

CCG-C-23-13931

**PHASE II GEOENVIRONMENTAL REPORT
FOR LAND AT THE FORMER FARMERS ARMS
MOORFIELD
TOWER HILL
KIRKBY
L33 1XD
JUNE 2023**

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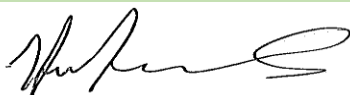
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1.0 INTRODUCTION

CC GEOTECHNICAL LIMITED (CCG) is providing consultancy services to **BUILT GROUP LIMITED** (the *Client*) in connection with the redevelopment of land at the former Farmers Arms, No. 8 Moorfield, Tower Hill, Kirkby, Knowsley, L33.

Following the demolition of the former public house (Farmers Arms) and subsequent site clearance works, it is understood that the site is to be redeveloped for residential use by the construction of 2nr x 2-storey apartment blocks, each constructed in traditional brick elevations under pitched roofing materials together with associated external works and areas of communal soft landscaping.

The proposed layout of the development is as shown on **Level 2 ARCHITECTS** architectural drawings contained herein.

The proposed development falls within the administrative jurisdiction of **KNOWSLEY METROPOLITAN BOROUGH COUNCIL**.

2.0 PREVIOUS STUDIES

The development site was the subject of a Phase I Desk Study Report prepared by **CCG** under report Reference No. **CCG-C-23-13930**, dated May 2023 which concluded that a Phase II intrusive investigation was required, and made recommendations on the scope of the Phase II investigation.

This report documents the findings of the Phase II investigation.

This report should be read in conjunction with **CCG** Desk Study Report No. **CCG-C-23-13930**, and with the Notes on Limitations, given in Appendix J.

3.0 PURPOSE & AIMS OF THE PHASE II INTRUSIVE INVESTIGATION

The primary purpose of the Phase II intrusive investigation was to confirm the indications of the desk study with respect to:

- The collation of data on soil and groundwater contamination, as far as they may adversely impact on human and/or environmental receptors
- The collation of data on the properties of the substrata, as far as they relate to the design and construction of foundations, ground slabs, and development infrastructure

4.0 SITE DATA

The site is located immediately to the south of the junction of Moorfield, Mossborough Drive, Tower Hill, Knowsley, L33 1XD as illustrated on **CCG** Drawing No. CCG-C-13931-1 and Aerial Plate No. CCG-C-23-13931-2 contained herein.

The **ORDNANCE SURVEY** coordinates for the approximate site centre are 341727, 400397. The approximate site centre stands at an elevation of c. 33.5maOD.

The site is situated within a residential context. It comprises a rectangular shaped parcel of land which extends to the approximate dimensions of c. 68m x 41m; its long axis being on a northeast – southwest alignment. Its is bound to the west by public pavements extending along Moorfield, and to the north by Mossborough Drive. Its eastern and southern boundaries are adjoined by extensive parcels of public amenity land.

The surface topography across the site was seen to be sensibly flat with external surfaces comprising poorly maintained hard standing.

Permanent structures occupying the site comprise a 2-storey former public house. At the time of undertaking the site walkover survey, it was evident that the structure had been the subject to extensive acts of vandalism and substantial fire damage.

Given that the site is currently developed, it is assumed that buried services associated with this structure may be buried beneath the site.

There was no visual evidence of the presence of native and/or non-native plant species within, or adjoining, the site boundary.

Access to the site is currently proposed from the Moorfield frontage to the west.

4.1 Published Geology

The geology of the site was researched by reference to Tonks L.H *et.al* (1938) '*Memoirs of the Geological Survey England and Wales: Explanation of Sheet 84: The Geology of Wigan District*', the **BRITISH GEOLOGICAL SURVEY (BGS)** 1:50, 000 scale Sheet 084 Wigan (2011), and 1:10, 000 scale (*Solid and Drift Editions*) geological mapping data.

The **BGS** 1:10, 000 Scale Drift Geological map indicate that the site is underlain with natural drift deposits comprising the Shirdley Hill Sand Formation (*aeolian sands*) of post glacial origin (*Pleistocene Epoch - Late Quaternary - Devensian – Holocene Sub Ages*) overlying impermeable diamicton (*boulder clay*) comprising gravel sand silt and clay deposits of glacial origin (*Pleistocene Epoch - Late Quaternary - Devensian Sub Age*).

