A CLEAN COVER VERIFICATION REPORT FOR PHASE 3, THE OPENSHAW CAMPUS, THE MANCHESTER COLLEGE

TE1291-TE-00-XX-RP-GE-001-V01

VERSION 1.0

15 JANUARY 2024

FINAL

Prepared for:

The Manchester College

Prepared by: Adrian Read

Tier Environmental Ltd

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1. INTRODUCTION

Tier Environmental was commissioned by The Manchester College to undertake a Clean Cover Verification Report for an area of land referred to as the Phase 3 area, Openshaw Campus, The Manchester College located off Ashton Old Rd, Openshaw, Manchester M11 2WH (the "site").

1.1. Development

The wider development comprises the following as detailed in planning permission 124268/FO/2019:

> *"Proposed erection of a three storey (with partial basement) Sports & Social Care Building, single storey extension of existing workshop accommodation, construction of new full size artificial turf football pitch (106m x 70m) with 8 no. 15m high floodlights and spectator seating, associated changes to the existing landscaping and car parking arrangements, and new boundary treatments following the demolition of existing buildings".*

Please note that this report pertains solely to the Phase 3 area of the development that comprises the artificial turf football pitch and car parking area. It has been previously confirmed to Tier Environmental that the only area of soft landscaping within the Phase 3 area is the swale area adjacent to the carpark.

Condition 13 states:

> *"13) a) Before any Phase of development hereby approved commences, a report (the Preliminary Risk Assessment) to identify and evaluate all potential sources and impacts of any ground contamination, groundwater contamination and/or ground gas relevant to the site shall be submitted to and approved in writing by the City Council as local planning authority. In the event of the Preliminary Risk Assessment identifying risks which in the written opinion of the Local Planning Authority require further investigation, the development shall not commence until a scheme for the investigation of the site and the identification of remediation measures (the Site Investigation Proposal) has been submitted to and approved in writing by the City Council as local planning authority. The measures for investigating the site identified in the Site Investigation Proposal shall be carried out, before development commences and a report prepared outlining what measures, if any, are required to remediate the land (the Site Investigation Report and/or Remediation Strategy) which shall be submitted to and approved in writing by the City Council as local planning authority.*
>
> *b) When any Phase of development commences, the development shall be carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority. In the event that ground contamination, groundwater contamination and/or ground gas, not previously identified, are found to be present on the site at any time before the development is occupied, then development shall cease and/or the development shall not be occupied until, a report outlining what measures, if any, are required to remediate the land (the Revised Remediation Strategy) is submitted to and approved in writing by the City Council as local planning authority and the development shall be carried out in accordance with the Revised Remediation Strategy, which shall take precedence over any Remediation Strategy or earlier Revised Remediation Strategy. Upon completion of the revised remedial works, a Completion/Verification Report shall be submitted to and approved in writing by the City Council as local planning authority.*
>
> *Reason - To ensure that the presence of or the potential for any contaminated land and/or groundwater is detected and appropriate remedial action is taken in the interests of public safety, pursuant to policies DM1 and EN18 of the Core Strategy."*

Partial discharge of Condition 13 has already been achieved as described in the *'Partial approval of details reserved by condition'* (dated 29th July 2020) pertaining to application number CDN/20/0198:

> *"On the basis that the development is implemented in accordance with the details and measures in the above documentation and reports , condition no.13* ***part a*** *is discharged.*
>
> *Consideration can only be given to discharging* ***part b*** *of condition no.13 on receipt of confirmation that the development has been carried out in accordance with the previously agreed Remediation Strategy and a Completion/Verification Report has been submitted for consideration."*

This report has therefore been prepared in support of discharge of Condition 13 **part b** for the Phase 3 area.

1.2. Previous Reports

Tier Environmental has previously produced the following pertinent reports for the Site:

- Remedial Options Appraisal, Remediation Strategy and Verification Plan For The Openshaw Campus, The Manchester College, Manchester (report reference: TE1291ROARS1.0, dated 12th March 2020) (hereafter referred to as the 'ROARS');
- Asbestos and Materials Re-Use Verification Report, The Manchester College, Manchester (report reference: TE1291ASB1.0, dated 7th December 2020)

Tier Environmental have also been provided with the following third party reports:

- Earth Environmental and Geotechnical - Phase I Geoenvironmental Desk Study, Manchester College Openshaw, Manchester (report reference: A2876/19, dated May 2019); and,
- Earth Environmental and Geotechnical – Phase II Geoenvironmental Investigation Manchester College Openshaw, Manchester (report reference: A2876/19/B.3, dated August 2019)

1.3. Background and Previous Works Summary

Based upon the findings of the previous EEG investigations and a Remedial Options Appraisal included in the ROARS report, the following remediation strategy was devised in order to make the site safe and suitable for redevelopment, as proposed:

- Removal of any below ground relict structures encountered during the ground works including inspection of any potential sources of contamination (such as the known interceptor) by a suitably experienced geoenvironmental engineer. It should be note that the interceptor in question (illustrated as Figure 4.1 in the ROARS report) is located in the Phase 2 area and has therefore not been considered further within this report.
- In order to break the dust inhalation pathways associated with the asbestos impacts, a clean cover system will be installed in all soft landscaped areas. A minimum of 600mm 'clean cover' derived from imported topsoil and subsoil laid over a geotextile membrane to prevent mixing of potentially contaminated material with the capping layer. It will also guard against ecological disturbance (e.g. moles, plant roots); if deeper areas of planting are required, such as around trees, the geotextile will be deepened locally to the base of the excavation and the thickness of the soil capping layer increased accordingly. Implementation of clean cover may require the removal of Made Ground and impacted natural soil to create a void space into which the clean cover system can be installed. Imported topsoil will provide a suitable growing medium for vegetation, in line with BS 3882:2007 *Specification for Topsoil.*

- Laboratory chemical testing and risk assessment of all proposed imported topsoil / subsoil materials.

The driver for these remedial requirements was the presence of asbestos positively identified in 7 No. samples: the asbestos was identified to be bundles of chrysotile fibres in TP7, TP8, WS1, WS6 and IP2) and bundles of amosite fibres in WS4 and TP2):

Figure 1.1 Summary of Exploratory Hole Locations with Positive Identification of Asbestos



1.4. Objectives

Taking into account the planned future use of the site, the objectives of this appraisal were:

- To summarise pertinent previous investigations;
- To highlight the salient points with regards to the remediation strategy;
- To highlight any deviations from the remediation strategy;
- To provide details of the site works undertaken as part of the verification process;
- To provide lines of evidence which inform suitable clean cover requirements have been implemented in accordance with the remediation strategy;
- To provide documented assessment of the data and permanent records of verification works;
- To determine if there is any residual risk to receptors, post remediation and whether contaminated land planning conditions should be partially discharged for the Phase 3 area.

This report, which was designed to meet the requirements of all relevant current guidance including 'Land contamination: risk management' (LC:RM) (which supersedes CLR11) presents the factual information available during this appraisal, interpretation of the data obtained and recommendations relevant to the defined objectives.

1.5. Assumptions

The following assumptions are made in this report:

- It is assumed that ground levels will not change significantly from those described in this report or a shown on proposed development drawings. If this is not the case, then amendments to the recommendations made in this report may be required.
- The ground investigations that have informed this report were designed with due consideration of known or suspected constraints (including underground services and access constraints).
- Any references to observations of suspected asbestos-containing materials are for information only and should be verified by a suitably qualified asbestos specialist and/or confirmed by laboratory analysis.
- The use of the term 'Topsoil' within this report is based on a visual identification only and that these materials have not been classified in accordance with BS3882:2015.
- The use of the terms 'shallow' and 'deep' within this report (from a geotechnical perspective) assume *typically* between ground level to circa 3.00m below ground level (bgl) for 'shallow' and greater than 3.00m bgl regarded as 'deep';
- The comments and opinions presented in this report are based on the findings of the desk study, ground conditions encountered during intrusive investigation works performed by Tier Environmental and the results of tests carried out within one or more laboratories. There may be other conditions prevailing on the site which have not been revealed by these previous investigations and which have not been taken into account by this report.
- Responsibility cannot be accepted for any conditions not revealed by the previous investigations. Any diagram or opinion on the possible configuration of the findings is conjectural and given for guidance only. Confirmation of intermediate ground conditions should be undertaken if deemed necessary.

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2. SITE DETAILS AND DESCRIPTION

Table 2.1 Current Site Overview.

Site name	Phase 3 Area, Openshaw Campus, The Manchester College, Manchester
Site address	located off Ashton Old Rd, Openshaw, Manchester M11 2WH
National Grid Reference	NS 387589 397306
Location description	The Site is located within the Manchester College in a broadly mixed commercial / industrial and residential area.
Approximate Site area (ha)	Approximately 2.1 ha
Site shape	The Site is irregularly shaped.
Current land use	The site is currently an active college consisting of multi-storey buildings, soft verge, hardstanding (asphalt and concrete), car parking and access roads.

