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Phase 1 Land Contamination Risk Assessment

for

Erection of 4 Flats

on the site of

Cradge Bank, Splading, PE11 3AB

Date: June 2018

Status:	Final Report
Reference:	1298H Pacca - Spalding
Date:	23/06/2018

EXECUTIVE SUMMARY

The site is currently a grass-covered, unused plot of land which is orientated northwest-southeast. Access is gained from Cradge Bank. There are several fir trees with space in between each one along the western boundary. Currently the site is bounded up by metal and wooden fencing.

Surrounding practices have the potential to contaminate the site with various substances

Based on the information contained in this report, it is the opinion of Castledine & Co that the site represents a Very Low risk with respect to the proposed development.

It is recommended that a remediation in line with section 11.0 is undertaken.

CONTENTS

1.0 QUALITY ASSURANCE 1

2.0 LIMITATIONS 1

3.0 INTRODUCTION 2

4.0 SCOPE 2

5.0 SITE DESCRIPTION 4

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA 4

6.1 HYDROLOGICAL 5

6.1.1 AQUIFER 5
6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES 5
6.1.3 SOURCE PROTECTION ZONE 5
6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL 5
6.1.5 POTENTIAL SURFACE WATER 5
6.1.6 DISCHARGE CONSENTS 6

6.2 PERMITTED PROCESSES 8

6.3 POLLUTION INCIDENTS 8

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS 8

6.5 WASTE 8

6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS) 8
6.5.2 LANDFILL SITES 8
6.5.3 REGISTERED WASTE TREATMENT OR DISPOSAL SITES 8

6.6 HAZARDOUS SUBSTANCES 8

6.7 ECOLOGICAL RECEPTORS 9

6.8 SOILS AND GEOLOGY 9

6.8.1 SUPERFICIAL DEPOSITS 9
6.8.2 BEDROCK 9
6.8.3 COAL MINING 10
6.8.4 NON-COAL MINING 10
6.8.5 RADON 10

6.9 AERIAL PHOTOGRAPHY 10

6.9.1 BING 10
6.9.2 GOOGLE MAPS 10
6.9.3 GOOGLE EARTH 10
6.9.4 ENVIRONMENTAL SEARCH 11

6.10 GOOGLE STREET VIEW 11

6.11 HISTORIC MAPPING 11

6.12 CURRENT LAND USE DATA 13

6.13 PETROL AND FUEL SITES 14

6.14 HISTORICAL PETROL AND FUEL SITE DATABASE 14
6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING 14
6.16 HISTORICAL TANK DATABASE 15
6.17 HISTORICAL ENERGY FACILITIES 15
6.18 HISTORICAL GARAGE AND MOTOR VEHICLE REPAIR DATABASE 15
6.19 POTENTIALLY INFILLED LAND 15
6.20 PLANNING HISTORY 17
7.0 POLLUTANT LINKAGE ASSESSMENT 19
7.1 SOURCES 19
7.1.1 ONSITE 19
7.1.2 OFFSITE 19
7.2 PATHWAYS 20
7.3 RECEPTORS 20
8.0 CONCEPTUAL SITE MODEL 21
8.1 PRELIMINARY CONCEPTUAL SITE MODEL 21
8.1.1 SOIL CONTAMINATION 21
8.1.2 HAZARDOUS GROUND GAS AND VAPOURS 21
9.0 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT 26
10.0 FURTHER ENVIRONMENTAL INVESTIGATION 26
11.0 REMEDIAL ACTIONS AND VERIFICATION 26
12.0 REFERENCES 27
12.1 LEGISLATION AND REGULATIONS 27
12.1.1 ACTS 27
12.1.2 PLANNING REGULATIONS 27
12.1.3 CONTAMINATED LAND REGULATIONS 27
12.2 STATUTORY GUIDANCE 27
12.3 BRITISH STANDARDS 28
12.4 NON STATUTORY TECHNICAL GUIDANCE 28
12.4.1 ENVIRONMENT AGENCY 28
12.4.2 CIRIA PUBLICATIONS 28
12.4.3 CL:AIRE 28
13.0 APPENDICES 29

LIST OF APPENDICES

APPENDIX A	ENVIRONMENTAL SEARCH	30
APPENDIX B	PROPOSED AND CURRENT SITE PLANS	32
APPENDIX C	SITE PHOTOS AND LOCATIONS	34
APPENDIX D	SOIL SCREENING CRITERIA	39

LIST OF TABLES

TABLE 1.	SUMMARY OF SIGNIFICANT POLLUTION LINKAGES	23
TABLE 2.	RISK CLASSIFICATION MATRIX	25
TABLE 3.	CLASSIFICATION OF RISK	26

1.0 QUALITY ASSURANCE

Castledine & Co. confirm that all reasonable efforts have been made to ensure that the information outlined within this report is accurate.

Castledine & Co. would further confirm that due care, attention and technical skill were used in the creation of this report.

For and on behalf of Castledine & Co.

Kevin Castledine

(Proprietor)

2.0 LIMITATIONS

The conclusions and recommendations made in this report are limited to those based on the findings of the investigation. Where comments are made based on information obtained from third parties, Castledine & Co. assumes that all third party information is true and correct. No independent action has been undertaken to validate the findings of third parties. The assessments and interpretation have been made in line with legislation and guidelines in force at the time of writing, representing best practice at the time.

This survey has not included asbestos within existing structures, invasive plant species or any elements unconnected with potential ground contamination at the site. If required, such surveys should be undertaken by suitably accredited organisations.

There may be other conditions prevailing at the site which have not been disclosed by this investigation and which have not been taken into account by this report. Responsibility cannot be accepted for conditions not revealed by the investigation.

3.0 INTRODUCTION

Castledine & Co. have been appointed by Carmine Pacca to undertake a Phase 1 Desk study on Cradge Bank, Splading, PE11 3AB

4.0 SCOPE

Castledine & Co. have prepared this report for the sole use and reliance of Carmine Pacca and his appointees for the purpose of ensuring compliance with:

- paragraphs 120 and 121 of the NPPF,
- part C1 of the building regulations.
- Condition 5 of the South Holland District Council planning approval reference H16-0364-18 http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0364-18&from=planningSearch

Condition 5: The development hereby permitted shall not be commenced until a scheme to deal with any contamination of land or pollution of controlled waters has been submitted to and approved in writing by the Local Planning Authority (LPA) and until the measures approved in that scheme have been implemented. The scheme shall include all of the following measures:

i) a desk-top study carried out to identify and evaluate all potential sources of contamination and the impacts on land and/or controlled waters, relevant to the site. The desk-top study shall establish a 'conceptual site model' and identify all plausible pollutant linkages. Furthermore, the assessment shall set objectives for intrusive site investigation works/Quantitative Risk Assessment (or state if none required). Two full copies of the desk- top study and a non-technical summary shall be submitted to the LPA without delay upon completion.

ii) if identified as being required following the completion of the desk-top study, a site investigation shall be carried out to fully and effectively

characterise the nature and extent of any land contamination and/or pollution of controlled waters. It shall specifically include a risk assessment that adopts the Source-Pathway-Receptor principle, in order that any potential risks are adequately assessed taking into account the sites existing status and proposed new use. Two full copies of the site investigation and findings shall be forwarded to the LPA without delay upon completion.

iii) thereafter, a written method statement detailing the remediation requirements for land contamination and/or pollution of controlled waters affecting the site shall be submitted to and approved in writing by the LPA, and all requirements shall be implemented and completed to the satisfaction of the LPA. No deviation shall be made from this scheme. If during redevelopment contamination not previously considered is identified, then the LPA shall be notified immediately and no further work shall be carried out until a method statement detailing a scheme for dealing with the suspect contamination has been submitted to and agreed in writing by the LPA.

iv) two full copies of a full closure report shall be submitted to and approved in writing by the LPA. The report shall provide verification that the required works regarding contamination have been carried out in accordance with the approved Method Statement(s). Post-remediation sampling and monitoring results shall be included in the closure report to demonstrate that the required remediation has been fully met.

