LK CONSULT LIMITED

PART OF THE LK GROUP

LAND AT ALBERT STREET HADFIELD

GEO-ENVIRONMENTAL INVESTIGATION & RISK ASSESSMENT REPORT



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1 INTRODUCTION

1.1 Background

LK Consult Ltd (LKC) has been commissioned by Valley Construction (NW) Ltd to carry out a Geo-environmental Investigation and Risk Assessment Report for land at Albert Street, Hadfield. The investigation was undertaken in support of a planning application (reference number NMA/2010/0003) to redevelop the site for a residential end use. Information is therefore required on the properties of any potential contaminants that may be present in, on or under the site.

A Preliminary Risk Assessment (PRA) report has previously been undertaken by LKC (Ref: CL-602-CL1957-01, dated 29th May 2012) and summarised in Section 2. This report should be read in conjunction with the PRA report.

1.2 Site Details

The site is located south east of Albert Street in the area of Hadfield and is centred at National Grid Reference 402160E 396380N (Figure 1-1). The site is bounded by residential dwellings to the north, east and west and residential dwellings and small retail units to the south. The site has most recently been used as storage sheds and the outside space for minor body repair work and car sales.

The site is approximately 0.05ha in size (see Figure 1-2). The site is approximately level with an approximate elevation of 159m AOD. The site proposed layout is indicated in Figure 1-3 and comprises two detached bungalows.

1.3 Disclaimer

This report has been prepared by LKC who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant experienced in preparing reports of a similar scope. However, to the extent that the report is based on or relies upon information contained in records, reports or other materials provided to LKC which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is issued on the condition that LKC will not be held liable for any loss arising from ground conditions between sampling points (i.e. boreholes/trial pits/hand augers/surface samples) which have not been shown by the sampling points or related testing carried out during the investigation, nor for any loss arising from conditions below the maximum depth of the investigation. Opinions on such conditions, where given, are for general guidance only.

This report is prepared solely for the benefit of Valley Construction (NW) Ltd. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

Those using this information in subsequent assessments or evaluations do so at their own risk.



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Figure 1-1: Location Plan, Land off Albert Street, Hadfield

Drawn: May 2012 Scale: approx 1:25,000 @ A4

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Figure 1-2: Site Location Plan, Land off Albert Street, Hadfield

Drawn: May 2012 Scale: approx 1:250 @ A4 Source: Planmart (Drawing no. 2269-1F)

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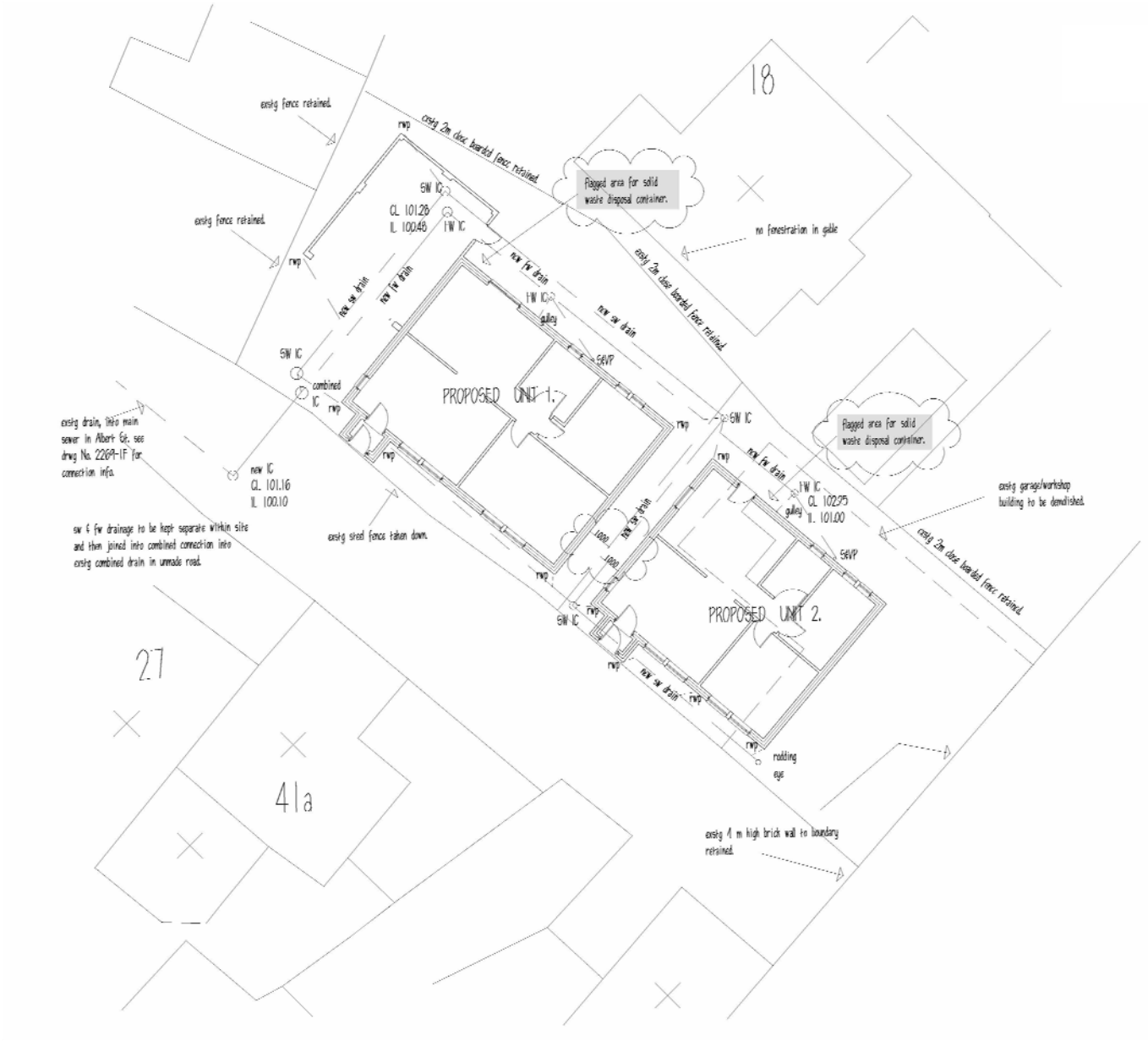

Figure 1-3: Proposed Site Layout, Land off Albert Street, Hadfield

Drawn: May 2012 Scale: approx 1:250 @ A4 Source: Planmart (Drawing No. 2269-1F)

2 PREVIOUS WORK

2.1 Summary of Existing Information

A Preliminary Risk Assessment (PRA) report has previously been undertaken by LKC (Ref: CL-602-CL1957-01, dated 29th May 2012). The report comprised a review of factual information sources such as site history via historical mapping, geology, hydrogeology and an Envirocheck search. A preliminary contamination conceptual model was provided which identified several potential pollutant linkages.

A summary of the available information is provided below along with the preliminary conceptual model.

2.2 Site History

Site Features	**Location**	**Map Dates Present**	**Comments**
Site undeveloped	Whole site	1882-1954	
Undifferentiated buildings	SE of site	1968-Present	-Site currently use as storage sheds.
Surrounding Area Features	**Distance/ Location**	**Map Dates Present**	**Comments**
Undifferentiated buildings and Station Road	Adjacent to SW boundary	1882-2011	-Residential dwellings.
Undifferentiated buildings and road	10m W	1882-2011	-Residential dwellings. -Road identified as Albert Street from 1886 mapping.
Police Station	30m NW	1882-1954	-No longer identified from 1968 mapping.
Pond associated with Thornley Mill	50m N	1882-1954	-Annotated as 'Mill Pond' from 1886 mapping. -No longer identified from 1968 mapping.
Thornley Mill (cotton)	100m N	1882-1887	-No longer identified in 1898 mapping.
Pond associated with White Mill	50m SE	1882-1910	-Annotated as 'Mill Pond' from 1886 mapping. -No longer identified from 1922 mapping.
White Mill (cotton)	80m E	1882-1910	-Annotated as 'disused' from 1898 mapping. -No longer identified from 1922 mapping.
Pond	90m E	1882-1910	-Possibly associated with White Mill. -No longer identified as Pond from 1922 mapping.
Pond	210m NW	1882-1954	-Possibly associated with Waterside Mill. -Annotated as 'Mill Pond' from 1886 mapping. -Identified as rough ground/marsh from 1968 mapping.
Quarry	230m SW	1882-1954	-Not extensively worked, site appears to be mainly rough ground. -No longer identified from 1968 mapping.
Un-named stream/issue	95m NE	1886-2011	-Flows SE to NW.
Pond	140m E	1886-1968	-Possibly associated with White Mill. -No longer identified from 1974 mapping.
Sluice	75m E	1886-1887	-No longer identified from 1898 mapping.
Residential dwellings	Adjacent to W boundary	1898-2011	

Table 2-1: Summary of Site History, Land off Albert Street, Hadfield.

Surrounding Area Features	Distance/ Location	Map Dates Present	Comments
Undifferentiated building	Adjacent to E boundary	1898-2011	-Identified as 'Sheet Metal Works' from 1968 mapping. -Identified as 'Works' from 1982 mapping.
Mill Pond	100m E	1898 only	-No longer annotated as Pond from 1910 mapping.
Cutting	180m SW	1898-1954	-No longer identified on 1968 mapping.
Garage	50m SE	1968-2011	-Vehicle repair, still in use.
Garage	30m W	1974-2011	-Vehicle repair, still in use.
Car park	50m SW	1794-1992	-No longer annotated as car park from 1994 mapping.
Pond	220m NW	1974-1978	-No longer identified on 1984 mapping.

Table 2-1 (cont'd): Summary of Site History, Land off Albert Street, Hadfield.

2.3 Environmental Setting

Summary of Environmental Settings			
Geology	Superficial		-Till – Devensian (Diamicton).
	Bedrock		-Mudstone Grit Group – Namurian (Mudstone, Siltstone and Sandstone).
	Faulting		-Fault adjacent to SE site boundary running N–S. -Fault 30m N of the site running NW–SE.
	BGS logs		-SK09NW25/E 241m W (Map ID 128 on Envirocheck borehole map). 0-0.38m Made Ground: Tarmac and setts. 0.38-1.67m Made Ground: Ash and clay fill. 1.67-2.44m Brown silty CLAY. 2.44-2.97m Sandy CLAY and GRAVEL.
Hydrogeology	Aquifer Designation	Superficial	-Unproductive.
		Bedrock	-Secondary A.
	Groundwater abstractions		-8 within 500m. The nearest being 396m W by Nestle UK Ltd abstracting water for boiler feed.
Hydrology	Nearest surface water		-Un-named stream 94m E.
	Flooding		-No risk.
	Surface water abstractions		-None within 500m.
	Discharge consent		-40 within 1km. The nearest being 137m N by United Utilities Water Plc. discharging final/treated effluent.
	Pollution Incidents		-7 within 250m. The nearest being 112m N in June 1992 of inert suspended solids.
Mining	Coal Mining Referral Area		-Not within Referral Area.
	Mineral Abstraction		-7 mineral extraction sites within 1km of the site. The nearest being 327m W extracting sandstone. This activity has ceased.

Table 2-2: Summary of Environmental Setting, Land off Albert Street, Hadfield.

Summary of Environmental Settings		
Landfill sites (within 250m)	Known/Registered	-211m W – 'Paradise Quarry'. Industrial, commercial and household waste type. Operational dates not supplied. -222m NW – Etherow Gardens, Waterside Industrial Estate, Hadfield. Construction and demolition waste types. Licence ended 1/12/1982. -245m W – 'Paradise Tip'. Domestic waste type. Closed 31/12/1966.
	Potential	-Quarry 230m SW (Possibly not infilled). -Cutting 180m SW. -7 ponds (ranging from 50m N to 220m NW). Nearest potentially infilled by 1968 mapping.
Radon		-Probability of <1% of homes above Action Level. -No further action required.
Designated Sites		-Adopted Green Belt 443m N, 739m W and 813m W. -Environmentally Sensitive Area – 'North Peak' 446m N. -National Park – 'Peak District' 529m N.
Contemporary Trade Directory		-12 within 250m, The nearest being 7m SE 'Aquaclean UK Ltd' (Blast Cleaning).

