✓	
19	pyrene	204-927-3	129-00-0		13 mg/kg		9.88 mg/kg	0.000988 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		6.7 mg/kg		5.092 mg/kg	0.000509 %	✓	
21	chrysene	601-048-00-0	205-923-4		5.1 mg/kg		3.876 mg/kg	0.000388 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		5.5 mg/kg		4.18 mg/kg	0.000418 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		2.2 mg/kg		1.672 mg/kg	0.000167 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		4.9 mg/kg		3.724 mg/kg	0.000372 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		2.4 mg/kg		1.824 mg/kg	0.000182 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.61 mg/kg		0.464 mg/kg	0.0000464 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		2.9 mg/kg		2.204 mg/kg	0.00022 %	✓	
Total:								0.051 %		

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 Determinand - 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: WS11

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

Sample details

Sample name:	LoW Code:
WS11	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.30 m	
Moisture content:	
13%	
(wet weight correction)	

Hazard properties

None identified

Determinands

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

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				8.2	pH		8.2	pH	8.2 pH		
2	arsenic { arsenic trioxide }				15	mg/kg	1.32	17.23	mg/kg	0.00172 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	0.8	mg/kg	1.285	0.895	mg/kg	0.0000696 %	✓	
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				21	mg/kg	1.462	26.703	mg/kg	0.00267 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				110	mg/kg	1.126	107.748	mg/kg	0.0108 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	320	mg/kg	1.56	434.253	mg/kg	0.0278 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				0.3	mg/kg	1.353	0.353	mg/kg	0.0000353 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				18	mg/kg	1.579	24.735	mg/kg	0.00247 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				1	mg/kg	1.405	1.222	mg/kg	0.000122 %	✓	
	034-002-00-8											
11	zinc { zinc chromate }				220	mg/kg	2.774	530.972	mg/kg	0.0531 %	✓	
	024-007-00-3	236-878-9	13530-65-9									
12	naphthalene				0.58	mg/kg		0.505	mg/kg	0.0000505 %	✓	
	601-052-00-2	202-049-5	91-20-3									
13	acenaphthylene				0.23	mg/kg		0.2	mg/kg	0.00002 %	✓	
		205-917-1	208-96-8									
14	acenaphthene				1.2	mg/kg		1.044	mg/kg	0.000104 %	✓	
		201-469-6	83-32-9									
15	fluorene				1	mg/kg		0.87	mg/kg	0.000087 %	✓	
		201-695-5	86-73-7									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		9.2 mg/kg		8.004 mg/kg	0.0008 %	✓	
17	anthracene	204-371-1	120-12-7		2.2 mg/kg		1.914 mg/kg	0.000191 %	✓	
18	fluoranthene	205-912-4	206-44-0		12 mg/kg		10.44 mg/kg	0.00104 %	✓	
19	pyrene	204-927-3	129-00-0		12 mg/kg		10.44 mg/kg	0.00104 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		6.5 mg/kg		5.655 mg/kg	0.000566 %	✓	
21	chrysene	601-048-00-0	205-923-4		5.4 mg/kg		4.698 mg/kg	0.00047 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		6.6 mg/kg		5.742 mg/kg	0.000574 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		1.7 mg/kg		1.479 mg/kg	0.000148 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		5 mg/kg		4.35 mg/kg	0.000435 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		2.6 mg/kg		2.262 mg/kg	0.000226 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.81 mg/kg		0.705 mg/kg	0.0000705 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		3 mg/kg		2.61 mg/kg	0.000261 %	✓	
Total:								0.105 %		

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 Determinand - 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: WS05