The solid geology is documented to comprise the Wilmslow Sandstone Formation of the Sherwood Sandstone Group comprising red to brown, generally pebble free medium grained sandstone with localised argillaceous mudstone and siltstone horizons of the Low Triassic Period (*Phanerozoic: Mesozoic Era: Olenekian Age*).

There are no documented geological lines of weakness within 500m of the study site.

The '*Indicative Atlas of Radon in England and Wales*' (Miles. J.C.H *et.al*, 2007) Map 13 '*Northern Welsh Marches and Liverpool*', shows the site to be situated within an area where it is believed that less than 1% of the properties within the area are affected by Radon and therefore no Radon Protection Measures are required for new structures in contact with the ground.

As with many previously developed sites superficial made ground deposits of an unknown composition thickness and extent associated with the development of the site and its immediate environs may underlie the site.

4.2 Hydrogeology & Hydrology

Information pertaining to hydrogeological and hydrological features of the site may be summarised as follows:

- Superficial made ground deposits, if present, are classified as an Unproductive Aquifer
- The underlying Shirdley Hill Sand Formation classifies as being a Secondary A Aquifer
- The underlying diamicton (boulder clay) classifies and being a Secondary Undifferentiated Aquifer
- The solid geology (Wilmslow Sandstone Formation) is classified as a Principal Aquifer
- There are no records pertaining to current / active Ground Water Abstraction Licences within 1000m of the site
- There are no records pertaining to the presence of current / active Surface Water Abstraction points within 1000m of the study site
- There are no records pertaining to the presence of current / active Portable Water Abstraction points within 1000m of the study site
- The site is located within a designated Source Protection Zone (Zone III – Total Catchment)
- The site is not located within an Environment Agency Zone II Flood Plain
- The site is not located within an Environment Agency Zone III Flood Plain

5.0 PRELIMINARY CONCEPTUAL MODEL

5.1 Introduction

The risk assessment methodologies adopted by **CCG** are based on current available guidance from several sources and are included in Appendix I.

A Tier 1 Risk Assessment and Preliminary Conceptual Model (PCM) were formulated using the information collated in the Phase I Desk Study and based on the following assumptions:

- Following the demolition of a former public house (Farmers Arms) and subsequent site clearance works, it is understood that the site is to be redeveloped for residential land use by the construction of 2nr 2-storey apartment blocks, each constructed of traditional brick elevations under pitched roofing materials together with associated external works and areas of communal

soft landscaping.

The proposed layout of the development is as shown on **LEVEL 2 ARCHITECTS** architectural drawings contained herein.

- Drinking water will be from a mains supply.

In constructing the Preliminary Conceptual Model (PCM), **CCG** applied the guidance contained in CIRIA C552: 2001. This recommends use of a Risk Matrix which classifies risk based on the product of Probability of a source being present, and the Consequence of receptors being exposed to the source. Guidance tables setting out the classifications of probability and consequence together with a risk matrix are given in Tables 1-3 hereunder. In using this approach **CCG** recommends actual intrusive investigation of any Risk Classification of “*Moderate*” or over.

Table 1: Matrix of consequences against probability to gain a risk classification [CIRIA C552, 2001]

		CONSEQUENCE			
		SEVERE	MEDIUM	MILD	MINOR
Probability	High Likelihood	Very High Risk	High Risk	Moderate Risk	Moderate / Low Risk
	Likely	High Risk	Moderate Risk	Moderate / Low Risk	Low Risk
	Low Likelihood	Moderate Risk	Moderate / Low Risk	Low Risk	Very Low Risk
	Unlikely	Moderate / Low Risk	Low Risk	Very Low Risk	Very Low Risk

Table 2: Classification Definitions (C552 CIRIA, 2001)

CLASSIFICATION	DEFINITION
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 server 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 server, or if any harm were to occur it is more likely that harm would be relatively mild. Investigation (if not undertaken already) is normally required to clarify the risk and to determine to 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 server.

5.2 Preliminary Conceptual Model

By application of the risk assessment methodology outlined above, the following PCM was constructed.