Table 2-1(cont'd): Summary of Environmental Setting, Land off Albert Street, Hadfield.

2.4 Site Reconnaissance

A site reconnaissance of the study site area was carried out by LKC on the 21st May 2012.

The site was accessed along a small road off Albert Street, Hadfield. The site is currently used to store cars for re-sale and for undertaking some minor bodywork repairs, although currently the site has been cleared and foundations excavated. Two sheds were original observed, which are used to store equipment. A possible corrugated asbestos roof was noted on the sheds. The site was level and no fuel stains were noted on the ground.

The ground across the study site was sandy and gravelly. Two small trial holes were excavated to a maximum of 0.2m. These were terminated due to increased sandstone cobbles at that depth. Made ground encountered as coarse orange gravelly sand, with occasional ash and gravels of sandstone and brick.

2.5 Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in CLR11[1] has been summarised in Table 2-3. This is based on the premise that if there is no pollutant linkage then there will be no risk to the receptor. The site will follow a 'residential' land use scenario.

The onsite features that may be of concern are the two buildings identified in the SE portion of the site from mapping dating from 1968 to present which are currently storage sheds used to store equipment. The remainder of the site appears to have been undeveloped on the historic mapping; however, it has recently been used as an area to undertake minor bodywork repairs and to store cars before re-sale.

[1] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.

Potential contaminants that may be present on the site could be localised spillages of fuels, thinners and paints from minor bodywork repairs and car storage[2].

The site reconnaissance noted occasional ash in near surface soils. Contaminants may include heavy metals (such as arsenic and lead) and Polycyclic Aromatic Hydrocarbons ((PAHs), such as benzo(a)pyrene (B(a)P))[3]. Depending upon the sulphate content of the combusted coal, soluble sulphate may also be generated. In addition, asbestos containing materials (ACMs) may be present associated with the building structure onsite. A possible asbestos corrugated roof was identified on the buildings.

The immediate surrounding areas have mainly been developed for residential uses. Several potentially contaminative land-uses have been identified within 250m of the study site including two cotton mills (Thornley Mill and White Mill), Sheet Metal Works and two garages.

Potential offsite contaminants could be associated with the adjacent former Sheet Metal Works. These could include raw materials such as metals and metalloids; cleaning agents such as solvents, and general contaminants such as fuel spills[4]. If these contaminants are present, it would be likely within any groundwater flowing under the site. It should be noted that when foundations were excavated the site appears to be over slightly sandy firm clay, which will likely minimise contamination migration. High Peak Council have concerns about a fuel spill approximately 80m from the site, which may have potentially migrated to the site.

The Envirocheck Report has identified three known/registered landfill sites within 250m of the study site (nearest being 211m W). A review of the historical OS mapping by LKC has identified nine potentially infilled areas within 250m of the site (nearest being 50m N). Infilled features have the potential to generate hazardous gas (primarily carbon dioxide and methane).

Hazardous gas generation can also occur from made ground on the site, however this is strongly dependent upon its quantity and composition. If significant amounts of putrescible or degradable material is found on site hazardous gas generation may be possible. The shallow Trial Holes undertaken onsite did not identify putrescible material.

Potential receptors with respect to human health and hazards present on the site include site residents at the proposed development and the residents of nearby residential dwellings. Depending on the nature and concentration of the potential contaminants, the underlying Secondary A Aquifer and un-named stream 95m northeast may be considered potential receptors along with the fabric of proposed buildings, building materials and services.

The pathways by which the receptors could be exposed to the potential hazards present are through dermal contact, inhalation, uptake or ingestion of contaminated soils and dust, migration of groundwater into the underlying Secondary A Aquifer and un-named stream, migration along service runs, permeation through and attack of building materials and consumption of potentially tainted water supplies.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers. The Preliminary Contamination Conceptual Model deals with long term

[2] Department of the Environment Industry Profile (1996). “Road Vehicle Fuelling, Service and Repair – Garages and Filling Stations”.
[3] Defra (2002). “Potential Contaminants for the Assessment of Land.” R&D Publication CLR 8
[4] Department of the Environment Industry Profile (1996). “Metal Manufacturing, Refining and Finishing Works”.

exposure to key receptors. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance[5]) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

Pollutant Linkage No.	Contaminant					Pathway	Receptor
	ACM	Gases		Contaminants			
		Hazardous	Ground	Organic	Inorganic		
PL1	?	x	x	?	?	-Dermal contact. -Ingestion of soils and vegetables. -Inhalation of contaminated soil, fibres and dust.	-Future site residents (inc. veg uptake).
PL2	x	x	x	?	x	-Inhalation of vapours. -Vapour migration through permeable strata.	-Future site residents.
PL3	x	?	x	x	x	-Inhalation of hazardous gas. -Migration through permeable strata. -Migration through underlying fault.	-Future site residents.
PL4	x	x	x	?	?	-Groundwater migration through permeable strata. -Perched waters migration on site.	-Secondary A Aquifer. -Un-named stream 94m E.
PL5	x	?	x	x	?	-Contact with potential hazards.	-Site buildings.
PL6	x	x	x	?	?	-Ingestion of tainted water supply. -Corrosion of metal pipework.	-Future site residents. -Pipework.
PL7	x	x	x	x	?	-Root uptake of phytotoxic contaminants.	-Flora in future landscaping.

Table 2-1 Preliminary Contamination Conceptual Model for land at Albert Street, Hadfield.
(Key: ? – pollutant linkage possible; x – pollutant linkage unlikely)

Seven generic pollutant linkages have been identified due to the likely presence of made ground onsite, potential migration of hydrocarbon impacted ground water from offsite source and risk from hazardous gas.

It was considered that detailed intrusive investigations were required to assess these linkages further. The investigation is outlined in Section 3.

[5] HSE (1991). "Protection of workers and the general public during development of contaminated land" London HMSO.

3 GROUND INVESTIGATION

3.1 Site Investigation Design and Methodology

In order to investigate the potential pollutant linkages identified in the preliminary contamination conceptual model, an intrusive investigation was undertaken using hand augers on the 29th June 2012. A Site Investigation Brief was sent to High Peak Council on the 25th June 2012 for their approval, which was provisionally agreed over the phone and later in writing in an e-mail dated 12th July 2012.

It was decided that hand augers were appropriate since most of the site had been excavated for foundations (see Appendix A, Photograph 1) and only shallow made ground was identified (Appendix A, Photograph 2 and 3).

The intrusive site investigation involved the excavation of four hand augers (referenced HA101 to HA104) to depths of 1 metre below ground level (mbgl). All hand auger locations are shown in Figure 3-1. All profile logs are presented in Appendix B.

The number of sampling points corresponds to approximately one location per 11m square centres (approximate herringbone pattern). This is considered robust for a residential land use and is in general accordance with BS10175[6], BS14688-1[7] and BS5930[8].

3.2 Sampling Protocol

3.2.1 Soil Sample Collection

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[9,10]. Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4˚C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

A total of four representative soil samples were taken during the site investigation and were selected for chemical contamination analysis. The samples were subjected to the following analysis:

- **Four Soil Samples:** Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc, water soluble sulphate, pH, USEPA speciated polycyclic aromatic hydrocarbons (PAHs) and organic matter.
- **One Soil Samples:** Arsenic, cadmium, total chromium, hexavalent chromium, copper, lead, mercury, nickel, selenium, vanadium, zinc, boron, cyanide suite, water soluble sulphate, pH, banded TPH (TPHCWG), BTEX, MTBE, USEPA speciated polycyclic aromatic hydrocarbons (PAHs), phenol, Volatile Organic Compounds (VOCs), Semi-volatile Organic Compounds (SVOCs) and organic matter.

[6] British Standard (2011). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2011
[7] British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002
[8] British Standard (1999). "Code of Practice for Site Investigations. " BS5930:1999
[9] EA (2000). "Technical Aspects Of Site Investigation.Volume 1 (Of 2) Text Supplements Research and Development Technical Report." P5-065/Tr.
[10] EA (2000). "Technical Aspects Of Site Investigation.Volume 2 (Of 2) Text Supplements Research and Development Technical Report." P5-065/Tr.

All soil samples were taken from the made ground to represent site conditions, in particular a more comprehensive suite was undertaken for HA104, where a very slight thinners odour was noted in the made ground. This was in the location of the former work shed.

It should be noted that hexavalent chromium soil is analysed using the USEPA recommended method of alkaline leach. This method limits chromium (VI) reduction to chromium (III)[11].

With regards to ACM the engineer onsite examined soil for obvious ACM. In addition, the laboratory screen samples routinely to identify the presence or absence of ACM. If ACM is identified then bulk analysis is undertaken.

Many of the tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix C. A summary of the elevated analytical results are given in Section 5.2.

3.2.2 Water Sample Collection

No water was identified onsite. Made ground (0.4-0.7mbgl) overlies firm clay and therefore water will likely be perched, if present.

Considering the low risk contribution to controlled waters no leaching test samples were taken.

3.2.3 Gas Monitoring

A potential risk from migrating gas was identified for the site in the PRA. Considering the thin layer of made ground and underlying Till gas migration at significant flow rate is not anticipated and precautionary gas measures will be recommended.

Based on the above no gas monitoring was undertaken.

[11] Palmer, CD and Roberts, WP (1994). "Natural Attenuation of Hexavalent Chromium in Groundwater and Soils." EPA Issue EPA/540/5-94/505.

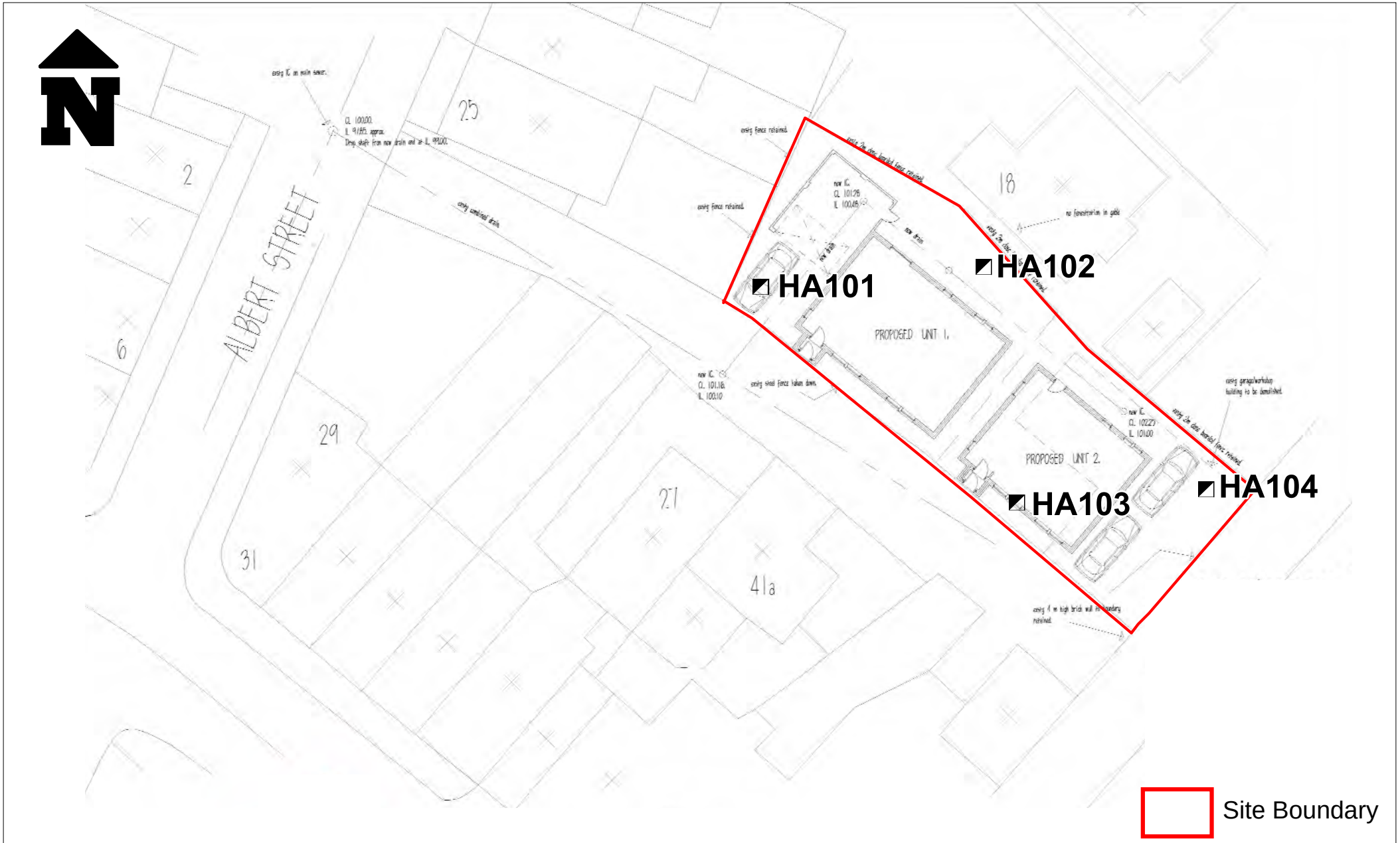

Figure 3-1: Sampling Location Plan, Land off Albert Street, Hadfield

Drawn: July 2012 Scale: approx 1:250 @ A4 Source: Planmart (Drawing no. 2269-1F)

