

PHASE II GENERIC RISK ASSESSMENT REPORT

The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB

Project Reference:

CON288-ROYS-001

Site Address:

The Sycamores
43 Kneesworth Street
Royston
SG8 5AB

Report Date:

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Customer:

Unbuttoned Limited
1a Melbourn Street
Royston
SG8 7BP

Prepared By:

Stansted Environmental Services Limited
The Stansted Centre
Parsonage Road
Takeley
CM22 6PU

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Prepared By:



**Azra Koese MSc (Ag)
Geoenvironmental Consultant**

Azra Koese has 2 years' experience as a GeoEnvironmental Engineer working for a variety of consultants and contractors within the contaminated land and ground investigation fields.

Reviewed & Approved By:



**Gavin Greenwood BSc (Hons) MSc (Eng) FGS
Associate Director (Geoenvironmental)**

Gavin Greenwood has over 30 years' experience as a GeoEnvironmental Engineer working for a variety of consultants and contractors within the contaminated land field.

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EXECUTIVE SUMMARY

Stansted Environmental Services Limited has been commissioned by Unbuttoned Limited, to undertake a Phase II Generic Risk Assessment at The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB. The site may be located by National Grid Reference TL 569217.

This Phase II Generic Risk Assessment has been prepared to assess contamination in relation to the proposed redevelopment of the site and has considered a variety of sources of information regarding the past land uses. It is the intention for the existing area to be converted from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens.

Geological records indicate that the site is underlain by the Holywell Nodular Chalk Formation. No superficial deposits are shown. The Holywell Nodular Chalk Formation has been identified as Principal Aquifer by the Environment Agency. The site lies between the Groundwater Source Protection Zone 2 (Outer Zone) and Zone 3 (Total Catchment).

A building, named The Sycamores, is shown on site since the first Ordnance Survey map dated 1886. No changes occurred on site since then. The surrounding area has gone through a substantial residential development since 1970s with industrial facilities mainly present between 500m and 100m to the northwest of the site.

An intrusive investigation was undertaken on 4th July 2025 and consisted of three hand dug trial pits to a maximum depth of 1.15m bgl. Suitable soil samples were taken and subjected to a range of contaminant testing

The intrusive investigation has shown that there are pollutant linkages due to elevated heavy metals (arsenic, lead and beryllium) within the Made Ground.

Consequently, some limited remediation will be required in garden areas and soft landscaped areas of the proposed development, but this should be limited to a minimum thickness of clean cover. To this end a Remediation Method Statement (RMS) should be prepared as required by Part C of Condition 6 relating to contamination (ref: 22/01840/FP). In addition to a RMS, a validation report will be required to show what remediation has taken place at site, what validation sampling has been undertaken and where, and validation of any imported topsoil's for residential or communal garden areas.

This report should be submitted to the Local Authority as suitable evidence to discharge Part B of Condition 6, relating to contamination.

1. INTRODUCTION

Stansted Environmental Services Limited (SES) has been commissioned by Unbuttoned Limited (WH), the Client, to provide a Phase II Generic Risk Assessment Report for the site known as The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB.

The purpose of the investigation was to evaluate the contamination status at the site and to develop a risk assessment based on the past uses of the site and the proposed end use.

It is understood that the existing area is to be converted from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens.

The existing and proposed site layouts are included in Appendix A.

1.1 Planning Status

The proposed scheme, covered by North Hertfordshire District Council Planning Permission 22/01840/FP (dated 15th September 2022), is for change of use from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens. A plan showing the proposed development is given in Appendix A.

The permission has the following condition attached:

- 6 *(a) No development approved by this permission shall be commenced prior to the submission to, and agreement of the Local Planning Authority of a written preliminary environmental risk assessment (Phase I) report containing a Conceptual Site Model that indicates sources, pathways and receptors. It should identify the current and past land uses of this site (and adjacent sites) with view to determining the presence of contamination likely to be harmful to human health and the built and natural environment.*
- (b) If the Local Planning Authority is of the opinion that the report which discharges condition (a), above, indicates a reasonable likelihood of harmful contamination then no development approved by this permission shall be commenced until a Site Investigation (Phase II environmental risk assessment) report has been submitted to and approved by the Local Planning Authority which includes:*
- (i) A full identification of the location and concentration of all pollutants on this site and the presence of relevant receptors, and;*
 - (ii) The results from the application of an appropriate risk assessment methodology.*

(c) No development approved by this permission (other than that necessary for the discharge of this condition) shall be commenced until a Remediation Method Statement report; if required as a result of (b), above; has been submitted to and approved by the Local Planning Authority.

(d) This site shall not be occupied, or brought into use, until:

(i) All works which form part of the Remediation Method Statement report pursuant to the discharge of condition (c) above have been fully completed and if required a formal agreement is submitted that commits to ongoing monitoring and/or maintenance of the remediation scheme.

(ii) A Remediation Verification Report confirming that the site is suitable for use has been submitted to, and agreed by, the Local Planning Authority.

(e) Any contamination, other than that reported by virtue of condition (a) and (b), encountered during the development of this site shall be brought to the attention of the Local Planning Authority as soon as practically possible; a scheme to render this contamination harmless shall be submitted to and agreed by the Local Planning Authority and subsequently fully implemented prior to the occupation of this site.

Reason: To ensure that any contamination affecting the site is dealt with in a manner that safeguards human health, the built and natural environment and controlled waters.

1.2 Project Objectives

The overall objective of the work has been to obtain and provide adequate information on the presence and extent of any potential contamination and should it be confirmed, provide a strategy for progression in support of the proposed change of use from office to single dwellinghouse.

A Phase I Report was completed for the site and discussed in Section 3, below. As part of a review of this report, further investigative works have been carried out to confirm the findings of the earlier report and infill data gaps.

Attention is drawn to the fact that whilst every effort has been made to ensure the accuracy of the data supplied and any analysis derived from it, there is the potential for variations in ground conditions and contamination between and beyond the specific locations investigated. No liability can be accepted for any such variations. Furthermore, any recommendations are specific to the clients' requirements and no liability will be accepted should these be used by third parties without prior consultation with SES.

2. SITE SETTING

2.1 Site Location

The site is located at The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB and may be approximated by the National Grid reference TL 35538 40912. The site location is shown in Figure 1.

FIGURE 1: Site Location Plan



2.2 Site Description

The proposed development site is irregular in shape, covering an area of approximately 1000m² and is roughly level. The site is immediately bounded by Kneesworth Street to the west and other residential and commercial buildings to the south, east and north of the site.

2.3 Geological Setting and Hydrogeological Setting

Reference to the British Geological Survey website (www.bgs.ac.uk) indicates that the site is underlain by the Holywell Nodular Chalk Formation. No superficial deposits are shown.

The Holywell Nodular Chalk Formation has been identified as Principal Aquifer by the Environment Agency. The site lies between the Groundwater Source Protection Zone 2 (Outer Zone) and Zone 3 (Total Catchment).

The closest surface water feature is located 636m to the northwest.

2.4 Proposed Development

It is understood that the existing area is to be converted from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens.

3. SUMMARY OF PHASE I DESK STUDY

A Phase I Desk Study Report was carried out by SES for the site with the following reference:

- Phase I Desk Study & Preliminary Risk Assessment, The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB. Ref. CON288-ROYS-001, dated 27th June 2025.

At the time of the walkover, the site could be accessed from Kneesworth Street via a dedicated driveway located to the south of the building. The site comprised a three-storey Victorian building with a parking area situated at the rear. The entire parking area and the driveway were covered with gravel. An area of soft landscaping was identified in the northeastern corner of the site, raised approximately 500mm above surrounding ground level. This area included several mature trees, including a Sycamore, a Yew, and a Walnut, with estimated heights ranging from 8m to 10m. A hard-surfaced area with concrete slabs was present adjacent to the eastern side of the building, extending to the northern site boundary where a shed used for storage was located. Another mature Yew tree approximately 8m in height was identified in the southern corner of the site, adjacent to the driveway, with several rubbish bins located at its base.

A building, named The Sycamores, is shown on site since the first Ordnance Survey map dated 1886. No changes occurred on site since then. The surrounding area has gone through a substantial residential development since 1970s with industrial facilities mainly present between 500m and 100m to the northwest of the site.

The research has identified the car park usage as potential source of contamination, posing a risk to future site users.

The risk to groundwater is considered to be low as the site is underlain by the Holywell Nodular Chalk Formation.

Significant pollutant linkages have been identified associated with the site and, therefore, further works with respect to contamination were recommended.

An initial Conceptual Site Model (CSM) was developed on the basis of the desk study. The CSM was used to identify potential sources, pathways and receptors (i.e. potential pollutant linkages) on site and is summarised in the table below.

TABLE 1: Outline Conceptual Site Model

Potential Source	Contaminants of Concern	Medium	Potential Pathways	Receptors	Linkage Potentially Active?	Risk Level
On-site – current and historical • Car park usage	TPHs, PAHs, heavy metals	Soil	Direct contact/ingestion	Site users	✓	Moderate/Low
			Inhalation of volatiles			
			Airborne migration of soil or dust	Off-site users	✓	Moderate/Low
			Leaching of mobile contaminants	Principal Aquifer	x	Low
		Groundwater	Direct contact/ingestion	Site users Off-site users	x x	Low
			Inhalation of volatiles	Site users Off-site users	x x	Low
			Vertical and lateral migration in permeable strata	Principal Aquifer	x	Low
Off-site – current Cemetery, Factory, Works, Depot, Recycling Site, Dry cleaner Off-site – historical: Gas works, Foundry, Burial Ground, Nurseries, Artificial Manure Factory, Factories, Engineering Works, generic Works, builder's yards, Depots	TPHs, PAHs, heavy metals, solvents, PCE, TCE	Ground water	Direct contact/ingestion	Site users	x	Very Low
			Inhalation of volatiles	Site users	x	Very Low
		Service conduits	Direct contact/ingestion	Site users	x	Very Low
			Inhalation of volatiles	Site users	x	Very Low

Potential Source	Contaminants of Concern	Medium	Potential Pathways	Receptors	Linkage Potentially Active?	Risk Level
On and off-site • Made Ground / natural strata or bio-degradation of contamination	Carbon dioxide and methane	Ground Gas	Inhalation of ground gas	Site users Off-site users	x x	Very Low
			Explosive risks	Site users Off-site users	x x	Very Low

4. SITE WORK

The site work for the current phase of development was carried out on 4th July 2025 on the basis of the practices set out in BS 10175:2001+A2:2017, BS 5930:2015+A1:2020, ISO 1997:2007. The locations of exploratory holes have been planned, where possible, in general accordance with CLR 4.

Three trial pits , designated TP01 to TP03, were excavated at the positions shown on the exploratory hole plan, Appendix A.

The depths of the trial pits, descriptions of strata encountered and comments on groundwater conditions are given on the exploratory holes records, Appendix B.

Representative disturbed samples were taken at the depths shown on the trial pit records and despatched to the laboratory. Samples for environmental purposes were collected in appropriate containers and kept in a cool box prior to dispatch to the laboratory.

5. SUMMARY OF GROUND CONDITIONS

The sequence of the strata encountered during the investigation generally confirms the anticipated geology as interpreted from the geological map.

Interpolation of strata depths between locations should be undertaken with caution, particularly for depths of Made Ground where structures are still observed at the time of the investigation.