This report may not be used or relied upon by any unauthorised third party, or for any other proposed use than that specified above, without the explicit written agreement of Castledine & Co.

The report consists of a preliminary risk assessment in accordance with BS10175:2011+A1:2013 and CLR11 “Model Procedures for the Management of Land Contamination”.

The objectives of the report are:-

- To assess historical activities at the site with respect to their potential impact on the site environment.
- To characterise the environmental setting of the site, identify migration pathways and vulnerable receptors for contamination originating at the site, focusing on potential soil and groundwater liabilities.
- To assess historical and current surrounding land use in relation to known or potential off site contamination issues that may impact on the subject site and
- To develop a preliminary conceptual site model (CSM).

5.0 SITE DESCRIPTION

The site is located in Spalding, Lincolnshire at National Grid 524151, 321197 and is approximately 0.05ha in area.

The site is currently a grass-covered, unused plot of land which is orientated northwest-southeast. Access can be granted from Cradge Bank. There are several fir trees with space in between each one along the western boundary. Currently the site is bounded up by metal and wooden fencing.

Photos of the site are present in Appendix C

6.0 REGULATORY AUTHORITY AND OTHER ENVIRONMENTAL DATA

An environmental search listing historical and environmental factors likely to affect the property has been reviewed.

The most pertinent information is summarised in the following sections.

A copy is presented in Appendix A

Additional geological and hydrological data was obtained from the British Geological Survey.

6.1 HYDROLOGICAL

6.1.1 AQUIFER

6.1.1.1 SUPERFICIAL GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.1.1.2 BEDROCK GEOLOGY

ID	Distance (m)	Direction	Designation	Description
1	0	On Site	Unproductive	These are rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow

6.1.2 ABSTRACTIONS AND PRIVATE WATER SUPPLIES

None within 250m.

6.1.3 SOURCE PROTECTION ZONE

Not in a source protection source.

6.1.4 GROUNDWATER VULNERABILITY AND SOIL LEACHING POTENTIAL

None within 250m.

6.1.5 POTENTIAL SURFACE WATER

Distance (m)	Direction
49	SE
68	SE
120	E
130	SE

Distance (m)	Direction
134	N
169	NE
220	SE
232	S
234	SE

6.1.6 DISCHARGE CONSENTS

ID	Distance (m)	Direction	NGR	Description	
3	87	SE	524240 321150	Address:	Locksmill House, The Island, Cowbit Road, Spalding, Linconshire, PE12 6AA
				Effluent Type:	Sewage Discharges – Final/Treatment Effluent – Not Water Company
				Permit Number:	PRNNF09915
				Permit Version:	1
				Receiving Water:	New River
				Status:	Post NRA Legislation where date >31 August 1989
				Issue Date:	12/12/1995
				Effective Date:	12/12/1995
				Revocation Date:	-
4	154	S W	524100 321040	Address:	Welland Yacht Club, River Bank, Spalding, PE11 3AA
				Effluent Type:	Unspecified
				Permit Number:	PR5LF3041
				Permit Version:	1

ID	Distance (m)	Direction	NGR	Description	
				Receiving Water:	Land
				Status:	Post NRA Legislation where issue date > 31/08/89
				Issue Date:	01/08/1997
				Effective Date:	01/08/1997
				Revocation Date:	01/08/1997
5B	249	W	523890 321130	Address:	Lafarge Readymix, Spalding, Lincolnshire, PE11 3AB
				Effluent Type:	Trade discharges – Process Effluent – Not Water Company
				Permit Number:	PRNNF04494
				Permit Version:	1
				Receiving Water:	Tributary River Welland
				Status:	Post NRA Legislation where issue date > 31/08/89
				Issue Date:	13/09/1991
				Effective Date:	13/09/1991
				Revocation Date:	08/05/1994
6B	249	W	523890 321130	Address:	Lafarge Readymix, Spalding, Lincolnshire, PE11 3AB
				Effluent Type:	Trade discharges – Process Effluent – Not Water Company
				Permit Number:	PRNNF04494
				Permit Version:	2
				Receiving Water:	Tributary River Welland
				Status:	Post NRA Legislation where issue date > 31/08/89
				Issue Date:	09/05/1994
				Effective Date:	09/05/1994
				Revocation Date:	-

6.2 PERMITTED PROCESSES

ID	Distance (m)	Direction	NGR	Description	
8A	101	NE	524204 321293	Address:	Little London Service Station (Malthurst Petroleum Ltd), London Road, Little London, Spalding, Lincolnshire, PE11 2TW
				Process:	Unloading of Petrol into Storage at Service Stations
				Status:	Current Permit
				Permit Type:	Part B
				Enforcement:	No Enforcements Notified
				Date of Enforcement:	No Enforcements Notified
				Comment	No Enforcements Notified

6.3 POLLUTION INCIDENTS

None within 250m.

6.4 RADIOACTIVE SUBSTANCES REGISTRATIONS

None within 250m.

6.5 WASTE

6.5.1 LICENSED WASTE MANAGEMENT FACILITIES (LOCATIONS)

None within 250m.

6.5.2 LANDFILL SITES

None within 250m.

6.5.3 REGISTERED WASTE TREATMENT OR DISPOSAL SITES

None within 250m

6.6 HAZARDOUS SUBSTANCES

ID	Distance (m)	Direction	NGR	Description	
1A	104	NE	524200 321300	Name:	Little London Service Station
				Status	Not Active
				Receiving Water:	Na
				Authorised Susbtances:	pH
1 A	10 4	NE	524200 321300	Name:	Acco UK Ltd
				Status	Not Active
				Receiving Water:	Na
				Authorised Susbtances:	pH

6.7 ECOLOGICAL RECEPTORS

The site is within the Nitrate Vulnerable Zone.

6.8 SOILS AND GEOLOGY

"Contains British Geological Survey materials © NERC 2018" obtained from http://www.bgs.ac.uk/data/mapViewers/home.html under the Open Government Licence

6.8.1 SUPERFICIAL DEPOSITS

Tidal Flat Deposits - Clay And Silt. Superficial Deposits formed up to 2 million years ago in the Quaternary Period. Local environment previously dominated by shorelines.

6.8.2 BEDROCK

Oxford Clay Formation – Mudstone. Sedimentary Bedrock formed approximately 157 to 166 million years ago in the Jurassic Period. Local environment previously dominated by shallow seas.

6.8.3 COAL MINING

Property is not in a coal mining area.

6.8.4 NON-COAL MINING

No non-coal mining areas within 50m.

6.8.5 RADON

The property is not in a Radon Affected Area, as less than 1% of properties are above the Action Level.. No radon protective measures are necessary as described in publication BR211:2015 by the Building Research Establishment.

6.9 AERIAL PHOTOGRAPHY

Aerial photography shows the following:

6.9.1 BING

The site is a grass-covered field which is orientated northwest-southeast. Access can be granted from Cradge Bank. The western boundary contains a line of trees from top to bottom.

6.9.2 GOOGLE MAPS

The site is a grass-covered field which is orientated northwest-southeast. Access can be granted from Cradge Bank. The western boundary contains a line of trees from top to bottom.

6.9.3 GOOGLE EARTH

Nine images are held in the historic imagery dataset, as follows:

Date	Description
31/12/1999	The site is a well-kept grass cover field. The site is bounded by shrubs in the north.
31/12/2000	No significant changes onsite.
23/04/2004	No significant changes onsite.
17/04/2005	No significant changes onsite
11/03/2006	No significant changes onsite.
31/12/2007	No significant changes onsite.

Date	Description
31/12/2010	No significant changes onsite.
16/04/2014	Fir trees have been planted on the southwest boundary.
30/08/2016	No significant changes onsite.

6.9.4 ENVIRONMENTAL SEARCH

Image taken 06/04/2015

The site is a grass-covered field which is orientated northwest-southeast. Access can be granted from Cradge Bank. The western boundary contains a line of trees from top to bottom.

6.10 GOOGLE STREET VIEW

The site is grass-covered field which is orientated northwest-southeast. Access can be granted from Cradge Bank. The northern boundary is lined with pruned fir trees and the western boundary there are several recently planted small fir trees with space in between each one.