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4 GROUND CONDITIONS

4.1 Introduction

The ground conditions beneath the site comprised made ground comprising ash overlying slightly sandy firm clay. The made ground was more gravelly with ash in the central and eastern part of the site

A summary of typical ground conditions are detailed below in Table 4-1. All profile logs are presented in Appendix B.

Depth to Top of Strata (mbgl)	Depth to Base of Strata (mbgl)	Thickness of Strata (m)	Description
0.0 to 0.2	0.4 to 0.7	0.2 to 0.4	**MADE GROUND 1:** soft brown gravelly sandy clay with occasional brick, sandstone, ash and coal. HA101, HA102 and HA104 only. Very slight thinners odour in HA104 (0.3mbgl to 0.4mbgl)
0.3 to 0.4	0.4 to 0.45	0.05 to 0.1	**MADE GROUND 2:** orange sandy gravel (sandstone) with occasional sandstone cobbles HA101 and HA102 only.
0.0 to 0.5	0.2 to 0.5	0.2 to 0.5	**MADE GROUND 3:** loose black sandy slightly clayey gravel with abundant ash and occasional coal fragments. HA103 and HA104 only.
0.4 to 0.7	>1.0	>0.6	**CLAY:** firm brown slightly sandy clay. All HA locations

Table 4-1: Summary of ground conditions for land at Albert Street, Hadfield.

5 GENERIC RISK ASSESSMENT

5.1 Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site specific basis, using a risk based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (CLR11[12]). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 5.6.

5.2 Soil Risk Assessment

The results of the soil samples were compared to the new Soil Guideline Values (SGVs). Unfortunately, there are only a select number of new SGVs currently available and therefore, where there are no SGVs, ATRISK Soil Screening Values (SSVs) have been used as screening values. These have been generated using the CLEA V1.06 model[13] based on 1% and 6% SOM and are considered scientifically robust and conservative. All these criteria now follow current UK methodology[14,15,16,17]. A summary of the ATRISK SSVs (Revision 3 and 5) for 1 % SOM and 6% SOM for a 'residential with plant uptake' land use is presented in Appendix D.

A selection of other contaminants not presented by ATKINS has been presented by the CL:AIRE[18]. They have generated GACs for a number of contaminants using the UK methodology and will be used as appropriate. A summary of the CL:AIRE GACs are presented in Appendix D.

For ATRISK SSVs where contaminants (such as PAHs) are above the lowest aqueous or vapour saturation limits by <10% the combined values have been used, as per the EA CLEA user manual where no free product has been observed.

The lead SSV has been derived using a threshold substance, which differs from the original SGV blood level model. In the interim before the official SGV for lead has been published LKC will continue to use the old lead SGV.

With regards to chromium the generic value uses toxicity data from TOX 4[19] and assumed to be all Cr(VI), i.e. the most harmful chromium oxidation state. The TOX 4 report recognises that assuming total chromium as Cr(VI) is "highly conservative" and that Cr(III) is of much less toxicity. Therefore, the risk assessment for chromium will be based upon the Cr(VI) results.

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P), dibenzo(a,h)anthracene (D(a,h)A) and naphthalene. This is due to B(a)P and D(a,h)A possibly being carcinogens and most toxic of the PAHs[20,21] and naphthalene the most

[12] EA (2004). "Model Procedures for the Management of Land Contamination." R&D Publication CLR 11.
[13] EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.
[14] EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.
[15] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[16] EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.
[17] EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.
[18] CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."
[19] EA (2002). "Contaminants in Soil: Collation of Toxicological Data and Intake Values for Humans. Chromium." R&D Publication TOX 4.
[20] EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.
[21] USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

volatile and soluble[22]. These determinands will be used to establish the risk from PAHs, although high concentrations of other PAHs will be compared to appropriate generic values, where appropriate.

Elevated results are presented in Table 5-1 below and all analysis sheets are presented in Appendix C.

	Contaminant	Units	No. of samples	Result Ranges	No. Exceeded	Assessment Criteria (1%/6% SOM)	Source of Criteria
PAHs	Benzo(a)anthracene	mg/kg	4	<0.5-160$_{(HA103)}$	1	4.52 / 8.54	ATRISK
	Benzo(b)fluoranthene	mg/kg	4	<0.5-160$_{(HA103)}$	1	7.72 / 9.86	ATRISK
	Benzo(a)pyrene	mg/kg	4	<0.5-130$_{(HA103)}$	1	0.81 / 1.0	ATRISK
	Dibenzo(ah)anthracene	mg/kg	4	<0.1-25$_{(HA103)}$	1	0.84 / 1.0	ATRISK
	Indeno(123-cd)pyrene	mg/kg	4	<0.1-89$_{(HA103)}$	1	7.31 / 9.75	ATRISK
General	pH	pH	4	Range 7.4 to 8.2			
	SOM	%	4	Range 2.8 to 21			

Table 5-1: Summary of elevated analytical results for land at Albert Street, Hadfield.

Notes:

Only results that exceeded SGVs and SSVs have been shown and results from **all depths** are noted. Assumed pH7 and 1% or 6%, where this parameter is required.

Elevated results have been identified for heavier end PAHs present in the gravel ash band from HA103.

5.2.1 Direct Contact Risk – Pollutant Linkage 1

Heavier end PAHs were above the generic guideline value for a residential end use. These contaminants are likely carcinogens and may pose a risk to future site users through direct contact of impacted soils. The source appears to be the ash/coal gravel band (0mbgl to 0.5mbgl) identified in HA103. Similar PAH contaminants are anticipated in the thin ash/coal gravel band (0mbgl to 0.2mbgl) in HA104.

A double ratio plot (see Graph 5-2) was taken on site data from HA103. This method of appraisal compares a ratio of comparative compound pairs for 4 PAH compounds. This means that the properties of the comparative PAH compounds are similar (such as aqueous solubility, molecular weight, Kow) and have diagnostic source ratios which should retain their relative concentrations and hence their ratio remain constant. Similar work has been undertaken by a number of authors[23,24,25,26,27,28] on both soil and sediments. Forensic laboratories, such as Jones Environmental also routinely use these techniques to ascertain hydrocarbon source.

[22] EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5-079/TR1.

[23] Yunker, M. B. Macdonald, R. W. Vingarzin, R. Mitchell, R. H. Goyette, D. and Sylvestre, S. (2002). "PAH in the Fraser River basin: A critical appraisal of PAH ratios as indicators of PAH source and composition." *Organic Geochemistry* **33**:489-515.

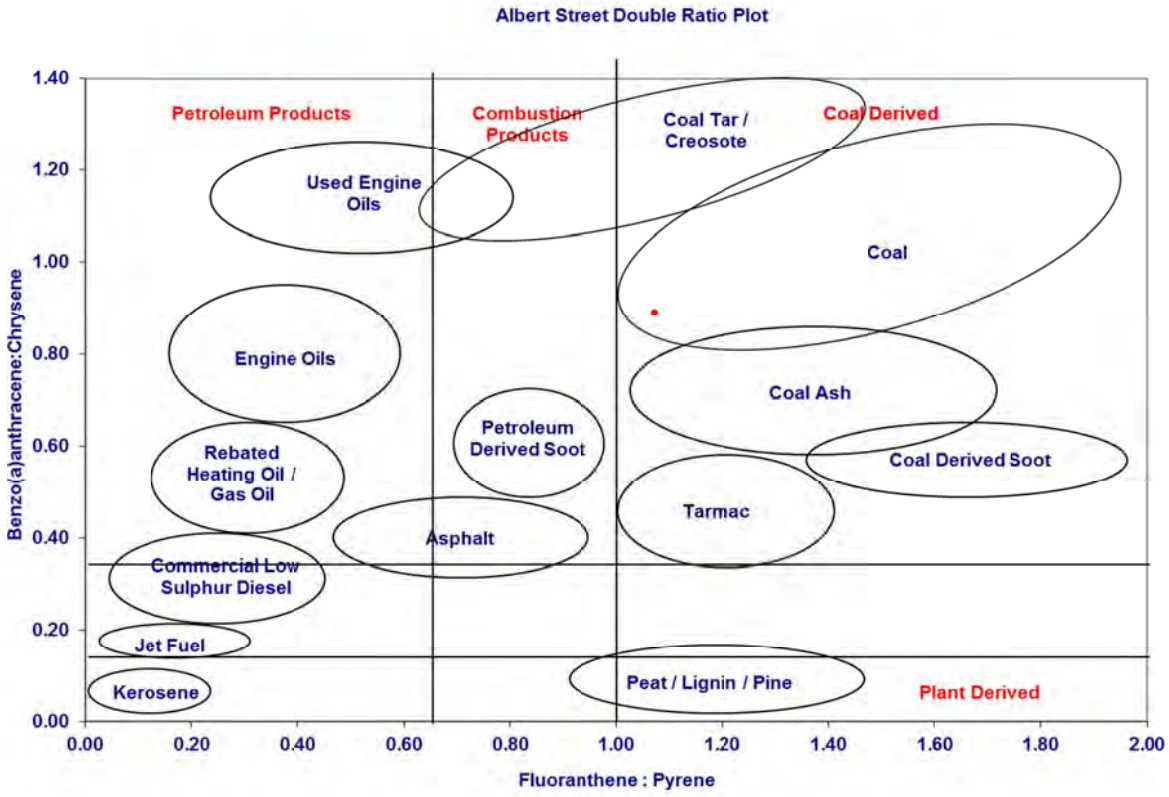
[24] Costa, H. J. and Sauer, T. C. Jr. (2005)." Technical Note - Forensic Approaches and Considerations in Identifying PAH Background." *Environmental Forensics,* **6**:9-16.

[25] Costa, H.J., White, K.A., Ruspantini, J.J.(2004) "Distinguishing PAH Background and MGP Residues in Sediments of Fresh Water Creek." *Environmental Forensics,*:**3**, 171-182

[26] Seung-Kyu Kim, Dong Soo Lee, Won Joon Shim, Un Hyuk Yim, Yong-Seung Shin (2009). "Interrelationship of Pyrogenic Polycyclic Aromatic Hydrocarbon (PAH) Contamination in Different Environmental Media. Sensors." 9:9582-9602; doi: 10.3390/s91209582.