TABLE 2: Summary of Ground Conditions

Strata Encountered	Depth Encountered (m bgl)		Maximum Measured Strata Thickness m
	From	To	
Made Ground	Ground Level	0.48 to 1.10	1.10
Holywell Nodular Chalk Formation	0.48 to 1.15	>1.15	Not proven

5.1 Made Ground

Made Ground was encountered in all trial pits (TP01 to TP03), extending to depths of 0.48m to 1.10m bgl. A surface layer of gravel was recorded in all pits, with underlying tarmac noted in TP01 and TP02 only. Made Ground generally comprised gravelly slightly silty sand with flint, brick, and occasional chalk fragments. A geotextile membrane was observed in TP03 at 0.35m bgl, and a layered brick structure was recorded in TP02.

Rare roots and rootlets, up to 10 mm in diameter, were noted within the Made Ground in all pits. They extended to depths of 0.48m in TP01, 0.30m in TP02, and 0.90m in TP03.

PID screening indicated low levels of volatile compounds, with a maximum reading of 3.1 ppm in TP01.

5.2 Holywell Nodular Chalk Formation

Holywell Nodular Chalk Formation was encountered beneath the Made Ground in all the trial pits, to a maximum depth of 1.15m bgl in TP03 corresponding to the maximum depth dug.

The chalk was generally described as possible structured chalk recovered as structureless composed of slightly gravelly sandy silt. Gravel is angular to subangular fine to coarse chalk. The gravel was described as white, weak to very weak, of low to medium density.

6. LABORATORY ANALYSIS

In order to test the pollutant linkages identified in the Phase I Desktop Study Report, and assess whether the soils beneath the site could pose a significant risk to human and environmental receptors, samples of the Made Ground were selected for analysis. The samples were placed in laboratory prepared vessels with a minimum of headspace and labelled accordingly prior to being despatched to accredited analytical laboratory in cool boxes.

The suite of analysis was selected with reference to the findings of the Phase I report as well as onsite observations and included the following determinands:

- A suite of metals comprising AS, B (water soluble), Be, Cd, Cr, CrVI, Cu, Pb, Hg, Ni, Se and Zn;
- Speciated PolyAromatic Hydrocarbons (USEPA 16);
- Total Petroleum Hydrocarbons (CWG speciated analysis);
- Benzene, Toluene, Ethylbenzene, Xylenes (BTEX) and MTBE;
- Total Cyanide;
- Phenols (total monohydric);
- Asbestos (identification only);
- Soil Organic Matter (SOM); and
- pH and Water Soluble Sulphate.

The results for this site are presented in Appendix D.

7. GENERIC RISK ASSESSMENTS

7.1 Results of Soil Analysis

The pH of the tested soils ranged from 7.4 to 9.8 with an average of 8.5. The Soil Organic Matter (SOM) of the samples ranged from 1% to 4.6% with an average SOM is 2.3%. Therefore, a SOM of 2.5% has been used in this assessment.

A summary of the metal concentrations recorded in the tested samples is presented in the below table:

TABLE 3: Results of Metals Analysis

Contaminant	Number of Samples Analysed	Range of Measured Concentration (mg/kg)	Location of Maximum Concentration and Depth (m bgl)
Arsenic	3	8.1 – 190	TP02 at 0.30m
Beryllium	3	0.28 – 7.3	TP01 at 0.30m
Boron	3	0.7 – 1.6	TP01 at 0.30m
Cadmium	3	0.05 – 0.08	TP01 at 0.30m
Chromium	3	7.3 – 33	TP01 at 0.30m
Chromium VI	3	All results below Limit of Detection	
Copper	3	14 – 130	TP01 at 0.30m
Lead	3	20 – 390	TP01 at 0.30m
Mercury	3	0.3	TP03 at 0.35m
Nickel	3	7.3 – 79	TP02 at 0.30m
Selenium	3	2.9 – 3.3	TP01 at 0.30m
Vanadium	3	12 – 94	TP01 at 0.30m
Zinc	3	27 – 460	TP01 at 0.30m

Concentrations of the sixteen PAH compounds analysed are summarised below:

TABLE 4: Results of PAH Analysis

Contaminant	Number of Samples Analysed	Range of Measured Concentration (mg/kg)	Location of Maximum Concentration and Depth (m bgl)
Naphthalene	3	0.13	TP01 at 0.30m
Acenaphthylene	3	0.08	TP01 at 0.30m
Acenaphthene	3	0.19	TP01 at 0.30m
Fluorene	3	0.13	TP01 at 0.30m
Phenanthrene	3	0.23 – 1.1	TP01 at 0.30m
Anthracene	3	0.08 – 0.3	TP01 at 0.30m

Contaminant	Number of Samples Analysed	Range of Measured Concentration (mg/kg)	Location of Maximum Concentration and Depth (m bgl)
Fluoranthene	3	0.06 – 1.7	TP01 at 0.30m
Pyrene	3	0.06 – 1.6	TP01 at 0.30m
Benzo(a)anthracene	3	0.62	TP01 at 0.30m
Chrysene	3	0.29 – 0.65	TP01 at 0.30m
Benzo(b)fluoranthene	3	0.59 – 0.86	TP01 at 0.30m
Benzo(k)fluoranthene	3	0.18 – 0.39	TP01 at 0.30m
Benzo(a)pyrene	3	0.49 – 0.74	TP01 at 0.30m
Indeno(123-cd)pyrene	3	0.33 – 0.44	TP01 at 0.30m
Dibenzo(ah)anthracene	3	0.1	TP01 at 0.30m
Benzo(ghi)perylene	3	0.48 – 0.55	TP01 at 0.30m

Neither monohydric phenols or total cyanide were recorded in excess of their respective Limits of Detection.

A summary of the recorded petroleum hydrocarbons and BTEX compounds are given in the table below:

TABLE 5: Results of TPH Analysis

Contaminant	Number of Samples Analysed	Range of Measured Concentration (mg/kg)	Location of Maximum Concentration and Depth (m bgl)
TPH aliphatic C ₅ -C ₆	3	All results below Limits of Detection	
TPH aromatic C ₆ -C ₇	3	All results below Limits of Detection	
TPH aliphatic C ₆ -C ₈	3	All results below Limits of Detection	
TPH aromatic C ₇ -C ₈	3	All results below Limits of Detection	
TPH aliphatic C ₈ -C ₁₀	3	All results below Limits of Detection	
TPH aromatic C ₈ -C ₁₀	3	All results below Limits of Detection	
TPH aliphatic C ₁₀ -C ₁₂	3	All results below Limits of Detection	
TPH aromatic C ₁₀ -C ₁₂	3	All results below Limits of Detection	
TPH aliphatic C ₁₂ -C ₁₆	3	All results below Limits of Detection	
TPH aromatic C ₁₂ -C ₁₆	3	All results below Limits of Detection	
TPH aliphatic C ₁₆ -C ₂₁	3	All results below Limits of Detection	
TPH aromatic C ₁₆ -C ₂₁	3	All results below Limits of Detection	
TPH aliphatic C ₂₁ -C ₃₅	3	All results below Limits of Detection	

Contaminant	Number of Samples Analysed	Range of Measured Concentration (mg/kg)	Location of Maximum Concentration and Depth (m bgl)
TPH aromatic C ₂₁ -C ₃₅	3	25	TP01 at 0.30m
Benzene	3	All results below Limits of Detection	
Toluene	3	All results below Limits of Detection	
Ethylbenzene	3	All results below Limits of Detection	
m/p Xylene	3	All results below Limits of Detection	
o Xylene	3	All results below Limits of Detection	

No asbestos was identified in any of the samples selected for analysis.

8.3 Generic Human Health Risk Assessment

The statutory definition of contaminated land is defined in the Environmental Protection Act 1990, which was introduced by the Environment Act 1995, as;

‘Land which appears to the Local Authority in whose area it is situated to be in such a condition, by reason of substances in, on or under the land, that –

- significant harm is being caused or there is a significant possibility of such harm being caused; or
- significant pollution of controlled waters is being caused, or there is a significant possibility of such pollution being caused.’

The definition of contaminated land is based on the principles of risk assessment. Risk is defined as a combination of:

- The probability, or frequency of exposure to a substance with the potential to cause harm; and
- The seriousness of the consequence.

The basis of an environmental risk assessment involves identifying a ‘source’ of contamination, a ‘pathway’ along which the contamination may migrate and a ‘receptor’ at risk from the contamination.

Current legislation defines the various elements of the pollution linkage as:

- A contaminant is a substance, which is in or under the ground and which has the potential to cause harm or to cause pollution of controlled waters;
- A pathway is one or more routes through which a receptor is being exposed to, or affected by, a contaminant, or could be so affected; and

- A receptor is either a living organism, an ecological system, a piece of land or property, or controlled water.

A pollutant linkage indicates that all three elements have been identified. The site can only be defined as 'Contaminated Land' if a pollutant linkage exists and the contamination meets the criteria in above.

It is understood that the existing area is to be converted from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens.

In order to provide an indication of whether the soils present beneath the study area could pose a risk to human health, SES subjected the aforementioned chemical data to a Generic Risk Assessment (GRA). The initial screen of the chemical data was made against available Suitable 4 Use Levels (S4ULs) developed by LQM/CIEH (2015) and Category 4 Screening Levels (C4SLs) as developed by DEFRA (2014). Exceedances of assessment criteria may require further detailed/semi detailed quantitative risk assessment.

As the development includes private gardens which may be used for the growing of vegetables for consumption, the S4ULs for 'Residential with Homegrown Produce (RwHP)' have been adopted for this assessment. In this instance, the most sensitive receptor is judged to be a 6 year old female child.

The results of chemical analyses have been processed in accordance with recommendations set out in the CIEH and CL:AIRE document 'Guidance on Comparing Soil Contamination Data with a Critical Concentration'. Where the concentrations determined on site are at or below the respective Generic Assessment Criteria (GAC), they are considered not to pose a risk and are removed from further consideration, unless otherwise stated.

Further details of the adopted Generic Assessment Criteria are given in Appendix E.

A comparison of the recorded concentrations of metals with the corresponding S4ULs is presented in the following table:

TABLE 6: Metals Statistics

Contaminant	Key statistics				S4UL* (RwHP)	
	Number of detects	Min. Value (mg/kg)	Max. Value (mg/kg)	Mean Value (mg/kg)	S4UL (mg/kg)	No. Samples exceeding assessment criteria
Arsenic	3	8.1	190	96	37	2
Beryllium	3	0.28	7.3	2.96	1.7	1
Water Soluble Boron	3	0.7	1.6	1.03	290	0
Cadmium	2	0.5	0.8	0.65	11	0
Chromium	3	7.3	33	23.1	910	0
Copper	3	14	130	60.33	2400	0
Lead [#]	3	20	390	153	200	1
Mercury	3	-	0.3	-	1.2	0
Nickel	3	7.3	79	52.43	180	0
Selenium	2	2.9	3.3	3.1	250	0
Vanadium	3	12	94	58.33	410	0
Zinc	3	27	460	215	3700	0
<i>Notes to Table</i> * Most appropriate screening values are Sustainable 4 Use Level (S4UL) Residential with Homegrown Products end use, a sandy loam soil type, pH of 7 and a soil organic matter (SOM) of 2.5%. # Category 4 Screening Level (2014) use in absence of suitable S4UL.						

As the above table shows, arsenic, lead and beryllium exceed their relevant S4UL/C4SL and may have the potential to pose a risk to human health via direct contact, ingestion, inhalation and plant uptake exposure pathways.

None of the remaining heavy metals exceeded their respective SULs.