3. REMEDIATION STRATEGY SUMMARY

Based upon the findings of the previous EEG investigations and a Remedial Options Appraisal included in the ROARS report, the following remediation strategy was devised in order to make the site safe and suitable for redevelopment, as proposed:

- Removal of any below ground relict structures encountered during the ground works including inspection of any potential sources of contamination (such as the known interceptor) by a suitably experienced geoenvironmental engineer. It should be note that the interceptor in question (illustrated as Figure 4.1 in the ROARS report) is located in the Phase 2 area and has therefore not been considered further within this report.
- In order to break the dust inhalation pathways associated with the asbestos impacts, a clean cover system will be installed in all soft landscaped areas. A minimum of 600mm 'clean cover' derived from imported topsoil and subsoil laid over a geotextile membrane to prevent mixing of potentially contaminated material with the capping layer. It will also guard against ecological disturbance (e.g. moles, plant roots); if deeper areas of planting are required, such as around trees, the geotextile will be deepened locally to the base of the excavation and the thickness of the soil capping layer increased accordingly. Implementation of clean cover may require the removal of Made Ground and impacted natural soil to create a void space into which the clean cover system can be installed. Imported topsoil will provide a suitable growing medium for vegetation, in line with BS 3882:2007 *Specification for Topsoil.*
- Laboratory chemical testing and risk assessment of all proposed imported topsoil / subsoil materials.

3.1. Clean Cover System

Installation

In order to remove the remaining pollutant linkages, it was considered that the soft landscaped areas of the site should be covered with a 600mm deep clean cover system (150mm Topsoil layer underlain by 450mm subsoil or full 600mm clean cover system and a Terram-style geotextile membrane. It was considered that as the proposed development is for commercial and sporting / educational purposes, that a 600mm clean cover system with a geotextile membrane would provide sufficient thickness for the exposure scenarios typical for the future site use and the geotextile will provide a physical barrier in the unlikely event that any excavations are undertaken to this depth. It was noted that the clean cover system should only be implemented in those areas for which shallow soils still lie at ground surface.

It was stated that the source of the aggregates, imported subsoil and Topsoil material would be inspected and tested to ensure its chemical suitability and absence of any deleterious materials such as glass, metal, roots, invasive weed species and the like.

Verification

It was considered necessary to ensure that the development of the site does not cause an increased risk to receptors. All materials topsoil / subsoil materials imported to the site were to be tested to determine its chemical suitability for use on the site in the soft landscaping areas. The imported material will be tested for the standard Tier Environmental soil suite listed in Appendix D of the ROARS report as part of a verification testing exercise along with asbestos screens. The purpose of the testing is to verify the quality of any materials imported to the site and to determine the contaminant concentrations of materials. It was determined that imported materials would need to be tested at a rate of 1 sample per 50m^3 for topsoil and 1 per 150m^3 for subsoil/other backfill materials with a minimum of 3 No. samples of each.

In addition to the chemical testing, the depth of clean cover would also be verified. Verification would take the form of a suitably qualified environmental engineer undertaking hand dug pits in each soft landscape plot, with the number of holes determined based on a 1 per 25m^2 or per soft landscaped 'plot' area.

Irrespective of the finished total area of soft landscaped areas, a minimum of 3 No. pits overall will be undertaken within soft landscaped areas to ensure that a combined thickness of 600mm subsoil and Topsoil has been achieved and to prove the installation of the Terram geotextile. These hand dug pits will be photographed and photographs will be submitted as part of the verification report.

Contingency for any Unknowns

Whilst relatively uniform ground conditions have been encountered at the Site during previous investigations, a small risk existed of the presence of localised unidentified contamination of Made Ground soils.

Should any suspicious material be encountered during the redevelopment works, it was determined that works should be ceased within this part of the site and the area should then be investigated further by a suitably qualified geo-environmental engineer and sampled as necessary. The Contaminated Land Officer (or equivalent) at the local authority should also be notified immediately. Samples will be forwarded to a UKAS/MCERTS accredited laboratory for a suite of analytical testing deemed appropriate based upon an appraisal of the material identified.

Once the results of the analysis are known and have been interpreted, the required remedial action (if any) would be determined and approved with the relevant regulatory authorities.

4. VERIFICATION

It was detailed in the Remediation Strategy that a Verification Report should be compiled which would comprise all relevant site records and act as certification that the remedial preparation works have been carried out in accordance.

The Verification Report is to include the following:

- A description of the works undertaken in accordance with the Remediation Strategy described above;
- Records of the works;
- Progress photographs of the clean cover system;
- Waste Transfer Notes;
- Chemical verification test results.

4.1. Topsoil Verification

Topsoil was sourced as indicated in Table 4.1. Laboratory chemical analysis of topsoil was conducted by Tier Environmental on stockpiled material at source in accordance with the testing sampling rate requirements stipulated in the Remediation Strategy.

Table 4.1 Topsoil Verification Sources

Location Used	Material	Source	Volume Imported	Samples Taken
Swale area in Phase 3	Compliant Topsoil, no visual / olfactory evidence of contaminants or deleterious materials	**Digway Aggregates,** Junction 19, Heywood off the M62	~200m³	4 No. samples which meets the 1 per 50m³ requirement in accordance with the remediation strategy. Analysed for: • Metals (inc hexavalent chromium); • Speciated PAHs; • Phenols; • pH; • TOC; • Asbestos

4.2. Chemical Laboratory Results And Risk Assessment

The approach for the selection of Generic Assessment Criteria (GACs) that shall be used as screening criteria for this assessment is provided in Appendix D, as proposed in the Remediation Strategy. In short, for the majority of the contaminants of concern, LQM/CIEH Suitable 4 Use Levels (S4ULs) published recently in 2015 have been adopted as GACs for a commercial land use. The results of chemical testing are presented in Appendix B and summarised below.

The results of 4 No. representative samples of topsoil have been reported below the LQM / CIEH S4UL GACs (2015) for a commercial land use. On this basis, the materials are considered suitable for use in accordance with the remediation strategy.

Sampling testing results indicate no potential risk to human health as no potential contaminants of concern exceed the GACs protective of human health for the proposed land use.

Asbestos

Of the 4 No. samples submitted for an asbestos screen, no samples were returned positive for asbestos.

4.3. Clean Cover Thickness Verification

In total, the swale area that has been verified occupied approximately 345m^2 and therefore on a 1 per 25m^2 basis this equates to 14 No. locations. Tier Environmental conducted a spread of 16 No. pits as shown on Drawing TE1291-TE-00-XX-DR-GE-002-V01 presented in Appendix A which exceeds the minimum requirement and therefore satisfies the remediation strategy requirements.

It can be seen in the hand pit proforma sheets that all hand pits proved a thickness of 600mm (underlain by a geotextile membrane); however, at 3 No. locations (HDP01, HDP05 and HDP16), only 300mm was observed. It is understood that the contractor was not able to build up any further in in these locations due to the angle of the slopes locally encountered in these areas. Therefore, Tier Environmental conducted supplementary asbestos analysis on the soils located beneath the geotextile membrane at these locations. The results of this additional analysis are included in Appendix B and demonstrate that no asbestos is locally present at these positions such that the 300mm cover system, is therefore acceptable to act as a localised precautionary cover system in these areas. Confidence in this conclusion is supported by the remaining 13 No. locations in the swale area satisfying the 600mm thickness requirement.

5. SITE CERTIFICATION

It has been demonstrated in this report that clean cover measures have been appropriately implemented across site for the Phase 3 soft landscaping area and that no residual risk remains. **It is therefore recommended that the relevant planning conditions are discharged for the Phase 3 area of the site as it is considered to be safe and suitable for the desired land use.**

6. REGULATORY APPROVALS

The conclusions and recommendations presented above are considered reasonable based on the findings of the site investigations. However, these cannot be guaranteed to gain regulatory approval and, therefore, the report should be passed to the appropriate regulatory authorities and/or other organisations for their comment and approval.

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8. GLOSSARY OF TERMS

ACEC	Aggressive Chemical Environment for Concrete (classification)
aOD	Above Ordnance Datum
bgl	Below ground level
BGS	British Geological Survey
BRE	Building Research Establishment
CBR	California Bearing Ratio (test)
COMAH	Control of Major Accident Hazards (regulations)
Designated location	Site (and the ecosystem on that site) protected under national of international legislation. A potential ecological receptor to be considered as part of the assessment of land contamination. Example designated locations include SSSIs (q.v.), SACs (q.v.), national nature reserves, Ramsar sites and bird special protection areas.
DQA	Data Quality Assessment
DQO	Data Quality Objective
DQRA	Detailed Quantitative Risk Assessment
DWS	Drinking Water Standard
EQS	Environmental Quality Standard
GAC	Generic Assessment Criterion
GQA	General Quality Assessment (Environment Agency)
GSV	Gas Screening Value
HCV	Health Criteria Value
IPPC	Integrated Pollution Prevention and Control (regulations)
K_{ow}	Octanol-water partition coefficient
LEL	Lower Explosive Limit
LL	Liquid Limit
LoD	Limit of Detection (analytical)
LoQ	Limit of Quantification (analytical)
Mean Value Test	Statistical test (described in the CIEH Guidance) to estimate the mean value of a normally distributed population of data at a given level of confidence. Normally for contaminated land assessment, the 95th percentile (referred to as the 95%UCL or US95) is applied as a reasonable but conservative estimate of the mean concentration for comparison with the relevant assessment criteria.
Maximum Value Test	Statistical test (described in the CIEH Guidance) to identify whether an elevated concentration within a normally distributed data set forms part of the underlying population from which it has been sampled or whether it is an outlier (such as a localised area of contamination) that merits further consideration.
MC	Moisture Content
NGR	National Grid Reference
NIHHS	Notification of Installations Handling Hazardous Substances (regulations)
OS	Ordnance Survey
PI	Plasticity Index
PID	Photoionisation Detector
PL	Plastic Limit
ppm	Parts per million
ppmv	Parts per million by volume
QA	Quality Assurance
QC	Quality Control
SAC	Special Area of Conservation
SOM	Soil Organic Matter

