

CONTAMINATED LAND RISK ASSESSMENT

PHASE 1 DESK TOP STUDY– PRELIMINARY RISK ASSESSMENT

Dave Calam

**Garden of Redthorn
Murton**



Our Ref: SES/DC/GR/I#1

Date: 21st March 2022

Client:


Dave Calam

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EXECUTIVE SUMMARY

Current site conditions	An unused building currently occupies the site.
Proposal	The proposal is for the demolition of the existing workshop and for the erection of a residential dwelling. Planning application 21/01856/FUL.
Adjacent site conditions	Residential buildings surround the site
Site history	The building was used as a private car servicing and repair facility from 1997 until early in 2020, prior to this the building was used as a domestic garage. Prior to this, from 1965 to the early 1980's, it was used for agricultural purposes as a vegetable packing shed.
Geology	Alne Glaciolacustrine Formation - Clay, Silty over Sherwood Sandstone Group – Sandstone.
Hydrogeology	The site is on a low vulnerability Unproductive Superficial and Principal Bedrock aquifer and is not in a source protection zone.
Hydrology	Surface water flow is expected to flow to the south leading to the drains mapped 200 m south of the site.
Potential sources and contaminants	No significant sources are considered to exist on or within a significant distance of the site.
Conclusions	No significant plausible pollutant linkages or significant uncertainties are considered to exist. A watching brief should be undertaken during development works.

1. INTRODUCTION AND OBJECTIVES

1.1 Introduction

The purpose of this assessment is to examine specifically the current and potential risks to human, ecological and ground and surface water receptors associated with possible contamination of the ground at the site located at:

Garden of Redthorn
Murton Garth,
Murton
York
YO19 5UJ
OS Grid Ref: 464820, 452640

The proposal is for the demolition of the existing workshop and for the erection of a residential dwelling. Planning application 21/01856/FUL.

1.2 Objectives

The primary objective of this risk assessment is to assess potential contamination sources, the pathways which these could possibly take through the environment and then the effects on likely receptors. A preliminary Conceptual Site Model (CSM) has been developed and evaluation of the risks is given. Subsequently, if needed, recommendations are made with regard to further (Phase 2) investigation and/or remediation.

2. SITE CHARACTERISATION

2.1 Current setting and condition (Drawing 1)

The site assessed for this investigation currently comprises approximately 0.04 ha of land located at Murton. The site is situated within a residential garden (Photos 1-5). The topography of the land on and surrounding the site generally slopes down to the south.

PHOTO 1 Aerial view



Walkover findings (photographs provided by the client)

PHOTO 2 View inside workshop

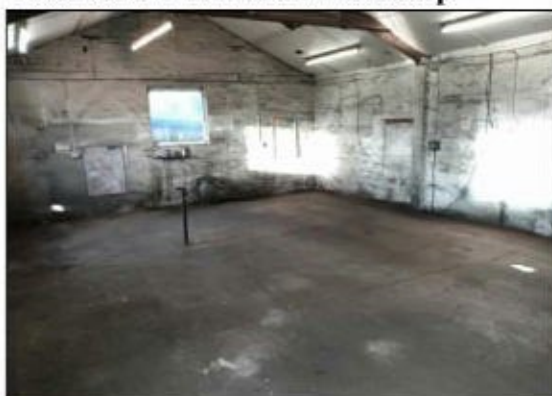


PHOTO 3



PHOTO 4



PHOTO 5



The client has informed:

- *The garage building is a detached brick structure with a pitched roof and a solid concrete floor slab. The floor slab is uncracked and in good order with construction joints in the middle of the area which have not opened noticeably.*
- *The roofing material is corrugated asbestos cement sheeting which will be safely removed and disposed of by specialists.*
- *There is no olfactory evidence of oils, fuel oils, petrol or diesel either within the garage or externally around the building.*
- *We understand that the floor slab is at least 100mm thick as fixings were drilled 100mm into the concrete when garage equipment was installed in the past.*
- *The building was used as a private car servicing and repair facility from 1997 until early in 2020 when all operations ceased. Immediately prior to its use as a vehicle repair facility, it was simply used as a domestic garage. Prior to this, from 1965 to the early 1980's it was used for agricultural purposes as a vegetable packing shed.*
- *There has never been any bulk storage of lubricants in the area as the proprietor purchased oils individually in standard 5 litre containers.*
- *The garage toilet and sink installations are connected to the combined public sewer in Murton Way, and we understand that the roof water is disposed of via a combination of connections to the main sewer and to a garden soakaway (not located).*

2.2 Former investigations and consultations

No former investigations in relation to contamination have been undertaken for the site.