A summary of the PAH compounds recorded by the analysis are included in the following table:

TABLE 7: PAH Statistics

Contaminant	Key statistics				S4UL* (RwHP)	
	Number of detects	Min. Value (mg/kg)	Max. Value (mg/kg)	Mean Value (mg/kg)	S4UL (mg/kg)	No. Samples exceeding assessment criteria
Naphthalene	1	-	0.13	-	5.6	0
Acenaphthylene	1	-	0.08	-	420	0
Acenaphthene	1	-	0.19	-	510	0
Fluorene	1	-	0.13	-	400	0
Phenanthrene	2	0.23	1.1	0.66	220	0
Anthracene	2	0.08	0.3	0.19	5400	0
Fluoranthene	3	0.06	1.7	0.75	560	0
Pyrene	3	0.06	1.6	0.74	1200	0
Benzo(a)anthracene	1	-	0.62	-	11	0
Chrysene	2	0.29	0.65	0.47	22	0
Benzo(b)fluoranthene	2	0.59	0.86	0.72	3.3	0
Benzo(k)fluoranthene	2	0.18	0.39	0.28	93	0
Benzo(a)pyrene	2	0.49	0.74	0.61	2.7	0
Indeno(123-cd)pyrene	2	0.33	0.44	0.38	36	0
Dibenzo(ah)anthracene	1	-	0.1	-	0.28	0
Benzo(ghi)perylene	2	0.48	0.55	0.51	340	0
Notes to Table <i>* Most appropriate screening values are Sustainable 4 Use Level (S4UL) Residential with Homegrown Products end use, a sandy loam soil type, pH of 7 and a soil organic matter (SOM) of 2.5%.</i>						

As the above table demonstrates, none of the speciated PAHs exceeded their relevant S4ULs. It is therefore considered that there is negligible risk to human receptors via the direct contact, ingestion, dust inhalation and volatile exposure pathways.

A summary of the petroleum hydrocarbon and BTEX concentrations recorded by the analysis is included in the following table:

TABLE 8: TPH Statistics

Contaminant	Key statistics				S4UL* (RwHP)	
	Number of detects	Min. Value (mg/kg)	Max. Value (mg/kg)	Mean Value (mg/kg)	S4UL (mg/kg)	No. Samples exceeding assessment criteria
TPH aromatic C ₂₁ -C ₃₅	1	-	25	-	1500	0
<i>Notes to Table</i> * Most appropriate screening values are Sustainable 4 Use Level (S4UL) Residential with Homegrown Products end use, a sandy loam soil type, pH of 7 and a soil organic matter (SOM) of 2.5%.						

As the above table demonstrates, none of the petroleum hydrocarbon or BTEX compounds detected by the analysis exceeded the corresponding S4ULs and as such it is considered that they are likely to pose a negligible risk to human receptors.

7.2 Asbestos

None of the samples tested identified the presence of asbestos.

8. REVISED CONCEPTUAL SITE MODEL

8.1 General

In accordance with Environment Agency, Land Contamination Risk Management (LCRM):2020 and R&D Publication 66:2008, Guidance for the Safe Development of Housing on Land Affected by Contamination, SES has developed the basic Conceptual Site Model (as contained within the previously issued Phase I Desktop Study) which identified potential contamination sources, migration pathways, and receptors within the study area.

Potential Sources of Contamination

Potential on-site sources of contaminants include;

- Contamination within made ground associated with historical or current car park use on the site.

There are no off-site sources sufficiently close enough to impact the site.

Potential Receptors

SES has identified the following possible receptors;

- Future site users and construction workers
- Underlying Principal Chalk Aquifer
- Buildings and services

Generic pathways

The potential pathways for contaminants have been identified as;

- Direct ingestion, such as inhalation of dust and swallowing water.
- Indirect ingestion – absorption through skin.
- Plant uptake
- Soil leaching and subsequent vertical migration.

Existing Active Pollutant Linkages associated with the Subject Site

The Phase I Report indicated that the eastern side of the site was historically used as a car park. The proposed development introduces a garden and soft landscaping in this area, which could establish potential pathways between the identified Made Ground and human receptors. As the development introduces a more sensitive receptor (i.e., full-time residents), the associated risk is assessed as moderate/low.

Potential Pollution Linkages and Updated Risk Assessment

The intrusive site investigation has assessed all potential sources of contamination. The findings indicate a potential pollutant linkage due to elevated concentrations of arsenic, lead, and beryllium within the Made Ground. These contaminants exceed their respective S4UL/C4SL and may pose a risk to human health via direct contact, ingestion, inhalation and plant uptake exposure pathways.

All other tested substances, including other metals, PAHs, TPHs, and BTEX compounds, were recorded at concentrations below their respective screening levels. Therefore, these substances are considered to present a negligible risk to human health via direct contact, ingestion, dust inhalation, and plant uptake.

8.2 Discussion of the Revised Conceptual Site Model

It is understood that the existing area is to be converted from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens.

As noted above, there are currently limited active pollutant linkages. However, the Conceptual Site Model considers the pollutant linkages that could become active as a result of residential development at the site.

TABLE 9: Post Investigation Conceptual Site Model

Potential Source	Contaminants of Concern	Medium	Potential Pathways	Receptors	Linkage Potentially Active?	Risk Level
On-site – current and historical • Car park usage	Arsenic, lead and beryllium	Soil	Direct contact/ingestion	Site users	✓	Moderate
			Inhalation of volatiles			
			Airborne migration of soil or dust	Off-site users	✓	Moderate/Low
			Leaching of mobile contaminants	Principal Aquifer	✓	Moderate/Low
		Groundwater	Direct contact/ingestion	Site users Off-site users	x x	Low
			Inhalation of volatiles	Site users Off-site users	x x	Low
			Vertical and lateral migration in permeable strata	Principal Aquifer	x	Low
Off-site – current none Off-site – historical: none		Groundwater	Direct contact/ingestion	Site users	x	Very Low
			Inhalation of volatiles	Site users	x	Very Low
		Service conduits	Direct contact/ingestion	Site users	x	Very Low
			Inhalation of volatiles	Site users	x	Very Low

The risk assessment is based upon the available information relating to the site. Should ground conditions inconsistent with those outlined in this report be encountered, SES should be contacted to enable further assessment. The findings of the CSM should be confirmed upon finalisation of the proposed redevelopment plans.

9. MANAGEMENT OF CONTAMINATION

9.1 Remediation & Verification

The risk management framework set out LCRM 2020, is applicable to the redevelopment of sites that may be affected by contamination.

The risk management process set out in the Model Procedures has three main components:

- Risk assessment
- Options appraisal
- Remediation and Verification

This risk assessment has identified the presence of elevated arsenic, lead and beryllium within the Made Ground across the site. Relevant pollutant linkages have been identified, as demonstrated in the updated conceptual model.

The remediation strategy will need to review methods of reducing or controlling the identified unacceptable risks. This could be done by removing or treating the sources of contamination, removing or modifying the pathways or removing or modifying the behaviour of the receptors, to ensure there is no significant risk of significant harm to either human health or controlled waters from the identified contamination, in relation to the proposed end use.

An important part of the risk management process is identifying and informing all stakeholders with an interest in the outcome of the risk management project. To this end, if the regulators have not yet been contacted with regard to the redevelopment of this site, it is recommended that they be supplied with a copy of both the Phase I Desktop Study Report and this Phase II Ground Investigation Report in order to enable liaison to be undertaken with them.

Following liaison with the relevant regulatory bodies, a remediation strategy should be formulated, which should incorporate an options appraisal and summarise in detail the chosen remedial approach, along with the verification proposals. The remediation strategy should then be approved by the relevant regulatory authorities prior to implementation.

Where remediation is required, a verification report will need to be formulated following implementation of the remediation strategy, which should provide a complete record of all remedial activities conducted on site and include all the data obtained to support the remedial objectives and demonstrate that the remediation has been effective. Any unexpected conditions encountered during the remedial works should also be detailed within the verification report.

9.2 Management of Unidentified Sources of Contamination

There is the possibility that sources of contamination may be present on the site, which was not detected during the investigation. Should such contamination be identified or suspected during the site clearance or ground works, this should be dealt with accordingly. A number of options are available for handling this material, which include:

- The removal from site and disposal to a suitably licensed tip of all material suspected of being contaminated. The material would need to be classified prior to disposal;
- Short-term storage of the suspected material while undertaking verification testing for potential contamination. The storage area should be a contained area to ensure that contamination does not migrate and affect other areas of the site. Depending upon the amounts of material under consideration, this could be either a skip or a lined area; and
- Having a suitably experienced environmental engineer either on-call or with a watching brief for the visual and olfactory assessment of the material, and sampling for verification purposes.

9.3 Risk Management During Site Works

During ground works, some simple measures may have to be put in place to mitigate the risk of any known or previously unidentified contamination affecting the site workers and the environs. The majority of the proposed measures represent good practice for the construction industry and include:

- Informing the site workers of the contamination on site and the potential health effects from exposure;
- Where appropriate, the provision of suitable Personal Protective Equipment (PPE) for workers who may be potentially impacted by working in areas of the contamination;
- Ensuring good hygiene is enforced on site and washing facilities are maintained on the site. Workers are discouraged from smoking, eating or drinking without washing their hands first;
- Dust monitoring, and if necessary, suppression measures should be put into practice where contamination is becoming airborne; and
- Where contaminated materials are being removed from the site they should be disposed of at a suitably licensed landfill, with a 'duty of care' system in place and maintained throughout the disposal operations.

10. CONCLUSIONS

This Phase II Generic Risk Assessment has considered a variety of sources of information regarding the past land uses at The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB.

It is understood that the existing area is to be converted from office to single dwellinghouse (Class C3) to include replacing 10 existing car parking spaces with a drive and gardens.

The report has been prepared to assess contamination in relation to the proposed re-development of the site.

A building, named The Sycamores, is shown on site since the first Ordnance Survey map dated 1886. No changes occurred on site since then. The surrounding area has gone through a substantial residential development since 1970s with industrial facilities mainly present between 500m and 100m to the northwest of the site.

Intrusive investigations were undertaken by SES on 4th July 2025 comprising three hand dug trial pits to a maximum depth of 1.15m bgl. Suitable soil samples were taken and subjected to a range of contaminant testing.

The intrusive investigation has shown that there are pollutant linkages due to elevated heavy metals (arsenic, lead and beryllium) within the Made Ground.

Therefore, some limited remediation will be required in garden areas and soft landscaped areas of the proposed development, but this should be limited to a minimum thickness of clean cover. To this end a Remediation Method Statement (RMS) should be prepared as required by Part C of Condition 6 relating to contamination (ref: 22/01840/FP).

In addition to a RMS, a validation report will be required to show what remediation has taken place at site, what validation sampling has been undertaken and where, and validation of any imported topsoil's for residential or communal garden areas.

This report should be submitted to the Local Authority as suitable evidence to discharge Part B of Condition 6, relating to contamination.