Table 3: Preliminary Conceptual Model (PCM)

POLLUTANT LINKAGE	SOURCE	PATHWAY	RECEPTOR	PROBABILITY	CONSEQUENCE	RISK RATING
1	Broad spectrum of heavy metals, aggressive pH, hydrocarbons, PAH's in Made Ground associated with the development & redevelopment of the site & adjoining area & historical onsite demolition works etc.	Soil and / or soil dust ingestion	Construction workers Future worker Offsite receptors	Likely	Medium	Moderate
2	Asbestos containing materials (ACM) in made ground soils associated with the development & redevelopment of the site & adjoining area & adjoining area & historical onsite demolition works etc.	Fibre Inhalation	Construction workers Future worker Offsite receptors	Likely	Severe (ACM)	High
3	Inhalation of vapours associated with potential on-site made ground deposits & the in-filling of nearby historical ponds etc.	Inhalation	Future residents	Unlikely	Medium	Moderate
4	Inhalation of ground gases from onsite or offsite sources i.e., made ground deposits	Inhalation	Future residents	Unlikely	Medium	Moderate
5	pH & Sulphate attack on concrete	Future building	Future building	Likely	Mild	Moderate

						/ Low
6	Organic contamination associated with on-site car parking facilities	Direct contact with water mains	Potable water supply	Unlikely	Medium	Moderate

The contaminants of concern associated with those risks which require intrusive investigation were researched by reference to published industry profiles, and are summarised hereunder:

Table 4: Summary of Contaminants of Concern based on PCM

LINKAGE NO.	METALS	NON-METALS	ORGANICS	GASES	OTHERS
PL1, PL2, PL3, PL5, PL6	Cd, Cr (total & hexavalent), Ni, Cu, Zn, Pb, Hg, Se, Mo, Sb	As, sulphates, sulphides, boron, free cyanide	TPHCWG, PAH's, BTEX, Volatiles (by PID), VOC's & SVOC's, SOM	-	pH Asbestos
PL4	-	-	-	CH ₄ , CO ₂ , CO, H ₂ S	-
PL1, PL6	-	-	TPHCWG, PAH's, BTEX,	-	-
PL1-PL6	Cd, Cr (total), Ni, Cu, Zn, Pb, Hg, Se, Mo, Sb	As, sulphates, sulphides, boron, free cyanide	TPHCWG, BTEX PAH's, Volatiles (by PID), SOM	CH ₄ , CO ₂ , CO, H ₂ S	pH Asbestos

5.3 Summary of Risks

The foregoing analysis identified a considerable number of potential risks, and if present, these could adversely impact on human or environmental receptors. Given the sensitivity of the proposed end use, an intrusive phase of investigation was undertaken to determine whether the postulated pollutant linkages are present on site.

6.0 FIELDWORK

6.1 Introduction

A programme of fieldwork investigation was undertaken in May 2023. The programme comprised:

- The manual excavation and CAT scanning of 6nr borehole service avoidance pits, each extending to 1.2mbngl
- The subsampling of borehole starter pit arisings for soil contamination analyses
- The advancement of boreholes from the base of the service avoidance pits using light dynamic boring methods
- The logging and sampling of borehole arisings for laboratory testing
- Installation of 50mm HDPE plain and slotted well-tube and associated headworks, complete with non-lime pea gravel surround and bentonite seals at 3nr borehole positions
- The instigation of a programme of groundwater / gas monitoring comprising 6nr rounds distributed over a 3-month period

The fieldwork was planned in accordance with BSEN 1997-1 (2007) Eurocode 7, BS10175: 2011, BS5930: 1999, and the sampling and monitoring methodologies employed by **CCG** as presented in Appendix B, as far as they related to the scope of the investigation.

The layout of the proposed intrusive investigation is as annotated on **CCG** Drawing No. CCG-C-23-13930-3 'Site Investigation Plan' contained herein.

6.2 Borehole Drilling & Monitoring Installations

6.2.1 Light Dynamic Sampling

In accordance with the ground investigation plan, 6nr boreholes were sunk using light dynamic sampling methods using a Dando Terrier 2000 rig deploying 100mm casings and associated tools.

Each borehole location was positioned clear of all overhead services and scanned for buried electrical services using CAT cable avoidance scanner before and during hand excavation of a starter pit extending to 1.2mbngl.

Boring tools were decontaminated prior to commencement.