6.11 HISTORIC MAPPING

The following historic maps have been reviewed as part of this assessment. Castledine and Co. do not hold a license for the reproduction and/or distribution of this data.

Map	Onsite	Offsite
OS County Series: LINCOLNSHIRE 1888-1889 1:2,500	The site is part of a small field.	The River Welland is located 55m E. 150m SE there is the Locks Mill producing corn and the Cowbit sluice. North of the site it is dominated by residential dwellings, to the east river embankments and agricultural farm and associated fields, to the south there are fields and to the west further fields and residential dwellings. 250m N there is a marshy field.

Map	Onsite	Offsite
OS County Series: LINCOLNSHIRE 1904 1:2,500	No significant changes onsite.	150m Nurseries have been developed. The Locks Mill has been demolished. The marshy fields in the N have separated into two ponds
OS County Series: LINCOLNSHIRE 1931-1932 1:2,500	No significant changes onsite.	50m N Allotments have been developed.
OS County Series: LINCOLNSHIRE 1968 1:2,500	There several drains onsite on the N-E boundaries.	100m W, 100m SW and 100m NE stores have been built. E of the NE store allotment gardens have been developed. The area which were previously used for allotments is now unmarked and several areas have been developed on. 150m W a Builder's Yard has been built. 250m SW several Works have been developed along with an electricity substation. 150m NE there is a garage and an electricity substation. The Nurseries in the west are now unmarked and have been developed on, however 175m NE another Nursery has been developed.
OS Plan (partial) 1971 1:2,500	No significant changes onsite.	One of the stores in the SW stores oil. 125m SW behind the oil stores is a tank. 125m NW there is a large box factory along a store, works, bakery, saw mill and mill.
OS Plan (partial) 1982 1:10,000	No significant changes onsite.	Works 100m W of the site have been demolished and developed into a larger building expanding 150m. Residential estates have been built in the N and W. Allotments have been removed from its previous site and moved N of the Box Factory.

6.12 CURRENT LAND USE DATA

ID	Distance [m]	Direction	Company	Activity	Category
1	25	NE	4 W D Services	Vehicle Repair, Testing and Servicing	Repair and Servicing
2	90	NE	Motor Repairs	Vehicle Repair, Testing and Servicing	Repair and Servicing
3A	101	NE	Spalding Service Station	Petrol and Fuel Stations	Road and Rail
4A	101	NE	MRH Spalding	Petrol and Fuel Stations	Road and Rail
5	118	NW	Saw Mill	Wood Products including Charcoal, Paper, Card and Board	Industrial Products
6	120	NE	Electricity Substation	Electrical Features	Infrastructure and Facilities
7	120	SW	Tank	Tanks (Generic)	Industrial Products
8	121	N	Spalding Signs Ltd	Signs	Industrial Products
9	128	SW	Tank	Tanks (Generic)	Industrial Features
10	135	NW	Works	Unspecified Works Or Factories	Industrial Features
11	136	W	Rooke’s Pet Products Ltd	Animal Feeds, Pet Foods, Hay and Straw	Foodstuffs
12	144	NW	Factory	Unspecified Works Or Factories	Industrial Features
13	151	SW	Warehouse	Container and Storage	Transport, Storage and Delivery
14	151	NW	Crane	Travelling Cranes and Cantries	Industrial Features
15	177	SW	Transport Depot	Container and Storage	Transport, Storage and Delivery
16	188	S	Slipway	Moorings and Unloading Facilities	Water
17	203	SW	Works	Unspecified Works Or Factories	Industrial Features

ID	Distance [m]	Direction	Company	Activity	Category
18	225	NW	Pumping Station	Water Pumping Stations	Industrial Features
19	249	W	Hopper	Hoppers and Silos	Farming

6.13 PETROL AND FUEL SITES

ID	Distance [m]	Direction	Company	Address	Status
20	125	NE	BP	Mrh Spalding, London Road, Cradge Bank Road, Little London, Spalding, Lincolnshire, PE11 2TP	Open

6.14 HISTORICAL PETROL AND FUEL SITE DATABASE

None within 250m.

6.15 POTENTIAL CONTAMINATIVE LAND USES IDENTIFIED ON MAPPING

ID	Distance [m]	Direction	Use	Date
1A	61	W	Unspecified Depot	1980
2A	61	W	Unspecified Depot	1990
3	65	NW	Smithy	1903
4	75	SE	Corn Mill	1887
5	75	W	Smithy	1903
6	157	NW	Sewage Pumping Station	1932
7V	200	NW	Sewage Pumping Station	1938
8B	213	SW	Nursery	1980
9B	213	SW	Nursery	1990
10C	223	E	Nurseries	1903
11C	223	E	Nursery	1950

6.16 HISTORICAL TANK DATABASE

ID	Distance(m)	Direction	Use	Date
42L	114	SW	Unspecified Tank	1986
43L	114	SW	Unspecified Tank	1988
44L	144	SW	Unspecified Tank	1965
45L	116	SW	Unspecified Tank	1995
46L	118	SW	Unspecified Tank	1995
47L	119	SW	Unspecified Tank	1972
48L	119	SW	Unspecified Tank	1965
49L	119	SW	Unspecified Tank	1988
50L	119	SW	Unspecified Tank	1986
51L	119	SW	Unspecified Tank	1965

6.17 HISTORICAL ENERGY FACILITIES

ID	Distance(m)	Direction	Use	Date
52M	75	NE	Electricity Substation	1965
53M	75	NE	Electricity Substation	1986
54M	75	NE	Electricity Substation	1988
55M	79	NE	Electricity Substation	1972
56M	79	NE	Electricity Substation	1965
57T	96	NE	Electricity Substation	1995
58	114	NE	Electricity Substation	1967
59N	169	NW	Electricity Substation	1989
60N	169	NW	Electricity Substation	1992
61	247	SW	Electricity Substation	1967

6.18 HISTORICAL GARAGE AND MOTOR VEHICLE REPAIR DATABASE

ID	Distance (m)	Direction	Use	Date
93M	75	NE	Garage	1975
94T	83	NE	Garage	1965
95T	83	NE	Garage	1988
96T	83	NE	Garage	1965
97T	83	NE	Garage	1986
98T	91	NE	Garage	1967

6.19 POTENTIALLY INFILLED LAND

ID	Distance (m)	Direction	Use	Date
99U	127	NW	Ponds	1887
100U	161	NW	Pond	1903

ID	Distance (m)	Direction	Use	Date
101U	161	NW	Pond	1938
102U	161	NW	Pond	1903
103U	163	NW	Pond	1950
104U	164	NW	Pond	1932
105V	200	NW	Pond	1903
106W	235	SE	Pond	1938
107W	240	SE	Pond	1887

6.20 PLANNING HISTORY

This information is taken from the South Holland District Council planning website

http://planning.sholland.gov.uk/OcellaWeb/planningSearch

Reference	Address	Proposal	Hyperlink
H16-0335-18	149a Cradge Bank, Spalding, PE11 3AF	Proposed extension and alterations	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0335-18&from=planningSearch
H16-0121-18	123 Cradge Bank Spalding, PE11 3AF	Single storey double garage extension and single storey rear extension	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0121-18&from=planningSearch
H16-1156-16	197 Cradge Bank Spalding PE11 3AQ	Residential development - 10 three-bed and four-bed houses	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-1156-16&from=planningSearch
H16-0929-16	Land off Cradge Bank Spalding Lincs PE11 3AB	Erection of 3 bedroom dwelling	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0929-16&from=planningSearch
H16-1059-15	Land adjacent to Jacksons Cradge Bank Spalding Lincs PE11 3AB	Proposed detached house	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-1059-15&from=planningSearch
H16-0109-15	Land Adjacent Jacksons Cradge Bank Spalding PE11 3AB	Erection of detached garage with self-contained annexe above for Plot 7	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0109-15&from=planningSearch
H16-0808-14	Land adjacent to Jacksons Cradge Bank Spalding Lincolnshire PE11 3AB	Erection of detached dwelling	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0808-14&from=planningSearch

Reference	Address	Proposal	Hyperlink
H16-0117-14	Welland House Cradge Bank Spalding Lincolnshire PE11 3AB	Extension and alterations to dwelling and erection of detached garage with office. Modification of condition 3 of H16-0530-13 to allow existing dwelling and extension to be reclad with a different brick.	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0117-14&from=planningSearch
H16-0294-11	9 Cradge Bank Industrial Park Cradge Bank Spalding Lincs PE11 3AB	Change of use of part of car wash site to tyre fitting	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0294-11&from=planningSearch
H16-0127-11	Land adjacent Honeysuckle Cottage Cradge Bank Spalding Lincs PE11 3AB	Erection of one pair semi-detached houses	http://planning.sholland.gov.uk/OcellaWeb/planningDetails?reference=H16-0127-11&from=planningSearch

7.0 POLLUTANT LINKAGE ASSESSMENT

The risk posed by any contaminants in soil or groundwater will depend on the nature of the hazard, the probability of exposure, the pathway by which exposure occurs, and the likely effects on the receptors. A contaminant is defined as a substance that has the potential to cause harm, while a risk is considered to exist if such a substance is present in sufficient concentration to cause harm and a pathway exists for a receptor to be exposed to the substance.