2.3 Relevant planning history for the site.

- Erection of 2no. semi detached dwellings following demolition of motor vehicle repair workshop
Ref. No: 17/O1971/FUL | Status: Application Refused
- Erection of 1no. dwelling following demolition of motor vehicle repair workshop, (Resubmission of 17/O1971/FUL)
Ref. No: 18/O1333/FUL | Status: Application Permitted
- Erection of 1no. dwelling following demolition of workshop
Ref. No: 21/O1856/FUL | Status: Application Permitted

2.4 Site history (see Historical maps – Appendix A)

A chronological list of potential sources of contamination and significant features on and surrounding the site considered relevant to the proposed development are outlined below (Table 1).

TABLE 1 Significant features on the historical maps

Land use	Direction	Distance (m)	Notes
On-site			
Undeveloped land (pre-1892)	On-site	0	
Building mapped by 1970	On-site	0	
Off site			
Smithy (1892-1930)	NE	220	
Residential development (1967)	N,S,W	1	
Farm (1967-current)	S	42	

2.5 Soils, geology and hydrology

BGS maps indicate that the site is located on:

Superficial geology

1:50 000 scale superficial deposits description: Alne Glaciolacustrine Formation - Clay, Silty. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by ice age conditions

Bedrock geology

1:50 000 scale bedrock geology description: Sherwood Sandstone Group - Sandstone. Sedimentary Bedrock formed approximately 237 to 272 million years ago in the Triassic and Permian Periods. Local environment previously dominated by rivers.

Hydrology

Flow of surface water may occur through the soils to the aquifer at depth.

Surface water flow is expected to flow to the south leading to the drains mapped 200 m south of the site.

The site is on an Unproductive Superficial and Principal Bedrock aquifer and is not in a source protection zone.

2.6 Environmental data search

Environmental data (Appendix B) indicates the following:

- The site is situated on an Unproductive Superficial and Principal Bedrock aquifer and is not in a source protection zone.
- No Contaminated Land Register Entries and Notices within 1000 m.
- The Urban Soil Chemistry maps (Appendix B) indicate no significant elevated soil metal concentrations in relation to the proposed development.
- No contemporary trade directory entries are listed for the site.
- No current or historical landfill sites are mapped within 1000 m.
- No waste management, treatment or disposal sites are mapped within 550 m.
- No fuel station entries within 1000 m of the site.
- The property is in a low probability radon area (less than 1% of homes are estimated to be at or above the Action Level). No radon protective measures are necessary in the construction of new dwellings or extensions.
- Two pollution incidents to controlled waters mapped 218 m south-east (date of incident: 1991) and 246 m south-west (1994). Both are classed as a Category 3 incidents (minor).
- Potentially infilled land (water) 203 m north (date of infill: 1853) and 227 m south (date of infill: 1958).

3. INITIAL CONCEPTUAL SITE MODEL

The initial conceptual site model detailed here is by a written and tabular description of the sources, pathways and receptors. A cross section or diagram is only added if this will aid in understanding the conceptual site model.

Model summary

The site is located on a low vulnerability groundwater area. No significant potential sources of contamination are considered to exist from on or off-site sources. The residents will be the main receptors on site. No significant plausible pollutant linkages with regards to on-residents or controlled waters are considered to exist.

3.1 Potential sources

A review of the historical maps (Appendix A) and other information has identified that no potential sources of contamination are considered to exist on the site from on and off-site sources (Table 2).

