

CONTAMINATED LAND RISK ASSESSMENT

PHASE 1 DESK TOP STUDY – PRELIMINARY RISK ASSESSMENT

Daniel Hutchinson

**Land rear of 42 Milton Road
Waterlooville**



Our Ref: SES/DH/MR/1#1

Date: 30th May 2017

Client:

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42 Milton Road
Waterlooville
PO7 6AA

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CONTENTS

	Page
EXECUTIVE SUMMARY	
1. INTRODUCTION AND OBJECTIVES	6
1.1 Introduction	6
1.2 Objectives	6
2. SITE CHARACTERISATION	7
2.1 Current settings and conditions	7
2.2 Former investigations and consultations	8
2.3 Planning history	8
2.4 Site history	10
2.5 Soil, geology and hydrology	10
2.6 Environmental data search	12
3. INITIAL CONCEPTUAL SITE MODEL	13
3.1 Significant sources	13
3.2 Receptors	14
3.3 Pathways and plausible pollutant linkages	14
4. RISK ASSESSMENT SUMMARY	18
4.1 Human health	18
4.2 Controlled waters	18
4.3 Ecology	18
4.4 Buildings and services	18
5. UNCERTAINTIES AND RECOMMENDATIONS	19
DRAWING 1	Current site location
DRAWING 2	Proposed site plan
APPENDIX A	Historical maps
APPENDIX B	Environmental data
APPENDIX C	Risk consequence
REFERENCES	

LIST OF TABLES

TABLE 1 Significant features on the historical maps

TABLE 2 Possible source locations and potential contaminants

TABLE 3 Initial source/receptor matrix

TABLE 4 Initial Conceptual Site Model

EXECUTIVE SUMMARY

Current site conditions	Trees and shrubs occupy the site.
Proposal	The proposal is for residential development (see Drawing 2). Planning Application APP/16/00631– erection of a one-bed dwelling.
Adjacent site conditions	Residential dwellings bound the site to the north and west, with a road to the east and industrial units to the south.
Site history	No development appears to have occurred on the site.
Geology	Head - Clay, Silt, Sand and Gravel over London Clay Formation - Clay, Silt and Sand.
Hydrogeology	The site is on a negligibly permeable Secondary Undifferentiated Superficial and Unproductive Bedrock aquifer and is in the Inner Zone (subsurface activity only – Zone 1c) of a groundwater source protection zone.
Hydrology	No surface water is mapped within 500 m down-gradient of the site.
Potential sources and contaminants	Potential sources are considered to exist from off-site activities.
Conclusions	Plausible pollutant linkages and significant uncertainties are considered to exist from off-site sources. A moderate risk is evident and therefore some remedial measures or an intrusive investigation is considered to be needed.

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:

Land rear of 42 Milton Road
Waterlooville
PO7 6AA

OS Grid Ref: 467922, 110220

The proposal is for residential development (see Drawing 2). Planning Application APP/16/00631– erection of a one-bed dwelling.

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 comprises 0.02 ha of land located on Jubilee Road, Waterloooville. Residential dwellings bound the site to the north and west, with a road to the east and a collection of industrial units to the south (Photo 1). Trees and shrubs occupy the site (Photos 1 & 2). The topography of the site and surrounding land slopes gently down to the south.

PHOTO 1 Aerial view



PHOTO 2 Google Streetview May 2015 – View SE to NW from adjacent factory



PHOTO 3 Google Streetview October 2014 – View from west of adjacent factory



2.2 Former investigations and consultations

No known former investigations with regards to contamination have been undertaken for the site.

2.3 Planning history

07/72384/000 - Demolition of existing garage and erection of a double garage with new access onto Jubilee Road. Raise roof of bungalow to form barn hipped roof with dormer windows to front and rear. PERM,14/08/2007

08/72384/001 - Erection of 1No. 3 bed chalet style dwelling with associated garaging and parking together with refuse/recycling, bottle/glass storage and undercover secure cycle storage., REF,16/12/2008

GEN/16/00396 - Proposed two bed chalet bungalows rear of 42 Milton Road, fronting Jubilee Road., ,05/05/2016 15:27:35

An Environmental Health Memorandum dated 21 July 2016 informs:

Contamination I note that the applicant asserts that the "possibility of contamination of the soil is unlikely since natural growth on the site has not been retarded, nor is showing any evidence of stress".