The following sections discuss all the identified potential on and off site sources, pathways and receptors in the context of the proposed development and plausible pollutant linkages which may represent a risk to identified receptors from the data gained from the desk study. At this stage the assessment is qualitative and aimed to determine all pollutant linkages, irrespective of significance or allowing for uncertainty.

Three impact potentials exist for any given site, these are:

- The site impacting upon itself;
- The site impacting on its surroundings; and
- The surroundings impacting on the site.

All three impacts need to be considered in a risk assessment.

7.1 SOURCES

The following potential sources of contamination have been identified.

7.1.1 ONSITE

- Unknown use of the land

7.1.2 OFFSITE

- Storage, in particular the storage of oil
- Unknown Works
- Electricity Substations
- Garage
- Allotments

7.2 PATHWAYS

A pathway is defined as a mechanism or route by which a contaminant comes into contact with, or otherwise affects a receptor. Pathways by which the identified receptors may be impacted upon in the context of the proposed development are identified as follows:

- Ingestion;
- Skin contact;
- Inhalation;
- Plant uptake,
- Direct contact by buried structures;
- Leaching of soluble contamination into groundwater

7.3 RECEPTORS

Receptors are defined as people, living organisms, ecological systems, controlled waters, atmosphere, structures and utilities that could be adversely affected by contaminant(s).

- Human Health
    - Current users of the site;
    - Future users of the site;
    - Users of neighbouring sites;
    - Construction workers; and
    - Services personnel working in trenches.
    - Construction Materials
- Buried concrete, which may be affected by high concentrations of sulphate and/or low pH, in the soils and groundwater underlying the site; and
- Buried water pipes.
- Controlled Waters
- Ecological Receptors
- Flora and fauna using the proposed development

8.0 CONCEPTUAL SITE MODEL

The Conceptual Site Model (CSM) is a hypothesis of the nature and sources of contamination, potential receptors that may be the recipient of contamination arising from those sources and any pathways that may exist. It creates a plausible source-pathway-receptor pollutant linkage (hazard), set within the context of the ground and proposed end use of the site.

8.1 PRELIMINARY CONCEPTUAL SITE MODEL

8.1.1 SOIL CONTAMINATION

The site is currently a grass-covered, unused plot of land which is orientated northwest-southeast. Access can be granted from Cradge Bank. There are several fir trees with space in between each one along the western boundary. Currently the site is bounded up by metal and wooden fencing.

Surrounding practices have the potential to contaminate the site with various substances including;

- Metals and metalloids;
- Polycyclic aromatic hydrocarbons (PAH's);
- Petroleum hydrocarbons

However, it is very unlikely that the surrounding industrial practices would have contaminated the area. If any of the surrounding industries do have the potential contaminate any mobile phase contaminates would likely migrate into the Welland River due to topography and precipitation. Any unlikely potential contamination onsite will be mitigated by the present of underlying unproductive clays and mudstone.

8.1.2 HAZARDOUS GROUND GAS AND VAPOURS

It is unlikely that the site could produce significant amounts of hazardous gases and therefore no gas protection measures are needed.

As such the protection offered by modern building regulations compliant floor is likely to provide sufficient protection as outlined in CL:AIRE RB17 A Pragmatic Approach to Ground Gas Risk Assessment.

TABLE 1. SUMMARY OF SIGNIFICANT POLLUTION LINKAGES

Contaminant	Pathway	Receptor	Comments	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Contaminated Soils	Direct Ingestion & Direct Contact	Site Workers		Ul	Mi	VL	Site workers to wear appropriate PPE for health and safety reasons
Contaminated Soils	Inhalation of Dust	Site Workers		Ul	Mi	VL	
Contaminated Soils	Direct Ingestion & Direct Contact	End Users		Ul	Mr	VL	
Contaminated Soils	Inhalation of Dust	End Users		Ul	Mr	VL	
Contaminated Soils	Direct Ingestion	Flora and Fauna		Lw	Mi	VL	
Contaminated Soils	Vertical and lateral migration	Controlled Waters		Ul	Mi	VL	
Contaminated Soils	Direct contact	Services		Lw	Mr	VL	

Contaminant	Pathway	Receptor	Comments	Probability of Pollutant Linkage	Consequence	Risk	Possible Mitigation
Ground Gases (Methane and CO_2)	Vertical and lateral migration	End Users & Building Envelope		Ul	Mi	VL	No Gas Protection Measures needed.
Volatile and Semi-volatile Organic Compounds	Vertical and lateral migration	End Users & Building Envelope		Ul	Mi	VL	
Radon	Vertical and lateral migration	End Users & Building Envelope		Ul	Mi	VL	

KEY:

Probability of pollutant linkage Hi = Highly likely, Li = Likely, Lw = Low Likelihood, Ul = Unlikely

Consequence Sv = Severe, Md = Medium, Mi = Mild, Mr = Minor,

Overall Risk VH = Very High, H = High, M = Moderate, M/L = Moderate/Low, L = Low, VL = Very Low

Based on the preliminary CSM for the site, an environmental risk assessment has been undertaken. A simple matrix can provide a consistent basis for decision making. It should be used with caution, recognising the over-simplification that it will normally represent. The probability and consequences are defined according to parameters relevant to the situation; the boundaries of risk acceptability (and tolerability, where relevant) indicated on the matrix provided in Table 2, can be tailored to the factors influencing the significance of the risk. Individual situations are mapped onto the matrix to provide a ready and consistent indication of their acceptability or tolerability.

TABLE 2. RISK CLASSIFICATION MATRIX

		Consequence			
		Severe (Sv)	**Medium (Md)**	**Mild (Mi)**	**Minor (Mr)**
Probability	**High (Hi)**	Very high risk	High risk	Moderate Risk	Moderate/ Low Risk
	Likely (Li)	High risk	Moderate Risk	Moderate/Low Risk	Low Risk
	Low Likelihood (Lw)	Moderate Risk	Moderate/ Low Risk	Low Risk	Very Low Risk
	Unlikely (Ul)	Moderate/ Low Risk	Low Risk	Very Low Risk	Very Low Risk

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

These attributes are evaluated qualitatively against individual hazard assessments to determine the likelihood of a given hazard occurring. The risk evaluations for each plausible pollutant linkage are given in the last three columns of Table 1..

TABLE 3. CLASSIFICATION OF RISK

Very high risk (Vh)	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 risk (Hi)	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 risk (Md)	It is possible that harm could arise to a designated receptor from an identified hazard. However, it is either relatively unlikely that any 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.
Low risk (Lw)	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 risk (Vl)	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.

Source: CIRIA Report C552, Contaminated Land Risk Assessment. A Guide to Good Practice, 2001

9.0 PRELIMINARY ENVIRONMENTAL RISK ASSESSMENT

Based on the information contained in this report, it is the opinion of Castledine & Co that the site represents a Very Low risk with respect to the proposed development.