TABLE 2 Possible source locations and potential contaminants

Land use	Direction	Distance (m)	Potential Contaminants
On-site			
Car repair activities	On-site	0	Metals, hydrocarbons, solvents
Off site			
Smithy (1892-1930)	NE	220	Metals, hydrocarbons
Farm (1967-current)	S	42	Metals, hydrocarbons, pesticides, herbicides
Potentially Infilled land (1853 & 1958)	NS	203, 227	Methane, carbon dioxide

3.2 Receptors

Humans

- Residents in the proposed dwelling.
- Residents in adjacent properties.

Controlled waters

- The site is on a low vulnerability Unproductive Superficial and Principal Bedrock aquifer and is not in a source protection zone.

Ecology

- Animals and plants are considered to be possible receptors.

Buildings and services

- Underground pipes and foundations.

3.3 Pathways and plausible pollutant linkages (See Table 3)

Pathways to and from the site could exist via service channels and horizontal flow within the low leaching potential superficial strata mapped on and adjacent to the site.

Human health

The main pathways considered possible are:

1. Ingestion of soil and dust
3. Ingestion of contaminated vegetables
4. Ingestion of soil attached to vegetables
5. Dermal contact with soil
6. Dermal contact with dust
7. Inhalation of fugitive soil dust
8. Inhalation of fugitive dust
9. Inhalation of vapours outside
10. Inhalation of vapours inside
11. Ingress to water supplies is also considered
12. Ingress and accumulation of methane

Controlled waters

Flow of surface water may occur through the soils to the aquifer at depth.

Surface water flow is expected to flow to the south leading to the drains mapped 200 m south of the site.

The site is on an Unproductive Superficial and Principal Bedrock aquifer and is not in a source protection zone.

The identified potential contaminants (sources) and receptors have been considered in relation to pathways that may link them (Table 3 and Appendix C):

TABLE 3 – Initial Conceptual Site Model (see Appendix C)

Potential source	Potential contaminants of concern	Plausible pathway	Potential receptor	Probability	Severity	Risk	Justification	Risk classification
ON-SITE								
Former car repair activities	Metals, hydrocarbons, solvents	Indoor inhalation and direct ingestion and/or dermal contact/ingestion with contaminants	Humans (site users), development workers	Unlikely	Medium	Low	Hard standing ground in the building restricting pathways. The quantity of substances used was minimal.	Low
		Leaching via vertical or lateral migration following any movement through the strata	Perched water, groundwater	Unlikely	Medium	Low	Natural attenuation. Hard standing ground and low permeability geology restricting pathways to depth	Low
		Direct contact	Buildings and service pipes	Unlikely	Medium	Low	No significant quantities of any aggressive substances expected	Low
OFF-SITE								
Former smithy	Metals, hydrocarbons	Indoor inhalation, direct soil and dust ingestion and/or inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Distance restricting pathways	Low
Farm	Metals, hydrocarbons, pesticides, herbicides	Indoor inhalation, direct soil and dust ingestion and/or inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Geology and topography restricting pathways	Low
Infilled water	Methane, carbon dioxide	Inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Natural attenuation given the time since infill*. Distance restricting pathways	Low

Notes to table: * Given the length of time since in-fill, any potential gas generated during decomposition is likely to have peaked and be in decline. This information is based on the document prepared by CIRIA titled 'CIRIA C665 -Assessing risks posed by hazardous gases to buildings'. Section 7.2.5 (Figure 7.1), details that the landfill gas generation rate significantly reduces with the age of the waste. By 30 years, the rate of gas generation is insignificant, and by 50 years, the rate is minimal.

Pathway: Classification of human exposure pathways (routes) from The CLEA model. Research and Development Publication CLR10. **Probability and severity:** Classification of Probability and Consequence from CIRIA C552 Contaminated land risk assessment, a guide to good practice 2001. **Risk Classification** from DETR Guidelines for Environmental Risk Assessment and Management, 2000

4. RISK ASSESSMENT SUMMARY

4.1 Human health

A *low* potential risk exists from on and off-site sources. The likelihood of occurrence of significant risks associated with any significant contamination associated with activities on or surrounding the site is considered to be *low*.