[27] Stout, S.A. Magar, V.S. Uhler, R.M. Ickes, J. Abbott, J. Brenner, R. (2001)."Characterization of Naturally Occurring and Anthropogenic PAHs in Urban Sediments – Wycoff/Eagle Harbor Superfund Site." *Environmental Forensics*, **2**:287-300

[28] Paech, O., Nabbelfeld, B. Khun, G and Schwark, L (2007)."PAH in Different Environmental Sample Matrices." Reference: P316-WE.



Graph 5-2: Double ratio plot on PAH dataset for land at Albert Street, Hadfield.

The double ratio plot indicates the PAHs are coal derived. It is known that coal can have high concentrations of PAHs[29] and is likely contributing to the site PAH concentrations. The double ratio plot supports the argument that the PAH source is likely ash/coal derived as it is close to the coal and coal ash boundary.

Direct contact (ingestion, dermal and inhalation of dust) are the primary pathways to the receptor for these contaminants. Given the high exceedences of these PAH compounds related to ash/coal material in the central and eastern part of the site (likely a base for the former shed), there is a risk to future users if made ground is exposed.

It is understood that the entire site will be hardstood with no gardens or soft landscaping. This will prevent direct contact. Furthermore, material will need to be removed offsite to accommodate the hard standing.

Based on the above LKC considers Pollutant Linkage 1 is complete, subject to mitigation measures ensuring no exposed ashy made ground is present.

5.2.2 Inhalation Risk – Pollutant Linkage 2

No elevated volatile contaminants were identified onsite that will pose a risk through the inhalation of vapours.

High Peak Borough Council noted a potential for migrating hydrocarbon impacted groundwater from an offsite source. This is considered unlikely at shallow depths based on the identified firm Till onsite.

[29] Achten, C; Hofmann, T (2009). "Native Polycyclic Aromatic Hydrocarbons (PAHs) in Coals – A Hardly Recognised Source of Environmental Contamination." *Science in the Total Environment* 407 (2009) 2461-2473.

The very slight thinners odour noted in HA 104 appeared to be from a thin discrete depth (0.1m thick at 0.3mbgl to 0.4mbgl) under the footprint of the former shed. The analysis did not show elevated hydrocarbon fractions or VOCs above detection limits.

Based upon the above LKC consider Pollutant Linkage 2 to be incomplete and no special precautions are required to protect the site specifically from vapours.

5.2.3 Hazard Quotient

To examine the potential additivity of toxicological effects between the petroleum hydrocarbon fractions a Hazard Index (HI) as described by the Environment Agency[30] technical report was undertaken. This should be undertaken when there are no elevated petroleum hydrocarbons and maximum values found on the site were used to generate the HI (See Appendix E). The HI was less than one (HI of 0.13) and therefore LKC considers there is no significant risk from hydrocarbons on the study site, in particular from the very slight thinners odour identified in HA104.

5.3 Controlled Water Assessment

LKC does not consider there is a significant risk to controlled waters from the site. Thin strata of made ground was identified relating to PAHs, which are hydrophobic in nature[31]. The very slight odour relating to thinners has not been identified in high soil concentrations (detectable in mainly heavier end) and will unlikely have detectable dissolved phase concentrations as heavy end petroleum hydrocarbons are considered recalcitrant and hydrophobic in behaviour[32,33].

Considering the shallow underlying firm Till deposits (unproductive aquifer), any percolated water is likely to be perched and will not migrate to the underlying Secondary A aquifer (bedrock).

The nearest surface water feature is a small stream 95m east. As any percolated water will be perched at shallow depth the impact to the stream will be negligible considering interceding features offsite, such as road drains.

Based on the above LKC considers Pollutant Linkage 4 to be incomplete and no remediation is required to protect controlled waters.

5.4 Gas Risk Assessment

A gas risk from potentially infilled features within 250m was identified.

Precautionary gas measures are advised in lieu of no gas monitoring to follow Characteristic Situation 2/3 measures as described in CIRIA C665[34] and BS8485:2007[35].

Based on the assumption that there is a gas risk (LKC considers this to be of low risk based on site conditions) Pollutant Linkage 3 is considered complete.

[30] EA (2005). "The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils." Science report P5-080/TR3.
[31] EA (1999)."Methodology for the Derivation of Remedial Targets for the Soil and Groundwater to Protect Water Resources." R&D Technical Report, P20
[32] Shedeh, J. (2009). "Characteristics of removal of hydrophobic organic carbons from sand / mulch using non ionic surfactants". Land Contamination and Reclamation, 17 (2) 2009.
[33] EA (2009). "Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for hydrological Risk Assessment."
[34] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665
[35] BSI (2007). "Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments." BS8485:2007.

5.5 Additional Risk Assessment

The concentrations of soluble sulphate in the soil when contrasted to BRE Digest[36] categorise the concrete requirement as DS-1 AC-1s and therefore no special requirements are required. LKC considers that Pollutant Linkage 5 is incomplete and no sulphate resistant concrete is required for the proposed building.

United Utilities (UU) guidelines have been recently replaced with new guidance[37], where sampling is required for contaminants that include speciated petroleum hydrocarbons, chlorinated compounds, BTEX compounds, phenols, cresols, ethers, nitrobenzene, ketones, aldehydes and amines. However, the guidelines do state a robust risk assessment can be undertaken on why specific pipework is not required. If pipework is to be founded in made ground it is likely that barrier pipe would be required (due to naphthalene above 0.5mg/kg). However, pipeline is normally placed at depth between 0.7-1.2m, which will be in the natural clay. If this is the case then protective pipeline will unlikely be needed. This is subject to completing a UU risk assessment form and consultation with UU. Therefore, at this stage LKC considers Pollutant Linkage 6 is possible pending the completion of a UU risk assessment document or letter confirming the potable supply has been connected by UU (they will not connect the supply if they are not satisfied).

No soft landscaping will be present onsite, as the site is to be fully hardstood. No remedial measures will be required for any areas of soft landscaping and gardens to protect flora, Therefore, pollutant linkage 7 is considered incomplete.

5.6 Revised Conceptual Model

A revised conceptual model may be undertaken for the site using all available data and this is presented in Table 5-3. Based on the results of the site investigation, only pollutant linkages that possibly still exist are shown. A description of the likelihood for the pollutant linkage to exist is summarised below.

Pollutant Linkage No.	Contaminant					Pathway	Receptor
	ACM	Gases		Contaminants			
		Hazardous	Ground	Organic	Inorganic		
PL1	x	x	x	✓	x	-Dermal contact. -Ingestion of soils and vegetables. -Inhalation of contaminated soil, fibres and dust.	-Future site residents.
PL3	x	?	x	x	x	-Inhalation of hazardous gas. -Migration through permeable strata. -Migration through underlying fault.	-Future site residents.
PL6	x	x	x	?	x	-Ingestion of tainted water supply. -Corrosion of metal pipework.	-Future site residents. -Pipework.

Table 5-3: Revised Contamination Conceptual Model for land at Albert Street, Hadfield.
Key: ✓ – pollutant linkage identified; ? – pollutant linkage possible, x – pollutant linkage unlikely

5.6.1 Pollutant Linkage 1

Pollutant Linkage 1 (direct contact) is considered complete for future users if the site to has exposed soil in gardens or soft landscaping (due to elevated PAHs).

Some form of capping layer will be required to break this pollutant linkage. It is understood that the site will be fully hardstood which will break the pollutant linkage.

[36] BRE (2005)."Concrete in Aggressive Ground." Special Digest 1.
[37] UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."

5.6.2 Pollutant Linkage 3

Potential pollutant linkage 3 refers to possible hazardous gas migrating to the site, based on potentially infilled features within 250m of the site.

In lieu of no gas monitoring, precautionary gas protection will need to be incorporated into the houses.

5.6.3 Pollutant Linkage 6

Potential pollutant linkage 6 refers to the possible contaminants permeating potable water pipes.

Concentrations of naphthalene are above guidelines for standard alkathene pipe (0.5mg/kg). However, pipe will likely be laid into the natural clay >0.7m deep as per standard utility depths.

The pollutant linkage is still considered possible subject to completing of the United Utilities Risk Assessment document or connection of the potable pipe by United Utilities. The latter would only take place if UU were satisfied with the pipework fitted.

Further details of the outline remedial proposals and a remedial option appraisal are given in Section 6.

6 CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

A site investigation comprising four hand augers to a maximum depth of 1mbgl was undertaken at the site.

Made ground was encountered from 0.2mbgl to 0.7mbgl comprising reworked clay with occasional ash and coal. The area to the centre and east had a gravel band of ash and coal to maximum depth of 0.5mbgl. Superficial deposits of firm Till was encountered below the made ground in all locations. The foundations were already laid into the clay when LKC visited the site. A very slight (almost none detectable) odour of thinners was noted in a thin ashy clay band in HA104 (0.3mbgl to 0.4mbgl). This was located under the footprint of the former shed.

The site investigation and risk assessment has identified elevated PAHs in HA103 within the ash band. A risk from similar PAHs has also been assumed from the thin ash band under the footprint of the former shed. According to double ratio plots the PAHs related to coal and ash. The strata with the very slight thinners odour was not elevated.

A risk to controlled waters was not considered significant due to the overlying Till (assumed perched waters over none productive aquifer).

A gas risk (although considered low) has been assumed in lieu of no gas monitoring.

LKC conclude that there are three remaining pollutant linkages that still exist (relating to direct contact of soils, hazardous gas and installation of suitable potable pipe work), which will need to be remediated (detailed below).

6.2 Recommendations

The recommendations provided below are considered appropriate for the site based on the site investigation.

6.2.1 Soil Contamination – Direct Contact (Pollutant Linkage 1)

Pollutant linkage 1 has been identified for PAHs where the gravel ash/coal band was located. Some form of capping layer will be required to break the pollutant linakge.

It is understood that the site will be either covered by buildings or fully hardstood, with no exposed soil. This will prevent direct contact and be protective to future users.

6.2.2 Hazardous Gas (Pollutant Linkage 3)

In lieu of no gas monitoring LKC have recommended gas protection measures commensurate with the CS2/CS3 as per UK guidance[38,39].

[38] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665
[39] BSI (2007). "Code of Practice for the Characterisation and Remediation from Ground Gas in Affected Developments." BS8485:2007.

Gas protection provided to the new build comprises the following:

- Ventilation of confined spaces within the building.
- Well-constructed reinforced cast in situ ground slab.
- Methane and carbon dioxide resistant membrane suitably lapped (Radbar Super 400 total gas barrier).
- Passive subfloor ventilation system (granular filled void with limited fines and perforated vented pipe attached to telescopic vents at 2m spacings).
- Minimum penetration of ground slab by services.
- All joints and penetrations to be sealed.
- Validation of gas protection measures.

Foundation design plan was not provided to LKC at the time of writing, but can confirm from a site visit that the above gas protection is in place (to be presented in the Completion Report). LKC do advise that the final foundation design follow BRE 414[40] and drawings are provided to the Local Authority for approval.

6.2.3 Potable Water Supply (Pollutant Linkage 6)

Potential risk to potable water supplies has been identified and we would advise consulting with United Utilities about suitable protection for water supplies. They may require the completion of a UU Risk Assessment form. Protection measures may include the following:

- If pipes are to be installed in the made ground then all pipework should be installed in oversized sterile trenches and, depending on the requirements of United Utilities, barrier pipes may be required.
- Alkathene pipes may be installed in the natural ground (likely site scenario).

6.3 Additional Considerations

6.3.1 Unexpected Contamination

The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination be encountered at the site, LKC and the Local Authority should be informed and further assessment of the material may be required.

6.3.2 Health and Safety Considerations

In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance[41]) should be adopted by all workers involved with site enabling and construction works.

[40] BRE (2001). "Protective Measures for Housing on Gas-Contaminated Land." BRE 414.
[41] HSE (1991). "Protection of workers and the general public during development of contaminated land" London HMSO.

6.4 Remediation, Verification and Site Completion Report

It is recommended that any remediation carried out on the site is validated by a third party and suitable documentary evidence provided in a Site Completion Report, such as photographs, consignment documents and analytical results. This should include as a minimum:

- Validation of all gas protection measures.
- Information on the installation of protective pipes (letter from UU detailing connection details to mains may be suitable, as they will not connect potable pipework if it is insufficient).
- Photographic evidence of the site being hardstood.
- Waste transfer notes for any material removed offsite.
- Provision of pre-demolition and refurbishment asbestos report.