10.0 FURTHER ENVIRONMENTAL INVESTIGATION

It is not envisaged that further testing will be required.

This should be Discussed with the Local Planning Authority / Local council Contaminated Land Officer

11.0 REMEDIAL ACTIONS AND VERIFICATION

No remedial actions are required onsite.

12.0 REFERENCES

12.1 LEGISLATION AND REGULATIONS

12.1.1 ACTS

[1] Environmental Protection Act 1990, Part IIA: inserted by Environment Act 1995, Section 57. See Environment Act 1995 for text of Part IIA.

12.1.2 PLANNING REGULATIONS

[2] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 1999 SI1999/No.293

[3] The Town and Country Planning (Environmental Impact Assessment) (England and Wales) (Amendment) Regulations 2000 SI2000/No.2867

12.1.3 CONTAMINATED LAND REGULATIONS

[4] The Contaminated Land (England) Regulations 2000. SI2000/No.227

[5] The Contaminated Land (England) (Amendment) Regulations 2001 SI2001/No.663

[6] The Contaminated Land (England) Regulations 2006 SI2006/No.1380

12.2 STATUTORY GUIDANCE

[7] Department of Environment, Food and Rural Affairs. 2012. *Environmental Protection Act 1990: Part 2A Contaminated Land Statutory Guidance.* Department of Environment, Food and Rural Affairs

[8] Communities and local Government, 2012: National Planning Policy Framework.

12.3 BRITISH STANDARDS

[9] BS 5930:1999 Code of practice for site investigations

[10] BS 10175:2011+A1:2013 Investigation of potentially contaminated sites - Code of practice

[11] BS 8485:2015 bs 8485 - 2015 - Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings

[12] BS 8576:2013 Guidance on investigations for ground gas. Permanent gases and Volatile Organic Compounds (VOCs)

12.4 NON STATUTORY TECHNICAL GUIDANCE

12.4.1 ENVIRONMENT AGENCY

[13] Cassella Stranger, 2002. Model Procedures for the Management of Contaminated Land, Contaminated Land Report (CLR) 11, Department for Environment, Food, and Rural Affairs.

12.4.2 CIRIA PUBLICATIONS

[14] Wilson, S., Oliver, S., Mallett, H., Hutchings, H., and Card, G.. 2007, *C 665 Assessing risks posed by hazardous ground gases to buildings* London: Construction Industry Research and Information Association

[15] Mallett, H., Cox, L., Wilson, S. and ,Corban M... 2014, *C 735 Good practice on the testing and verification of protection systems for buildings against hazardous ground gases* London: Construction Industry Research and Information Association

12.4.3 CL:AIRE

[16] Card G, Wilson S, Mortimer S. 2012. *A Pragmatic Approach to Ground Gas Risk Assessment. CL:AIRE Research Bulletin RB17*. CL:AIRE, London, UK. ISSN 2047- 6450 (Online)

13.0 APPENDICES

APPENDIX A ENVIRONMENTAL SEARCH


NW
N
NE
W
E
SW
S
SE

APPENDIX B PROPOSED AND CURRENT SITE PLANS

a3
Cradge Bank | Spalding
renway
Exig boundary fence
Permeable Brindle Block Paving
Exig access
Remove boundary hedge
2.0m high close boarded fencing
lawn
lawn
7.3 m
6.8 m
Site Block Plan
1 : 250
2902 / 01 rev C
VISUAL SCALE 1:250 @ a3
VISUAL SCALE 1:1250 @ a3
Site Location Plan
1 : 1250
Site Location Plans

APPENDIX C SITE PHOTOS AND LOCATIONS


1
2
3
4

1. 

2.



3.



4.



APPENDIX D **SOIL SCREENING CRITERIA**

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Default Suite																			
Arsenic	SGV report + CLEA 1.06	35	35	35	32	32	32	43	43	43	640	640	640	79	79	79	170	170	170
Beryllium	LQM/CIEH + CLEA 1.06	51	51	51	51	51	51	55	55	55	420	420	420	93	93	93	670	670	670
Boron	LQM/CIEH + CLEA 1.06	1000	1000	1000	290	290	290	45	45	45	190000	190000	190000	21000	21000	21000	46000	46000	46000
Cadmium	SGV report + CLEA 1.06	85	85	85	11	11	11	1.9	1.9	2	230	230	230	120	120	120	560	560	560
Chromium (III)	LQM/CIEH + CLEA 1.06	630	630	630	630	630	630	15000	15000	15000	8800	8800	8800	1500	1500	1500	27000	27000	27000
Chromium (VI)	LQM/CIEH + CLEA 1.06	4.3	4.3	4.3	4.3	4.3	4.3	2.2	2.2	2.2	35	35	35	7.7	7.7	7.7	220	220	220
Copper	LQM/CIEH + CLEA 1.06	6200	6200	6200	2300	2300	2300	520	520	520	72000	72000	72000	12000	12000	12000	44000	44000	44000
Lead	C4SL	310	310	310	200	200	200	80	80	80	2330	2330	2330	630	630	630	1300	1300	1300
Mercury, inorganic	SGV report + CLEA 1.06	240	240	240	170	170	170	80	80	80	3600	3600	3600	470	470	470	1100	1100	1100
Nickel	SGV report + CLEA 1.06	130	130	130	130	130	130	230	230	230	1800	1800	1800	290	290	290	3500	3500	3500
Selenium	SGV report + CLEA 1.06	600	600	600	350	350	350	120	120	120	13000	13000	13000	1400	1400	1400	2600	2600	2600
Vanadium	LQM/CIEH + CLEA 1.06	190	190	190	74	74	74	18	18	18	3200	3200	3200	440	440	440	970	970	970
Zinc	LQM/CIEH + CLEA 1.06	40000	40000	40000	3700	3700	3700	620	620	620	670000	670000	670000	81000	81000	81000	170000	170000	170000
Cyanide (free)	Hydrock + CLEA 1.06	760	760	760	750	750	750	2300	2300	2300	16000	16000	16000	1600	1600	1600	3400	3400	3400
Phenol	SGV report + CLEA 1.06	310	420	520	180	290	420	66	140	280	3200	3200	3200	3200	3200	3200	3200	3200	3200
Acenaphthene	LQM/CIEH + CLEA 1.06	2000	3100	3900	210	480	1000	34	85	200	85000	98000	100000	15000	15000	15000	29000	30000	30000

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Acenaphthylene	LQM/CIEH + CLEA 1.06	2000	3000	3900	170	400	850	28	69	160	84000	97000	100000	15000	15000	15000	29000	30000	30000
Anthracene	LQM/CIEH + CLEA 1.06	20000	22000	23000	2300	4900	9200	380	950	2200	520000	540000	540000	74000	74000	74000	150000	150000	150000
Benz(a)anthracene	LQM/CIEH + CLEA 1.06	3.7	5.2	6.2	3.1	4.7	5.9	2.5	5.5	10	89	95	97	17	18	18	26	33	40
Benzo(a)pyrene	LQM/CIEH + CLEA 1.06	1	1	1	0.83	0.94	1	0.6	1.2	2.1	14	14	14	2.6	2.6	2.6	4.5	5.6	6.5
Benzo(b)fluoranthene	LQM/CIEH + CLEA 1.06	7	7.3	7.4	5.6	6.5	7	3.5	7.4	13	100	100	100	18	18	18	30	38	45
Benzo(ghi)perylene	LQM/CIEH + CLEA 1.06	47	47	47	44	46	47	70	120	160	650	660	660	120	120	120	270	310	350
Benzo(k)fluoranthene	LQM/CIEH + CLEA 1.06	10	10	10	8.5	9.6	10	6.8	14	23	140	140	140	26	26	26	46	57	67
Chrysene	LQM/CIEH + CLEA 1.06	8.8	9.7	10	6	8	9.3	2.6	5.8	12	140	140	140	25	26	26	34	45	55
Dibenz(ah)anthracene	LQM/CIEH + CLEA 1.06	0.86	0.91	0.93	0.76	0.86	0.9	0.76	1.5	2.3	13	13	13	2.3	2.3	2.3	4.5	5.5	6.3
Fluoranthene	LQM/CIEH + CLEA 1.06	970	990	1000	260	460	670	52	130	290	23000	23000	23000	3100	3100	3100	6300	6300	6400
Fluorene	LQM/CIEH + CLEA 1.06	1900	2500	2900	160	380	780	27	67	160	64000	69000	71000	9900	9900	9900	20000	20000	20000
Indeno(123cd)pyrene	LQM/CIEH + CLEA 1.06	4.2	4.4	4.4	3.2	3.9	4.2	1.8	3.8	7.1	60	61	62	11	11	11	17	22	26
Naphthalene	LQM/CIEH + CLEA 1.06	1.6	3.9	9.3	1.5	3.7	8.7	4.1	9.9	23	200	480	1100	3900	4100	4200	1100	1600	2300
Phenanthrene	LQM/CIEH + CLEA 1.06	840	930	970	92	200	380	16	38	90	22000	22000	23000	3100	3100	3100	6200	6300	6300
Pyrene	LQM/CIEH + CLEA 1.06	2300	2400	2400	560	1000	1600	110	270	620	54000	54000	55000	7400	7400	7400	15000	15000	15000
TPH fractions																			
TPH ali EC05-EC06	LQM/CIEH + CLEA 1.06	30	55	110	30	55	110	740	1700	3900	300	560	1200	300	560	600000	300	560	1200
TPH ali >EC06-EC08	LQM/CIEH + CLEA 1.06	73	160	370	73	160	370	2300	5600	13000	140	320	740	600000	610000	620000	140	320	740