SPT	Standard Penetration Test
SPZ	Source Protection Zone
SSAC	Site-Specific Assessment Criterion
SSSI	Site of Special Scientific Interest
SVOC	Semi-Volatile Organic Compound
TEF	Toxicity Equivalent Factor
TPH	Total Petroleum Hydrocarbons
TWA	Time Weighted Average
US95	95th percentile estimate of the true mean value of a data population (also known as 95%UCL).
VOC	Volatile Organic Compound

APPENDIX A – DRAWINGS

Contract Number	TE1291
Contract	Manchester College
Client	Caddick Construction

Exploratory Location Plan



Trial Pit Location

<600mm achieved

Scale	NTS		
Drawn by	CS	**Approved**	AR
Drawing Number	TE1291-TE-00-XX-DR-GE-002-V01		

APPENDIX B – LABORATORY CERTIFICATES

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Attention :	Adrian Read
Date :	7th December, 2022
Your reference :	TE1291
Our reference :	Test Report 22/19608 Batch 1
Location :	Openshaw College, Manchester
Date samples received :	28th November, 2022
Status :	Final Report
Issue :	1

Fifteen samples were received for analysis on 28th November, 2022 of which four were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

Authorised By:

[redacted]

Liza Klebe
Project Co-ordinator

Element Materials Technology Environmental UK Limited
Registered in England and Wales
Registered Office: 3rd Floor Davidson Building, 5 Southampton Street, London WC2E 7HA
Company Registration No: 11371415

Element Materials Technology

Client Name: Tier Environmental
Reference: TE1291
Location: Openshaw College, Manchester
Contact: Adrian Read
EMT Job No: 22/19608

Report : Solid

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

EMT Sample No.	1-4	17-20	37-40	57-60							LOD/LOR	Units	Method No.
Sample ID	TSHA01	TSHA05	TSHA10	TSHA15									
Depth	0.30	1.00	0.70	0.20									
COC No / misc													
Containers	V J T	V J T	V J T	V J T									
Sample Date	28/11/2022	28/11/2022	28/11/2022	28/11/2022									
Sample Type	Soil	Soil	Soil	Soil									
Batch Number	1	1	1	1									
Date of Receipt	28/11/2022	28/11/2022	28/11/2022	28/11/2022									
Arsenic #	13.4	12.8	13.3	21.8							<0.5	mg/kg	TM30/PM15
Cadmium #	0.2	0.1	0.1	0.1							<0.1	mg/kg	TM30/PM15
Chromium #	46.6	46.3	43.7	49.5							<0.5	mg/kg	TM30/PM15
Copper #	47	48	51	99							<1	mg/kg	TM30/PM15
Lead #	104	108	131	147							<5	mg/kg	TM30/PM15
Mercury #	0.4	0.4	0.4	0.5							<0.1	mg/kg	TM30/PM15
Nickel #	14.8	17.6	26.1	15.8							<0.7	mg/kg	TM30/PM15
Selenium #	1	<1	<1	<1							<1	mg/kg	TM30/PM15
Total Sulphate as SO4 #	502	313	333	449							<50	mg/kg	TM50/PM29
Zinc #	122	112	123	134							<5	mg/kg	TM30/PM15
PAH MS													
Naphthalene #	<0.04	<0.04	<0.04	<0.04							<0.04	mg/kg	TM4/PM8
Acenaphthylene	<0.03	<0.03	0.05	0.05							<0.03	mg/kg	TM4/PM8
Acenaphthene #	<0.05	<0.05	0.15	<0.05							<0.05	mg/kg	TM4/PM8
Fluorene #	0.05	<0.04	0.09	<0.04							<0.04	mg/kg	TM4/PM8
Phenanthrene #	0.68	0.51	1.56	0.46							<0.03	mg/kg	TM4/PM8
Anthracene #	0.11	0.12	0.35	0.10							<0.04	mg/kg	TM4/PM8
Fluoranthene #	1.06	1.08	2.36	1.07							<0.03	mg/kg	TM4/PM8
Pyrene #	0.96	0.96	2.07	0.97							<0.03	mg/kg	TM4/PM8
Benzo(a)anthracene #	0.57	0.69	1.35	0.61							<0.06	mg/kg	TM4/PM8
Chrysene #	0.58	0.51	1.08	0.53							<0.02	mg/kg	TM4/PM8
Benzo(bk)fluoranthene #	1.11	0.95	1.73	1.04							<0.07	mg/kg	TM4/PM8
Benzo(a)pyrene #	0.56	0.47	0.82	0.53							<0.04	mg/kg	TM4/PM8
Indeno(123cd)pyrene #	0.44	0.37	0.73	0.43							<0.04	mg/kg	TM4/PM8
Dibenzo(ah)anthracene #	0.05	<0.04	0.10	0.05							<0.04	mg/kg	TM4/PM8
Benzo(ghi)perylene #	0.35	0.30	0.66	0.37							<0.04	mg/kg	TM4/PM8
PAH 16 Total	6.5	6.0	13.1	6.2							<0.6	mg/kg	TM4/PM8
Benzo(b)fluoranthene	0.80	0.68	1.25	0.75							<0.05	mg/kg	TM4/PM8
Benzo(k)fluoranthene	0.31	0.27	0.48	0.29							<0.02	mg/kg	TM4/PM8
PAH Surrogate % Recovery	101	98	107	99							<0	%	TM4/PM8
Total Phenols HPLC	<0.15	<0.15	<0.15	<0.15							<0.15	mg/kg	TM26/PM21B
Natural Moisture Content	26.3	31.8	26.0	27.1							<0.1	%	PM4/PM0
Hexavalent Chromium #	<0.3	<0.3	<0.3	<0.3							<0.3	mg/kg	TM38/PM20
Sulphate as SO4 (2:1 Ext) #	0.0582	0.0387	0.0418	0.0803							<0.0015	g/l	TM38/PM20
Total Organic Carbon #	2.92	3.73	5.27	2.96							<0.02	%	TM21/PM24
pH #	7.69	7.66	7.70	7.74							<0.01	pH units	TM73/PM11

Please see attached notes for all abbreviations and acronyms

Client Name: Tier Environmental
Reference: TE1291
Location: Openshaw College, Manchester
Contact: Adrian Read

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
22/19608	1	TSHA01	0.30	3	Emma Woodward	05/12/2022	**General Description (Bulk Analysis)**	Brown soil stone
					Emma Woodward	05/12/2022	**Asbestos Fibres**	NAD
					Emma Woodward	05/12/2022	**Asbestos ACM**	NAD
					Emma Woodward	05/12/2022	**Asbestos Type**	NAD
22/19608	1	TSHA05	1.00	19	Emma Woodward	05/12/2022	**General Description (Bulk Analysis)**	Brown soil stone
					Emma Woodward	05/12/2022	**Asbestos Fibres**	NAD
					Emma Woodward	05/12/2022	**Asbestos ACM**	NAD
					Emma Woodward	05/12/2022	**Asbestos Type**	NAD
22/19608	1	TSHA10	0.70	39	Emma Woodward	05/12/2022	**General Description (Bulk Analysis)**	Brown soil stone
					Emma Woodward	05/12/2022	**Asbestos Fibres**	NAD
					Emma Woodward	05/12/2022	**Asbestos ACM**	NAD
					Emma Woodward	05/12/2022	**Asbestos Type**	NAD
22/19608	1	TSHA15	0.20	59	Emma Woodward	05/12/2022	**General Description (Bulk Analysis)**	Brown soil stone
					Emma Woodward	05/12/2022	**Asbestos Fibres**	NAD
					Emma Woodward	05/12/2022	**Asbestos ACM**	NAD
					Emma Woodward	05/12/2022	**Asbestos Type**	NAD

Client Name: Tier Environmental
Reference: TE1291
Location: Openshaw College, Manchester
Contact: Adrian Read

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 22/19608						

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

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 22/19608

SOILS and ASH

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

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

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

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

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

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

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

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

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

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

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

WATERS

Please note we are not a UK Drinking Water Inspectorate (DWI) Approved Laboratory .

ISO17025 accreditation applies to surface water and groundwater and usually one other matrix which is analysis specific, any other liquids are outside our scope of accreditation.