The Site Completion Report will assist the Local Authority in the discharge of any relevant contamination planning condition and will also be of use to solicitors acting on behalf of any prospective conveyancer who may have concerns over the former use of the site.

APPENDIX A

PHOTOGRAPHS



Photograph 1: Site layout following foundation excavation.



Photograph 2: Typical soil profile across central and western part of the site (mainly sandy clay with occasional ash and coal) over clay.



Photograph 3: Typical soil profile across eastern part of the site (ash as main component) over clay.

APPENDIX B

PROFILE LOGS

LK CONSULT LTD

Bury Business Centre, Kay Street, Bury, BL9 6BU
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
Albert Street, Hadfield	HA101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Valley Construction (NW) Ltd	CL1957

Location	Dates	Engineer	Sheet
	29/06/2012	PQ	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.30	S				(0.30)	MADE GROUND: Soft brown gravelly sandy clay with occasional angular gravel size brick and sandstone fragments; rare coal and ash.		
					0.30			
					(0.10)	MADE GROUND: Medium dense orange sandy gravel with occasional subangular sandstone cobbles.		
					0.40			
					(0.30)	MADE GROUND: Soft brown gravelly sandy clay with occasional angular gravel size brick and sandstone fragments; rare coal and ash.		
					0.70			
					(0.30)	Firm brown slightly sandy CLAY.		
					1.00			
						Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:10	PQ	CL1957.HA101

Produced by the GEOtechnical DAtabase SYstem (GEODASY) (C) all rights reserved

LK CONSULT LTD Bury Business Centre, Kay Street, Bury, BL9 6BU Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** Albert Street, Hadfield	**Trial Pit Number** **HA102**	
Excavation Method Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Valley Construction (NW) Ltd	**Job Number** CL1957
	Location	**Dates** 29/06/2012	**Engineer** PQ	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.40	S				(0.40)	MADE GROUND: Soft brown gravelly sandy clay with occasional angular gravel size brick and sandstone fragments; rare coal and ash.		
					0.40 (0.05) 0.45	MADE GROUND: Medium dense orange sandy gravel with occasional subangular sandstone cobbles.		
					(0.25)	MADE GROUND: Soft brown gravelly sandy clay with occasional angular gravel size brick and sandstone fragments; rare coal and ash.		
					0.70 (0.30)	Firm brown slightly sandy CLAY.		
					1.00	Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:10	PQ	CL1957.HA102

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LK CONSULT LTD
Bury Business Centre, Kay Street, Bury, BL9 6BU
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Trial Pit Number
Albert Street, Hadfield	HA103

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Trial Pit			Valley Construction (NW) Ltd	CL1957
	Location	**Dates** 29/06/2012	**Engineer** PQ	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.50	S				(0.50)	MADE GROUND: Loose black sandy slightly clayey gravel with abundant ash and occasional coal fragments.		
					0.50	Firm brown slightly sandy CLAY.		
					(0.50)			
					1.00	Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:10	PQ	CL1957.HA103

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LK CONSULT LTD Bury Business Centre, Kay Street, Bury, BL9 6BU Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** Albert Street, Hadfield	**Trial Pit Number** **HA104**	
Excavation Method Trial Pit	**Dimensions**	**Ground Level (mOD)**	**Client** Valley Construction (NW) Ltd	**Job Number** CL1957
	Location	**Dates** 29/06/2012	**Engineer** PQ	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.30	S		0.3mbgl to 0.4mbgl very slight thinner odour.		(0.20) 0.20 (0.20) 0.40 (0.60) 1.00	MADE GROUND: Loose black sandy gravel with abundant ash and occasional coal fragments. MADE GROUND: Soft sandy brown clay with occasional ash and coal fragments. Firm brown slightly sandy CLAY. Complete at 1.00m		

Plan

Remarks

Scale (approx)	Logged By	Figure No.
1:10	PQ	CL1957.HA104

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APPENDIX C

SOIL LABORATORY ANALYSIS RESULTS

Chemtest
The right chemistry to deliver results

Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070

Leyden Kirby
Unit 25 Bury Business Centre
Kay Street
Bury, Lancashire
BL9 6BU

FAO Paul Quimby
06 July 2012

Dear Paul Quimby

Test Report Number **208695i Interim Test Report**
Your Project Reference **CL1957 - Albert Street, Hadfield**

Please find enclosed the results of analysis for the samples received 2 July 2012.

All soil samples will be retained for a period of one month and all water samples will be retained for 7 days following the date of the test report. Should you require an extended retention period then please detail your requirements in an email to customerservices@chemtest.co.uk. Please be aware that charges may be applicable for extended sample storage.

If you require any further assistance, please do not hesitate to contact the Customer Services team.

Yours sincerely



Darrell Hall, Director

UKAS TESTING
2183

mCERTS

ISO 14001
sira
UKAS ENVIRONMENTAL MANAGEMENT

Notes to accompany report:

- *The sign < means 'less than'*
- *Tests marked 'U' hold UKAS accreditation*
- *Tests marked 'M' hold MCertS (and UKAS) accreditation*
- *Tests marked 'N' do not currently hold UKAS accreditation*
- *Tests marked 'S' were subcontracted to an approved laboratory*
- *n/e means 'not evaluated'*
- *i/s means 'insufficient sample'*
- *u/s means 'unsuitable sample'*
- *Comments or interpretations are outside of the scope of UKAS accreditation*
- *The results relate only to the items tested*
- *Stones represent the quantity of material removed prior to analysis*
- *All results are expressed on a dry weight basis*
- *The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, phenols*
- *For all other tests the samples were dried at < 37°C prior to analysis*
- *Uncertainties of measurement for the determinands tested are available upon request*
- *Soil descriptions, including colour and texture, are beyond the scope of MCertS accreditation*
- *None of the test results included in this report have been recovery corrected*

Leyden Kirby
Unit 25 Bury Business Centre
Kay Street
Bury, Lancashire
BL9 6BU

FAO Paul Quimby

LABORATORY TEST REPORT

Results of analysis of 4 samples received 2 July 2012

CL1957 - Albert Street, Hadfield

Report Date 06 July 2012

Login Batch No					208695			
Chemtest LIMS ID					AH48773	AH48774	AH48775	AH48776
Sample ID					HA101	HA102	HA103	HA104
Sample No								
Sampling Date					29/6/2012	29/6/2012	29/6/2012	29/6/2012
Depth					0.2m	0.4m	0.3m	0.3m
Matrix					*SOIL*	*SOIL*	*SOIL*	*SOIL*
SOP↓	Determinand↓	CAS No↓	Units↓	*				
2030	Moisture		%	n/a	25.9	14.2	16.4	26.2
	Stones content (>50mm)		%	n/a	<0.02	<0.02	<0.02	<0.02
2040	Soil colour			n/a	brown	brown	brown	grey
	Soil texture			n/a	clay	loam	loam	clay
	Other material			n/a	stones	stones	stones	stones
2010	pH			M	8.2	7.6	8.1	7.4
2300	Cyanide (free)	57125	mg kg-¹	M				< 0.5
	Cyanide (total)	57125	mg kg-¹	M				< 0.5
2625	Organic matter		%	M	9.3	2.8	21	4.8
2120	Boron (hot water soluble)	7440428	mg kg-¹	M				0.7
	Sulfate (2:1 water soluble) as SO4	14808798	g l-¹	M	0.06	0.04	0.02	0.07
2490	Chromium (hexavalent)	18540299	mg kg-¹	N	<0.5	<0.5	<0.5	<0.5
2450	Arsenic	7440382	mg kg-¹	M	25	5.1	21	9.2
	Cadmium	7440439	mg kg-¹	M	0.56	0.47	0.60	0.21
	Chromium	7440473	mg kg-¹	M	22	14	12	21
	Copper	7440508	mg kg-¹	M	82	39	71	32
	Mercury	7439976	mg kg-¹	M	0.31	<0.10	0.16	0.11
	Nickel	7440020	mg kg-¹	M	19	11	17	14
	Lead	7439921	mg kg-¹	M	210	120	350	78
	Selenium	7782492	mg kg-¹	M	0.37	0.28	<0.20	0.50
	Vanadium	7440622	mg kg-¹	M	28	14	11	
	Zinc	7440666	mg kg-¹	M	190	210	260	240
2675	TPH aliphatic >C5-C6		mg kg-¹	N				< 0.1

All tests undertaken between 02/07/2012 and 06/07/2012

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Leyden Kirby
Unit 25 Bury Business Centre
Kay Street
Bury, Lancashire
BL9 6BU

FAO Paul Quimby

LABORATORY TEST REPORT

Results of analysis of 4 samples received 2 July 2012

CL1957 - Albert Street, Hadfield

Report Date 06 July 2012

					208695			
					AH48773	AH48774	AH48775	AH48776
					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2675	TPH aliphatic >C6-C8		mg kg-¹	N				< 0.1
	TPH aliphatic >C8-C10		mg kg-¹	N				< 0.1
	TPH aliphatic >C10-C12		mg kg-¹	M				< 1
	TPH aliphatic >C12-C16		mg kg-¹	M				< 1
	TPH aliphatic >C16-C21		mg kg-¹	M				< 1
	TPH aliphatic >C21-C35		mg kg-¹	M				< 1
	TPH aliphatic >C35-C44		mg kg-¹	N				< 1
	TPH aromatic >C5-C7		mg kg-¹	N				< 0.1
	TPH aromatic >C7-C8		mg kg-¹	N				< 0.1
	TPH aromatic >C8-C10		mg kg-¹	N				< 0.1
	TPH aromatic >C10-C12		mg kg-¹	M				2.1
	TPH aromatic >C12-C16		mg kg-¹	M				2.7
	TPH aromatic >C16-C21		mg kg-¹	M				6.1
	TPH aromatic >C21-C35		mg kg-¹	M				6.7
	TPH aromatic >C35-C44		mg kg-¹	N				< 1
	Total Petroleum Hydrocarbons		mg kg-¹	N				18
2700	Naphthalene	91203	mg kg-¹	M	0.42	< 0.1	5.4	
	Acenaphthylene	208968	mg kg-¹	M	0.68	0.1	23	
	Acenaphthene	83329	mg kg-¹	M	0.24	< 0.1	2	
	Fluorene	86737	mg kg-¹	M	0.14	< 0.1	29	
	Phenanthrene	85018	mg kg-¹	M	3	0.68	200	
	Anthracene	120127	mg kg-¹	M	0.94	0.2	59	
	Fluoranthene	206440	mg kg-¹	M	4.3	2.1	290	
	Pyrene	129000	mg kg-¹	M	3.9	1.7	270	

All tests undertaken between 02/07/2012 and 06/07/2012

* Accreditation status

This report should be interpreted in conjuction with the notes on the accompanying cover page.