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
TPH ali >EC08-EC10	LQM/CIEH + CLEA 1.06	19	46	110	19	46	110	320	770	1700	78	190	450	13000	13000	13000	77	190	450
TPH ali >EC10-EC12	LQM/CIEH + CLEA 1.06	48	120	280	48	120	280	2200	4400	7300	48	120	280	13000	13000	13000	48	120	280
TPH ali >EC12-EC16	LQM/CIEH + CLEA 1.06	24	59	140	24	59	140	11000	13000	13000	24	59	140	13000	13000	13000	24	59	140
TPH ali >EC16-EC35	LQM/CIEH + CLEA 1.06	45000	64000	77000	45000	64000	76000	260000	270000	270000	1000000	1000000	1000000	250000	250000	250000	460000	480000	490000
TPH ali >EC35-EC44	LQM/CIEH + CLEA 1.06	45000	64000	77000	45000	64000	76000	260000	270000	270000	1000000	1000000	1000000	250000	250000	250000	460000	480000	490000
TPH aro EC05-EC07	LQM/CIEH + CLEA 1.06	260	480	980	65	130	280	13	27	57	1200	2300	4700	56000	56000	56000	1200	2300	4700
TPH aro >EC07-EC08	LQM/CIEH + CLEA 1.06	610	1300	2700	120	270	610	22	51	120	870	1900	4400	56000	56000	56000	870	1900	4400
TPH aro >EC08-EC10	LQM/CIEH + CLEA 1.06	33	81	190	27	65	150	8.6	21	51	610	1500	3600	5000	5000	5000	610	1500	3600
TPH aro >EC10-EC12	LQM/CIEH + CLEA 1.06	180	420	870	69	160	350	13	31	74	360	900	2200	5000	5000	5000	360	900	10000
TPH aro >EC12-EC16	LQM/CIEH + CLEA 1.06	1250	1600	1700	140	310	590	23	57	130	36000	37000	38000	5000	5000	5000	10000	10000	10000
TPH aro >EC16-EC21	LQM/CIEH + CLEA 1.06	1300	1300	1300	250	480	770	46	110	260	28000	28000	28000	3800	3800	3800	7600	7700	7800
TPH aro >EC21-EC35	LQM/CIEH + CLEA 1.06	1300	1300	1300	890	1100	1200	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900
TPH aro >EC35-EC44	LQM/CIEH + CLEA 1.06	1300	1300	1300	890	1100	1200	370	820	1600	28000	28000	28000	3800	3800	3800	7800	7800	7900
TPH >EC44-EC70	LQM/CIEH + CLEA 1.06	1300	1300	1300	1200	1300	1300	1200	2100	3000	28000	28000	28000	3800	3800	3800	7800	7800	7900
VOCs - BTEX & MTBE																			
Benzene	SGV report + CLEA 1.06	0.27	0.49	1	0.08	0.16	0.33	0.017	0.035	0.075	28	50	95	72	72	73	90	100	110
Toluene	SGV report + CLEA 1.06	610	1300	2700	120	270	610	22	51	120	870	1900	4400	56000	56000	56000	870	1900	4400
Ethylbenzene	SGV report + CLEA 1.06	170	380	840	65	150	350	16	39	91	520	1200	2800	25000	25000	25000	520	1200	2800

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
Xylene, o-	SGV report + CLEA 1.06	60	140	320	45	110	250	28	67	160	480	1100	2600	41000	42000	43000	480	1100	2600
Xylene, m-	SGV report + CLEA 1.06	55	130	300	44	100	240	31	74	180	630	1500	3500	41000	42000	43000	630	1500	3500
Xylene, p- (use this for combined m & p)	SGV report + CLEA 1.06	53	130	290	42	98	230	29	70	160	580	1400	3200	41000	42000	43000	580	1400	3200
MTBE	EIC/AGS/CL:AIRE + CLEA 1.06	73	120	220	49	84	160	23	44	90	7900	13000	24000	75000	75000	75000	20000	33000	63000
VOCs - other benzenes																			
Iso-propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.06	12	28	67	11	27	64	32	79	190	390	950	2300	25000	25000	25000	390	950	2300
Propylbenzene	EIC/AGS/CL:AIRE + CLEA 1.06	40	97	230	34	82	190	34	83	200	400	980	2300	25000	25000	25000	400	980	2300
1,2,4-Trimethylbenzene	EIC/AGS/CL:AIRE + CLEA 1.06	0.41	0.99	2.3	0.35	0.86	2	0.38	0.93	2.2	42	99	220	250	250	250	310	360	410
VOCs - chlorobenzenes																			
Bromobenzene	EIC/AGS/CL:AIRE + CLEA 1.06	0.91	2.1	4.9	0.88	2	4.7	3.2	7.6	18	97	220	520	5200	5400	5600	850	2000	3500
Chlorobenzene	LQM/CIEH + CLEA 1.06	0.33	0.74	1.7	0.33	0.73	1.7	5.9	14	32	59	130	310	12000	13000	14000	680	1500	2900
1,2-Dichlorobenzene	LQM/CIEH + CLEA 1.06	17	40	94	16	39	91	94	230	540	570	1400	3200	95000	100000	100000	570	1400	3300
1,3-Dichlorobenzene	LQM/CIEH + CLEA 1.06	0.31	0.74	1.7	0.29	0.7	1.7	0.25	0.61	1.5	32	77	180	300	300	300	390	440	470
1,4-Dichlorobenzene	LQM/CIEH + CLEA 1.06	42	100	230	30	72	170	15	37	88	230	540	1300	17000	17000	17000	220	540	1300
Hexachlorobenzene	LQM/CIEH + CLEA 1.06	0.2	0.5	1.7	0.2	0.5	1.4	0.18	0.42	0.92	0.2	53	55	6.5	6.5	6.5	11	11	11
Pentachlorobenzene	LQM/CIEH + CLEA 1.06	14	21	27	5.2	10	17	1.2	3.1	7	43	110	830	110	110	110	190	190	190
1,2,3-trichlorobenzene	LQM/CIEH + CLEA 1.06	1.1	2.6	6.2	1	2.6	6.1	4.7	12	28	110	270	630	1700	1800	1800	130	330	1600
1,2,4-trichlorobenzene	LQM/CIEH + CLEA 1.06	1.8	4.5	11	1.8	4.5	11	31	75	180	230	560	1300	10000	11000	12000	320	790	1900