4.2 Controlled Waters

A *low* risk to groundwater is considered to exist given the hardstanding floor and the low permeability of the superficial geology mapped on the site.

4.3 Ecology

A *low risk* is considered to exist as no significant sources or receptors are considered to exist on or within a significant distance of the site. Hence no plausible pollutant linkages are present.

4.4 Buildings and services

A *low* risk is considered to exist as no significant quantities of aggressive substances which may affect the foundations or plastic/metal pipes of any buildings are considered to be present on the site.

5. UNCERTAINTIES AND RECOMMENDATIONS

Based on the above information, no significant plausible pollutant linkages or uncertainties will be expected to exist.

No Phase 2 is considered to be needed.

Appropriate PPE should be worn by development workers and a watching brief should be conducted during development works. Should any significant made ground be encountered during development works or should any areas of odorous, abnormally coloured or suspected contaminated ground be encountered, an amended risk assessment of the development should be undertaken to determine whether further investigation or remedial works are necessary.

To ensure minimal dust production, any ground excavation works should not be undertaken when the ground is dry. If water is to be used as a dust suppressant during any soil removal, on-site ponding or off-site run off must be appropriately controlled.

If any soil is removed from the site it will be:

- WAC tested and subsequently disposed of by an appropriate waste carrier. A copy of the waste transfer note should be provided as an appendix within the verification report.

If any soil is imported onto the site it will be:

- 1) suitably certified and subject to chemical testing against residential assessment criteria prior to being imported onto the site and again in-situ.
 - Inert materials can be sourced from site won material and obtained from a clean donor site. No soil should be imported from industrial sites. Evidence of the source of material should be provided to the Local Authority and details provided in the Verification report.
 - Any imported topsoil should be to BS3882:2007 specification.
 - **A visual and olfactory inspection of imported material should be undertaken** by a suitably qualified person to ensure that there is no obvious staining, it is not odorous, it is free from invasive species (i.e. Japanese Knotweed) and unsuitable material (i.e. glass, rebar, bricks) or obvious asbestos containing materials are not present.


- **Imported fill** will require certification or testing **before placement**. This testing should be undertaken **prior to placement** for site won material and **prior to importation** for imported material to determine that they are chemically suitable for use, to avoid cross-contamination and to avoid the costly exercise of re-excavating unsuitable material.
- **Testing should also be undertaken in-situ** and include common indicative pollutants such as *heavy metals, arsenic, speciated PAHs (16 priority EPA), and fractionated hydrocarbons (CLWG), asbestos* and be assessed against guidelines for residential development

The Phase 1 Preliminary Risk Assessment should be submitted for review by the relevant authorities for their comments prior to any development works.