The lack of vegetation stress is a good indicator of absence of particular contaminants that have phytotoxic effects (especially nickel, copper, and aromatic hydrocarbons). Flora can however be quite tolerant of contaminants which have

the potential to impact human health (e.g. aliphatic hydrocarbons, lead). Whilst it is appreciated that this property is to be marketed as 'retirement living' accommodation, it's use class would permit occupation by any class of persons (albeit that 'parents with young children' is accepted to be relatively unlikely given that the living accommodation is limited to one bedroom under this application).

My previous comments on presence of contamination & averaging areas (as regards the relative significance of any elevated contaminants found to be present on site) remain valid. It is still considered appropriate & necessary to demonstrate that the development is safe & suitable for use as a residential dwelling.

As previously noted, the identified risk is off-site, and it is acknowledged that the applicant cannot be held liable for a contaminant source that is neither their responsibility, nor located on land they are responsible for. However, the applicant is able to mitigate the risks to the future occupants of the development from such contamination; for example through use of barriers or by ensuring the soils present on the development site are safe and suitable for cultivation as a private ornamental garden or for the domestic growing of vegetables for personal consumption'.

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 1881)	On-site	0	
No development appears to have occurred	On-site	0	
Off site			
Allotment gardens (1932-c.1962)	N	2	
Ponds (1938-c.1963)	E	52	
Residential development (c.1965)	N	1	
(Milk) depot (1965-current)	SE	105	
Boatbuilding yard (1972-c.1991)	S	3	
Electricity substation (1972-current)	SW	95	
(Engineering) works (1972-current)	S	10	
Industrial estate marked (1991-current)	S	3	

2.5 Soils, geology and hydrology

BGS maps indicate that the site is located on:

Superficial geology

1:50 000 scale superficial deposits description: Head - Clay, Silt, Sand and Gravel. Superficial Deposits formed up to 3 million years ago in the Quaternary Period. Local environment previously dominated by subaerial slopes.

Bedrock geology

1:50 000 scale bedrock geology description: London Clay Formation - Clay, Silt and Sand. Sedimentary Bedrock formed approximately 34 to 56 million years ago in the Palaeogene Period. Local environment previously dominated by deep seas.

One BGS listed borehole log mapped 5 m north of the site (BGS ID 421422, BGS Reference SU61SE68) informs of made ground over soft brown CLAY to 9 m bgl over grey/brown silty CLAY with flint fragment to 13 m bgl over firm grey/blue silty CLAY.

Hydrology

Flow to groundwater may occur through the soils to the aquifer at depth.

Surface water flow could possibly find a route via surface water drains and channels to the south and west. No surface water is mapped within 500 m down-gradient of the site.

The site is on a negligibly permeable Secondary Undifferentiated Superficial and Unproductive Bedrock aquifer and is in the Inner Zone (subsurface activity only – Zone 1c) of a groundwater source protection zone. There is the potential for groundwater flooding of properties situated below ground level.

2.6 Environmental data search

Environmental data (Appendix B) indicates the following:

- The site is located on a negligibly permeable Secondary Undifferentiated Superficial and Unproductive Bedrock aquifer
- The site is in the Inner Zone (subsurface activity only – Zone 1c) of a groundwater source protection zone.
- No Contaminated Land Register Entries and Notices within 1000 m.
- No pollution incidents within 600 m.
- No substantiated pollution incidents within 1000 m.
- No current or historic landfill sites within 1000 m.
- No waste management, treatment or disposal sites within 500 m.
- No contemporary trade directory entries are listed for the site or within a 60 m radius.
- No potentially infilled land (non-water) within 470 m.
- Less than 1 % of homes are above the action level for radon. No radon protective measures are considered necessary in the construction of new properties.
- The Urban Soil Chemistry maps (Appendix B) indicate no significant elevated soil metal concentrations.
- No fuel stations within 350 m.
- Potentially infilled land (water) 177 m north-west (1962).