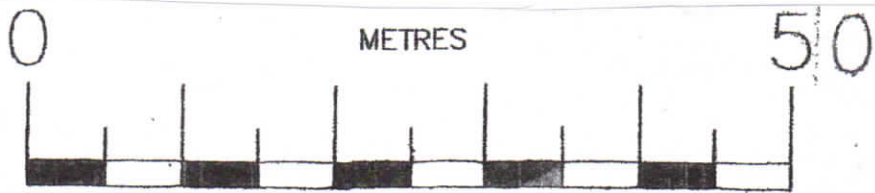
APPENDICES

- A. PLANS & FIGURES**
- B. EXPLORATORY HOLE RECORDS**
- C. SITE WORK RECORDS**
- D. RESULTS OF LABORATORY ANALYSIS**
- E. SOIL ASSESSMENT CRITERIA & GENERIC RISK ASSESSMENT**

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A. PLANS & FIGURES

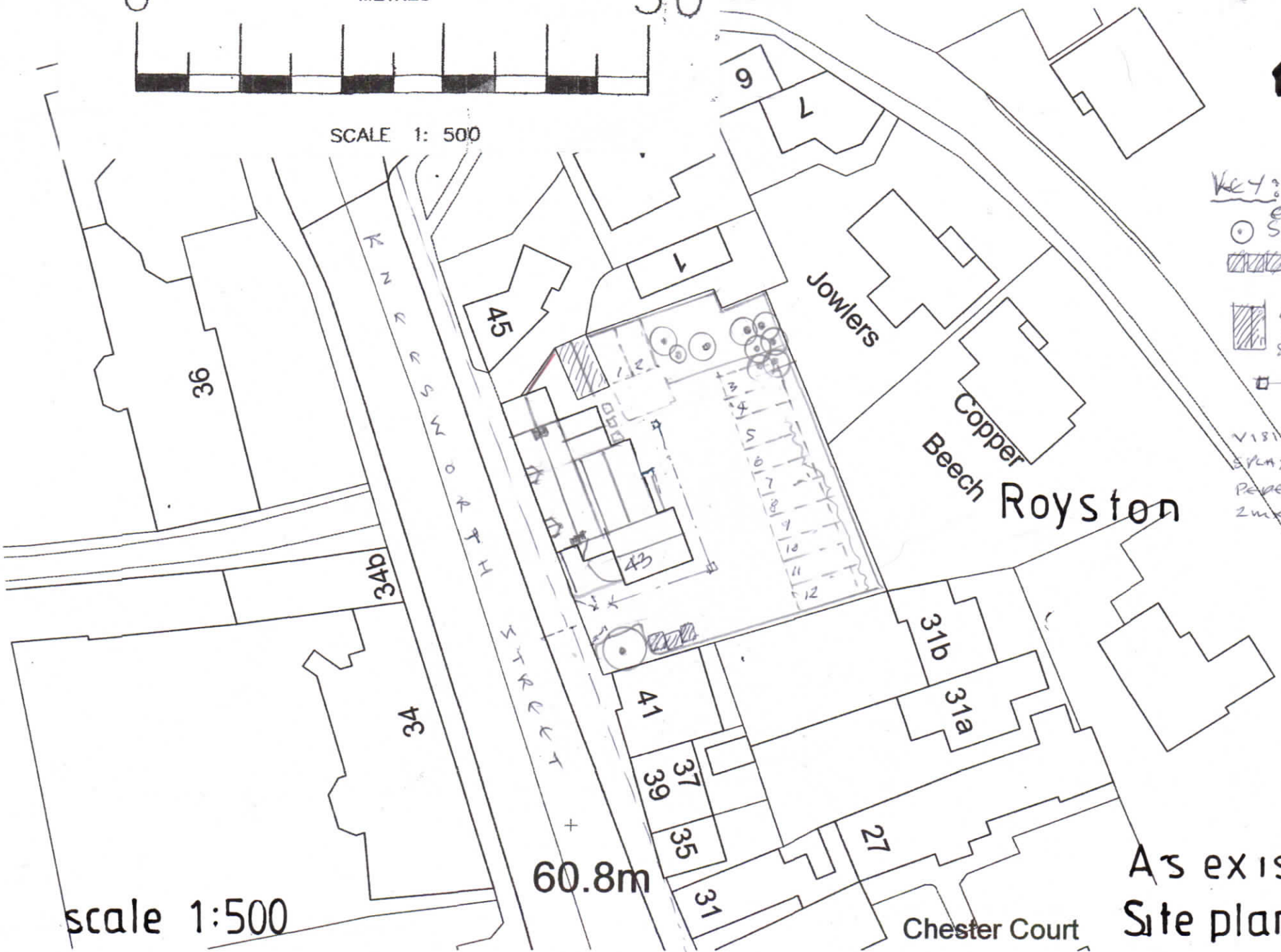
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SCALE 1: 500



- Key:
- EXISTING SYCAMOVES
 - WASTE STORAGE BINS
 - EXISTING CYCLE SHED PROVISION
 - FOUL DRAIN
 - VISIBILITY (VEHICLE) SPLAYS 2.4m x 12m
 - PEDESTRIAN SPLAYS 2m x 2m



scale 1:500

60.8m

Chester Court

As existing
Site plan S1



LEGEND

-  Site Boundary
-  Trial Pit

Originator	AK	THE SYCAMORES, ROYSTON CON288-ROYS-001
Checked & Approved	WGG	EXPLORATORY HOLE LOCATION PLAN



B. EXPLORATORY HOLE RECORDS

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KEY TO EXPLORATORY HOLE RECORDS

Samples

D	Small Disturbed Sample
B	Bulk Disturbed Sample
ES	Environmental Sample (Tub, jar and vial)
U	Undisturbed Sample (100mm nominal diameter) with Number of Blows to Achieve 450mm Penetration
UT	Undisturbed Thin Walled Sample (100mm nominal diameter)
U38	Hand Driven 'Undisturbed' Sample (38mm nominal diameter)
P	Undisturbed Piston Sample
W	Water Sample
ICBR	Insitu California Bearing Ration Sample
*	Denotes No Sample Recovery

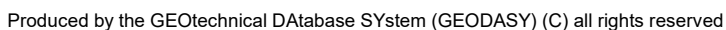
Tests

S	Standard Penetration Test (using spoon)
C	Standard Penetration Test (using cone)
N	SPT/CPT 'N' Value (number of blows for full 300mm penetration) 50/225 Number of Blows/Total Penetration (mm) for SPT/CPT 25/25SP As Above for Seating Drive Only
Vh	Insitu Hand Vane Test (kPa)
m	Insitu CBR Test using MexeProbe
V	Insitu Field Vane Test (kPa)
pp	Pocket Penetrometer (kg/cm ²)
ppm	Total Volatile Organic Compound (parts per million)

Observations, Backfill & Installations

	Groundwater Strike (depth shown in metres below ground level)
	Gravel Backfill
	Bentonite Backfill
	Arising Backfill
	Concrete Backfill
	Plain Pipe
	Slotted Pipe

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 Stansted Environmental Services Limited The Stansted Centre, Parsonage Road Takeley, Essex, CM22 5PU					Site The Sycamores, 43 Kneesworth Street, Royston, SG8 5AB		Trial Pit Number TP02			
Machine : Had digging tools Method : Trial Pit		Dimensions 0.30m x 0.30m		Ground Level (mOD)		Client Unbuttoned Ltd		Job Number CON288-ROYS-001		
		Location See Location Plan		Dates 04/07/2025		Project Contractor Stansted Environmental Services Ltd		Sheet 1/1		
Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water		
0.30	ES1				(0.10)	MADE GROUND (Light brown sandy angular to subrounded fine to coarse GRAVEL.)	    			
					0.10					
					0.15	TARMAC				
					(0.40)	MADE GROUND (Light brown gravelly slightly silty fine to coarse SAND. Gravel is angular to subrounded fine to coarse flint)				
					0.55	Rare roots and rootlets up to 10mm in diameter encountered to a depth of 0.30m bgl.				
			(0.24)	A layered brick structure was encountered between 0.34m and 0.45m bgl during trial pit excavation.						
				0.79	Possible structured CHALK recovered as structureless composed of slightly gravelly sandy SILT. Gravel is angular to subangular fine to coarse chalk. Gravel is white very weak to weak, medium density. (Grade Dm) [HOLYWELL NODULAR CHALK FORMATION]					
						Complete at 0.79m				
Plan • • • • • • • • • •					Remarks Location CAT scanned prior excavation. Groundwater not encountered. Sample was screened using a PID. A concentration of 0.00ppm was recorded. After taking the sample, to assist with the excavation, approximately 1L of water was poured into the trial pit. Trial pit backfilled with arisings after completion.					
					Scale (approx) 1:25		Logged By AK		Figure No. B2	

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C. SITE WORK RECORDS

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TP01

Originator	AK	THE SYCAMORES, ROYSTON CON288-ROYS-001	
Checked & Approved	WGG		

THE SYCAMORES, ROYSTON
CON288-ROYS-001

TRIAL PIT PHOTOGRAPHS



Originator

AK

Checked & Approved

WGG



Base of TP01

Originator	AK	THE SYCAMORES, ROYSTON CON288-ROYS-001	
Checked & Approved	WGG		

THE SYCAMORES, ROYSTON
CON288-ROYS-001

TRIAL PIT PHOTOGRAPHS





TP02

Originator	AK	THE SYCAMORES, ROYSTON CON288-ROYS-001	
Checked & Approved	WGG	TRIAL PIT PHOTOGRAPHS	



Base of TP02

THE SYCAMORES, ROYSTON
CON288-ROYS-001

TRIAL PIT PHOTOGRAPHS

Originator

AK

Checked
&
Approved

WGG



04/07/2025



TP03

Originator	AK	THE SYCAMORES, ROYSTON CON288-ROYS-001	
Checked & Approved	WGG	TRIAL PIT PHOTOGRAPHS	



Geotextile membrane in TP03

Originator	AK	THE SYCAMORES, ROYSTON CON288-ROYS-001	
Checked & Approved	WGG		

D. RESULTS OF LABORATORY ANALYSIS

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Stansted Environmental Services Ltd
The Stansted Centre
Parsonage Road
Takeley
Bishop's Stratford
CM22 6PU

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

Analytical Report Number : 25-0354

Project / Site name:	The Sycamores, Royston	Samples received on:	04/07/2025
Your job number:	CON288 ROYS 001	Samples instructed on/ Analysis started on:	04/07/2025
Your order number:	SES	Analysis completed by:	12/07/2025
Report Issue Number:	1	Report issued on:	14/07/2025
Samples Analysed:	3 soil samples		

Signed:

Anna Goc
PL Head of Reporting Team
For & on behalf of i2 Analytical Ltd.

Standard Geotechnical, Asbestos and Chemical Testing Laboratory located at: ul. Pionierów 39, 41-711 Ruda Śląska, Poland.

Accredited tests are defined within the report, opinions and interpretations expressed herein are outside the scope of accreditation.

Standard sample disposal times, unless otherwise agreed with the laboratory, are :

soils - 4 weeks from reporting
leachates - 2 weeks from reporting
waters - 2 weeks from reporting
asbestos - 6 months from reporting
air - once the analysis is complete

Excel copies of reports are only valid when accompanied by this PDF certificate.

Retention period for records and reports is minimum 6 years from the date of issue of the final report.
Some records may be kept for longer according to other legal/best practice requirements.