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

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

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

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

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

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

DILUTIONS

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

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a UKAS requirement for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above calibration range, the result should be considered the minimum value. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 22/19608

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
PM4	Gravimetric measurement of Natural Moisture Content and % Moisture Content at either 35°C or 105°C. Calculation based on ISO 11465:1993(E) and BS1377-2:1990.	PM0	No preparation is required.			AR	
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.			AR	Yes
TM4	Modified USEPA 8270D v5:2014 method for the solvent extraction and determination of PAHs by GC-MS.	PM8	End over end extraction of solid samples for organic analysis. The solvent mix varies depending on analysis required.	Yes		AR	Yes
TM21	Modified BS 7755-3:1995, ISO10694:1995 Determination of Total Organic Carbon or Total Carbon by combustion in an Eltra TOC furnace/analyser in the presence of oxygen. The CO2 generated is quantified using infra-red detection. Organic Matter (SOM) calculated as per EA MCERTS Chemical Testing of Soil, March 2012 v4.	PM24	Dried and ground solid samples are washed with hydrochloric acid, then rinsed with deionised water to remove the mineral carbon before TOC analysis.	Yes		AD	Yes
TM26	Determination of phenols by Reversed Phased High Performance Liquid Chromatography and Electro-Chemical Detection.	PM21B	As Received samples are extracted in Methanol: Water (60:40) by reciprocal shaker.			AR	Yes
TM30	Determination of Trace Metals by ICP-OES (Inductively Coupled Plasma – Optical Emission Spectrometry): WATERS by Modified USEPA Method 200.7, Rev. 4.4, 1994; Modified EPA Method 6010B, Rev.2, Dec 1996; Modified BS EN ISO 11885:2009: SOILS by Modified USEP 6010B, Rev.2, Dec.1996; Modified EPA Method 3050B, Rev.2, Dec.1996	PM15	Acid digestion of dried and ground solid samples using Aqua Regia refluxed at 112.5 °C. Samples containing asbestos are not dried and ground.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AD	Yes
TM38	Soluble Ion analysis using Discrete Analyser. Modified US EPA methods: Chloride 325.2 (1978), Sulphate 375.4 (Rev.2 1993), o-Phosphate 365.2 (Rev.2 1993), TON 353.1 (Rev.2 1993), Nitrite 354.1 (1971), Hex Cr 7196A (1992), NH4+ 350.1 (Rev.2 1993) – All anions comparable to BS ISO 15923-1: 2013I	PM20	Extraction of dried and ground or as received samples with deionised water in a 2:1 water to solid ratio using a reciprocal shaker for all analytes except hexavalent chromium. Extraction of as received sample using 10:1 ratio of 0.2M sodium hydroxide to soil for hexavalent chromium using a reciprocal shaker.	Yes		AR	Yes
TM50	Acid soluble sulphate (Total Sulphate) analysed by ICP-OES	PM29	A hot hydrochloric acid digest is performed on a dried and ground sample, and the resulting liquor is analysed.	Yes		AD	Yes
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

EMT Job No: 22/19608

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM73	Modified US EPA methods 150.1 (1982) and 9045D Rev. 4 - 2004) and BS1377-3:1990. Determination of pH by Metrohm automated probe analyser.	PM11	Extraction of as received solid samples using one part solid to 2.5 parts deionised water.	Yes		AR	No

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Tier Environmental
Suite 414, Chadwick House
Warrington Rd
Birchwood
Warrington
United Kingdom
WA3 6AE

Attention :	Eve Rowland
Date :	28th December, 2023
Your reference :	TE1291
Our reference :	Test Report 23/21632 Batch 1
Location :	Manchester College
Date samples received :	19th December, 2023
Status :	Final Report
Issue :	202312281017

Six samples were received for analysis on 19th December, 2023 of which six were scheduled for analysis. Please find attached our Test Report which should be read with notes at the end of the report and should include all sections if reproduced. Interpretations and opinions are outside the scope of any accreditation, and all results relate only to samples supplied.
All analysis is carried out on as received samples and reported on a dry weight basis unless stated otherwise. Results are not surrogate corrected.

The greenhouse gas emissions generated (in Carbon – Co2e) to obtain the results in this report are estimated as:

Scope 1&2 emissions - 2.172 kg of CO2

Scope 1&2&3 emissions - 5.133 kg of CO2

Authorised By:



Bruce Leslie
Project Manager

Please include all sections of this report if it is reproduced

Client Name: Tier Environmental
Reference: TE1291
Location: Manchester College
Contact: Eve Rowland

Note:

Asbestos Screen analysis is carried out in accordance with our documented in-house methods PM042 and TM065 and HSG 248 by Stereo and Polarised Light Microscopy using Dispersion Staining Techniques and is covered by our UKAS accreditation. Detailed Gravimetric Quantification and PCOM Fibre Analysis is carried out in accordance with our documented in-house methods PM042 and TM131 and HSG 248 using Stereo and Polarised Light Microscopy and Phase Contrast Optical Microscopy (PCOM). Asbestos sub-samples are retained for not less than 6 months from the date of analysis unless specifically requested.

The LOQ of the Asbestos Quantification is 0.001% dry fibre of dry mass of sample.

Where the sample is not taken by a Element Materials Technology consultant, Element Materials Technology cannot be responsible for inaccurate or unrepresentative sampling.

Where trace asbestos is reported the amount of asbestos will be <0.1%.

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analyst Name	Date Of Analysis	Analysis	Result
23/21632	1	HDP16	0.40	1	Emily Anderton	22/12/2023	**General Description (Bulk Analysis)**	Brown soil with stones and vegetation
					Emily Anderton	22/12/2023	**Asbestos Fibres**	NAD
					Emily Anderton	22/12/2023	**Asbestos ACM**	NAD
					Emily Anderton	22/12/2023	**Asbestos Type**	NAD
23/21632	1	HDP05	0.50	2	Emily Anderton	22/12/2023	**General Description (Bulk Analysis)**	Brown soil with stones and vegetation
					Emily Anderton	22/12/2023	**Asbestos Fibres**	NAD
					Emily Anderton	22/12/2023	**Asbestos ACM**	NAD
					Emily Anderton	22/12/2023	**Asbestos Type**	NAD
23/21632	1	HDP01	0.40	3	Mathew Day	22/12/2023	**General Description (Bulk Analysis)**	brown soil
					Mathew Day	22/12/2023	**Asbestos Fibres**	NAD
					Mathew Day	22/12/2023	**Asbestos ACM**	NAD
					Mathew Day	22/12/2023	**Asbestos Type**	NAD
23/21632	1	HDP16	0.70	4	Emily Anderton	22/12/2023	**General Description (Bulk Analysis)**	Brown soil with stones and vegetation
					Emily Anderton	22/12/2023	**Asbestos Fibres**	NAD
					Emily Anderton	22/12/2023	**Asbestos ACM**	NAD
					Emily Anderton	22/12/2023	**Asbestos Type**	NAD
23/21632	1	HDP05	0.70	5	Mathew Day	22/12/2023	**General Description (Bulk Analysis)**	brown soil
					Mathew Day	22/12/2023	**Asbestos Fibres**	NAD
					Mathew Day	22/12/2023	**Asbestos ACM**	NAD
					Mathew Day	22/12/2023	**Asbestos Type**	NAD
23/21632	1	HDP01	0.60	6	Emily Anderton	22/12/2023	**General Description (Bulk Analysis)**	Brown soil with stones and vegetation
					Emily Anderton	22/12/2023	**Asbestos Fibres**	NAD
					Emily Anderton	22/12/2023	**Asbestos ACM**	NAD
					Emily Anderton	22/12/2023	**Asbestos Type**	NAD

Element Materials Technology

Notification of Deviating Samples

Client Name: Tier Environmental
Reference: TE1291
Location: Manchester College
Contact: Eve Rowland

EMT Job No.	Batch	Sample ID	Depth	EMT Sample No.	Analysis	Reason
No deviating sample report results for job 23/21632						

Please note that only samples that are deviating are mentioned in this report. If no samples are listed it is because none were deviating. Only analyses which are accredited are recorded as deviating if set criteria are not met.
It is a requirement under ISO 17025 that we inform clients if samples are deviating i.e. outside what is expected. A deviating sample indicates that the sample 'may' be compromised but not necessarily will be compromised. The result is still accredited and our analytical reports will still show accreditation on the relevant analytes.

NOTES TO ACCOMPANY ALL SCHEDULES AND REPORTS

EMT Job No.: 23/21632

SOILS and ASH

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

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

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

All samples will be discarded one month after the date of reporting, unless we are instructed to the contrary. Asbestos samples are retained for 6 months.

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

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

All analysis is reported on a dry weight basis unless stated otherwise. Limits of detection for analyses carried out on as received samples are not moisture content corrected. Results are not surrogate corrected. Samples are dried at 35°C ±5°C unless otherwise stated. Moisture content for CEN Leachate tests are dried at 105°C ±5°C. Ash samples are dried at 37°C ±5°C.

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

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

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

Sufficient amount of sample must be received to carry out the testing specified. Where an insufficient amount of sample has been received the testing may not meet the requirements of our accredited methods, as such accreditation may be removed.

Negative Neutralization Potential (NP) values are obtained when the volume of NaOH (0.1N) titrated (pH 8.3) is greater than the volume of HCl (1N) to reduce the pH of the sample to 2.0 - 2.5. Any negative NP values are corrected to 0.

The calculation of Pyrite content assumes that all oxidisable sulphides present in the sample are pyrite. This may not be the case. The calculation may be an overesitimate when other sulphides such as Barite (Barium Sulphate) are present.

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

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

STACK EMISSIONS

Where an MCERTS report has been requested, you will be notified within 48 hours of any samples that have been identified as being outside our MCERTS scope. As validation for Dioxins and Furans and Dioxin like PCBs has been performed on XAD-2 Resin, only samples which use this resin will be within our MCERTS scope.

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

DEVIATING SAMPLES

All samples should be submitted to the laboratory in suitable containers with sufficient ice packs to sustain an appropriate temperature for the requested analysis. The temperature of sample receipt is recorded on the confirmation schedules in order that the client can make an informed decision as to whether testing should still be undertaken.

SURROGATES

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

DILUTIONS

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

BLANKS

Where analytes have been found in the blank, the sample will be treated in accordance with our laboratory procedure for dealing with contaminated blanks.