Leyden Kirby
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Results of analysis of 4 samples received 2 July 2012

CL1957 - Albert Street, Hadfield

Report Date 06 July 2012

					208695			
					AH48773	AH48774	AH48775	AH48776
					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2700	Benzo[a]anthracene	56553	mg kg-¹	M	1.9	0.62	160	
	Chrysene	218019	mg kg-¹	M	2.5	0.77	180	
	Benzo[b]fluoranthene	205992	mg kg-¹	M	1.6	0.78	160	
	Benzo[k]fluoranthene	207089	mg kg-¹	M	1.2	0.5	80	
	Benzo[a]pyrene	50328	mg kg-¹	M	1.6	0.6	130	
	Dibenzo[a,h]anthracene	53703	mg kg-¹	M	< 0.1	< 0.1	25	
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	M	1.1	< 0.1	89	
	Benzo[g,h,i]perylene	191242	mg kg-¹	M	1.2	< 0.1	76	
	Total (of 16) PAHs		mg kg-¹	M	25	8.1	1800	
2750	Fuel Type (soils)			N				PAH
2760	Methyl tert-butyl ether	1634044	µg kg-¹	N				< 1
	Dichlorodifluoromethane	75718	µg kg-¹	U				< 1.0
	Chloromethane	74873	µg kg-¹	M				< 1.0
	Vinyl chloride	75014	µg kg-¹	M				< 1.0
	Bromomethane	74839	µg kg-¹	U				< 20
	Chloroethane	75003	µg kg-¹	U				< 2.0
	Trichlorofluoromethane	75694	µg kg-¹	U				< 1.0
	1,1-Dichloroethene	75354	µg kg-¹	U				< 1.0
	Dichloromethane	75092	µg kg-¹	N				ne
	trans-1,2-Dichloroethene	156605	µg kg-¹	U				< 1.0
	1,1-Dichloroethane	75343	µg kg-¹	M				< 1.0
	cis-1,2-Dichloroethene	156592	µg kg-¹	M				< 1.0
	Bromochloromethane	74975	µg kg-¹	U				< 1.0
	Trichloromethane	67663	µg kg-¹	M				< 1.0

All tests undertaken between 02/07/2012 and 06/07/2012

* Accreditation status

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Leyden Kirby
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FAO Paul Quimby

LABORATORY TEST REPORT

Results of analysis of 4 samples received 2 July 2012

CL1957 - Albert Street, Hadfield

Report Date 06 July 2012

					208695			
					AH48773	AH48774	AH48775	AH48776
					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2760	1,1,1-Trichloroethane	71556	µg kg-1	M				< 1.0
	Tetrachloromethane	56235	µg kg-1	M				< 1.0
	1,1-Dichloropropene	563586	µg kg-1	U				< 1.0
	Benzene	71432	µg kg-1	M				< 1.0
	1,2-Dichloroethane	107062	µg kg-1	U				< 2.0
	Trichloroethene	79016	µg kg-1	U				< 1.0
	1,2-Dichloropropane	78875	µg kg-1	U				< 1.0
	Dibromomethane	74953	µg kg-1	U				< 10
	Bromodichloromethane	75274	µg kg-1	U				< 5.0
	cis-1,3-Dichloropropene	10061015	µg kg-1	N				< 10
	Toluene	108883	µg kg-1	M				< 1.0
	trans-1,3-Dichloropropene	10061026	µg kg-1	N				< 10
	1,1,2-Trichloroethane	79005	µg kg-1	U				< 10
	Tetrachloroethene	127184	µg kg-1	M				< 1.0
	1,3-Dichloropropane	142289	µg kg-1	U				< 2.0
	Dibromochloromethane	124481	µg kg-1	U				< 10
	1,2-Dibromoethane	106934	µg kg-1	U				< 5.0
	Chlorobenzene	108907	µg kg-1	M				< 1.0
	1,1,1,2-Tetrachloroethane	630206	µg kg-1	M				< 2.0
	Ethylbenzene	100414	µg kg-1	M				< 1.0
	m- & p-Xylene	1330207	µg kg-1	U				< 1.0
	o-Xylene	95476	µg kg-1	U				< 1.0
	Styrene	100425	µg kg-1	U				< 1.0
	Tribromomethane	75252	µg kg-1	U				< 10

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					AH48773	AH48774	AH48775	AH48776
					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2760	Isopropylbenzene	98828	µg kg-¹	U				< 1.0
	Bromobenzene	108861	µg kg-¹	U				< 1.0
	1,2,3-Trichloropropane	96184	µg kg-¹	N				< 50
	n-Propylbenzene	103651	µg kg-¹	U				< 1.0
	2-Chlorotoluene	95498	µg kg-¹	M				< 1.0
	1,2,4-Trimethylbenzene	95636	µg kg-¹	U				< 1.0
	4-Chlorotoluene	106434	µg kg-¹	U				< 1.0
	tert-Butylbenzene	98066	µg kg-¹	U				< 1.0
	1,3,5-Trimethylbenzene	108678	µg kg-¹	U				< 1.0
	sec-Butylbenzene	135988	µg kg-¹	U				< 1.0
	1,3-Dichlorobenzene	541731	µg kg-¹	U				< 1.0
	4-Isopropyltoluene	99876	µg kg-¹	U				< 1.0
	1,4-Dichlorobenzene	106467	µg kg-¹	U				< 1.0
	n-Butylbenzene	104518	µg kg-¹	U				< 1.0
	1,2-Dichlorobenzene	95501	µg kg-¹	U				< 1.0
	1,2-Dibromo-3-chloropropane	96128	µg kg-¹	U				< 50
	1,2,4-Trichlorobenzene	120821	µg kg-¹	U				< 1.0
	Hexachlorobutadiene	87683	µg kg-¹	U				< 1.0
	1,2,3-Trichlorobenzene	87616	µg kg-¹	U				< 2.0
2790	Acenaphthene	83329	mg kg-¹	N				< 0.5
	Acenaphthylene	208968	mg kg-¹	N				< 0.5
	Azobenzene	103333	mg kg-¹	N				< 0.5
	Benzo[a]anthracene	56553	mg kg-¹	N				< 0.5
	Benzo[a]pyrene	50328	mg kg-¹	N				< 0.5

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LABORATORY TEST REPORT

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CL1957 - Albert Street, Hadfield

Chemtest
The right chemistry to deliver results

Report Date
06 July 2012

					208695			
					AH48773	AH48774	AH48775	AH48776
					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2790	Benzo[b]fluoranthene	205992	mg kg-¹	N				< 0.5
	Benzo[g,h,i]perylene	191242	mg kg-¹	N				< 0.5
	Benzo[k]fluoranthene	207089	mg kg-¹	N				< 0.5
	bis(2-Chloroethoxy)methane	111911	mg kg-¹	N				< 0.5
	bis(2-Chloroethyl)ether	111444	mg kg-¹	N				< 0.5
	bis(2-Chloroisopropyl)ether	108601	mg kg-¹	N				< 0.5
	bis(2-Ethylhexyl)phthalate	117817	mg kg-¹	N				< 0.5
	Butylbenzylphthalate	85687	mg kg-¹	N				< 0.5
	Chrysene	218019	mg kg-¹	N				< 0.5
	Di-n-butylphthalate	84742	mg kg-¹	N				< 0.5
	Di-n-octylphthalate	117840	mg kg-¹	N				< 0.5
	Dibenzo[a,h]anthracene	53703	mg kg-¹	N				< 0.5
	Dibenzofuran	132649	mg kg-¹	N				< 0.5
	Diethylphthalate	84662	mg kg-¹	N				< 0.5
	Dimethylphthalate	131113	mg kg-¹	N				< 0.5
	Fluoranthene	206440	mg kg-¹	N				1.8
	Fluorene	86737	mg kg-¹	N				< 0.5
	Hexachlorobenzene	118741	mg kg-¹	N				< 0.5
	Hexachlorobutadiene	87683	mg kg-¹	N				< 0.5
	Hexachlorocyclopentadiene	77474	mg kg-¹	N				< 0.5
	Hexachloroethane	67721	mg kg-¹	N				< 0.5
	Indeno[1,2,3-cd]pyrene	193395	mg kg-¹	N				< 0.5
	Isophorone	78591	mg kg-¹	N				< 0.5
	N-Nitrosodi-n-propylamine	621647	mg kg-¹	N				< 0.5

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					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2790	Naphthalene	91203	mg kg-¹	N				4.7
	Nitrobenzene	98953	mg kg-¹	N				< 0.5
	Pentachlorophenol	87865	mg kg-¹	N				< 0.5
	Phenanthrene	85018	mg kg-¹	N				1.4
	Phenol	108952	mg kg-¹	N				< 0.5
	Pyrene	129000	mg kg-¹	N				1.3
	1,2-Dichlorobenzene	95501	mg kg-¹	N				< 0.5
	1,2,4-Trichlorobenzene	120821	mg kg-¹	N				< 0.5
	1,3-Dichlorobenzene	541731	mg kg-¹	N				< 0.5
	1,4-Dichlorobenzene	106467	mg kg-¹	N				< 0.5
	2-Chloronaphthalene	91587	mg kg-¹	N				< 0.5
	2-Chlorophenol	95578	mg kg-¹	N				< 0.5
	2-Methyl-4,6-dinitrophenol	534521	mg kg-¹	N				< 0.5
	2-Methylnaphthalene	91576	mg kg-¹	N				< 0.5
	2-Nitroaniline	88744	mg kg-¹	N				< 0.5
	2-Nitrophenol	88755	mg kg-¹	N				< 0.5
	2,4-Dimethylphenol	105679	mg kg-¹	N				< 0.5
	2,4-Dinitrotoluene	121142	mg kg-¹	N				< 0.5
	2,4,5-Trichlorophenol	95954	mg kg-¹	N				< 0.5
	2,4,6-Trichlorophenol	88062	mg kg-¹					< 0.5
	2,6-Dinitrotoluene	606202	mg kg-¹	N				< 0.5
	3-Nitroaniline	99092	mg kg-¹	N				< 0.5
	4-Bromophenylphenylether	101553	mg kg-¹	N				< 0.5
	4-Chloro-3-methylphenol	59507	mg kg-¹	N				< 0.5

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					AH48773	AH48774	AH48775	AH48776
					HA101	HA102	HA103	HA104
					29/6/2012	29/6/2012	29/6/2012	29/6/2012
					0.2m	0.4m	0.3m	0.3m
					SOIL	*SOIL*	*SOIL*	*SOIL*
2790	4-Chloroaniline	106478	mg kg-¹	N				< 0.5
	4-Chlorophenylphenylether	7005724	mg kg-¹	N				< 0.5
	4-Nitroaniline	100016	mg kg-¹	N				< 0.5
2920	Phenols (total)		mg kg-¹	N				0.4

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APPENDIX D

ATRISK SSV VALUES / CL:AIRE GAC VALUES

Author	Atkins
Revision	3
Date	31/03/2011
Title	**SSVs derived using CLEA for 1% SOM, sand soil type, Residential with the consumption of homegrown produce land use**

PLEASE NOTE
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Compound	SSV mg/kg	Notes
1,1,1-Trichloroethane	2.23	
1,1,1,2-Tetrachloroethane	0.353	
1,1,2,2-Tetrachloroethane	0.695	
1,1,2-Trichloroethane	0.258	
1,1-Dichloroethane	0.827	
1,1-Dichloroethene	0.0857	
1,2-Dichloroethane	0.00190	
1,2,4-Trimethylbenzene	0.906	
1,2-Dichloropropane	0.00784	
2,4-Dichloro-o-cresol	31.1	
2,4-Dimethylphenol	17.2	The dermal approach published by EIC has been followed. In the phenol SGV report, additional consideration was given to localised dermal effects. This may be applicable to phenol derivatives but has not been considered.
2,4-Dinitrotoluene	1.41	
2,6-bis(1,1-dimethyl)-4-(1-methylpropyl)-phenol	21.7	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 18.7 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
2,6-Dinitrotoluene	0.751	
2-Chloronaphthalene	1.42	
2-Methylphenol	78.1	The dermal approach published by EIC has been followed. In the phenol SGV report, additional consideration was given to localised dermal effects. This may be applicable to phenol derivatives but has not been considered. Users must consider total exposure from all methylphenol isomers and not consider them in isolation. In line with the approach published by EIC when assessing total cresols, the lowest SSV of each methylphenol isomer may be chosen to compare to the total methylphenol concentration.
3-Methylphenol	77.4	The dermal approach published by EIC has been followed. In the phenol SGV report, additional consideration was given to localised dermal effects. This may be applicable to phenol derivatives but has not been considered. Users must consider total exposure from all methylphenol isomers and not consider them in isolation. In line with the approach published by EIC when assessing total cresols, the lowest SSV of each methylphenol isomer may be chosen to compare to the total methylphenol concentration.
4-Methylphenol	76.8	The dermal approach published by EIC has been followed. In the phenol SGV report, additional consideration was given to localised dermal effects. This may be applicable to phenol derivatives but has not been considered. Users must consider total exposure from all methylphenol isomers and not consider them in isolation. In line with the approach published by EIC when assessing total cresols, the lowest SSV of each methylphenol isomer may be chosen to compare to the total methylphenol concentration.
Acenaphthene	588	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 157 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Anthracene	8270	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 3.48 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.