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

Analytical Report Number: 25-035423
Project / Site name: The Sycamores, Royston
Your Order No: SES

Lab Sample Number				603894	603895	603896
Sample Reference				TP1	TP2	TP3
Sample Number				ES1	ES1	ES1
Water Matrix				N/A	N/A	N/A
Depth (m)				0.30	0.30	0.35
Date Sampled				04/07/2025	04/07/2025	04/07/2025
Time Taken				None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status			

Stone Content	%	0.1	NONE	10	22.4	< 0.1
Moisture Content	%	0.01	NONE	5.6	8.4	8.9
Total mass of sample received	kg	0.1	NONE	0.6	0.6	0.6

Asbestos

Asbestos in Soil Detected/Not Detected	Type	N/A	ISO 17025	Not-detected	Not-detected	Not-detected
Asbestos Analyst ID	N/A	N/A	N/A	MUA	MUA	MUA
Analysis completed	N/A	N/A	N/A	09/07/2025	09/07/2025	09/07/2025

General Inorganics

pH (L099)	pH Units	N/A	MCERTS	7.4	9.8	8.5
Total Cyanide	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
Water Soluble Sulphate as SO ₄ 16hr extraction (2:1)	mg/kg	2.5	MCERTS	41	370	8.3
Water Soluble SO ₄ 16hr extraction (2:1 Leachate Equivalent)	mg/l	1.25	MCERTS	20.3	187	4.15
Organic Matter (automated)	%	0.1	MCERTS	4.6	1.4	1

Total Phenols

Total Phenols (monohydric)	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
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Speciated PAHs

Naphthalene	mg/kg	0.05	MCERTS	0.13	< 0.05	< 0.05
Acenaphthylene	mg/kg	0.05	MCERTS	0.08	< 0.05	< 0.05
Acenaphthene	mg/kg	0.05	MCERTS	0.19	< 0.05	< 0.05
Fluorene	mg/kg	0.05	MCERTS	0.13	< 0.05	< 0.05
Phenanthrene	mg/kg	0.05	MCERTS	1.1	0.23	< 0.05
Anthracene	mg/kg	0.05	MCERTS	0.3	0.08	< 0.05
Fluoranthene	mg/kg	0.05	MCERTS	1.7	0.49	0.06
Pyrene	mg/kg	0.05	MCERTS	1.6	0.57	0.06
Benzo(a)anthracene	mg/kg	0.05	MCERTS	0.62	< 0.05	< 0.05
Chrysene	mg/kg	0.05	MCERTS	0.65	0.29	< 0.05
Benzo(b)fluoranthene	mg/kg	0.05	ISO 17025	0.86	0.59	< 0.05
Benzo(k)fluoranthene	mg/kg	0.05	ISO 17025	0.39	0.18	< 0.05
Benzo(a)pyrene	mg/kg	0.05	MCERTS	0.74	0.49	< 0.05
Indeno(1,2,3-cd)pyrene	mg/kg	0.05	MCERTS	0.44	0.33	< 0.05
Dibenz(a,h)anthracene	mg/kg	0.05	MCERTS	0.1	< 0.05	< 0.05
Benzo(ghi)perylene	mg/kg	0.05	MCERTS	0.55	0.48	< 0.05

Total PAH

Speciated Total EPA-16 PAHs	mg/kg	0.8	ISO 17025	9.51	3.74	< 0.80
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Analytical Report Number: 25-035423
Project / Site name: The Sycamores, Royston
Your Order No: SES

Lab Sample Number	603894	603895	603896
Sample Reference	TP1	TP2	TP3
Sample Number	ES1	ES1	ES1
Water Matrix	N/A	N/A	N/A
Depth (m)	0.30	0.30	0.35
Date Sampled	04/07/2025	04/07/2025	04/07/2025
Time Taken	None Supplied	None Supplied	None Supplied
Analytical Parameter (Soil Analysis)	Units	Test Limit of detection	Test Accreditation Status

Heavy Metals / Metalloids

Arsenic (aqua regia extractable)	mg/kg	1	MCERTS	91	190	8.1
Beryllium (aqua regia extractable)	mg/kg	0.06	MCERTS	7.3	1.3	0.28
Boron (water soluble)	mg/kg	0.2	MCERTS	1.6	0.8	0.7
Cadmium (aqua regia extractable)	mg/kg	0.2	MCERTS	0.8	0.5	< 0.2
Chromium (hexavalent)	mg/kg	1.8	MCERTS	< 1.8	< 1.8	< 1.8
Chromium (aqua regia extractable)	mg/kg	1	MCERTS	33	29	7.3
Copper (aqua regia extractable)	mg/kg	1	MCERTS	130	37	14
Lead (aqua regia extractable)	mg/kg	1	MCERTS	390	51	20
Mercury (aqua regia extractable)	mg/kg	0.3	MCERTS	< 0.3	< 0.3	0.3
Nickel (aqua regia extractable)	mg/kg	1	MCERTS	71	79	7.3
Selenium (aqua regia extractable)	mg/kg	1	MCERTS	3.3	2.9	< 1.0
Vanadium (aqua regia extractable)	mg/kg	1	MCERTS	94	69	12
Zinc (aqua regia extractable)	mg/kg	1	MCERTS	460	160	27

Petroleum Hydrocarbons

TPHCWG - Aliphatic >EC5 - EC6 _{HS,1D,AL}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC6 - EC8 _{HS,1D,AL}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC8 - EC10 _{HS,1D,AL}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aliphatic >EC10 - EC12 _{EH,CU,1D,AL}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPHCWG - Aliphatic >EC12 - EC16 _{EH,CU,1D,AL}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPHCWG - Aliphatic >EC16 - EC21 _{EH,CU,1D,AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC21 - EC35 _{EH,CU,1D,AL}	mg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
TPHCWG - Aliphatic >EC5 - EC35 _{EH,CU+HS,1D,AL}	mg/kg	10	NONE	< 10	< 10	< 10

TPHCWG - Aromatic >EC5 - EC7 _{HS,1D,AR}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC7 - EC8 _{HS,1D,AR}	mg/kg	0.01	MCERTS	< 0.010	< 0.010	< 0.010
TPHCWG - Aromatic >EC8 - EC10 _{HS,1D,AR}	mg/kg	0.02	MCERTS	< 0.020	< 0.020	< 0.020
TPHCWG - Aromatic >EC10 - EC12 _{EH,CU,1D,AR}	mg/kg	1	MCERTS	< 1.0	< 1.0	< 1.0
TPHCWG - Aromatic >EC12 - EC16 _{EH,CU,1D,AR}	mg/kg	2	MCERTS	< 2.0	< 2.0	< 2.0
TPHCWG - Aromatic >EC16 - EC21 _{EH,CU,1D,AR}	mg/kg	10	MCERTS	< 10	< 10	< 10
TPHCWG - Aromatic >EC21 - EC35 _{EH,CU,1D,AR}	mg/kg	10	MCERTS	< 10	< 10	< 10
TPHCWG - Aromatic >EC5 - EC35 _{EH,CU+HS,1D,AR}	mg/kg	10	NONE	< 10	< 10	< 10

VOCs

MTBE (Methyl Tertiary Butyl Ether)	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Benzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Toluene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
Ethylbenzene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0
p & m-Xylene	µg/kg	8	MCERTS	< 8.0	< 8.0	< 8.0
o-Xylene	µg/kg	5	MCERTS	< 5.0	< 5.0	< 5.0

U/S = Unsuitable Sample I/S = Insufficient Sample ND = Not detected

Analytical Report Number : 25-035423

Project / Site name: The Sycamores, Royston

* These descriptions are only intended to act as a cross check if sample identities are questioned. The major constituent of the sample is intended to act with respect to MCERTS validation. The laboratory is accredited for sand, clay and loam (MCERTS) soil types. Data for unaccredited types of solid should be interpreted with care.

Stone content of a sample is calculated as the % weight of the stones not passing a 10 mm sieve. Results are not corrected for stone content.

Lab Sample Number	Sample Reference	Sample Number	Depth (m)	Sample Description *
603894	TP1	ES1	0.3	Brown loam with gravel and stones
603895	TP2	ES1	0.3	Brown loam with gravel and stones
603896	TP3	ES1	0.35	Brown loam and clay with gravel and vegetation

Analytical Report Number : 25-035423

Project / Site name: The Sycamores, Royston

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)

Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Asbestos identification in Soil	Asbestos Identification with the use of polarised light microscopy in conjunction with dispersion staining techniques	In-house method based on HSG 248, 2021	A001B	D	ISO 17025
Organic matter (Automated) in soil	Determination of organic matter in soil by oxidising with potassium dichromate followed by titration with iron (II) sulphate (Walkley Black Method)	In-house method	L009B	D	MCERTS
Moisture Content	Moisture content, determined gravimetrically (up to 30°C)	In-house method	L019B	W	NONE
Stones content of soil	Standard preparation for all samples unless otherwise detailed. Gravimetric determination of stone > 10 mm as % dry weight	In-house method based on British Standard Methods and MCERTS requirements.	L019B	D	NONE
Metals in soil by ICP-OES	Determination of metals in soil by aqua-regia digestion followed by ICP-OES	In-house method based on MEWAM 2006 Methods for the Determination of Metals in Soil	L038B	D	MCERTS
Boron, water soluble, in soil	Determination of water soluble boron in soil by hot water extract followed by ICP-OES	In-house method based on Second Site Properties version 3	L038B	D	MCERTS
Sulphate, water soluble, in soil (16hr extraction)	Sulphate, water soluble, in soil (16hr extraction)	In-house method	L038B	D	MCERTS
Speciated PAHs and/or Semi-volatile organic compounds in soil	Determination of semi-volatile organic compounds (including PAH) in soil by extraction in dichloromethane and hexane followed by GC-MS	In-house method based on USEPA 8270	L064B	D	MCERTS
BTEX and/or Volatile organic compounds in soil	Determination of volatile organic compounds in soil by headspace GC-MS	In-house method based on USEPA 8260	L073B	W	MCERTS
Total petroleum hydrocarbons with carbon banding by GC-FID/GC-MS HS in soil	Determination of total petroleum hydrocarbons in soil by GC-FID/GC-MS HS with carbon banding aliphatic and aromatic	In-house method	L076B/L088-PL	D/W	MCERTS
Hexavalent chromium in soil	Determination of hexavalent chromium in soil by extraction in NaOH and addition of 1,5 diphenylcarbazide followed by colorimetry	In-house method	L080-PL	W	MCERTS
Monohydric phenols in soil	Determination of phenols in soil by extraction with sodium hydroxide followed by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
Total cyanide in soil	Determination of total cyanide by distillation followed by colorimetry	In-house method based on Examination of Water and Wastewater 20th Edition: Clesceri, Greenberg & Eaton	L080-PL	W	MCERTS
pH in soil (automated)	Determination of pH in soil by addition of water followed by automated electrometric measurement	In-house method	L099-PL	D	MCERTS

Analytical Report Number : 25-035423
Project / Site name: The Sycamores, Royston

Water matrix abbreviations:

Surface Water (SW) Potable Water (PW) Ground Water (GW) Process Waters Heating/Cooling (PrW) DI Process Water (DI PrW)

Final Sewage Effluent (FSE) Landfill Leachate (LL)

Analytical Test Name	Analytical Method Description	Analytical Method Reference	Method number	Wet / Dry Analysis	Accreditation Status
Soil Descriptions	Textural classification	In-house method	L019B	W	NONE

For method numbers ending in 'UK' or 'A' analysis have been carried out in our laboratory in the United Kingdom (Watford).

For method numbers ending in 'F' analysis have been carried out in our laboratory in the United Kingdom (East Kilbride).

For method numbers ending in 'PL' or 'B' analysis have been carried out in our laboratory in Poland.

Soil analytical results are expressed on a dry weight basis. Where analysis is carried out on as-received the results obtained are multiplied by a moisture correction factor that is determined gravimetrically using the moisture content which is carried out at a maximum of 30°C.

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

Quality control parameter failure associated with individual result applies to calculated sum of individuals.

The result for sum should be interpreted with caution

Analytical Report Number : 25-035423

Project / Site name: The Sycamores, Royston

This deviation report indicates the sample and test deviations that apply to the samples submitted for analysis. Please note that the associated result(s) may be unreliable and should be interpreted with care.

Key: a - No sampling date b - Incorrect container/Insufficient material provided c - Holding time d - Headspace e - Temperature

Sample ID	Other ID	Sample Type	Lab Sample Number	Sample Deviation	Test Name	Test Ref	Test Deviation
TP1	ES1	S	603894	b	Asbestos identification in Soil	A001B	b
TP2	ES1	S	603895	b	Asbestos identification in Soil	A001B	b
TP3	ES1	S	603896	b	Asbestos identification in Soil	A001B	b

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E. ASSESSMENT CRITERIA & GENERIC RISK ASSESSMENT

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Assessment Criteria

The Contaminated Land Regime reflects the UK Government's stated objectives of achieving sustainable development through the 'suitable for use approach'.