Contaminant	Source of GAC	Human Health Generic Assessment Criteria (mg/kg)																	
		residential without plant uptake (1%SOM)	residential without plant uptake (2.5%SOM)	residential without plant uptake (6%SOM)	residential with plant uptake (1%SOM)	residential with plant uptake (2.5%SOM)	residential with plant uptake (6%SOM)	allotments (1%SOM)	allotments (2.5%SOM)	allotments (6%SOM)	commercial (1%SOM)	commercial (2.5%SOM)	commercial (6%SOM)	POSresi (1%SOM)	POSresi (2.5%SOM)	POSresi (6%SOM)	POSpark (1%SOM)	POSpark (2.5%SOM)	POSpark (6%SOM)
1,3,5-trichlorobenzene	LQM/CIEH + CLEA 1.06	0.23	0.57	1.4	0.23	0.57	1.4	4.7	12	28	24	590	140	1600	1700	1800	37	91	220
1,2,3,4-tetrachlorobenzene	LQM/CIEH + CLEA 1.06	17	39	84	12	29	62	4.4	11	26	120	300	730	830	830	830	120	1600	1600
1,2,3,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.06	0.53	1.3	3	0.49	1.2	2.8	0.38	0.94	2.2	39	98	240	79	79	79	39	120	130
1,2,4,5-tetrachlorobenzene	LQM/CIEH + CLEA 1.06	0.51	1.2	2.4	0.3	0.68	1.4	0.064	0.16	0.37	20	49	97	13	13	13	25	26	26
VOCs - chloroalkanes & alkanes																			
Bromodichloromethane	EIC/AGS/CL:AIRE + CLEA 1.06	0.019	0.034	0.07	0.016	0.03	0.061	0.016	0.032	0.068	2.1	3.7	7.6	73	73	74	56	67	81
Bromoform	EIC/AGS/CL:AIRE + CLEA 1.06	5.2	11	2.3	2.8	6	13	0.95	2.1	4.6	760	1500	3100	3900	3900	4000	2700	4700	5200
Chloroethane	EIC/AGS/CL:AIRE + CLEA 1.06	8.4	11	18	8.3	11	18	110	210	380	960	1300	2100	2600	3500	5700	2600	3500	5700
Chloroethene (aka vinyl chloride)	LQM/CIEH + CLEA 1.06	0.00054	0.0007	0.0011	0.00047	0.00064	0.00099	0.00055	0.001	0.0018	0.063	0.081	0.12	3.5	3.5	3.5	4.8	5	5.4
Chloromethane	EIC/AGS/CL:AIRE + CLEA 1.06	0.0085	0.0099	0.013	0.0083	0.0098	0.013	0.066	0.13	0.23	1	1.2	1.6	540	550	560	140	150	170
1,1-Dichloroethane	EIC/AGS/CL:AIRE + CLEA 1.06	2.5	4.1	7.7	2.4	3.9	7.4	9.2	17	35	280	450	850	46000	47000	48000	1800	3000	5600
1,2-Dichloroethane	LQM/CIEH + CLEA 1.06	0.0065	0.0093	0.016	0.0053	0.008	0.014	0.0046	0.0083	0.016	0.71	1	1.8	29	29	29	21	24	28
1,1-Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.06	0.23	0.41	0.82	0.23	0.4	0.82	2.8	5.6	12	26	46	92	2200	3900	11000	2200	3900	5900
Cis 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.06	0.12	0.2	0.39	0.11	0.19	0.37	0.26	0.5	1	15	24	47	1300	1300	1400	690	840	1000
Trans 1,2 Dichloroethene	EIC/AGS/CL:AIRE + CLEA 1.06	0.19	0.35	0.71	0.19	0.34	0.7	0.93	1.9	4	22	40	81	3800	4000	4000	1700	2100	2700
Dichloromethane	EIC/AGS/CL:AIRE + CLEA 1.06	2.1	2.8	4.5	0.58	0.98	1.7	0.1	0.19	0.34	270	360	560	760	760	760	1500	1500	1500
1,2-Dichloropropane	EIC/AGS/CL:AIRE + CLEA 1.06	0.024	0.042	0.085	0.024	0.042	0.085	0.62	1.2	2.6	3.3	5.9	12	1700	1900	2200	160	210	290

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Hexachloroethane	EIC/AGS/CL:AIRE + CLEA 1.06	0.22	0.54	1.3	0.2	0.48	1.1	0.27	0.67	1.6	8.2	20	48	120	130	130	8.2	20	48
Tetrachloroethene	LQM/CIEH + CLEA 1.06	1	2.3	5.3	0.94	2.1	4.8	1.6	3.7	8.7	130	290	660	3400	3400	3400	420	950	2200
1,1,1,2-Tetrachloroethane	LQM/CIEH + CLEA 1.06	1.1	2.5	5.8	0.89	2.1	4.8	0.78	1.9	4.4	120	260	590	1400	1400	1400	1500	1800	2100
1,1,2,2-Tetrachloroethane	LQM/CIEH + CLEA 1.06	2.9	5.8	13	1.4	2.9	6.5	0.41	0.89	2	300	600	1200	1400	1400	1400	1800	2100	2300
Tetrachloromethane	LQM/CIEH + CLEA 1.06	0.018	0.04	0.09	0.018	0.039	0.089	0.16	0.37	0.85	3	6.7	15	340	350	350	170	240	320
Trichloroethene	LQM/CIEH + CLEA 1.06	0.11	0.23	0.51	0.11	0.22	0.49	0.43	0.95	2.2	12	25	55	1200	1300	1300	660	860	1100
1,1,1-Trichloroethane	LQM/CIEH + CLEA 1.06	6.3	13	28	6.2	13	28	48	110	240	700	1400	3100	140000	140000	140000	1400	2900	6400
1,1,2 Trichloroethane	EIC/AGS/CL:AIRE + CLEA 1.06	0.88	1.8	3.9	0.6	1.2	2.7	0.28	0.61	1.4	95	190	400	990	990	1000	1100	1300	1500
Trichloromethane	LQM/CIEH + CLEA 1.06	0.92	1.6	3.2	0.75	1.3	2.7	0.36	0.7	1.5	110	190	370	1700	1700	1700	2700	2900	3100
Other phenols & chlorophenols																			
2-Chlorophenol	LQM/CIEH + CLEA 1.06	65	94	120	3.7	8.4	18	0.58	1.4	3.2	3600	4000	4300	610	610	610	1100	1100	1100
2,4-Dichlorophenol	LQM/CIEH + CLEA 1.06	58	85	110	0.88	2	4.4	0.13	0.3	0.7	3500	4000	4200	610	610	610	1000	1100	1100
2,4-Dimethylphenol	EIC/AGS/CL:AIRE + CLEA 1.06	210	410	730	19	43	97	3.1	7.2	17	1400	3100	7200	5000	5000	5000	1400	9600	9900
2-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.06	3700	5400	6900	82	180	400	13	28	64	160000	180000	180000	25000	25000	25000	15000	48000	49000
3-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.06	4700	6300	7500	81	180	400	12	28	63	170000	180000	180000	25000	25000	25000	27000	48000	49000
4-Methylphenol	EIC/AGS/CL:AIRE + CLEA 1.06	3800	5500	7000	81	180	400	12	28	63	160000	180000	180000	25000	25000	25000	27000	48000	49000
Pentachlorophenol	LQM/CIEH + CLEA 1.06	22	31	35	0.55	1.3	3	0.084	0.21	0.49	1200	1300	1400	180	180	180	220	250	270
2,3,4,6-Tetrachlorophenol	LQM/CIEH + CLEA 1.06	82	110	130	0.87	2	4.7	0.13	0.31	0.73	3900	4200	4400	610	610	610	1000	1100	1100