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

No significant potential sources of contamination are considered to have been generated on the site. Potential sources of contamination are considered to have been generated off-site from the adjacent industrial estate activities. The future residents in the dwellings will be the main receptors on site. Plausible pollutant pathways to proposed future residents are considered to be evident

3.1 Potential sources

A review of the historical maps (Appendix A) has identified that potential sources of contamination may have been generated off-site and plausible pathways to future residents exist (Table 2).

TABLE 2 Possible source locations and potential contaminants

Source location	Direction	Distance (m)	Potential Contaminants
On-site			
None	On-site	0	No significant sources are considered to have been generated
Off site			
Allotment gardens (1932-c.1962)	N	2	Pesticides, herbicides, hydrocarbons
Ponds (1938-c.1963)	E	52	Methane, carbon dioxide
(Milk) depot (1965-current)	SE	105	Hydrocarbons
Boatbuilding yard (1972-c.1991)	S	3	Metals, hydrocarbons, paints, solvents
Electricity substation (1972-current)	SW	95	PCB's, mineral oils
(Engineering) works (1972-current)	S	10	Metals, hydrocarbons, acids, organic compounds

3.2 Receptors

Humans

- Residents in the proposed dwelling.
- Residents and workers in adjacent properties.
- Development workers.

Controlled Waters

- The site is on a negligibly permeable Secondary Undifferentiated Superficial and Unproductive Bedrock aquifer
- The site is in the Inner Zone (subsurface activity only – Zone 1c) of a groundwater source protection zone.
- Underlying aquifer.

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.

Human health

The main pathways considered possible are:

1. Ingestion of soil
2. Ingestion of 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

Controlled Waters

Flow to groundwater may occur through the soils to the aquifer at depth.

Surface water flow could possibly find a route via surface water drains and channels to the south and west. No surface water is mapped within 500 m down-gradient of the site.

The site is on a negligibly permeable Secondary Undifferentiated Superficial and Unproductive Bedrock aquifer and is in the Inner Zone (subsurface activity only – Zone 1c) of a groundwater source protection zone. There is the potential for groundwater flooding of properties situated below ground level.

TABLE 3. Initial source/receptor matrix											CSM	Ref	No.	1	Version	a								
SOURCE	Chemicals		RECEPTORS																					
		Possible present on site	On site								Off site													
	Type		Current workers	Future workers	Dev,ment workers	Current residents	Future residents	Ground water	Surface water	Ecology	Current workers	Future workers	Dev,ment workers	Current residents	Future residents	Ground water	Surface water	Ecology						
ON SITE																								
None	None	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N							
OFF SITE																								
Allotment gardens	Pesticides	N	N	N	N	N	N	N	N	N	N/A													
	Herbicides	N	N	N	N	N	N	N	N	N														
	Hydrocarbons	N	N	N	N	N	N	N	N	N														
Former ponds	Methane	N	N	N	N	N	N	N	N	N														
	Carbon dioxide	N	N	N	N	N	N	N	N	N														
Depot	Hydrocarbons	N	N	N	N	N	N	N	N	N														
Boat-building yard/industrial units	Metals	Y	N	N	N	N	Y	N	N	N														
	Hydrocarbons	Y	N	N	Y	N	Y	N	N	N														
	Paints	Y	N	N	Y	N	Y	N	N	N														
	Solvents	Y	N	N	Y	N	Y	N	N	N														
Electricity sub-station	PCB's	N	N	N	N	N	N	N	N	N														
	Mineral oils	N	N	N	N	N	N	N	N	N														
Engineering works	Metals	N	N	N	N	N	N	N	N	N														
	Hydrocarbons	N	N	N	N	N	N	N	N	N														
	Acids	N	N	N	N	N	N	N	N	N														
	Organic compounds	N	N	N	N	N	N	N	N	N														
Notes	For sources and contaminants see Section 3.1 of the report.																							
	For receptors and plausible linkages see Sections 3.2 and 3.3 of the report.																							
	For risks from sources on-site and sources off-site see Section 4 of the report.																							