In this method of investigation samples of subsoils are recovered by driving and extracting a series of reducing diameter 1m long steel tubes. Standard penetration test's (SPT's) were undertaken at regular depth increments with hand shear vane (HSV) tests being undertaken on

recovered cohesive soils. This method of sampling recovers relatively “undisturbed” soil profiles in Perspex tubes, which are used to line the steel tubes. The Perspex tubes were split and carefully logged and subsampled. Subsamples for potential chemical analysis were removed at appropriate positions from the profile and transferred to chilled amber glass jars and vials for laboratory analysis.

The logs of the light dynamic sampling boreholes, annotated with sampling details, SPT ‘N’ and *in-lab* HS (Cu-(kN/m²) values and details of standpipe construction, are presented in Appendix C.

Logs associated with dynamic probing are presented alongside their corresponding borehole log in Appendix C.

6.2.2 Monitoring Installations

Standpipes comprising 50mm diameter HDPE plain and slotted well tube set in bentonite and non-limestone pea gravel surround were installed at 3nr borehole positions. Each standpipe was fitted with a gas valve connector and was protected by a flush cover set in concrete. Details of standpipe installations are provided on the relevant borehole logs in Appendix C and summarised in the tabulation hereunder:

Table 5: Borehole Installation Details

BOREHOLE	DEPTH OF BOREHOLE (mbgl)	DEPTH OF STANDPIPE [mbgl]	RESPONSE ZONE (mbgl)	
			FROM	TO
WS01	5.0m	4.0m	0.5m	4.0m
WS02	5.0m	4.0m	0.5m	4.0m
WS06	5.0m	4.0m	0.5m	4.0m

The standpipe installations were periodically monitored for flow rate and composition of ground gas using a Geotechnical Instruments GA 2000 infra-red analyser. The installations were also monitored for standing water levels with an electronic dip meter.

The results of the gas and groundwater monitoring, together with calibration certificates of the instruments used are given in Appendix D.

7.0 OBSERVED STRATIGRAPHY

The stratigraphy of the boreholes was consistent with the documented geology. The succession may be generalised as tabulated hereunder:

Table 6: Observed Stratigraphy

Location	STRATIGRAPHY
WS01	Made ground deposits comprising dark brown sandy gravel extending to 0.8mbgl. The sequence thereafter continues in natural drift deposits comprising loose dark brown clayey gravelly sand to 1.7mbgl, soft / loose black slightly gravelly clayey silt to 2mbgl, overlying soft becoming firm then stiff brown boulder clay, proven to 5mbgl
WS02	Made ground deposits comprising dark brown varying to brown gravelly silty sand extending to 0.8mbgl. The sequence thereafter continues in natural drift deposits comprising loose locally medium dense dark brown fine and medium grained sand locally interbedded stiff brown boulder clay, proven to 5mbgl
WS03	Made ground deposits comprising loose dark brown gravelly sand extending to 1mbgl. The sequence thereafter continues in natural drift deposits comprising loose dark brown varying to grey – brown fine and medium grained sands locally interbedded with firm brown boulder clay, proven to 5mbgl
WS04	Grassed topsoil overlying natural drift deposits comprising loose varying to medium dense dark brown varying to brown fine and medium grained sands locally interbedded with soft to firm becoming firm brown boulder clay, proven to 5mbgl
WS05	Deep made ground deposits comprising loose dark brown varying to brown gravelly sands interbedded with soft reworked clay deposits extending to 2.5mbgl. The sequence thereafter continues in natural drift deposits comprising soft becoming firm becoming soft then stiff brown boulder clay locally interbedded with loose clayey sands and gravel, proven to 5mbgl
WS06	Made ground deposits comprising brown varying to dark brown gravelly sands extending to 0.8mbgl. The sequence thereafter continues in natural drift deposits comprising loose dark brown fine and medium grained sands to 1mbgl, then firm becoming stiff brown boulder clay, proven to 5mbgl.

There was no visual and/or olfactory evidence of contamination and/or biodegradable materials affecting the made ground mass and/or the natural underlying drift deposits at any sampling position.

7.0 GROUNDWATER REGIME

All borehole positions were reported to be dry on completion of fieldworks with monitored standing water levels being in the order of 1.11m – 1.3mbgl during the initial rounds of gas – groundwater monitoring.

8.0 LABORATORY TESTING

8.1 Soil Engineering Test

A programme of soil engineering testing was undertaken at a UKAS / MCERTS accredited laboratory associated with **CCG**. The programme comprised:

- Determination of soil moisture content in accordance with BS: 1377: Part 2: 1990
- Determination of Atterberg Limits in accordance with BS: 1377: Part 2: 1990
- Determination of Particle Size Distribution BS 1377-2:1990 (a)
- Determination of soil pH and water-soluble sulphate content

The soil classification test results are presented in Appendix E.