NOTE

Data is only reported if the laboratory is confident that the data is a true reflection of the samples analysed. Data is only reported as accredited when all the requirements of our Quality System have been met. In certain circumstances where all the requirements of the Quality System have not been met, for instance if the associated AQC has failed, the reason is fully investigated and documented. The sample data is then evaluated alongside the other quality control checks performed during analysis to determine its suitability. Following this evaluation, provided the sample results have not been effected, the data is reported but accreditation is removed. It is a requirement of our Accreditation Body for data not reported as accredited to be considered indicative only, but this does not mean the data is not valid.
Where possible, and if requested, samples will be re-extracted and a revised report issued with accredited results. Please do not hesitate to contact the laboratory if further details are required of the circumstances which have led to the removal of accreditation.
Laboratory records are kept for a period of no less than 6 years.

REPORTS FROM THE SOUTH AFRICA LABORATORY

Any method number not prefixed with SA has been undertaken in our UK laboratory unless reported as subcontracted.

Measurement Uncertainty

Measurement uncertainty defines the range of values that could reasonably be attributed to the measured quantity. This range of values has not been included within the reported results. Uncertainty expressed as a percentage can be provided upon request.

Customer Provided Information

Sample ID and depth is information provided by the customer.

Age of Diesel

The age of release estimation is based on the nC17/pristane ratio only as prescribed by Christensen and Larsen (1993) and Kaplan, Galperin, Alimi et al., (1996).
Age estimation should be treated with caution as it can be influenced by site specific factors of which the laboratory are not aware.

ABBREVIATIONS and ACRONYMS USED

#	ISO17025 (UKAS Ref No. 4225) accredited - UK.
SA	ISO17025 (SANAS Ref No.T0729) accredited - South Africa
B	Indicates analyte found in associated method blank.
DR	Dilution required.
M	MCERTS accredited.
NA	Not applicable
NAD	No Asbestos Detected.
ND	None Detected (usually refers to VOC and/SVOC TICs).
NDP	No Determination Possible
SS	Calibrated against a single substance
SV	Surrogate recovery outside performance criteria. This may be due to a matrix effect.
W	Results expressed on as received basis.
+	AQC failure, accreditation has been removed from this result, if appropriate, see 'Note' on previous page.
>>	Results above quantitative calibration range. The result should be considered the minimum value and is indicative only. The actual result could be significantly higher.
*	Analysis subcontracted to an Element Materials Technology approved laboratory.
AD	Samples are dried at 35°C ±5°C
CO	Suspected carry over
LOD/LOR	Limit of Detection (Limit of Reporting) in line with ISO 17025 and MCERTS
ME	Matrix Effect
NFD	No Fibres Detected
BS	AQC Sample
LB	Blank Sample
N	Client Sample
TB	Trip Blank Sample
OC	Outside Calibration Range

HWOL ACRONYMS AND OPERATORS USED

HS	Headspace Analysis.
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent.
CU	Clean-up - e.g. by florisil, silica gel.
1D	GC - Single coil gas chromatography.
Total	Aliphatics & Aromatics.
AL	Aliphatics only.
AR	Aromatics only.
2D	GC-GC - Double coil gas chromatography.
#1	EH_Total but with humics mathematically subtracted
#2	EU_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +).
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry.

EMT Job No: 23/21632

Test Method No.	Description	Prep Method No. (if appropriate)	Description	ISO 17025 (UKAS/SANAS)	MCERTS (UK soils only)	Analysis done on As Received (AR) or Dried (AD)	Reported on dry weight basis
TM65	Asbestos Bulk Identification method based on HSG 248 Second edition (2021)	PM42	Modified SCA Blue Book V.12 draft 2017 and WM3 1st Edition v1.1:2018. Solid samples undergo a thorough visual inspection for asbestos fibres prior to asbestos identification using TM065.	Yes		AR	

APPENDIX C – CLEAN COVER PRO-FORMA

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP01
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

300mm achieved **- SUPPLEMENTARY ASBESTOS TESTING DEMONSTRATED NO RESIDUAL RISK TO END-USER IN THIS AREA**

Geotextile present at the base.

This plot has FAILED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS required for this plot

SUPPLEMENTARY ASBESTOS TESTING DEMONSTRATED NO RESIDUAL RISK TO END-USER IN THIS AREA

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP02
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP03
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP04
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification
(Any proposed remedial works will be noted in the 'Remarks' column on this form)
An additional inspection IS NOT required for this plot

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP05
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

300mm achieved **- SUPPLEMENTARY ASBESTOS TESTING DEMONSTRATED NO RESIDUAL RISK TO END-USER IN THIS AREA**

Geotextile present at the base.

This plot has FAILED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS required for this plot

SUPPLEMENTARY ASBESTOS TESTING DEMONSTRATED NO RESIDUAL RISK TO END-USER IN THIS AREA

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP06
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph		**Additional remarks**		





600mm achieved

Geotextile present at the base.

This plot has PASSED verification
(Any proposed remedial works will be noted in the 'Remarks' column on this form)
An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read	**Signature** [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP07
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP08
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP09
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP10
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification
(Any proposed remedial works will be noted in the 'Remarks' column on this form)
An additional inspection IS NOT required for this plot

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP11
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph		**Additional remarks**		





600mm achieved

Geotextile present at the base.

This plot has PASSED verification
(Any proposed remedial works will be noted in the 'Remarks' column on this form)
An additional inspection IS NOT required for this plot

Qualified Engineer Adrian Read

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP12
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification
(Any proposed remedial works will be noted in the 'Remarks' column on this form)
An additional inspection IS NOT required for this plot

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP13
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph		**Additional remarks**		





600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP14
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification
(Any proposed remedial works will be noted in the 'Remarks' column on this form)
An additional inspection IS NOT required for this plot

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP15
Developer	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

600mm achieved

Geotextile present at the base.

This plot has PASSED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS NOT required for this plot

Qualified Engineer **Adrian Read**

Signature [redacted]

Ground Remediation Verification Proforma

Site Name/ Location	The Manchester College
Pit ID	HDP16
Client	The Manchester College
Development Use	Commercial
Plot number/ Adj Landscaping Area	Phase 3 Swale

Remediation undertaken to the specified Plot (and as per agreed Remediation Strategy.)
(ie detail removal of any contaminated, detailed specification for soil capping system etc…)

600mm clean cover system underlain by a geotextile membrane

Supervising Environmental Consultant		Tier Environmental	
Engineer's Name	Lee Hogg	**Inspection Visit Date**	22.11.2023

Associated soil chemical analysis (Sample Reference No, strata tested etc)

Element Test Report 22/19608 Batch 1

Verification photograph





Additional remarks

300mm achieved **- SUPPLEMENTARY ASBESTOS TESTING DEMONSTRATED NO RESIDUAL RISK TO END-USER IN THIS AREA**

Geotextile present at the base.

This plot has FAILED verification

(Any proposed remedial works will be noted in the 'Remarks' column on this form)

An additional inspection IS required for this plot

SUPPLEMENTARY ASBESTOS TESTING DEMONSTRATED NO RESIDUAL RISK TO END-USER IN THIS AREA

Qualified Engineer Adrian Read

Signature [redacted]

APPENDIX D - HUMAN HEALTH ASSESSMENT CRITERIA

HUMAN HEALTH ASSESSMENT CRITERIA

Context

Contaminated Land is defined under law through Part IIA of the Environmental Protection Act 1990, implemented through Section 57 of the Environment Act 1995 and associated guidance ("Part IIA"). These specify that a "suitable for use" approach is to be applied in the assessment of potentially contaminated land, implemented through a phased programme of site investigation and risk assessment appropriate to the site under consideration.

The assessment of potential risks posed by contaminated land is based upon the assessment of plausible contaminant source - pathway - receptor linkages ("pollutant linkages") for the current and/or proposed future use of the site. The process for the assessment of contaminated land adopted in this report is in line with guidance issued by the Environment Agency Land contamination risk management (LCRM) - GOV.UK (www.gov.uk)

Land contamination can harm:

- human health
- drinking water supplies, groundwater and surface water
- soils
- ecosystems including wildlife, animals and wetlands.
- property

It can also affect the current and future land use. Dealing with land contamination helps make the environment clean and safe. Through regeneration it can:

- enhance the health and wellbeing of all.
- add to the economic, ecological and amenity value of the area.

Use land contamination risk management (LCRM) to:

- identify and assess if there is an unacceptable risk.
- assess what remediation options are suitable to manage the risk.
- plan and carry out remediation.
- verify that remediation has worked.

You can use LCRM in a range of regulatory and management contexts. For example, voluntary remediation, planning, assessing liabilities or under the Part 2A contaminated land regime. The Environment Agency expects you to follow LCRM if you are managing the risks from land contamination.

We support the use of the National Quality Mark Scheme (NQMS). You can use it for any type of land contamination report.

Using the NQMS:

- will make sure all legislative requirements and necessary standards related to managing land contamination are met.
- can provide increased confidence by submitting reports of the quality we expect.
- can result in cost and time savings by 'getting it right first time'.

LCRM is made up of 4 guides.

1. LCRM: Before you start.
2. LCRM: Risk assessment.
3. LCRM: Options appraisal.
4. LCRM: Remediation and verification.

We use a staged risk based approach. There are 3 stages, and each stage is broken down into tiers or steps.

Stage 1: Risk assessment

You will use a tiered approach to risk assessment. The 3 tiers are:

1. Preliminary risk assessment.
2. Generic quantitative risk assessment.
3. Detailed quantitative risk assessment.

Stage 1 includes information for intrusive site investigations.

Stage 2: Options appraisal

There are 3 steps to follow.