Contaminated Land Exposure Assessment Model (CLEA)

Current United Kingdom risk assessment practice is based on the Contaminated Land Exposure Assessment model (CLEA) which comprises the following documents:

1. EA Science Report SC050021/SR2: Human health toxicological assessment of contaminants in soil
2. EA Science Report SC050021/SR3: Updated technical background to the CLEA Model
3. EA CLEA Bulletin (2009)
4. CLEA Software version 1.06 (2009)
5. Toxicological reports and SGV technical notes

The CLEA guidance and tools:

- Do not cover other types of risk to humans, such as fire, suffocation or explosion, or short-term and acute exposures.
- Do not cover risks to the environment, such as groundwater, ecosystems or buildings.
- Do not provide a definitive test for telling when human health risks are significant.
- Are not a legal requirement in assessing land contamination risks. They are not part of the legal regime for Part 2A of the Environmental Protection Act 1990.

The CLEA guidance derives soil concentrations of contaminants above which (in the opinion of the EA) there may be a concern that warrants further investigation. It does not provide a definitive test for establishing that the risk is significant.

Land-use Scenarios

The CLEA model uses a range of standard land-use scenarios to develop conceptual exposure models as follows:

Residential (with home grown produce) (RwHP): Generic scenario assumes a typical two-storey house built on a ground bearing slab with a private garden having a lawn, flowerbeds and a small fruit and vegetable patch. In this scenario the critical receptor is a young female child (<6 years old); the exposure duration is 6 years; exposure pathways include direct soil and dust ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and indoor dust and inhalation of indoor dust and vapours; building type is a two storey house. A subset of this land-use is residential apartments with communal landscape gardens where the consumption of homegrown vegetables will not occur (***Residential without Homegrown Produce – RwoHP***).

Allotments: Provision of open space (about 250sq.m) commonly made available to tenants by the local authority to grow fruit and vegetable for their own consumption. Typically, there are a number of plots to a site which may have a total area of up to 1 hectare. The tenants are assumed to be adults and that young children make occasional accompanied visits. Although some allotment holders may choose to keep animals including rabbits, hens, and ducks, potential exposure to contaminated meat and eggs is not considered. In this scenario the critical receptor is a young female child (<6 years old); the exposure duration is 6 years; exposure pathways include direct soil ingestion, consumption of homegrown produce and any adhering soil, skin contact with soils and inhalation of outdoor dust and vapours; there is no building.

Commercial/Industrial: The generic scenario assumes a typical commercial or light industrial property comprising a three-storey building at which employees spend most time indoors and are involved in office-based or relatively light physical work. In this scenario the critical receptor is a working female adult (between 16 to 65 years old); the exposure duration is a working lifetime of 49 years; exposure pathways include direct soil and indoor ingestion, skin contact with soils and dusts and inhalation of dust and vapours; building type is pre1970s three storey office block.

LQM/CIEH Suitable for Use Levels (S4ULs)

The LQM/CIEH proposed additional land-use scenarios. The LQM/CIEH S4UL for a given land use is the concentration of the contaminant in soil at which the predicted daily exposure, as calculated by the CLEA software, equals the Health Criteria Value. The final output for each contaminant represents a synthesis of new toxicological (and fate and transport) reviews published since the preparation of the 2nd edition LQM/CIEH GAC's (Nathanial et al., 2009).

In the derivation of LQM/CIEH S4UL's the principles of 'minimal' or 'tolerable' risk enshrined in SR2, which has not been withdrawn, has been maintained. S4UL's have been derived for the basic CLEA land-uses, as described above, and for two new land uses:

Public Open Spaces near Residential Housing (POS_{resi}): This includes the predominantly grassed areas adjacent to high density housing, the central green area on many 1930's – 1970's housing estates, and smaller areas commonly incorporated in newer developments as informal grassed areas or more formal landscaped areas with a mixture of open space and covered soils with planting. It is assumed that the close proximity to the place of residence will allow tracking back of soil to occur.

Public Park (POS_{park}): This is an area of open space, usually owned and maintained by the local authority, provided for recreational uses including family visits and picnics, children's play area, informal sporting activities (not a dedicated sports pitch), and dog walking. It is assumed that tracking back of soils into places of residence will be negligible.

Further details are contained in:

- Nathaniel, P., McCaffrey, C., Gillet, A., Ogden, R., Nathaniel, J. The LQM/CIEH S4UL's for Human Health Risk Assessment. Land Quality Press. 2015

Category 4 Screening Levels (C4SLs)

In the case of Lead, no SGV or GAC has been published to date. This is likely to be due to the toxicity review that is being undertaken by the Environment Agency. In the absence of updated toxicity information the SGV derived using CLEA 1.06 methodology and related toxicity will be used.

The overall objective of the C4SLs research project was to assist the provision of technical guidance in support of DEFRA's revised Statutory Guidance for Part 2A of the Environmental Protection Act 1990 (Part 2A) (Defra, 2012a). Specifically, the project aimed to deliver:

- A methodology for deriving C4SLs for four generic land-uses comprising residential, commercial, allotments and public open space; and
- A demonstration of the methodology, via the derivation of C4SLs for six substances – arsenic, benzene, benzo(a)pyrene, cadmium, chromium (VI) and lead.

To help achieve a more targeted approach to identifying and managing contaminated land in relation to the risk (or possibility) of harm to human health, the revised Statutory Guidance presented a new four category system for considering land under Part 2A, ranging from Category 4, where there is no risk that land poses a significant possibility of significant harm (SPOSH), or the level of risk is low, to Category 1, where the risk that land poses a significant possibility of significant harm (SPOSH) is unacceptably high. More specific guidance on what type of land should be considered as Category 4 (Human Health) is provided in Paragraphs 4.21 and 4.22 of the revised guidance, as follows:

“4.21 The local authority should consider that the following types of land should be placed into Category 4: Human Health:

- (a) Land where no relevant contaminant linkage has been established.*
- (b) Land where there are only normal levels of contaminants in soil, as explained in Section 3 of this Guidance.*
- (c) Land that has been excluded from the need for further inspection and assessment because contaminant levels do not exceed relevant generic assessment criteria in accordance with Section 3 of this Guidance, or relevant technical tools or advice that may be developed in accordance with paragraph 3.30 of this Guidance.*
- (d) Land where estimated levels of exposure to contaminants in soil are likely to form only a small proportion of what a receptor might be exposed to anyway through other sources of environmental exposure (e.g. in relation to average estimated national levels of exposure to substances commonly found in the environment, to which receptors are likely to be exposed in the normal course of their lives).*

4.22 The local authority may consider that land other than the types described in paragraph 4.21 should be placed into Category 4: Human Health if following a detailed quantitative risk assessment it is satisfied that the level of risk posed is sufficiently low.”

The C4SLs are intended as “relevant technical tools” (in relation to Paragraph 4.21(c)) to help local authorities and others when deciding to stop further assessment of a site, on the grounds that it falls within Category 4 (Human Health).

The Impact Assessment (IA), which accompanied the revised guidance (Defra, 2012b) provides further information on the nature and potential role of the C4SLs. Paragraph 47(h) of the IA states that:

“The new statutory guidance will bring about a situation where the current SGVs/GACs are replaced with more pragmatic (but still strongly precautionary) Category 4 screening levels (C4SLs) which will provide a higher simple test for deciding that land is suitable for use and definitely not contaminated land.”

A key distinction between the Soil Guideline Values (SGVs) and the C4SLs is the level of risk that they describe. As described by the Environment Agency (2009a):

“SGVs are guidelines on the level of long-term human exposure to individual chemicals in soil that, unless stated otherwise, are tolerable or pose a minimal risk to human health.”

The implication of Paragraph 47(h) of the IA is that minimal risk is well within Category 4 and that the C4SLs should describe a higher level of risk which, whilst not minimal, can still be considered low enough to allow a judgement to be made that land containing substances at, or below, the C4SLs would typically fall within Category 4. This reflects Paragraph 4.20 of the revised SG, which states:

“4.20 The local authority should not assume that land poses a significant possibility of significant harm if it considers that there is no risk or that the level of risk posed is low. For the purposes of this Guidance, such land is referred to as a “Category 4: Human Health” case. The authority may decide that the land is a Category 4: Human Health case as soon as it considers it has evidence to this effect, and this may happen at any stage during risk assessment including the early stages.”

C4SLs, therefore, should not be viewed as “SPOSH levels” and they should not be used as a legal trigger for the determination of land under Part 2A.

The generic screening values referred to before usually take the form of risk based Soil Guideline Values (SGVs) or other Generic Assessment Criteria (GACs) that are most typically derived using the Environment Agency's Contaminated Land Exposure Assessment (CLEA) model, as described in the Environment Agency's SR2, SR3 and SR7 reports (EA, 2009b & c; EA, 2008). It is anticipated that C4SLs will be used in a similar manner; as generic screening criteria that can be used within a GQRA, albeit describing a higher level of risk than the SGVs.

The suggested approach to the development of C4SLs consists of the retention and use of the CLEA framework, modified according to considerations of the underlying science within

the context of DEFRA's policy objectives relating to the revised Statutory Guidance. Within this context, it is suggested that the development of C4SLs may be achieved in one of three ways, namely:

- By modifying the toxicological parameters used within CLEA (while maintaining current exposure parameters);
- By modifying the exposure parameters embedded within CLEA (while maintaining current toxicological "minimal risk" interpretations); and
- By modifying both toxicological and exposure parameters.

There is also a suggested check on "other considerations" (e.g., background levels, epidemiological data, sources of uncertainty) within the approach, applicable to all three options.

It is suggested that a new term is defined for the toxicological guidance values associated with the derivation of C4SLs – a Low Level of Toxicological Concern (LLTC). A LLTC should represent an intake of low concern that remains suitably protective of health, and definitely does not approach an intake level that could be defined as SPOSH.

CL:AIRE Generic Risk Assessment (GAC)

For derivation of the CL:AIRE Generic Assessment Criteria (GAC) reference should be made to the following report:

- CL:AIRE: The Soil Generic Assessment Criteria for Human Health Risk Assessment. Contaminated Land: Applications in the Real Environment. 2009.

Within this report CL:AIRE provided Generic Assessment Criteria (GAC's) in accordance with the CLEA software and the principles outlined above for a further 35 contaminants sometime encountered on land affected by contamination.

Detailed Quantitative Risk Assessments (DQRA)

Where the adoption of an S4UL/GAC/C4SL is not appropriate, for instance when the intended land-use is at variance the CLEA standard land-uses then a DQRA may be undertaken to develop site specific values for relevant soil contaminants.

- Establishing the plausibility that generic exposure pathways exist in practice by measurement and observation.
- Developing more accurate parameters using data.

Phytotoxicity

CLEA guidance only addresses human health toxicity; assessment of plant toxicity (phytotoxicity) is based on threshold trigger values obtained from the following source:

- ICRCCL 70/90: Notes on the restoration and aftercare of metalliferous mining sites for pasture and grazing.

Statistical Tests

DEFRA R&D Publication CLR 7 (DOE 1994) addressed the statistical treatment of test results and their comparison to Soil Guideline Values.

Consideration must be given to the appropriate area of land to be considered termed the critical averaging area.

For a communal open space or commercial land-use, the critical averaging area will depend on the proposed layout. For a residential use with private gardens the averaging area is the individual plot.