8.2 Contamination Analyses

A programme of soil chemical analyses was undertaken at a UKAS / MCERTS accredited laboratory:

- 6nr subsamples of made ground soils were analysed to a broad range of contaminants including metals, non-metals, speciated PAH's, BTEX compounds and hydrocarbons to the TPHCWG methodology
- 6nr subsamples of made ground were screened for asbestos containing materials (ACM's)
- 6nr subsamples of made ground soil were analysed for the presence of Benzene, Toluene, Ethylbenzene and Xylene (BTEX) organic compounds
- 6nr subsamples of made ground soils were analysed for the presence of Methyl tert-butyl ether (MTBE) organic compounds
- In the absence of adequate quantities of perched water, leachates prepared on soil recovered from 1nr borehole position (WS03) were analysed for a broad range of contaminants including metals, non-metals, speciated PAHs, and hydrocarbons to the TPHCWG methodology

The soil / soil leachate contamination test results and certificates are presented in Appendix F.

9.0 ASSESSMENT OF RISKS TO THE BUILT ENVIRONMENT

9.1 Specification of Buried Concrete

The data obtained in the investigations was assessed against the guidance given in BRE Special Digest 1: 2005, as summarised hereunder:

Table 7: Design Chemical Class Based on Soil Data

CONCRETE SPECIFICATION DATA SHEET		
Is the site Brownfield or Greenfield?	Brownfield	
Is the water table static or mobile?	Static	
Highest water-soluble Sulphate results	40mg/l	Design Sulphate Class of DS-1 Class of AC-1s
Lowest pH result	7	
Intended Working Life	50 years	Adopt Design Chemical Classification of DC-1

Based on the foregoing assessments, concrete in the ground should be specified to conform to the compositional requirements of Design Chemical Class **DC 1**, as defined in BRE Special Digest 1: 2005.

9.2 New Water Mains Supply

The assessment of requirements for new water mains within the investigation area was based on the criteria specified in Paper 10/WM/03/21 'Guidance for the selection of Water Supply Pipes to be used in Brownfield Sites' published by UK Water Industry Research (UKWIR) January 2011.

The preliminary findings indicate that the soil concentrations of pertinent hydrocarbon contaminant species are above the permitted threshold concentrations specified by the UKWIR for the adoption of PE water mains and therefore PE-AL-PE mains must be deployed. Good practice requires that mains be laid in a remediated alignment comprising of clean granular fill extending to 600mm + pipe diameter and to 300mm below pipe underside.

Pipes should be laid in accordance with BS EN 12201-2 'Plastic piping systems for water supply and for drainage and sewerage under pressure' as stated in UKWIR guidance.

It should be noted that this recommendation is subject to the opinion of the water supplier, and in this instance the local water authority (**UNITED UTILITIES**) must be consulted to confirm that the proposals above accord with their interpretation of current guidance.

9.3 Assessment of Risk from Ground Gases

Using the data gathered in the monitoring programme, a gas risk assessment was undertaken in accordance with the ground gas risk assessment methodology (See Appendix I) employed by **CCG**. The ground gas risk assessment methodology conforms to current UK guidance on the assessment of risks posed by ground gases.

The potential sources of gas identified in the desk study were considered as sources of “Low” generation potential, but since the development is of high sensitivity, a programme of monitoring comprising of 6 rounds distributed over a 3-month period was adopted.

A gas risk assessment was undertaken in accordance with current UK guidelines set out in CIRCA C665 2007 “*Assessing Risk Posed by Hazardous Gases to Buildings*”. The CIRIA risk assessment methodology uses typical maximum soil gas concentrations and worse case borehole flow rates to define a “*Characteristic Situation*” for the shallow gas regime.

The volumetric gas flow rate used by the risk assessment is termed “Gas Screening Value (GSV)” in the guidance and is defined below.