1. Identify feasible remediation options.
2. Do a detailed evaluation of options.
3. Select the final remediation option.

Stage 3: Remediation and verification

There are 4 steps to follow.

1. Develop a remediation strategy.
2. Remediate.
3. Produce a verification report.
4. Do long term monitoring and maintenance, if required

You must always start with a preliminary risk assessment.

The risk assessment stage is an iterative process. You can do the 3 tiers in order or progress from a preliminary risk assessment to a detailed quantitative risk assessment. As part of a generic or detailed quantitative risk assessment you will need to collect detailed information about the site. This is usually through an intrusive site investigation.

Depending on the level of risk or regulatory requirements, you can proceed from a preliminary risk assessment to the options appraisal stage. If you proceed direct to the options appraisal stage, you still need to collect the detailed site investigation information required by the generic and detailed quantitative risk assessments. This is to confirm that your approach is viable and acceptable.

Following the risk assessment stage, if you conclude that the risks are acceptable, with agreement from the relevant regulator, you can end the process.

If there are unacceptable risks, then remediation or mitigation is required. Follow stages 2 and 3 in order.

In stage 2 options appraisal, you will:

- look at the most feasible options.
- produce a shortlist of options.
- use evaluation criteria to assess them.
- select which ones are the most suitable to take forward to stage 3.

In stage 3 remediation and verification, you will produce a remediation strategy, do the remediation and then produce a verification report.

You will decide at the options appraisal stage if long term monitoring and maintenance is the remediation option. You may need to do post-remediation monitoring for further verification.

The risk assessment and subsequent investigation, remediation and verification must address all potential sources of pollutants that may be present on the site (the “hazards”), all receptors that may be harmed by these (e.g., human health, controlled waters, ecological receptors) and the pathways by which the contamination may be transported from the contaminant source(s) to the receptor(s). This is defined within the conceptual model for the site, which represents the characteristics of the site in a form that shows the possible pollutant linkages. As further information becomes available (for example, through site investigation), so the conceptual model will be refined.

Remedial action can be specified at any phase within this assessment process to break the identified pollutant linkage in determining whether or not to undertake further assessment or to undertake remediation, the potential cost-savings arising from a more thorough assessment of the pollutant linkages and more tightly defined remedial strategy must be considered against the direct costs involved in the work and the time that this will take to execute and gain regulatory approval.

A different approach to the statistical appraisal of data is required depending on whether the assessment is being undertaken to assess land as Contaminated Land in accordance with the regulations or whether the assessment is to assess whether the site is suitable for new development in accordance with the Planning regime. The statistical approach to assessment is discussed further in CL:AIRE:2020 “Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration”.

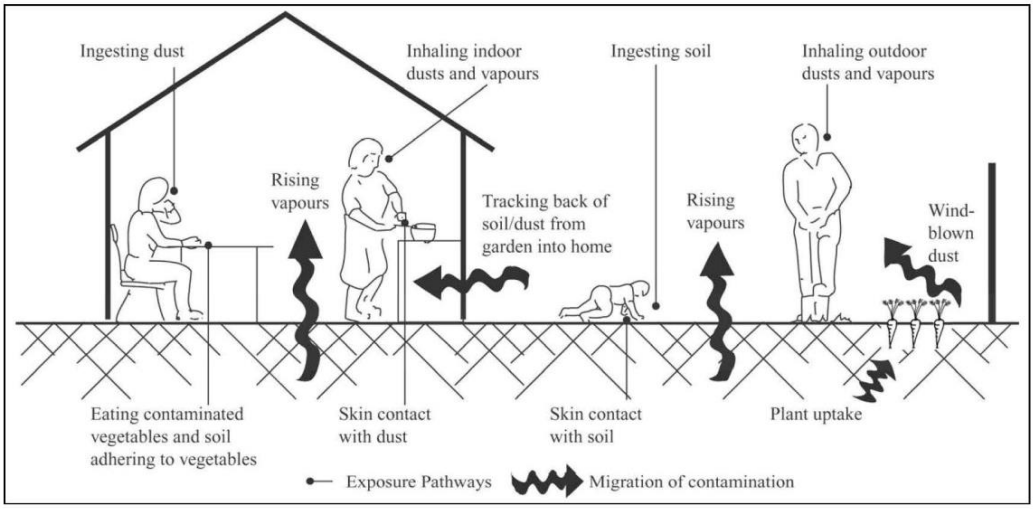
Some form of Detailed Quantitative Risk Assessment (DQRA) will be essential for those cases where appropriate GAC values cannot be established for the contaminant linkages under consideration.

Generic Assessment Criteria for Human Health Risk Assessment

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports and guidance. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. The initial documents (CLR7 – 10) were withdrawn and replaced with revised guidance issued by the Environment Agency including:

- "Using Soil Guideline Values"; EA,2009; Land contamination: using soil guideline values (SGVs) - GOV.UK (www.gov.uk)
- "Human Health toxicology assessment of contaminants in soil" EA;, 2009; https://www.gov.uk/government/publications/human-health-toxicological-assessment-of-contaminants-in-soil
- "Update technical background to the CLEA model" 2009; https://www.gov.uk/government/publications/updated-technical-background-to-the-clea-model
- CLEA Software (Version1.05) Handbook 2015; https://www.gov.uk/government/publications/contaminated-land-exposure-assessment-clea-tool
- Compilation of Data for priority Organic Contaminants for Derivation of Soil Guideline Values; Science Report SC050021/SR7, 2008; and,
- "Professional Guidance: Comparing Soil Contamination Data with a Critical Concentration". CL:AIRE:2020 https://www.claire.co.uk/component/phocadownload/category/9-other-cl-aire-documents?download=745:2020-stats-guidance

The CLEA model and associated guidance was developed to calculate an estimated tolerable daily intake (TDI) of contaminants for site users given a set of 'typical' human health exposure pathways which are detailed in "SR3: Updated technical background to the CLEA model"



(Science Report SC050021/SR3, EA, 2009) and reproduced below.

Ingestion

- Outdoor soil;
- Indoor dust;
- Home grown produce;
- Soil attached to home grown produce.

Dermal Contact

- Outdoor soil;
- Indoor dust.

Inhalation

- Outdoor dust;
- Indoor dust;
- Outdoor vapour;
- Indoor vapour.

It should be noted that the CLEA model does not include an exhaustive list of potential exposure pathways, e.g. certain compounds can pass through plastic water pipes into drinking water supply.

The potential significance of each of the exposure pathways is dependent upon the type of land use and the nature of the contaminant being considered. The CLEA model considers principal 'default' land use scenarios and makes a series of assumptions with regards to building type (where applicable), identification of the critical human receptor group, exposure frequency and duration. The definitions of the principal land use types given in SR3 (EA, 2009) are:

Residential land use;

- A typical residential property consisting of a two-storey terraced house built on a ground-bearing slab of 0.15m thickness with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden. The critical receptor is a 0 – 6-year-old female.
- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and indoor dust and vapour.

Allotments

- A plot of open space commonly made available by the Local Authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than one hectare. The tenants are assumed to be the parents or grandparents and that young children make occasional accompanied visits to the plots. The critical receptor is a 0 – 6-year-old female and there is no building present on site.
- Active exposure pathways are ingestion of outdoor soil, ingestion of home grown produce and soil adhering to home grown produce; direct dermal contact with outdoor soil; inhalation of outdoor vapour.

Commercial and industrial land use.

- A typical commercial or light industrial property consisting of a three-story office building (pre-1970) with a ground bearing floor slab at which employees spend most time indoors and are involved in office based or related light physical work. The critical receptor is a working female adult aged 16 – 65 years.
- Active exposure pathway is ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor dust; inhalation of outdoor dust and vapour and inhalation of indoor dust and vapour.

Soil Guideline Values

Based on the assumption of each land use type, the EA and DEFRA developed and published Soil Guideline Value (SGV) using the CLEA model for a number of principal contaminants and 'default' end-use scenarios of residential, allotments and commercial/industrial use. The primary purpose of the SGVs is as trigger value for the tolerable daily intake (TDI), below which it can be assumed that the soil does not pose an unacceptable risk to the identified receptor. Where soils contamination is present above this level further assessment may be required. SGVs were developed for the following contaminants:

- Heavy metals and other inorganic compounds: arsenic, cadmium, chromium, cyanide, lead (now withdrawn), mercury, nickel and selenium.
- Benzene, ethylbenzene, toluene and xylenes.
- Phenol.
- Dioxins and dioxin-like polychlorinated biphenyls (PCBs)
- Polycyclic aromatic hydrocarbons (PAHs) – 11 substances

LQM/CIEH Generic Assessment Criteria for Human Health Risk Assessment

In addition, in 2009 CIEH through LQM and EIC published generic assessment criteria (GACs) for 82 substances including metals, petroleum hydrocarbons, PAHs and explosive substances for a variety of soil types and the three 'default' land uses – (residential, allotments and commercial end-uses) as described in SR3 (EA, 2009). These have been superseded as described below.

Category 4 Screening Values

In 2013 "SP1010: Development of Category 4 Screening Levels for Assessment of Land Affected by Contamination" (CL:AIRE 2013) was issued which detailed findings of a research project undertaken by CL:AIRE to set out the framework by which potential Category 4 Screening Levels (pC4SL) may be derived for 6 contaminants of concern, Arsenic, Benzene, Benzo(a)pyrene, Cadmium, Chromium VI and Lead.