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2,4,6-Trichlorophenol	LQM/CIEH + CLEA 1.06	82	110	130	1.4	3.3	7.5	0.22	0.51	1.2	3900	4200	4400	610	610	610	1100	1100	1100
Phthalates																			
Bis (2-ethylhexyl) phthalate	EIC/AGS/CL:AIRE + CLEA 1.06	2700	2800	2800	280	610	1100	48	120	280	85000	86000	86000	9700	9700	9700	17000	17000	17000
Butyl benzyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.06	43000	44000	44000	1400	3400	7300	220	550	1300	940000	940000	950000	130000	130000	130000	250000	260000	260000
Diethyl Phthalate	EIC/AGS/CL:AIRE + CLEA 1.06	14	29	65	120	260	570	19	41	94	14	29	65	49000	50000	50000	14	93000	96000
Di-n-butyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.06	4.7	11	450	13	31	67	2	5	12	4.7	15000	15000	1300	1300	1300	2600	2700	2600
Di-n-octyl phthalate	EIC/AGS/CL:AIRE + CLEA 1.06	3400	3400	3400	2300	2800	3100	940	2100	3900	89000	89000	89000	11000	11000	11000	20000	20000	20000
Pesticides																			
Aldrin	LQM/CIEH + CLEA 1.06	2.1	2.1	2.2	1.7	2	2.1	1.3	2.6	4	54	54	54	6.6	6.6	6.6	13	13	13
Atrazine	LQM/CIEH + CLEA 1.06	31	32	32	0.24	0.56	1.3	0.037	0.085	0.2	870	880	880	100	100	100	180	180	180
DDD	Hydrock + CLEA 1.06	1300	1300	1300	890	1100	1100	400	790	1200	22000	22000	22000	2700	2700	2700	5700	5700	5700
DDE	Hydrock + CLEA 1.06	1300	1300	1300	860	1100	1200	370	770	1300	22000	22000	22000	2700	2700	2700	5700	5700	5700
DDT	Hydrock + CLEA 1.06	1100	1200	1200	770	940	1000	330	660	1100	21000	21000	21000	2600	2600	2600	5500	5500	5500
Dichlovos	LQM/CIEH + CLEA 1.06	25	32	37	0.29	0.6	1.3	0.044	0.091	0.2	840	870	890	120	120	120	140	160	180
Dieldrin	LQM/CIEH + CLEA 1.06	3.5	3.8	3.9	0.69	1.4	2.2	0.13	0.32	0.73	90	91	92	12	12	12	23	23	23
Endosulfan - alpha	LQM/CIEH + CLEA 1.06	44	78	110	2.9	7	16	0.47	1.2	2.7	2300	3000	3400	490	490	490	940	970	990
Endosulfan - beta	LQM/CIEH + CLEA 1.06	53	89	120	2.8	6.6	15	0.44	1.1	2.6	2600	3200	3500	490	490	490	950	980	990
Hexachlorocyclohexanes - alpha (inc.	LQM/CIEH + CLEA 1.06	460	580	650	19	46	100	3	7.4	18	14000	15000	15000	2000	2000	2000	4000	4100	4100

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Lindane)																			
Hexachlorocyclohexanes - beta (inc. Lindane)	LQM/CIEH + CLEA 1.06	50	52	52	1.7	3.9	8.5	0.26	0.64	1.5	1100	1100	1100	150	150	150	300	300	310
Hexachlorocyclohexanes - gamma (inc. Lindane)	LQM/CIEH + CLEA 1.06	18	22	23	0.58	1.4	3	0.089	0.22	0.52	530	550	550	71	71	71	140	140	140
Dioxins, furans & dioxin-like-PCBs																			
Total dioxins, furans & DL-PCB (aerial dep.)	SGV report + CLEA 1.06	0.0099	0.0099	0.0099	0.0085	0.0087	0.0087	0.0073	0.008	0.0083	0.24	0.24	0.24	0.023	0.023	0.023	0.049	0.049	0.049
Non-dioxin-like PCBs																			
PCB-28	Hydrock + CLEA 1.06	0.39	0.39	0.39	0.2	0.27	0.32	0.058	0.13	0.23	9	9	9	1.2	1.2	1.2	2.5	2.5	2.5
PCB-52	Hydrock + CLEA 1.06	0.39	0.39	0.39	0.2	0.28	0.34	0.062	0.14	0.28	9	9	9	1.2	1.2	1.2	2.5	2.5	2.5
PCB-101	Hydrock + CLEA 1.06	0.39	0.39	0.39	0.34	0.37	0.38	0.03	0.53	0.76	9	9	9	1.2	1.2	1.2	2.5	2.5	2.5
PCB-138	Hydrock + CLEA 1.06	0.39	0.39	0.39	0.36	0.37	0.38	0.41	0.67	0.89	9	9	9	1.2	1.2	1.2	2.5	2.5	2.5
PCB-153	Hydrock + CLEA 1.06	0.39	0.39	0.39	0.36	0.38	0.38	0.51	0.77	0.96	9	9	9	1.2	1.2	1.2	2.5	2.5	2.5
PCB-180	Hydrock + CLEA 1.06	0.39	0.39	0.39	0.37	0.38	0.39	0.6	0.87	1.1	9	9	9	1.2	1.2	1.2	2.5	2.5	2.5
Explosives																			
HMX	LQM/CIEH + CLEA 1.06	6500	6500	6500	5.7	13	26	0.86	1.9	3.9	110000	110000	110000	13000	13000	13000	0.35	0.4	0.5
RDX	LQM/CIEH + CLEA 1.06	370	370	370	3.5	7.4	16	0.52	1.1	2.5	6400	6400	6400	790	800	800	19	1500	1600
2,4,6-Trinitrotoluene	LQM/CIEH + CLEA 1.06	57	57	58	1.6	3.7	7.8	0.24	0.58	1.4	1000	1000	1100	130	130	130	260	270	270
Other inorganics																			

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Antimony	EIC/AGS/CL:AIRE + CLEA 1.06	370	370	370	180	180	180	52	52	52	6800	6800	6800	740	740	740	1700	1700	1700
Barium	EIC/AGS/CL:AIRE + CLEA 1.06	1300	1300	1300	780	780	780	260	260	260	22000	22000	22000	2700	2700	2700	5800	5800	5800
Mercury, elemental	SGV report + CLEA 1.06	0.17	0.42	1	0.17	0.42	1	4.3	11	26	4.3	11	26	4.3	11	26	4.3	11	26
Molybdenum	EIC/AGS/CL:AIRE + CLEA 1.06	670	670	670	250	250	250	58	58	58	18000	18000	18000	1400	1400	1400	2900	2900	2900
Thiocyanate	Hydrock + CLEA 1.06	8.9	8.9	8.9	8.8	8.8	8.8	28	28	28	190	190	190	25	25	25	53	53	53
Other organics																			
Biphenyl	EIC/AGS/CL:AIRE + CLEA 1.06	34	84	200	34	84	200	14	35	84	34	84	200	9500	9500	9500	34	84	19000
Carbon disulphide	LQM/CIEH + CLEA 1.06	0.1	0.2	0.44	0.1	0.2	0.44	4.8	10	23	12	23	50	11000	11000	12000	1300	1900	2700
2,4-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.06	170	170	170	1.5	3.2	7.2	0.22	0.49	1.1	3700	3800	3800	500	500	500	140	960	990
2,6-Dinitrotoluene	EIC/AGS/CL:AIRE + CLEA 1.06	78	84	87	0.78	1.7	3.9	0.12	0.27	0.61	1900	1900	1900	250	250	250	290	490	500
Hexachloro-1,3-butadiene	LQM/CIEH + CLEA 1.06	0.22	0.55	1.3	0.21	0.51	1.2	0.25	0.61	1.4	32	69	120	25	25	25	48	50	51
Mercury, methyl	SGV report + CLEA 1.06	8.4	11	14	7.4	9.6	11	7.9	8	8	370	390	410	53	53	53	73	93	97
Styrene	EIC/AGS/CL:AIRE + CLEA 1.06	35	78	170	8.1	19	43	1.6	3.7	8.7	630	1400	3400	3000	3000	3000	630	1400	3400
Tributyl tin oxide	EIC/AGS/CL:AIRE + CLEA 1.06	8.4	9.8	11	0.27	0.64	1.4	0.042	0.1	0.25	230	230	240	31	31	31	63	64	65
2-Chloronaphthalene	EIC/AGS/CL:AIRE + CLEA 1.06	3.8	9.3	22	3.7	9.2	22	40	98	230	390	960	2200	7500	8400	9000	110	1800	2800