It may be appropriate to compare the upper 95th percentile concentration with the Soil Guideline Value, subject to applying a statistical test to establish that the range of concentrations are reasonably consistent and belonging to the same underlying distribution of data.

The DEFRA discussion paper Assessing risks from land contamination – a proportionate approach ('the way forward') (CLAN06/2006) aimed to increase understanding of the role that statistics can play in quantifying the uncertainty attached to the estimates of the mean concentration of contaminants in soil. In direct response CLAIRE/CIEH published a joint report, *Guidance in comparing soil contamination data with a critical concentration* (CLAIRE/CIEH 2008). A software implementation of the statistical techniques given in the report was published by ESI International (2008).

- A statistical test is applied to establish whether the data is part of a single set, or whether outliers are present.
- Provided that the data is based on random sampling and no distinct contamination source was present at the sampling location, hotspot(s) may be excluded and the mean of the remaining data assessed.

Generic Assessment Criteria

Based on current UK guidance, the Generic Assessment Criteria used in this report are tabulated below:

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
Metals																		
Arsenic	37			40			79			170			640			43		
Beryllium	1.7			1.7			2.2			63			12			35		
Boron	290			11,000			21,000			46,000			240,000			45		
Cadmium	11			85			120			532			190			1.9		
Chromium III	910			910			1,500			33,000			8,600			18,000		
Chromium VI	6.0			6.0			7.7			220			33			1.8		
Copper	2,400			7,100			12,000			44,000			68,000			520		
Lead ¹	200			310			630			1,300			2,330			80		
Mercury (inorganic)	40			56			120			240			1,100			19		
Nickel	180			180			230			3400			980			230		
Selenium	250			430			1,100			1,800			12,000			88		
Vanadium	410			1,200			2,000			5,000			9,000			91		
Zinc	3,700			40,000			81,000			170,000			730,000			620		
PolyAromatic Hydrocarbons (PAH)																		
Naphthalene	2.3	5.6	13	2.3	5.6	13	4,900	4,900	4,900	1,200 (76.4) ²	1,900 (183) ²	3,000	190 (76.4) ²	460 (183) ²	1,100 (432) ²	4.1	10	24
Acenaphthylene	170	420	920	2,900 (86) ²	4,600 (212) ²	6,000 (506) ²	15,000	15,000	15,000	29,000	30,000	30,000	83,000 (86) ²	97,000 (212) ²	100,000	34	85	200
Acenaphthene	210	510	1100	3,000 (57) ²	4,700 (141) ²	6,000 (336) ²	15,000	15,000	15,000	29,000	30,000	30,000	84,000 (57) ²	97,000 (141) ²	100,000	28	69	160
Fluorene	170	400	860	2,800 (30) ²	3,800 (76) ²	4,500 (183) ²	9,900	9,900	9,900	20,000	20,000	20,000	63,000 (30) ²	68,000	71,000	27	67	160
Phenanthrene	95	220	440	1,300 (36) ²	1,500	1,500	3,100	3,100	3,100	6,200	6,200	6,300	22,000	22,000	23,000	15	38	90
Anthracene	2,400	5,400	11,000	31,000 (1.17) ³	35,000	37,000	74,000	74,000	74,000	150,000	150,000	150,000	52,000	54,000	54,000	380	950	2,200
Fluoranthene	280	560	890	1,500	1,600	1,600	3,100	3,100	3,100	6,300	6,300	6,400	23,000	23,000	23,000	52	130	290
Pyrene	620	1,200	2,000	3,700	3,800	3,800	7,400	7,400	7,400	15,000	15,000	15,000	54,000	54,000	54,000	110	270	620
Benz(a)anthracene	7.2	11	13	11	14	15	29	29	29	49	56	62	170	170	180	0.97	2.0	3.5
Chrysene	15	22	27	30	31	32	57	57	57	93	110	120	350	350	350	4.1	9.4	19
Benzo(b)fluoranthene	2.6	3.3	3.7	3.9	4.0	4.0	7.1	7.2	7.2	13	15	16	44	44	45	0.99	2.1	3.9

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
Benzo(k)fluoranthene	77	93	100	110	110	110	190	190	190	370	410	440	1,200	1,200	1,200	37	75	130
Benzo(a)pyrene	2.2	2.7	3.0	3.2	3.2	3.2	5.7	5.7	5.7	11	12	13	35	35	36	0.97	2.0	3.5
Indeno(123-cd)pyrene	27	36	41	45	46	46	82	82	82	150	170	180	500	510	510	9.5	21	39
Dibenzo(ah)anthracene	0.24	0.28	0.30	0.31	0.32	0.32	0.57	0.57	0.58	1.1	1.3	1.4	3.5	3.6	3.6	0.14	0.27	0.43
Benzo(ghi)perylene	320	340	350	360	360	360	640	640	640	1,400	1,500	1,600	3,900	4,000	4,000	290	470	640
Coal Tar (BaP as surrogate marker)	0.79	0.98	1.1	1.2	1.2	1.2	2.2	2.2	2.2	4.4	4.7	4.8	15	15	15	0.32	0.67	1.2

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
Total Petroleum Hydrocarbons (TPH)																		
Aliphatic C5-C6	42	78	160	42	78	160	570,000 (304) ²	590,000	600,000	95,000 (304) ²	130,000 (558) ²	180,000 (1,150) ²	3,200 (304) ²	5,900 (558) ²	12,000 (1,150) ²	730	1,700	3,900
Aromatic C5-C7 (ben)	70	140	300	370	690	1,400	56,000	56,000	56,000	76,000 (1,220) ²	84,000 (2,260) ²	92,000 (4,710) ²	26,000 (1,220) ²	46,000 (2,260) ²	86,000 (4,710) ²	13	27	57
Aliphatic C6-C8	100	230	530	100	230	530	600,000	610,000	620,000	150,000 (144) ²	220,000 (322) ²	320,000 (736) ²	7,800 (144) ²	17,000 (322) ²	40,000 (736) ²	2,300	5,600	13,000
Aromatic C7-C8 (tol)	130	290	660	860	1,800	3,900	56,000	56,000	56,000	87,000 (869) ²	95,000 (1,920) ²	100,000 (4,360) ³	56,000 (869) ³	110,000 (1,920) ²	180,000 (4,360) ³	22	51	120
Aliphatic C8-C10	27	65	150	27	65	150	13,000	13,000	13,000	14,000 (78) ²	18,000 (190) ³	21,000 (451) ³	2,000 (78) ²	4,800 (190) ³	11,000 (451) ³	320	770	1,700
Aromatic C8-C10	34	83	190	47	110	270	5,000	5,000	5,000	7,200 (613) ³	8,500 (1500) ³	9,300 (3580) ³	3,500 (613) ³	8,100 (1500) ³	17,000 (3580) ³	8.6	21	51
Aliphatic C10-C12	130 (48) ³	330 (118) ³	760 (283) ³	130 (48) ³	330 (118) ³	770 (283) ³	13,000	13,000	13,000	21,000 (48) ²	23,000 (118) ³	24,000 (283) ³	9,700 (48) ²	23,000 (118) ³	47,000 (283) ³	2,200	4,400	7,300
Aromatic C10-C12	74	180	380	250	590	1,200	5,000	5,000	5,000	9,200 (364) ²	9,700 (899) ²	10,000	16,000 (364) ³	28,000 (899) ³	34,000 (2,150) ³	13	31	74
Aliphatic C12-C16	1,100 (24) ²	2,400 (59) ²	4,300 (142) ²	1,100 (24) ²	2,400 (59) ²	4,400 (142) ²	13,000	13,000	13,000	25,000 (24) ²	25,000 (592) ²	26,000 (142) ²	59,000 (24) ²	82,000 (59) ²	90,000 (142) ²	11,000	13,000	13,000
Aromatic C12-C16	140	330	660	1,800	2,300 (419) ²	2,500	5,100	5,100	5,000	10,000	10,000	10,000	36,000 (169) ²	37,000	38,000	23	57	130
Aliphatic C16-C21	65,000 (8.5) ²	92,000 (21) ²	11,0000	65,000 (8.5) ²	92,000 (21) ²	110,000	250,000	250,000	250,000	450,000	480,000	490,000	1,600,000	1,700,000	1,800,000	260,000	270,000	270,000
Aromatic C16-C21	260	540	930	1,900	1,900	1,900	3,800	3,800	3,800	7,600	7,700	7,800	28,000	28,000	28,000	46	110	260

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
Aliphatic C21-C35	65,000 (8.5) ²	92,000 (21) ²	11,0000	65,000 (8.5) ²	92,000 (21) ²	110,000	250,000	250,000	250,000	450,000	480,000	490,000	1,600,000	1,700,000	1,800,000	260,000	270,000	270,000
Aromatic C21-C35	1,100	1,500	1,700	1,900	1,900	1,900	3,800	3,800	3,800	7,800	7,800	7,900	28,000	28,000	28,000	370	820	1,600
Aliphatic C35-C44	65,000 (8.5) ²	92,000 (21) ²	11,0000	65,000 (8.5) ²	92,000 (21) ²	110,000	250,000	250,000	250,000	450,000	480,000	490,000	1,600,000	1,700,000	1,800,000	260,000	270,000	270,000
Aromatic C35-C44	1,100	1,500	1,700	1,900	1,900	1,900	3,800	3,800	3,800	7,800	7,800	7,900	28,000	28,000	28,000	370	820	1,600
Aliphatic & Aromatic >C44	1,600	1,800	1,900	1,900	1,900	1,900	3,800	3,800	3,800	7,800	7,800	7,900	28,000	28,000	28,000	1,200	2,100	3,000

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
Organic Compounds																		
MTBE ⁵	49	84	160	73	120	220							7900	13 000	24 000	23	44	90
Benzene	0.087	0.17	0.37	0.38	0.7	1.4	72	72	73	90	100	110	27	47	90	0.017	0.034	0.075
Toluene	130	290	660	880(869)	1,900	3,900	56,000	56,000	56,000	87,000 (869)	95,000 (1,920)	100,000(4,360)	56,000(869)	110,000(1,920)	180,000(4,360)	22	51	120
Ethyl Benzene	47	110	260	83	190	440	24,000	24,000	25,000	17,000 (518)	22,000 (1,220)	27,000 (2,840)	5,700 (518)	13,000 (1220)	27,000 (2840)	16	39	91
Xylene-m	59	140	320	82	190	450	41,000	42,000	43,000	17,000 (625)	24,000 (1,470)	32,000 (3,460)	6,200 (625)	14,000 (1,470)	31,000 (3,460)	31	74	170
Xylene-o	60	140	330	88	210	480	41,000	42,000	43,000	17,000 (478)	24,000 (1,120)	33,000 (2,620)	6,600 (478)	15,000 (1,120)	33,000 (2,620)	28	67	160
Xylene-p	56	130	310	79	180	430	41,000	42,000	43,000	17,000 (576)	23,000 (1,350)	31,000 (3,170)	5,900 (576)	14,000 (1,350)	30,000 (3,170)	29	69	160
Phenol (monohydric)	280	550	1,100	750	1,300	2,300	760 ⁴	1,500 ⁴	3,200 ⁴	760 ⁴	1,500 ⁴	3,200 ⁴	760 ⁴	1,500 ⁴	3,200 ⁴	66	140	280
Total Cresols ⁵	80	180	400	3700	540	6900							160,000	180,000*	480,000*	12	27	63
Tributyl Tin Oxide (TBTO)	0.5	0.59	1.3	1.4	3.1	5.7							130*	180*	200*	0.042	0.10	0.24
Dioxins & D like PCBs		0.008												0.24			0.008	
PCBs		0.39			0.39									9				
Volatile Organic Compounds (VOC) & SemiVolatile Organic Compounds (SVOC)																		
Chloromethane ⁵	0.0083	0.0098	0.013	0.0085	0.0099	0.013							1.0	1.2	1.6	0.066	0.13	0.23
Chloroethane ⁵	8.3	11	18	8.4	11	18							960	1300	2100	110	200	380
Dichloromethane ⁵	0.58	0.98	1.7	2.1	2.8	4.5							270	360	560	0.10	0.19	0.34
1,1-Dichloroethane ⁵	2.4	3.9	7.4	2.5	4.1	7.7							280	450	850	9.2	17	35
1,2-Dichloroethane (1,2-DCA)	0.0071	0.011	0.019	0.0092	0.013	0.023	29 (300)	29	29	21	24	28	0.67	0.97	1.7	0.0046	0.0083	0.016
1,1 Dichloroethene ⁵	0.23	0.40	0.82	0.23	0.41	0.82							26	46	92	2.8	5.6	12
Cis-1,2-Dichloroethene ⁵	0.11	0.19	0.37	0.12	0.20	0.39							14	24	47	0.26	0.50	1.0
Trans-1,2-Dichloroethene ⁵	0.19	0.34	0.70	0.19	0.35	0.71							22	4	81	0.93	1.9	4.0
1,1,1-Trichloroethane	8.8	18	39	9	18	40	140,000	140,000	140,000	57,000 (1,425) ³	76,000 (2,915) ³	100,000 (6,392) ³	660	1,300	3,000	48	110	240
1,1,2 Trichloroethane ⁵	0.60	1.2	2.7	0.88	1.8	3.9							94	190	400	0.28	0.61	1.4