This was supplemented in 2014 by "SP1010: Development of Category 4 Screening Levels for the Assessment of Land Affected by Contamination – Policy Companion Document" (DEFRA, 2014). SP1010 proposed several updated toxicology information relating to contaminant behaviour updated assumptions relating to the modelling of human exposure to soil contaminants, derivation of separate C4SLs for residential with the consumption of home grown produce, residential without the consumption of home grown produce, and two new land uses: public open spaces near residential housing (POS resi) and public parks (POS park).

Public Open Space: Residential

- For public open space in close proximity to residential housing and the central green area around which houses are located, as on many housing estates from the 1930s to 1970s. It is also applicable for smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soil with planting. It is considered to be a generally grassed area up to 0.5ha with up to 50% bare soil. The land use is an important resource

for children and the area is near the homes. The critical receptor is a female child age >3 - <9 years old (CLEA age class 4 – 9) as younger children are unlikely to play outdoors unsupervised.

- Active exposure pathways are ingestion of outdoor soil, ingestion of indoor dust; direct dermal contact with outdoor soil and indoor soil derived dust; inhalation of outdoor and indoor dust and inhalation of outdoor vapour.

Public Open Space: Park

- A public park is defined as an area of open space provided for recreational use and usually owned and maintained by the Local Authority. It is anticipated the park could be used for a wide range of activities, including the following:
    - Family visits and picnics;
    - Children's play area;
    - Sporting activities such as football on an informal basis (i.e. not a dedicated sports pitch); and
    - Dog walking.
- The park is modelled as an area >0.5 ha of predominantly grasses open space with no more than 25% of exposed soil.
- The critical receptor is a female child with CLEA age classes 1 – 6.
- Active exposure pathways are: ingestion of outdoor soil; direct dermal contact with outdoor soil; inhalation of outdoor dust and inhalation of outdoor vapour.

Furthermore, the C4SLs are based on a different toxicological benchmark, the 'low level of toxicological concern' (LLTC). This difference in approach was adopted because the C4SLs were primarily intended for use under Part2A of the EPA 1990 to quickly screen out Category 4 sites where there is "*no risk or that the level of risk posed is low*". SGVs and LQM GACs are based on the more conservative 'minimal or tolerable level of risk' as defined in SR2 (EA, 2009) and were derived for assessment of contamination for the Planning process.

LQM/CIEH Suitable 4 Use Levels (S4ULs)

The publication of the C4SLs resulted in considerable and inconclusive debate about the applicability of the lower level of protection of the C4SL, which are underlain by the LLTC, outside of the Part 2A context for which they were derived. In 2014 LQM/CIEH presented a Suitable 4 Use Levels (S4ULs), which incorporate the updated assumption exposure derived for the production of the C4SLs but within the context of deriving screening criteria above which further assessment of the risks or remedial action may be needed. The S4ULs replace the 82 substances, species and fractions and congeners contained in the previous LQM/CIEH GACs issued in 2009. Additionally, following changes and new land uses proposed in the C4SL research project, S4ULs have also been derived for the majority of substances for which the EA derived SGVs in 2009 with the exception of lead (see below).

Lead

The C4SL for lead provides a technically robust and conservative assessment tool using significantly updated toxicological modelling than the withdrawn SGV and derived in line with current science of lead toxicology.

EIC/AGS/CL:AIRE Soil Generic Assessment Criteria (2010)

In some instances, EIC/AGC/CL:AIRE GACs for certain VOC / SVOC potential contaminants of concern have been used *in lieu* of available LQM / CIEH S4UL values.