Author	Atkins
Revision	3
Date	31/03/2011
Title	**SSVs derived using CLEA for 1% SOM, sand soil type, Residential with the consumption of homegrown produce land use**

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Compound	SSV mg/kg	Notes
Antimony	113	
Arsenic	32.0	Value presented is the Environment Agency Arsenic SGV published in May 2009. As plant concentration factors are used in deriving the SGV, assessment criteria do not change with soil type and SOM.
Barium	43.4	
Benzene	0.0493	Based on information within Environment Agency benzene SGVs published in March 2009.
Benzo(a)anthracene	4.52	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 1.71 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Benzo(a)pyrene	0.818	
Benzo(b)fluoranthene	7.72	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 1.22 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Benzo(g,h,i)perylene	96.2	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.0187 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Benzo(k)fluoranthene	84.4	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.686 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Beryllium	60.3	
Biphenyl	82.8	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 34.1 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Bis (2-ethylhexyl) phthalate	282	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 8.66 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the SSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Bromobenzene	0.319	

Author Atkins
Revision 3
Date 31/03/2011

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Compound	SSV mg/kg	Notes
Bromodichloromethane	0.00598	
Bromoform	1.40	
Butyl benzyl phthalate	1410	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 26.1 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the SSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Cadmium	10.0	Value presented is the Environment Agency Cadmium SGV published in July 2009. As plant concentration factors are used in deriving the SGV, assessment criteria do not change with soil type and SOM.
Carbon disulphide	0.0739	
Carbon tetrachloride	0.00656	
Chlorobenzene	3.49	
Chloroethane	3.05	
Chloroform / Trichloromethane	0.307	
Chloromethane	0.00301	
Chromium III	12800	
Chromium VI	14.2	
Chrysene	585	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.440 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Cis-1,2-dichloroethene	0.0393	
Copper	3970	
Cyanide	34.0	Based on acute exposure for a 0-6 year old child, using 5th percentile bodyweight from CLR10. Information is not available in SR3 and supporting documents regarding the 5th percentile bodyweight of SR3 bodyweight data. It is not considered likely that new data would significantly affect the SSV.
DDD	26.3	
Dibenz(a,h)anthracene	0.838	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.00393 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Dibromochloromethane	0.0623	
Dichloromethane	0.382	

Author	Atkins
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Compound	SSV mg/kg	Notes
Diethyl phthalate	108	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 12.8 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the SSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Di-n-butyl phthalate	12.9	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 4.62 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value. In line with the approach published by the EIC, the lower of the oral and inhalation assessment criteria has been selected. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the SSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Di-n-octyl phthalate	2250	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 32.6 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value. In line with the EIC report section 3.7, where the toxicity effects are the same, the potential additivity of phthalates should be considered by assessors when using the SSV for these substances. Guidance on additivity is provided in the Environment Agency for England and Wales SR2 document.
Dinoseb	0.0477	
Ethylbenzene	38.2	Based on information within Environment Agency ethylbenzene SGVs published in March 2009.
Fluoranthene	822	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 18.9 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Fluorene	615	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 125 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Formaldehyde	1.89	

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Compound	SSV mg/kg	Notes
Hexachloroethane	0.0735	
Indeno(1,2,3-c,d)pyrene	7.31	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.0614 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Iso-propylbenzene	34.4	
Lead	276	
Mercury (elemental)	0.0607	Based on information in the Environment Agency Mercury SGV report published in March 2009.
Mercury (inorganic)	170	Value presented is the Environment Agency inorganic mercury SGV published in March 2009. As plant concentration factors are used in deriving the SGV, assessment criteria do not change with soil type and SOM.
Mercury (methyl)	6.28	Based on information within the Environment Agency Mercury SGV report published in March 2009.
Methyl tert-butyl ether	20.0	
Molybdenum	74.6	
m-Xylene	17.9	The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration. Based on information within Environment Agency xylene SGVs published in March 2009. Users must consider total exposure from all xylene isomers and not consider them in isolation. The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration.
Naphthalene	0.585	
Nickel	130	Value presented is the Environment Agency Nickel SGV published in May 2009. As plant concentration factors are used in deriving the SGV, assessment criteria do not change with soil type and SOM.
Nicotine	0.0916	
o-Xylene	18.9	The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration. Based on information within Environment Agency xylene SGVs published in March 2009. Users must consider total exposure from all xylene isomers and not consider them in isolation. The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration.
Phenol	162	Based on information within the Environment Agency Phenol SGV report published in July 2009. Derived by comparing oral exposure to the oral HCV and inhalation and dermal exposure to the inhalation HCV.
Prochloraz	8.49	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.116 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Propylbenzene	85.6	
p-Xylene	17.2	The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration. Based on information within Environment Agency xylene SGVs published in March 2009. Users must consider total exposure from all xylene isomers and not consider them in isolation. The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration.
Pyrene	563	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 2.20 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.

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Compound	SSV mg/kg	Notes
Selenium	350	Value presented is the Environment Agency selenium SGV published in March 2009. As plant concentration factors are used in deriving the SGV, assessment criteria do not change with soil type and SOM.
Styrene	9.42	
Sum of PCDDs, PCDFs and dioxin-like PCBs	No SSV. Due to publication of the Dioxins, Furans and Dioxin-like PCB SGVs in September 2009, please see the Frequently Asked Questions for more information.	
Tetrachloroethene	0.455	
Toluene	86.9	Based on information within Environment Agency toluene SGVs published in March 2009.
TPH aliphatic C10-C12	1390	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 49.9 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
TPH aliphatic C12-C16	5100	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 21.0 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
TPH aliphatic C16-C35	145000	This fraction is not considered volatile and the inhalation of vapour pathways have not been considered (TPHCWG, 1997).
TPH aliphatic C5-C6	30.1	
TPH aliphatic C6-C8	69.8	
TPH aliphatic C8-C10	9.79	
TPH aromatic C10-C12	57.3	
TPH aromatic C12-C16	142	
TPH aromatic C16-C21	272	This fraction is not considered volatile and the inhalation of vapour pathways have not been considered (TPHCWG, 1997).
TPH aromatic C21-C35	888	This fraction is not considered volatile and the inhalation of vapour pathways have not been considered (TPHCWG, 1997).
TPH aromatic C5-C7	0.0493	Benzene is the only consituent of this fraction (TPHCWG 1997). Based on information within the Environment Agency benzene SGVs published in March 2009.
TPH aromatic C7-C8	86.9	Toluene is the only consituent of this fraction (TPHCWG 1997). Based on information within the Environment Agency toluene SGVs published in March 2009.
TPH aromatic C8-C10	14.8	
Trans-1,2-dichloroethene	0.0671	
Tributyl tin oxide	0.248	
Trichloroethene	0.0382	
Trichloromethylbenzene	0.000157	
Vanadium	113	
Vinyl chloride	0.000202	
Zinc	16900	

Note:
All values provided are rounded to 3 significant figures.
It is noted for some compounds that the SSV is sufficiently high that free product is likely to be encountered. Please see the Frequently Asked Questions for more advice.
In some instances the risk based value may be lower than the laboratory detection limit. Please see the Frequently Asked Questions for more advice.

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Compound	SSV mg/kg	Notes
1,1,1,2-Tetrachloroethane	4.82	
1,1,1-Trichloroethane	27.9	
1,1,2,2-Tetrachloroethane	6.34	
1,1,2-Trichloroethane		Please see the EIC GAC report.
1,1-Dichloroethane		Please see the EIC GAC report.
1,1-Dichloroethene		Please see the EIC GAC report.
1,2,4-Trimethylbenzene	8.28	
1,2-Dichloroethane	0.0139	
1,2-Dichloropropane		Please see the EIC GAC report.
2,4-Dichloro-o-cresol	167	
2,4-Dimethylphenol		Please see the EIC GAC report.
2,4-Dinitrotoluene		Please see the EIC GAC report.
2,6-bis(1,1-dimethyl)-4-(1-methylpropyl)-phenol	53.5	
2,6-Dinitrotoluene		Please see the EIC GAC report.
2-Chloronaphthalene		Please see the EIC GAC report.
2-Methylphenol		Please see the EIC GAC report.
3-Methylphenol		Please see the EIC GAC report.
4-Methylphenol		Please see the EIC GAC report.
Acenaphthene	2130	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 937 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Anthracene	18300	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 20.9 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Antimony	180	
Arsenic	32.0	Value presented is Environment Agency SGV published in May 2009.
Barium		Please see the EIC GAC report.
Benzene	0.330	Value presented is Environment Agency SGV published in March 2009.
Benzo(a)anthracene	8.54	
Benzo(a)pyrene	0.998	
Benzo(b)fluoranthene	9.86	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 7.29 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Benzo(g,h,i)perylene	103	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.112 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Benzo(k)fluoranthene	100	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 4.12 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Beryllium	60.9	

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Compound	SSV mg/kg	Notes
Biphenyl	462	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 201 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Bis (2-ethylhexyl) phthalate		Please see the EIC GAC report.
Bromobenzene		Please see the EIC GAC report.
Bromodichloromethane		Please see the EIC GAC report.
Bromoform		Please see the EIC GAC report.
Butyl benzyl phthalate		Please see the EIC GAC report.
Cadmium	10.0	Value presented is Environment Agency SGV published in July 2009.
Carbon disulphide	0.839	
Carbon tetrachloride	0.0892	
Chlorobenzene (mono)	45.7	
Chloroethane		Please see the EIC GAC report.
Chloroform / Trichloromethane	2.87	
Chloromethane		Please see the EIC GAC report.
Chromium III	12900	
Chromium VI	14.5	
Chrysene	927	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 2.64 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Cis-1,2-dichloroethene		Please see the EIC GAC report.
Copper	4020	
Cyanide	34.0	Based on acute exposure for a 0-6 year old child, using 5th percentile bodyweight from CLR10. Information is not available in SR3 and supporting documents regarding the 5th percentile bodyweight of SR3 bodyweight data. It is not considered likely that new data would significantly affect the SSV.
DDD	39.7	
Dibenzo(a,h)anthracene	1.00	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.0236 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Dibromochloromethane	0.757	
Dichloromethane		Please see the EIC GAC report.
Diethyl phthalate		Please see the EIC GAC report.
Di-n-butyl phthalate		Please see the EIC GAC report.
Di-n-octyl phthalate		Please see the EIC GAC report.
Dinoseb	0.527	
Ethylbenzene	350	Value presented is Environment Agency SGV published in March 2009.
Fluoranthene	2160	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 113 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.