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
1,1,2,2 Tetrachloroethane	1.6	3.4	7.5	3.9	8	17	1,400	1,400	1,400	1,800	2,100	2,300	270	550	1,100	0.41	0.89	2
1,1,1,2 Tetrachloroethane	1.2	2.8	6.4	1.5	3.5	8.2	1,400	1,400	1,400	1,500	1,800	2,100	110	250	560	0.79	1.9	4.4
Tetrachloroethene (PCE)	0.18	0.39	0.9	0.18	0.4	0.92	1,400	1,400	1,400	810 (424) ²	1,100 (951) ²	1,500	19	42	95	0.65	1.5	3.6
Tetrachloroethane	0.026	0.056	0.13	0.026	0.056	0.13	890	920	950	190	270	400	2.9	6.3	14	0.45	1	2.4
Trichloroethene (TCE)	0.016	0.034	0.075	0.017	0.036	0.08	120	120	120	70	91	120	1.2	2.6	5.7	0.041	0.091	0.21
Trichloromethane	0.91	1.7	3.4	1.2	2.1	4.2	2,500	2,500	2,500	2,600	2,800	3,100	99	170	350	0.42	0.83	1.7
Chloroethene (vinyl chloride)	0.00064	0.00087	0.0014	0.00077	0.001	0.0015	3.5	3.5	3.5	4.8	5	5.4	0.059	0.077	0.12	0.00055	0.001	0.0018
1,2 Dichloropropane ⁵	0.04	0.042	0.084	0.024	0.042	0.085							3.3	5.9	12	0.62	1.2	2.6
Hexachloroethane ⁵	0.20	0.48	1.1	0.22	0.54	1.3							22*	53*	120*	0.27	0.67	1.6
2,4 Dinitrotoluene ⁵	1.5	3.2	7.2	170 ²	170	170							3,700*	3,700*	3,800*	0.22	0.49	1.1
2,6 Dinitrotoluene ⁵	0.78	1.7	3.9	78	84	87							1,900*	1,900*	1,900*	0.12	0.27	0.61
2,4,6 Trinitrotoluene (TNT)	1.6	3.7	8.1	65	66	66	130	130	130	260	270	270	1,000	1,000	1,000	0.24	0.58	1.4
α-Hexachlorocyclohexane	0.23	0.55	1.2	6.9	9.2	11	24	24	24	47	48	48	170	180	180	0.035	0.087	0.21
β-Hexachlorocyclohexane	0.085	0.2	0.46	3.7	3.8	3.8	8.1	8.1	8.1	15	15	16	65	65	65	0.013	0.032	0.077
γ-Hexachlorocyclohexane	0.06	0.14	0.33	2.9	3.3	3.5	8.2	8.2	8.2	14	15	15	67	69	70	0.0092	0.023	0.054
Chlorobenzene	0.46	1.0	2.4	0.46	1	2.4	11,000	13,000	14,000	1,300 (675) ²	2,000 (1520) ²	2,900	56	130	290	5.9	14	32
Styrene ⁵	8.1	19	43	35	78	170							3,300*	6,500*	11,000*	1.6	3.7	8.7
Isopropylbenzene ⁵	11	27	64	12	28	67							1,400*	3,300*	7,700*	32	79	190
Propylbenzene ⁵	35	82	190	40	97	220							4,100*	9,700*	21,000*	34	83	200
1,2-Dichlorobenzene	23	55	130	24	57	130	90,000	95,000	98,000	24,000 (571) ²	36,000 (1,370) ²	51,000 (3,240) ²	2,000 (571) ²	4,800 (1,370) ²	11,000 (3,240) ²	94	230	540
1,3-Dichlorobenzene	0.4	1.0	2.3	0.44	1.1	2.5	300	300	300	390	440	470	30	73	170	0.25	0.6	1.5
1,4-Dichlorobenzene	61	150	350	61	150	350	17,000	17,000	17,000	36,000 (224) ³	36,000 (540) ³	36,000 (1280) ³	4400 (224) ³	10000 (540) ³	25000 (1280) ³	15	37	88
1,2,3-Trichlorobenzene	1.5	3.6	8.6	1.5	3.7	8.8	1,800	1,800	1,800	770 (134) ³	1,100 (330) ³	1,600 (789) ³	102	250	590	4.7	12	28
1,2,4-Trichlorobenzene	2.6	6.4	15	2.6	6.4	15	15,000	17,000	19,000	1,700 (318) ³	2,600 (786) ³	4,000 (1880) ³	220	530	1,300	55	140	320
1,3,5-Trichlorobenzene	0.33	0.81	1.9	0.33	0.81	1.9	1,700	1,700	1,800	380 (36.7) ³	580 (90.8) ³	860 (217) ³	23	55	130	4.7	12	28
1,2,4 Trimethylbenzene ⁵	0.35	0.85	2.0	0.41	0.99	2.3							42	99	220	0.38	0.93	2.2

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
1,2,3,4-Tetrachlorobenzene	15	36	78	24	56	120	830	830	830	1,500 (122) ³	1,600	1,600	1,700 (122) ³	3,080 (304) ³	4,400 (728) ³	4.4	11	26
1,2,3,5-Tetrachlorobenzene	0.66	1.6	3.7	0.75	1.9	4.3	78	79	79	110 (39) ³	120	130	49 (39.4) ³	120 (98.1) ³	240 (235) ³	0.38	0.9	2.2
1,2,4,5-Tetrachlorobenzene	0.33	0.77	1.6	0.73	1.7	3.5	13	13	13	25	26	26	42 (19.7) ²	72 (49.1) ²	96	0.06	0.16	0.37
Pentachlorobenzene	5.8	12	22	19	30	38	100	100	100	190	190	190	640 (43) ²	770 (107) ²	830	1.2	3.1	7
Hexachlorobenzene	1.8 (0.2) ³	3.3 (0.50) ³	4.9	4.1 (0.2) ³	5.7 (0.5) ³	6.7 (1.2) ³	16	16	16	30	30	30	110 (0.2) ³	120	120	0.47	1.1	2.5
Bromobenzene ⁵	0.87	2.0	4.7	0.91	2.1	4.9							97	220	520	3.2	7.6	18
Bromodichloromethane ⁵	.016	0.03	0.061	0.019	0.034	0.07							2.1	6.7	7.6	0.016	0.032	0.068
2-Chloronaphthalene ⁵	3.7	9.2	22	3.8	9.3	22							390*	960*	2200*	40	98	230
2,4-Dimethylphenol ⁵	19	43	97	210	410	730							16000*	24000*	30000*	3.1	7.2	17
Biphenyl ⁵	66 ²	160	360	220 ²	500 ²	980 ²							18,000*	33,000*	48,000*	14	35	83
Chlorophenols	0.87	2	4.5	94	150	210	620	620	620	1,100	1,100	1,100	3,500	4,000	4,300	0.13	0.3	0.7
Pentachlorophenol	0.22	0.52	1.2	27 (16.4) ³	29	31	60	60	60	110	120	120	400	400	400	0.03	0.08	0.19
Carbon Disulphide	0.14	0.29	0.62	0.14	0.29	0.62	11,000	11,000	11,000	1,300	1,900	2,700	11	22	47	4.8	10	23
Hexachlorobutadiene	0.29	0.7	1.6	0.32	0.78	1.8	25	25	25	48	50	51	31	66	120	0.25	0.61	1.4
Dlethylphthalate ⁵	120*	260*	570*	1,800*	3,500*	6,300*							150,000*	220,000*	290,000*	19*	41*	94*
Di-n-butylphthalate ⁵	13*	31*	67*	450*	450*	450*							15,000*	15,000*	15,000*	2.0	5.0	12
Bis-(2-ethylhexyl)-phthalate ⁵	280*	610*	1,100*	2,700*	2,800*	2,800*							85,000*	86,000*	86,000*	47*	120*	280*
Butyl-benzyl-phthalate ⁵	1,400*	3,300*	7,200*	42,000*	44,000*	44,000*							940,000*	940,000*	950,000*	220*	550*	1,300*
Miscellaneous Compounds																		
RDX	120	250	540	13,000	13,000	13,000	26,000	26,000	27,000	49,000 (18.7) ²	51,000	53,000	210,000	210,000	210,000	17	38	85
HMX	5.7	13	26	6,700	6,700	6,700	13,000	13,000	13,000	23,000 (0.35) ³	23,000 (0.39) ³	24,000 (0.48) ³	110,000	110,000	110,000	0.86	1.9	3.9
Aldrin	5.7	5=6.6	7.1	7.3	7.4	7.5	18	18	18	30	31	31	170	170	170	3.2	6.1	9.6
Dieldrin	0.97	2	3.5	7	7.3	7.4	18	18	18	30	30	31	170	170	170	0.17	0.41	0.96
Atrazine	3.3	7.6	17.4	610	620	620	1,200	1,200	1,200	2,300	2,400	2,400	9,300	9,400	9,400	0.5	1.2	2.7

Determinand	Residential with Plant Uptake			Residential without Plant Uptake			POS Residential			POS Park			Commercial			Allotments		
Soil Organic Matter (SOM)	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%	1.0%	2.5%	6.0%
Dichlorvos	0.032	0.066	0.14	6.4	6.5	6.6	16	16	16	26	26	27	140	140	140	0.0049	0.01	0.022
Endosulfan	7.4	18	41	160 (0.003) ³	280 (0.007) ³	410 (0.016) ³	1,200	1,200	1,200	2,400	2,400	2,500	5,600 (0.003) ³	7,400 (0.007) ³	8,400 (0.016) ³	1.2	2.9	6.8
Cyanide (free)	34			34									1400					

NOTES:

GAC based on LQM/CIEH S4UL unless stated and presented as mg/kg

- 1. Based on C4SL
- 2. Figure in brackets represents the soil saturation limit
- 3. Figure in brackets represents the vapour saturation limit
- 4. Figure based represents the GAC based on direct skin contact
- 5. Based on CL:AIRE GAC (asterisk denotes value exceeds the saturation limit)