DRAWING 1 & 2

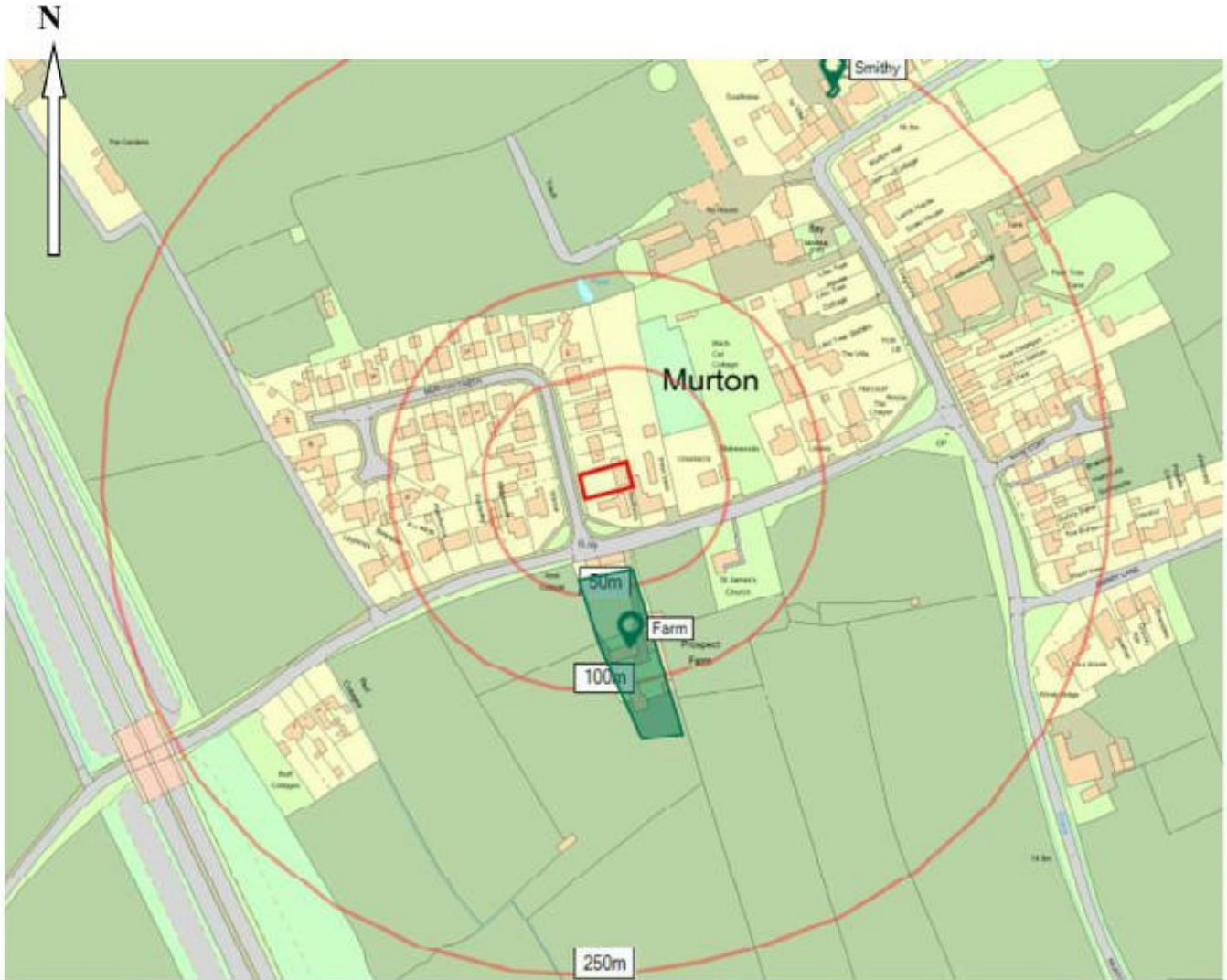
Current site setting

NOTES:


 Site boundary

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Drawing number	1
Drawing title	Current site setting
Scale	1:4167
Date	21/03/2022



NOTES:

 Site boundary

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Drawing number	2
Drawing title	Current and proposed site setting
Scale	N/A
Date	21/03/2022



APPENDIX A

Historical maps

APPENDIX B

Environmental data

APPENDIX C

Risk consequence

Risk is regarded as being a combination of the likelihood of an 'event' occurring and its severity. Both elements must be considered when assessing risk. As defined in CIRIA C552:2001, the magnitude of the potential severity of risk occurring may be assessed against:

Consequence of Risk Being Realised (based on C552 CIRIA, 2001)