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Compound	SSV mg/kg	Notes
Fluorene	1930	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 746 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Formaldehyde	7.16	
Hexachloroethane		Please see the EIC GAC report.
Indeno(1,2,3-c,d)pyrene	9.75	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.368 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Iso-propylbenzene	418	
Lead	342	
Mercury (elemental)	1.00	Value presented is Environment Agency SGV published in March 2009. Based on inhalation exposure only.
Mercury (inorganic)	170	Value presented is Environment Agency SGV published in March 2009.
Mercury (methyl)	11.0	Value presented is Environment Agency SGV published in March 2009.
Methyl tert-butyl ether		Please see the EIC GAC report.
Molybdenum		Please see the EIC GAC report.
m-Xylene	240	Value presented is Environment Agency SGV published in March 2009. Users must consider total exposure from all xylene isomers and not consider them in isolation. The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration.
Naphthalene	8.71	
Nickel	130	Value presented is Environment Agency SGV published in May 2009.
Nicotine	0.332	
o-Xylene	250	Value presented is Environment Agency SGV published in March 2009. Users must consider total exposure from all xylene isomers and not consider them in isolation. The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration.
Phenol	420	Value presented is Environment Agency SGV published in July 2009.
Prochloraz	44.0	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 0.682 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Propylbenzene	769	

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Compound	SSV mg/kg	Notes
p-Xylene	230	Value presented is Environment Agency SGV published in March 2009. Users must consider total exposure from all xylene isomers and not consider them in isolation. The lowest SSV of each xylene isomer may be chosen to compare to the total xylene concentration.
Pyrene	1550	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the combined assessment criterion calculated by the CLEA software, assuming that free phase product is not present. The inhalation of vapour pathway contributes less than 10% of total exposure which is unlikely to significantly affect the SSV. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 13.2 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
Selenium	350	Value presented is Environment Agency SGV published in March 2009.
Styrene	53.7	
Sum of PCDDs, PCDFs and dioxin-like PCBs		No SSV. Due to publication of the Dioxins, Furans and Dioxin-like PCB SGVs in September 2009, please see the Frequently Asked Questions for more information.
Tetrachloroethene	6.15	
Toluene	610	Value presented is Environment Agency SGV published in March 2009.
TPH aliphatic C10-C12	4140	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 297 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
TPH aliphatic C12-C16	5260	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 126 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
TPH aliphatic C16-C35	145000	This fraction is not considered volatile and the inhalation of vapour pathways have not been considered (TPHCWG, 1997).
TPH aliphatic C5-C6	259	
TPH aliphatic C6-C8	14700	The lower of the aqueous or vapour based saturation limits has been exceeded in the calculation. The SSV presented is the assessment criterion calculated using the approach outlined within SR4, assuming that free product is not present. Users may wish to consider the fact that the lower of the aqueous or vapour based saturation limits is 769 mg/kg and should confirm that free phase product is not observed where measured concentrations exceed this value.
TPH aliphatic C8-C10	144	
TPH aromatic C10-C12	389	
TPH aromatic C12-C16	687	
TPH aromatic C16-C21	804	This fraction is not considered volatile and the inhalation of vapour pathways have not been considered (TPHCWG, 1997).
TPH aromatic C21-C35	1220	This fraction is not considered volatile and the inhalation of vapour pathways have not been considered (TPHCWG, 1997).
TPH aromatic C5-C7 (benzene)	0.330	Benzene is the only constituent of this fraction (TPHCWG 1997). Value presented is Environment Agency SGV published in March 2009.
TPH aromatic C7-C8 (toluene)	610	Toluene is the only constituent of this fraction (TPHCWG 1997). Value presented is Environment Agency SGV published in March 2009.
TPH aromatic C8-C10	177	
Trans-1,2-dichloroethene		Please see the EIC GAC report.
Tributyl tin oxide		Please see the EIC GAC report.
Trichloroethene	0.493	
Trichloromethylbenzene	0.00165	
Vanadium	115	
Vinyl chloride	0.000986	
Zinc	17200	

Note:
All values provided are rounded to 3 significant figures.
It is noted for some compounds that the SSV is sufficiently high that free product is likely to be encountered. Please see the Frequently Asked Questions for more advice.
In some instances the risk based value may be lower than the laboratory detection limit. Please see the Frequently Asked Questions for more advice.

Table 4.2a: EIC/AGS/CL:AIRE GAC for organics with 1% SOM

Contaminant	GAC for 1% SOM ($mg.kg^{-1}$)				Soil Saturation Concentration ($mg.kg^{-1}$)
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
1,1,2 Trichloroethane	0.6	0.88	0.28	94	4030
1,1-Dichloroethane	2.4	2.5	9.2	280	1830
1,1-Dichloroethene	0.23	0.23	2.8	26	2230
1,2,4-Trimethylbenzene	0.35	0.41	0.38	42	557
1,2-Dichloropropane	0.024	0.024	0.62	3.3	1190
2,4-Dimethylphenol	19	210	3.1	16000	1380
2,4-Dinitrotoluene	1.5	170	0.22	3700	141
2,6-Dinitrotoluene	0.78	78	0.12	1900	287
2-Chloronaphthalene	3.7	3.8	40	390	114
Biphenyl	66	220	14	18000	34.4
Bis (2-ethylhexyl) phthalate	280	2700	47	85000	8.68
Bromobenzene	0.87	0.91	3.2	97	853
Bromodichloromethane	0.016	0.019	0.016	2.1	1790
Bromoform	2.8	5.2	0.95	760	2690
Butyl benzyl phthalate	1400	42000	220	940000	26.3
Chloroethane	8.3	8.4	110	960	2610
Chloromethane	0.0083	0.0085	0.066	1.0	1910
Cis 1,2 Dichloroethene	0.11	0.12	0.26	14	3940
Dichloromethane	0.58	2.1	0.10	270	7270
Diethyl Phthalate	120	1800	19	150000	13.7
Di-*n*-butyl phthalate	13	450	2.0	15000	4.65
Di-*n*-octyl phthalate	2300	3400	940	89000	32.6
Hexachloroethane	0.20	0.22	0.27	22	8.17
Isopropylbenzene	11	12	32	1400	390
Methyl *tert*-butyl ether	49	73	23	7900	20400
Propylbenzene	34	40	34	4100	402
Styrene	8.1	35	1.6	3300	626
Total Cresols (2-, 3- and 4-methylphenol)	80	3700	12	160000	15000
Trans 1,2 Dichloroethene	0.19	0.19	0.93	22	3420
Tributyl tin oxide	0.25	1.4	0.042	130	41.3

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC

GAC in highlighted boxes exceed soil saturation concentration. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

Table 4.3a: EIC/AGS/CL:AIRE GAC for organics with 2.5% SOM

Contaminant	GAC for 2.5% SOM ($mg.kg^{-1}$)				Soil Saturation Concentration ($mg.kg^{-1}$)
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
1,1,2 Trichloroethane	1.2	1.8	0.61	190	8210
1,1-Dichloroethane	3.9	4.1	17	450	2960
1,1-Dichloroethene	0.40	0.41	5.6	46	3940
1,2,4-Trimethylbenzene	0.85	0.99	0.93	99	1360
1,2-Dichloropropane	0.042	0.042	1.2	5.9	2110
2,4-Dimethylphenol	43	410	7.2	24000	3140
2,4-Dinitrotoluene	3.2	170	0.49	3700	299
2,6-Dinitrotoluene	1.7	84	0.27	1900	622
2-Chloronaphthalene	9.2	9.3	98	960	280
Biphenyl	160	500	35	33000	84.3
Bis (2-ethylhexyl) phthalate	610	2800	120	86000	21.6
Bromobenzene	2.0	2.1	7.6	220	1970
Bromodichloromethane	0.030	0.034	0.032	3.7	3220
Bromoform	5.9	11	2.1	1500	5480
Butyl benzyl phthalate	3300	44000	550	940000	64.7
Chloroethane	11	11	200	1300	3540
Chloromethane	0.0098	0.0099	0.13	1.2	2240
Cis 1,2 Dichloroethene	0.19	0.20	0.50	24	6610
Dichloromethane	0.98	2.8	0.19	360	9680
Diethyl Phthalate	260	3500	41	220000	29.1
Di-*n*-butyl phthalate	31	450	5.0	15000	11.4
Di-*n*-octyl phthalate	2800	3400	2100	89000	81.5
Hexachloroethane	0.48	0.54	0.67	53	20.1
Isopropylbenzene	27	28	79	3300	950
Methyl *tert*-butyl ether	84	120	44	13000	33100
Propylbenzene	82	97	83	9700	981
Styrene	19	78	3.7	6500	1440
Total Cresols (2-, 3- and 4-methylphenol)	180	5400	27	180000	32500
Trans 1,2 Dichloroethene	0.34	0.35	1.9	40	6170
Tributyl tin oxide	0.59	3.1	0.10	180	101

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC.

GAC in highlighted boxes exceed soil saturation concentration. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

Table 4.4a: EIC/AGS/CL:AIRE GAC for organics with 6% SOM

Contaminant	GAC for 6% SOM (mg.kg^{-1})				Soil Saturation Concentration (mg.kg^{-1})
	Residential with consumption of homegrown produce	Residential without consumption of homegrown produce	Allotments	Commercial	
1,1,2 Trichloroethane	2.7	3.9	1.4	400	18000
1,1-Dichloroethane	7.4	7.7	35	850	5600
1,1-Dichloroethene	0.82	0.82	12	92	7940
1,2,4-Trimethylbenzene	2.0	2.3	2.2	220	3250
1,2-Dichloropropane	0.084	0.085	2.6	12	4240
2,4-Dimethylphenol	97	730	17	30000	7240
2,4-Dinitrotoluene	7.2	170	1.1	3800	669
2,6-Dinitrotoluene	3.9	87	0.61	1900	1400
2-Chloronaphthalene	22	22	230	2200	669
Biphenyl	360	980	83	48000	201
Bis (2-ethylhexyl) phthalate	1100	2800	280	86000	51.7
Bromobenzene	4.7	4.9	18	520	4580
Bromodichloromethane	0.061	0.070	0.068	7.6	6570
Bromoform	13	23	4.6	3100	12000
Butyl benzyl phthalate	7200	44000	1300	950000	154
Chloroethane	18	18	380	2100	5710
Chloromethane	0.013	0.013	0.23	1.6	2990
Cis 1,2 Dichloroethene	0.37	0.39	1.0	47	12900
Dichloromethane	1.7	4.5	0.34	560	15300
Diethyl Phthalate	570	6300	94	290000	65
Di-*n*-butyl phthalate	67	450	12	15000	27.3
Di-*n*-octyl phthalate	3100	3400	3900	89000	196
Hexachloroethane	1.1	1.3	1.6	120	48.1
Isopropylbenzene	64	67	190	7700	2250
Methyl *tert*-butyl ether	160	220	90	24000	62700
Propylbenzene	190	230	200	21000	2330
Styrene	43	170	8.7	11000	3350
Total Cresols (2-, 3- and 4-methylphenol)	400	6900	63	180000	73300
Trans 1,2 Dichloroethene	0.70	0.71	4.0	81	12600
Tributyl tin oxide	1.3	5.7	0.24	200	241

Notes

It is strongly recommended that the accompanying EIC/AGS/CL:AIRE GAC report is read and understood if using these GAC.

GAC in highlighted boxes exceed soil saturation concentration. Soil concentrations above soil saturation may indicate that NAPL is present. Risks from NAPL may need to be considered separately.

APPENDIX E

HAZARD INDEX SPREADSHEET

$$HI = \sum_{Fi=1}^{16} HQ\ Fi = \frac{\text{Measured concentration Fi (mg/kg)}}{\text{SGV/GAC Fi (mg/kg)}}$$

where: HI = Hazard Index
HQ = Hazard Quotient
Fi = Fraction I
SGV/GAC = Soil Guideline Value or Generic Assessment Criteria

Residential with Plant Uptake Land Use

Job Albert Street, Hadfield
Job No. CL1957
SOM 1%
Comment Based upon HA104.

Residential With Plant Uptake

	1% SGV/SSV	2.50% SGV/GAC	6% SGV/SSV	Max Soil concn.	HQ (1%SOM)	HQ (2.5%SOM)	HQ (6% SOM)
Aliphatic							
EC5-EC6	30.1		259	0.1	0.0033223		
EC6-EC8	69.8		14700	0.1	0.0014327		
EC8-EC10	9.79		144	0.1	0.0102145		
EC10-EC12	1390		4140	1	0.0007194		
EC12-EC16	5100		5260	1	0.0001961		
EC16-EC21				1			
EC21-EC35	145000		145000	1	2.069E-05		
EC35-EC44				1			
Aromatic							
EC5-EC7 (benzene)	0.0493		0.33	0.001	0.020284		
EC7-EC8 (tolulene)	86.9		610	0.001	1.151E-05		
EC8-EC10	14.8		177	0.1	0.0067568		
EC10-EC12	57.3		389	2.1	0.0366492		
EC12-EC16	142		687	2.7	0.0190141		
EC16-EC21	272		804	6.1	0.0224265		
EC21-EC35	888		1220	6.7	0.007545		
EC35-EC44	888		1220	1	0.0011261		

HI	0.13	