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

Sample details

Sample name:	LoW Code:
WS05	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.20-0.40 m	
Moisture content:	
19%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 19% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	pH				7.9 pH		7.9 pH	7.9 pH		
2	arsenic { arsenic trioxide }				17 mg/kg	1.32	18.181 mg/kg	0.00182 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
3	cadmium { cadmium sulfide }			1	0.2 mg/kg	1.285	0.208 mg/kg	0.0000162 %	✓	
	048-010-00-4	215-147-8	1306-23-6							
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308 mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				18 mg/kg	1.462	21.309 mg/kg	0.00213 %	✓	
		215-160-9	1308-38-9							
6	copper { dicopper oxide; copper (I) oxide }				76 mg/kg	1.126	69.31 mg/kg	0.00693 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
7	lead { lead chromate }			1	220 mg/kg	1.56	277.959 mg/kg	0.0178 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
8	mercury { mercury dichloride }				0.4 mg/kg	1.353	0.439 mg/kg	0.0000439 %	✓	
	080-010-00-X	231-299-8	7487-94-7							
9	nickel { nickel dihydroxide }				18 mg/kg	1.579	23.029 mg/kg	0.0023 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]							
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				1 mg/kg	1.405	1.138 mg/kg	0.000114 %	✓	
	034-002-00-8									
11	zinc { zinc chromate }				150 mg/kg	2.774	337.059 mg/kg	0.0337 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
12	naphthalene				0.24 mg/kg		0.194 mg/kg	0.0000194 %	✓	
	601-052-00-2	202-049-5	91-20-3							
13	acenaphthylene				0.05 mg/kg		0.0405 mg/kg	0.00000405 %	✓	
		205-917-1	208-96-8							
14	acenaphthene				0.05 mg/kg		0.0405 mg/kg	0.00000405 %	✓	
		201-469-6	83-32-9							
15	fluorene				0.05 mg/kg		0.0405 mg/kg	0.00000405 %	✓	
		201-695-5	86-73-7							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		1.6 mg/kg		1.296 mg/kg	0.00013 %	✓	
17	anthracene	204-371-1	120-12-7		0.38 mg/kg		0.308 mg/kg	0.0000308 %	✓	
18	fluoranthene	205-912-4	206-44-0		3 mg/kg		2.43 mg/kg	0.000243 %	✓	
19	pyrene	204-927-3	129-00-0		2.9 mg/kg		2.349 mg/kg	0.000235 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		1.7 mg/kg		1.377 mg/kg	0.000138 %	✓	
21	chrysene	601-048-00-0	205-923-4		1.4 mg/kg		1.134 mg/kg	0.000113 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		1.6 mg/kg		1.296 mg/kg	0.00013 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.64 mg/kg		0.518 mg/kg	0.0000518 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		1.3 mg/kg		1.053 mg/kg	0.000105 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		0.66 mg/kg		0.535 mg/kg	0.0000535 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.22 mg/kg		0.178 mg/kg	0.0000178 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		0.8 mg/kg		0.648 mg/kg	0.0000648 %	✓	
Total:								0.0665 %		

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 Determinand - 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: WS08



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

Sample details

Sample name:	LoW Code:
WS08	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.20 m	
Moisture content:	
21%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 21% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	pH				7.7 pH		7.7	pH	7.7 pH		
2	arsenic { arsenic trioxide }				15 mg/kg	1.32	15.646	mg/kg	0.00156 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
3	cadmium { cadmium sulfide }			1	0.2 mg/kg	1.285	0.203	mg/kg	0.0000158 %	✓	
	048-010-00-4	215-147-8	1306-23-6								
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2 mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				17 mg/kg	1.462	19.629	mg/kg	0.00196 %	✓	
		215-160-9	1308-38-9								
6	copper { dicopper oxide; copper (I) oxide }				59 mg/kg	1.126	52.478	mg/kg	0.00525 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	200 mg/kg	1.56	246.451	mg/kg	0.0158 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				0.3 mg/kg	1.353	0.321	mg/kg	0.0000321 %	✓	
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel dihydroxide }				17 mg/kg	1.579	21.213	mg/kg	0.00212 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]								
10	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }				1 mg/kg	1.405	1.11	mg/kg	0.000111 %	✓	
	034-002-00-8										
11	zinc { zinc chromate }				120 mg/kg	2.774	262.989	mg/kg	0.0263 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
12	naphthalene				0.25 mg/kg		0.198	mg/kg	0.0000198 %	✓	
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				0.05 mg/kg		0.0395	mg/kg	0.00000395 %	✓	
		205-917-1	208-96-8								
14	acenaphthene				0.23 mg/kg		0.182	mg/kg	0.0000182 %	✓	
		201-469-6	83-32-9								
15	fluorene				0.05 mg/kg		0.0395	mg/kg	0.00000395 %	✓	
		201-695-5	86-73-7								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	phenanthrene	201-581-5	85-01-8		1.8 mg/kg		1.422 mg/kg	0.000142 %	✓	
17	anthracene	204-371-1	120-12-7		0.4 mg/kg		0.316 mg/kg	0.0000316 %	✓	
18	fluoranthene	205-912-4	206-44-0		2.9 mg/kg		2.291 mg/kg	0.000229 %	✓	
19	pyrene	204-927-3	129-00-0		2.9 mg/kg		2.291 mg/kg	0.000229 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6		1.8 mg/kg		1.422 mg/kg	0.000142 %	✓	
21	chrysene	601-048-00-0	205-923-4		1.4 mg/kg		1.106 mg/kg	0.000111 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9		1.5 mg/kg		1.185 mg/kg	0.000119 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.74 mg/kg		0.585 mg/kg	0.0000585 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		1.4 mg/kg		1.106 mg/kg	0.000111 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		0.7 mg/kg		0.553 mg/kg	0.0000553 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.24 mg/kg		0.19 mg/kg	0.000019 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		0.81 mg/kg		0.64 mg/kg	0.000064 %	✓	
Total:								0.0547 %		