Consequence of risk being realised			
Classification	Category	Definition	Examples
Severe short-term (acute) risks only	Humans	Short-term (acute) risk to human health likely to result in "significant harm" as defined by the Environment Protection Act 1990, Part 2A.	High concentrations of cyanide on the surface of an informal recreation area.
	Controlled Waters	Short-term risk of pollution (note: Water Resources Act contains no scope for considering significance of pollution) of sensitive water resource.	Major spillage of contaminants from site into controlled water.
	Property	Catastrophic damage to buildings/property.	Explosion causing building collapse (can also equate to a short-term human health risk if buildings are occupied).
	Ecological System	A short-term risk to a particular ecosystem, or organism forming part of such ecosystem.	
Medium chronic (long-term) risks; "significant harm"	Humans	Chronic damage to Human Health ("significant harm" as defined in Defra 2006).	Concentrations of a contaminant from site exceed the generic, or site-specific assessment criteria
	Controlled Waters	Pollution of sensitive water resources (note: Water Resources Act contains no scope for considering significance of pollution).	Leaching of contaminants from a site into a major or minor aquifer.
	Ecological System	A significant change in a particular ecosystem	Death of a species within a designated nature reserve.
Mild chronic (long-term) risks; less sensitive receptors	Controlled Waters	Pollution of non-sensitive water resources.	Pollution of non-classified groundwater.
	Property	Significant damage to buildings, structures and services ("significant harm" as defined in Circular on Contaminated Land, Defra, 2006). Damage to sensitive buildings/structures/services	Damage to building rendering it unsafe to occupy (e.g., foundation damage resulting in instability)
	Ecological System	Significant damage to crops. Damage to the environment.	
Minor chronic (long-term) risks; mild	Financial / project	Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve.	
	Humans	Non-permanent health effects to human health (easily prevented by means such as personal protective clothing, etc).	The presence of contaminants at such concentrations that protective equipment is required during site works.
	Property	Easily repairable effects of damage to buildings, structures and services	The loss of plants in a landscaping scheme. Discolouration of concrete.

Similarly, the classification of the magnitude of the probability of the risk occurring may be assessed against:

Probability of Risk Being Realised (C552 CIRIA, 2001)

Probability of risk being realised	
Classification	Definition
High Likelihood	There is a pollution linkage and an event that either appears very likely in the short term and almost inevitable over the long term, or there is evidence at the receptor of harm or pollution.
Likely	There is a pollution linkage and all the elements are present and in the right place, which means that it is probable that an event will occur. Circumstances are such that an event is not inevitable, but possible in the short term and likely over the long term.
Low Likelihood	There is a pollution linkage and circumstances are possible under which an event could occur. However, it is by no means certain that even over a longer period such event would take place, and is less likely in the shorter term.
Unlikely	There is a pollution linkage but circumstances are such that it is improbable that an event would occur even in the very long term.

The risk categories are summarised in the following table:

Risk Classification Matrix (C552 CIRIA, 2001)

Risk classification matrix					
(CIRIA C552, 2001, page 82)		Consequence			
		Severe	Medium	Mild	Minor
Probability	High Likelihood	Very High	High	Moderate	Moderate/Low
	Likely	High	Moderate	Moderate/Low	Low
	Low Likelihood	Moderate	Moderate/Low	Low	Very Low
	Unlikely	Moderate/Low	Low	Very Low	Very Low

Risk Classification Definitions (C552 CIRIA, 2001)

Risk classification definitions	
Very High	There is a high probability that severe harm could arise to a designated receptor from an identified hazard, OR, there is evidence that severe harm to a designated receptor is currently happening. This risk, if realised, is likely to result in a substantial liability. Urgent investigation (if not undertaken already) and remediation are likely to be required.
High	Harm is likely to arise to a designated receptor from an identified hazard. Realisation of the risk is likely to present a substantial liability. Urgent investigation (if not undertaken already) is required and remedial works may be necessary in the short term and are likely over the longer term.
Moderate	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that such harm would be severe, or if any harm were to occur it is more likely that the harm would be relatively mild. Investigation (if not already undertaken) is normally required to clarify the risk and to determine the potential liability. Some remedial works may be required in the longer term.
Moderate/Low	
Low	It is possible that harm could arise to a designated receptor from an identified hazard, but it is likely that this harm, if realised, would at worst normally be mild.
Very Low	There is a low possibility that harm could arise to a receptor. In the event of such harm being realised it is not likely to be severe.

REFERENCES

General guidance used:

BS 10175:2011 Investigation of potentially contaminated sites. British Standards Institution, London.

CLR 11: Model procedures for the management of land contamination. Environment Agency.

CIRIA C665 Assessing the risks posed by hazardous ground gases 2013.

CIRIA C682 The VOCs Handbook 2009 Investigation, assessing and managing risks from inhalation of Volatile Organic Compounds at land affected by contamination.

Chartered Institute for Environment and Health Indoor air quality in the home.

Environment Agency Guiding Principles for Land Contamination (GPLC).
(2010) Environment Agency.