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Metals/metalloids																			
Arsenic	37			40			43			640			79			170			LQM (2014)
Beryllium	1.7			1.7			35			12			2.2			63			LQM (2014)
Boron	290			11000			45			240000			21000			46000			LQM (2014)
Cadmium	11			85			1.9			190			120			532			LQM (2014)
Chromium III	910			910			18000			8600			1500			33000			LQM (2014)
Chromium VI	6			6			1.8			33			7.7			220			LQM (2014)
Copper	2400			7100			520			68000			12000			44000			LQM (2014)
Lead	200			310			80			2330			630			1300			C4SL
Mercury (elemental)	1.2			1.2			21			58 (25.8)			16			30 (25.8)			LQM (2014)
Mercury (Inorganic)	40			56			19			1100			120			240			LQM (2014)
Methylmercury	11			15			6			320			40			68			LQM (2014)
Nickel	180			180			230			980			230			3400			LQM (2014)
Selenium	250			430			88			12000			1100			1800			LQM (2014)
Vanadium	410			1200			91			9000			2000			5000			LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Zinc	3700			40000			620			730000			81000			170000			LQM (2014)
Other																			
Total Sulphate	2,400			2,400			2,400			2,400			2,400			2,400			BRE (2005)
Water Soluble Sulphate (g/l)	0.5			0.5			0.5			0.5			0.5			0.5			BRE (2005)
PAHs																			
Acenaphthene	210	510	1100	3000 (57)	4700(141)	6000 (336)	34	85	200	84000 (57)	97000 (141)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Acenaphthylene	170	420	920	2900 (86.1)	4600 (212)	6000 (506)	28	69	160	8300 (86.1)	97000 (212)	100000	15000	15000	15000	29000	30000	30000	LQM (2014)
Anthracene	2400	5400	11000	31000 (1.17)	35000	37000	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000	LQM (2014)
Benzo(a)anthracene	7.2	11	13	11	14	15	2.9	6.5	13	170	170	180	29	29	29	49	56	62	LQM (2014)
Benzo(a)pyrene	2.2	2.7	3	3.2	3.2	3.2	0.97	2	3.5	35	35	36	5.7	5.7	5.7	11	12	13	LQM (2014)
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4	4	0.99	2.1	3.9	44	44	45	7.1	7.1	7.1	13	15	16	LQM (2014)
Benzo(g,h,i)perylene	320	340	350	360	360	360	290	470	640	3900	4000	4000	640	640	640	1400	1500	1600	LQM (2014)
Benzo(k)fluoranthene	77	93	100	110	110	110	37	75	130	1200	1200	1200	190	190	190	370	410	440	LQM (2014)
Chrysene	15	22	27	30	31	32	4.1	9.4	19	350	350	350	57	57	57	93	110	120	LQM (2014)
Dibenz(a,h)anthracene	0.24	0.28	0.3	0.31	0.32	0.32	0.14	0.27	0.61	3.5	3.6	3.6	0.57	0.57	0.58	1.1	1.3	1.4	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Fluoranthene	280	560	890	1500	1600	1600	52	130	290	23000	23000	23000	3100	3100	3100	63	6300	6400	LQM (2014)
Fluorene	170	400	860	2800 (30.9)	3800 (76.5)	4500 (183)	27	67	160	63000 (30.9)	68000	71000	9900	9900	9900	20000	20000	20000	LQM (2014)
Indeno(1,2,3-cd)pyrene	27	36	41	45	46	46	9.5	21	39	500	510	510	82	82	82	150	170	180	LQM (2014)
Naphthalene	2.3	5.6	13	2.3	5.6	13	4.1	10	24	190 (76.4)	460 (183)	1100 (432)	4900	4900	4900	1200 (76.4)	1900 (183)	3000	LQM (2014)
Phenanthrene	95	220	440	1300 (36)	1500	1500	15	38	90	22000	22000	23000	3100	3100	3100	6200	6200	6300	LQM (2014)
Pyrene	620	1200	2000	3700	3800	3800	110	270	620	54000	54000	54000	7400	7400	7400	15000	15000	15000	LQM (2014)
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	0.32	0.67	1.2	15	15	15	2.2	2.2	2.2	4.4	4.7	4.8	LQM (2014)
BTEX and TPH																			
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	0.017	0.034	0.075	27	47	90	72	72	73	90	100	110	LQM (2014)
Toluene	130	290	660	880 vap (869)	1900	3900	22	51	120	56000 vap (869)	110000 vap (1920)	180000 vap (4360)	56000	56000	56000	87000 vap (869)	95000 vap (1920)	100000 vap (4360)	LQM (2014)
Ethylbenzene	47	110	260	83	190	440	16	39	91	5700 vap (518)	13000 vap (1220)	27000 vap (2840)	24000	24000	25000	17000 vap (518)	22000 vap (1220)	27000 vap (2840)	LQM (2014)
Xylene - o	60	140	330	88	210	480	28	67	160	6600 (478)	15000 (1120)	33000 (2620)	41000	42000	43000	17000 (478)	24000 (1120)	33000 (2620)	LQM (2014)
Xylene - m	59	140	320	82	190	450	31	74	170	6200 (625)	14000 (1470)	31000 (3460)	41000	42000	43000	17000 (625)	24000 (1470)	32000 (3460)	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Xylene - p	56	130	310	79	180	430	29	69	160	5900 (576)	14000 (1350)	30000 (3170)	41000	42000	43000	17000 (576)	23000 (1350)	31000 (3170)	LQM (2014)
Aliphatic EC 5-6	42	78	160	42	78	160	730	1700	3900	3200 (304)	5900 (558)	12000 (1150)	570000 (304)	590000	60000	95000 (304)	130000 (558)	180000 (1150)	LQM (2014)
Aliphatic EC >6-8	100	230	530	100	230	530	2300	5600	13000	7800 (144)	17000 (322)	40000 (736)	600000	610000	62000	150000 (144)	220000 (322)	320000 (736)	LQM (2014)
Aliphatic EC >8-10	27	65	150	27	65	150	320	770	1700	2000 (78)	4800 (190)	11000 (451)	13000	13000	13000	14000 (78)	18000 (190)	21000 (451)	LQM (2014)
Aliphatic EC >10-12	130 (48)	330 (118)	760 (283)	130 (48)	330 (118)	760 (283)	2200	4400	7300	9700 (48)	23000 (118)	47000 (283)	13000	13000	13000	21000 (48)	23000 (118)	24000(283)	LQM (2014)
Aliphatic EC >12-16	1100 (24)	2400 (59)	4300 (142)	1100 (24)	2400 (59)	4300 (142)	11000	13000	13000	59000 (24)	82000 (59)	90000 (142)	13000	13000	13000	25000 (24)	25000 (59)	26000 (142)	LQM (2014)
Aliphatic EC >16-35	65000 (8.48)	92000 (21)	11000 0	65000 (8.48)	92000 (21)	110000	26000 0	270000	27000 0	160000 0	1700000	180000 0	250000	250000	25000 0	450000	480000	490000	LQM (2014)
Aliphatic EC >35-44	65000 (8.48)	92000 (21)	11000 0	65000 (8.48)	92000 (21)	110000	26000 0	270000	27000 0	160000 0	1700000	180000 0	250000	250000	25000 0	450000	480000	490000	LQM (2014)
Aromatic EC 5-7	70	140	300	370	690	1400	13	27	57	26000 (1220)	46000 (2260)	86000 (4710)	56000	56000	56000	76000 (1220)	84000 (2260)	92000 (4710)	LQM (2014)
Aromatic EC >7-8	130	290	660	860	1800	3900	22	51	120	56000 (869)	110000 (1920)	180000 (4360)	56000	56000	56000	87000 (869)	95000 (1920)	100000 (4360)	LQM (2014)
Aromatic EC >8-10	34	83	190	47	110	270	8.6	21	51	3500 (613)	8100 (1500)	17000 (3580)	5000	5000	5000	7200 (613)	8500 (1500)	9300 (3580)	LQM (2014)
Aromatic EC >10-12	74	180	380	250	590	1200	13	31	74	16000 (364)	28000 (899)	34000 (2150)	5000	5000	5000	9200 (364)	9700 (899)	10000	LQM (2014)
Aromatic EC >12-16	140	330	660	1800	2300 (419)	2500	23	27	130	36000 (169)	37000	38000	5100	5100	5000	10000	10000	10000	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Aromatic EC >16-21	260	540	930	1900	1900	1900	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800	LQM (2014)
Aromatic EC >21-35	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >35-44	1100	1500	1700	1900	1900	1900	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
Aromatic EC >44-75	1600	1800	1900	1900	1900	1900	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900	LQM (2014)
VOCs																			
1,2-dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	0.0046	0.0083	0.016	0.67	0.97	1.7	29	29	29	21	24	28	LQM (2014)
1,1,1-trichloroethane	8.8	18	39	9	18	40	48	110	240	660	1300	3000	140000	140000	140000	57000 (1425)	76000 (2915)	100000 (6392)	LQM (2014)
1,1,2,2,tetrachloroethane	1.6	3.4	7.5	3.9	8	17	0.41	0.89	2	270	550	1100	1400	1400	1400	1800	2100	2300	LQM (2014)
tetrachloroethene	0.18	0.39	0.9	0.18	0.4	0.92	0.65	1.5	3.6	19	45	95	1400	1400	1400	810 (424)	1100 (951)	1500	LQM (2014)
tetrachloromethane (Carbon tetrachloride)	0.026	0.056	0.13	0.026	0.056	0.13	0.45	1	2.4	2.9	6.3	14	890	920	950	190	270	400	LQM (2014)
Trichloroethene	0.016	0.034	0.075	0.017	0.036	0.08	0.041	0.091	0.21	1.2	2.6	5.7	120	120	120	70	91	120	LQM (2014)
Trichloromethane (chloroform)	0.91	1.7	3.4	1.2	2.1	4.2	0.42	0.83	1.7	99	170	350	2500	2500	2500	2600	2800	3100	LQM (2014)
Chloroethene (Vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	0.00055	0.001	0.0018	0.059	0.077	0.12	3.5	3.5	3.5	4.8	5	5.4	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	0.24	0.58	1.4	1000	1000	1000	130	130	130	260	270	270	LQM (2014)
RDX	120	250	540	13000	13000	13000	17	38	85	210000	210000	210000	26000	26000	27000	49000 (18.7)	51000	53000	LQM (2014)
HMX	5.7	13	26	6700	6700	6700	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	23000 (0.35)	23000 (0.39)	24000 (0.48)	LQM (2014)
Aldrin	5.7	6.6	7.1	7.3	7.4	7.5	3.2	6.1	9.6	170	170	170	18	18	18	30	31	31	LQM (2014)
Dieldrin	0.97	2	3.5	7	7.3	7.4	0.17	0.41	0.96	170	170	170	18	18	18	30	30	31	LQM (2014)
Atrazine	3.3	7.6	17.4	610	620	620	0.5	1.2	2.7	9300	9400	9400	1200	1200	1200	2300	2400	2400	LQM (2014)
Dichlovos	0.032	0.066	0.014	6.4	6.5	6.6	0.0049	0.01	0.022	140	140	140	16	16	16	26	26	27	LQM (2014)
Alpha-Endosulfan	7.4	18	41	160 (0.003)	280 (0.007)	410 (0.016)	1.2	2.9	6.8	5600 (0.003)	7400 (0.007)	8400 (0.016)	1200	1200	1200	2400	2400	2500	LQM (2014)
alpha-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	0.035	0.087	0.21	170	180	180	24	24	24	47	48	48	LQM (2014)
beta-hexachlorocyclohexanes	0.085	0.2	0.46	3.7	3.8	3.8	0.013	0.032	0.077	65	65	65	8.1	8.1	8.1	15	15	16	LQM (2014)
gamma-hexachlorocyclohexanes	0.06	0.14	0.33	2.9	3.3	3.5	0.0092	0.023	0.054	67	69	70	8.2	8.2	8.2	14	15	15	LQM (2014)
Chlorobenzene	0.46	1	2.4	0.46	1	2.4	5.9	14	32	56	130	290	11000	13000	14000	1300 (675)	2000 (1520)	2900	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
1,2-Dichlorobenzene	23	55	130	24	57	130	94	230	540	2000 (571)	4800 (1370)	11000 (3240)	90000	95000	98000	24000 (571)	36000 (1370)	51000 (3240)	LQM (2014)
1,3-Dichlorobenzene	0.4	1	2.3	0.44	1.1	2.5	0.25	0.6	1.5	30	73	170	300	300	300	390	440	470	LQM (2014)
1,4-Dichlorobenzene	61	150	350	61	150	350	15	37	88	4400 (224)	10000 (540)	25000 (1280)	17000	17000	17000	36000 (224)	36000 (540)	36000 (1280)	LQM (2014)
VOCs Continued																			
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	4.7	12	28	102	250	590	1800	1800	1800	770 (134)	1100 (330)	1600 (789)	LQM (2014)
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	55	140	320	220	530	1300	15000	17000	19000	1700 (318)	2600 (786)	4000 (1880)	LQM (2014)
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	4.7	12	28	23	55	130	1700	1700	1800	380 (36.7)	580 (90.8)	860 (217)	LQM (2014)
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	4.4	11	26	1700 (122)	3080 (304)	4400 (728)	830	830	830	1500 (122)	1600	1600	LQM (2014)
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	0.38	0.9	2.2	49 (39.4)	120 (98.1)	240 (235)	78	79	79	110 (39)	120	130	LQM (2014)
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	0.06	0.16	0.37	42 (19.7)	72 (49.1)	96	13	13	13	25	26	26	LQM (2014)
Pentachlorobenzene	5.8	12	22	19	30	38	1.2	3.1	7	640 (43)	770 (107)	830	100	100	100	190	190	190	LQM (2014)
Hexachlorobenzene	1.8 (0.2)	3.3 (0.5)	4.9	4.1 (0.2)	5.7 (0.5)	6.7 (1.2)	0.47	1.1	2.5	110 (0.2)	120	120	16	16	16	30	30	30	LQM (2014)

Parameter	Residential with homegrown produce			Residential without homegrown produce			Allotment			Commercial / Industrial			Public Open Space near Residential			Public Open Space - Park			Source
	(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			(mg/kg, unless otherwise stated)			
SOM	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	**1%**	**2.50%**	**6%**	
Phenol	280	550	1100	750	1300	2300	66	140	280	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	760 $_{dir}$ (31000)	1500 $_{dir}$ (35000)	3200 $_{dir}$ (37000)	LQM (2014)
Chlorophenols (excluding pentachlorophenol)	0.87 (g)	2	4.5	94	150	210	0.13 (g)	0.3	0.7	3500	4000	4300	620	620	620	1100	1100	1100	LQM (2014)
Pentachlorophenol	0.22	0.52	1.2	27 (16.4)	29	31	0.03	0.08	0.19	400	400	400	60	60	60	110	120	120	LQM (2014)
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	4.8	10	23	11	22	47	11000	11000	12000	1300	1900	2700	LQM (2014)
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	0.25	0.61	1.4	31	66	120	25	25	25	48	50	51	LQM (2014)

(g) derived based on 2,3,4,6-tetrachlorophenol; dir - based on a threshold protective of direct skin contact with phenol (guideline in brackets based on health effects following long term exposure provided for illustration only); (vap) calculated for vapour phase only. SOM – Soil Organic Matter; (4.5) solubility.