The identified potential contaminants (sources) and receptors have been considered in relation to pathways that may link them (Table 4 and Appendix C):

TABLE 4 – Initial Conceptual Site Model (see Appendix C)

TABLE 4 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								
None	None	Indoor inhalation, direct ingestion and/or dermal contact with contaminants	Humans (site users), development workers	Unlikely	Medium	Low	No significant sources are considered to have been generated	Low
		Leaching via vertical or lateral migration following any movement through the strata	Perched water, groundwater	Unlikely	Medium	Low	No significant sources are considered to have been generated	Low
		Direct contact following any movement through the strata	Buildings and service pipes	Unlikely	Mild	Very low	No significant sources are considered to have been generated	Very low
OFF-SITE								
Former allotment gardens	Pesticides, herbicides, hydrocarbons	Indoor inhalation, direct soil and dust ingestion and/or inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Natural attenuation given the time since allotment operations	Low
Former ponds	Methane, carbon dioxide	Indoor inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Natural attenuation given the time since infill*	Low
Depot	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
Former boat-building yard/current industrial units	Metals, hydrocarbons, paints, solvents	Indoor inhalation, direct soil and dust ingestion and/or inhalation following any movement through the strata	Humans (site users)	Likely	Medium	Moderate	Given the proximity to the site, the migration of potential contaminants may have occurred	Moderate
Electricity sub-station	PCB's, mineral oils	Direct soil and dust ingestion and/or inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Distance restricting pathways	Low
Engineering works	Metals, hydrocarbons, acids, organic compounds	Indoor inhalation, direct soil and dust ingestion and/or inhalation following any movement through the strata	Humans (site users)	Unlikely	Medium	Low	Distance and topography 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 ***moderate*** potential risk exists from on and off-site sources (Table 4). The major risk could be from hydrocarbon and solvent vapour inhalation within indoor air-space and also to a lesser degree, ingestion and dermal contact with metals and hydrocarbons in any future landscaped or garden areas.

4.2 Controlled Waters

A ***low*** risk to groundwater is considered to exist due to no significant sources being generated on the site.

4.3 Ecology

A ***low risk*** is considered to exist as no significant 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 ***moderate/low*** risk is considered to exist as aggressive substances (PAH's) which may affect the foundations or plastic/metal pipes of any buildings may be present on the site from off-site sources.

5. UNCERTAINTIES AND RECOMMENDATIONS

Some risks are considered to be evident in relation to the possible presence of hydrocarbons, metals and other contaminants from the adjacent industrial units. Allowance should therefore be made to address the potential for the migration of certain contaminants from the current and future industrial estate activities bounding the south of the site. It would therefore be prudent to implement some remedial measures or undertake a Phase 2 site investigation.

Suggested remedial measures include the following:

1. Insertion of a hydrocarbon barrier into the building.
2. Barrier water pipes.
3. Removal of 0.6 m depth of ground in any proposed landscaped/garden areas. Imported fill will require certification or testing before placement. This testing should be undertaken either at source or following importation but prior to placement to determine that they are chemically suitable for use.
4. Any topsoil purchased should be in accordance with BS3882. In addition, materials imported to make up the cover system shall be demonstrated to be in compliance with BS: 8601 (Specification for Subsoil and Requirement for use) as well as being demonstrated as chemically suitable for the proposed use with respect to the risk to human health.
5. If any soils are removed from the site, they will be WAC tested and disposed of to an appropriate landfill.