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 Determinand - 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: WS09

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:	LoW Code:
WS09	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 03 * (Soil and stones containing hazardous substances)
0.00-0.05 m	
Moisture content:	
40%	
(wet weight correction)	

Hazard properties

HP 7: Carcinogenic "waste which induces cancer or increases its incidence"

Hazard Statements hit:

Carc. 1A; H350 "May cause cancer [state route of exposure if it is conclusively proven that no other routes of exposure cause the hazard]."

Because of determinand:

zinc chromate: (compound conc.: 0.25%)

Determinands

Moisture content: 40% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	pH				7.8	pH		7.8	pH	7.8 pH		
2	arsenic { arsenic trioxide }				230	mg/kg	1.32	182.205	mg/kg	0.0182 %	✓	
	033-003-00-0	215-481-4	1327-53-3									
3	cadmium { cadmium sulfide }			1	11	mg/kg	1.285	8.483	mg/kg	0.00066 %	✓	
	048-010-00-4	215-147-8	1306-23-6									
4	chromium in chromium(VI) compounds { chromium(VI) oxide }				<1.2	mg/kg	1.923	<2.308	mg/kg	<0.000231 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
5	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				160	mg/kg	1.462	140.309	mg/kg	0.014 %	✓	
		215-160-9	1308-38-9									
6	copper { dicopper oxide; copper (I) oxide }				360	mg/kg	1.126	243.192	mg/kg	0.0243 %	✓	
	029-002-00-X	215-270-7	1317-39-1									
7	lead { lead chromate }			1	170	mg/kg	1.56	159.101	mg/kg	0.0102 %	✓	
	082-004-00-2	231-846-0	7758-97-6									
8	mercury { mercury dichloride }				0.3	mg/kg	1.353	0.244	mg/kg	0.0000244 %	✓	
	080-010-00-X	231-299-8	7487-94-7									
9	nickel { nickel dihydroxide }				20	mg/kg	1.579	18.954	mg/kg	0.0019 %	✓	
	028-008-00-X	235-008-5 [1] 234-348-1 [2]	12054-48-7 [1] 11113-74-9 [2]									
10	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				1	mg/kg	1.405	0.843	mg/kg	0.0000843 %	✓	
	034-002-00-8											
11	zinc { zinc chromate }				1500	mg/kg	2.774	2496.732	mg/kg	0.25 %	✓	
	024-007-00-3	236-878-9	13530-65-9									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
12	naphthalene				0.9 mg/kg		0.54 mg/kg	0.000054 %	✓	
	601-052-00-2	202-049-5	91-20-3							
13	acenaphthylene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
		205-917-1	208-96-8							
14	acenaphthene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
		201-469-6	83-32-9							
15	fluorene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
		201-695-5	86-73-7							
16	phenanthrene				0.25 mg/kg		0.15 mg/kg	0.000015 %	✓	
		201-581-5	85-01-8							
17	anthracene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
		204-371-1	120-12-7							
18	fluoranthene				0.4 mg/kg		0.24 mg/kg	0.000024 %	✓	
		205-912-4	206-44-0							
19	pyrene				0.4 mg/kg		0.24 mg/kg	0.000024 %	✓	
		204-927-3	129-00-0							
20	benzo[a]anthracene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
	601-033-00-9	200-280-6	56-55-3							
21	chrysene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
	601-048-00-0	205-923-4	218-01-9							
22	benzo[b]fluoranthene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
	601-034-00-4	205-911-9	205-99-2							
23	benzo[k]fluoranthene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
	601-036-00-5	205-916-6	207-08-9							
24	benzo[a]pyrene; benzo[def]chrysene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
	601-032-00-3	200-028-5	50-32-8							
25	indeno[123-cd]pyrene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
		205-893-2	193-39-5							
26	dibenz[a,h]anthracene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
	601-041-00-2	200-181-8	53-70-3							
27	benzo[ghi]perylene				0.05 mg/kg		0.03 mg/kg	0.000003 %	✓	
		205-883-8	191-24-2							
Total:								0.319 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Hazardous result
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - 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 GB MCL 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)

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

■ 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

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 chromate}

Worst case species based on hazard statements

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 selenide 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 v1.2.GB - Oct 2021**

HazWasteOnline Classification Engine Version: 2022.25.4995.9469 (25 Jan 2022)

HazWasteOnline Database: 2022.25.4995.9469 (25 Jan 2022)

This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

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 Waste 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

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

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