Alternatively, a Phase 2 investigation be undertaken with sampling of the soil in order to substantiate the possible risks from contamination. The investigation should consist of soil samples from targeted boreholes with samples analysed in a UKAS and MCERTS accredited laboratory for metals, hydrocarbons and other associated contaminants, such that a site specific quantitative risk assessment can be undertaken and appropriate risk reduction measures recommended.

Any site investigation should be targeted with regard to sampling locations and all works be undertaken in accordance with BS 10175 - Investigation of Potentially Contaminated Sites: Code of Practice and CLR11 - Model Procedures for the Management of Land Contamination, using LQM/CIEH S4ULs guideline values.

The above proposed remediation measures or a Phase 2 scope of works will need to be agreed with the council prior to intrusive or development works.

DRAWING 1 & DRAWING 2

Current site location & proposed site plan

NOTES:

 Site boundary

Soil Environment Services

Drawing number

1

Drawing title

Current site location

Scale

1:2680

Date

31/05/2017

N



NOTES:

Soil Environment Services

Drawing number

2

Drawing title

Proposed site plan

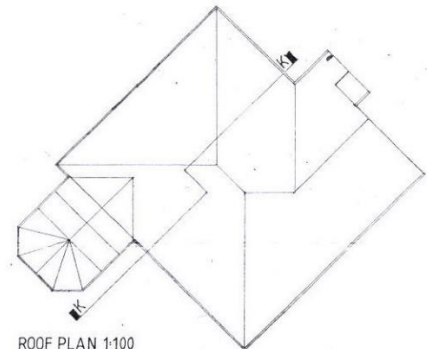
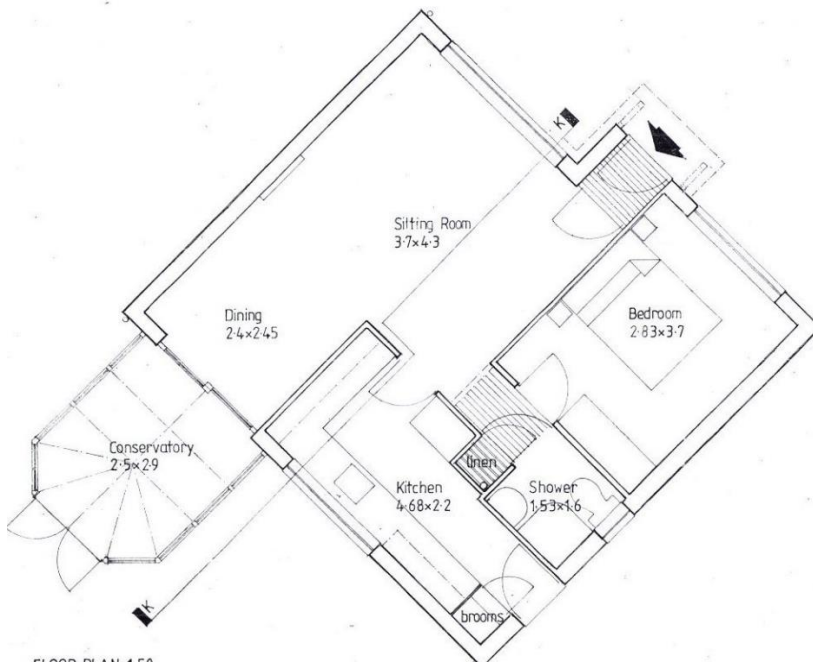
Scale

1:100

Date

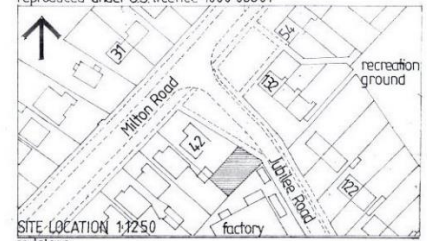
31/05/2017

APR/16/000651 Amended Plan



ROOF PLAN 1:100

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SITE LOCATION 1:1250

revisions

A high level windows in Sitting Room & Dining omitted:
full hip facing no. 42 Milton Road.

3.8.16

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.