Table 8: Gas Monitoring Data

Position	WS01	WS02	WS06
No Monitoring Visits	1	1	1
CH ₄ (%)	Nil	Nil	Nil
CO ₂ (%)	0.3	0.2	<0.1
O ₂ (%)	20.5	20.3	21.1
H ₂ S (ppm)	Nil	Nil	Nil
CO (ppm)	Nil	Nil	Nil
Flow (l/hr)	<0.1	<0.1	<0.1
Water Levels (m)	1.3	1.27	1.11
PID response	0.0	0.0	0.0
Pressure Range (mb)	1022mbar		

After 1st round of monitoring, a preliminary Gas Screening Value (GSV) of 0.00003l/hrs is calculated for CO₂, and <0.0001l/hr for CH₄.

Using these GSV values, the risk to the proposed development was assessed in line with Situation A as defined in CIRIA C665, and on this basis the site complies with Characteristic Situation 1 (CS1) and based on this classification gas protection measures are not required.

It must be borne in mind that a further 5th rounds of monitoring are required to complete the ongoing gas- groundwater monitoring programme.

10.0 HUMAN HEALTH RISK ASSESSMENT

10.1 Legislative Background to Contaminated Land Assessment

Current approaches (CLR11- ‘*Model Procedures for the Management of Land Contamination*’ and Part IIA of the *Environmental Protection Act 1990*) to risk assessment of contaminated land suggest the construction of a Preliminary Conceptual Model. The purpose of this model is to define all possible complete pollution linkages, where the requisite source – pathway – target elements are present; these elements being defined as:

- A contaminant (source) is a hazardous substance or agent, present at levels that have the potential to cause harm or damage a receptor
- A pathway is the means by or through which a contaminant meets, or otherwise affects, the receptor
- A receptor (target) is an entity (human being, aquatic environment, flora, and fauna etc) that is vulnerable to the adverse effects of the contaminant

This relationship is termed a “pollution linkage.” It should be recognised that for a health or environmental risk to exist, all three elements of the relationship or linkage must be present, *i.e.*

- If there is no contaminant, or contaminant present at levels below those considered to be harmful or damaging to a receptor, then there can be no adverse effect on a receptor
- If there is no receptor present that can be adversely affected by a contaminant, no harm or damage can arise
- Even where both a contaminant and a receptor are present, no harm or damage will occur if there is no pathway by or through which a linkage between the two can be established

10.2 Risk Assessment Methodologies

The risk assessment methodologies employed by **CCG** are based on the use of CLEA 1.06 and are detailed in Appendix I.

10.3 Basis of Assessment of Risk to Human Health

The Human Health Risk Assessment was carried out in accordance with the **CCG** methodology for assessing soil contamination data as contained in Appendix I, and since it is proposed that the site be redeveloped for residential use, the assessment was based on criteria contained in publication LQM/CIEH S4UL's for Human Health Risk Assessment (2015) (**CCG** Licence No. S4UL3233), applicable to the "Residential" land use *With* plant uptake scenario. This document does not provide criteria for Lead, for which the results were compared to the C4SL (200mg/kg) published by DEFRA SP1010 Development of Category 4 Screening Levels.

10.4 Assessment of Contamination Data

Based on a Soil Organic Matter content of an average 2.5%, an assessment of the soil data was undertaken as summarised in the tabulations hereunder, and presented on the worksheets in Appendix G.

10.4.1 Assessment of Metal Data

The assessment of the metal data is presented hereunder:

Table 9: Assessment of Metal Data

Contaminant	LQM / CIEH S4UL (mg/kg)	Maximum (mg/kg)	Exceedances	
			(mg/kg)	Location
Cadmium	11	1.1		
Chromium	910	44.6		
Copper	2400	369		
Lead	200	555	466 509 555	WS01 WS02 WS05
Mercury	1.2	0.7		
Nickel	180	61.5		
Zinc	3700	393		

The above assessment confirms the presence of elevated concentrations of Lead at 3nr borehole positions. Hence a potential risk to human health is indicated.

10.4.2 Assessment of Non-Metal Data

The assessment of the non-metal data is presented hereunder:

Table 10: Assessment of Non-Metal Data

Contaminant	LQM / CIEH S4UL (mg/kg)	Maximum (mg/kg)	Exceedances	
			(mg/kg)	Location
Arsenic	37	61.7	52.1 59.2 61.7	WS01 WS02 WS05
Selenium	250	<1		
Free Cyanide	22	<1		

The above assessment confirms the presence of elevated concentrations of Arsenic at 3nr borehole positions. Hence a potential risk to human health is indicated.

10.4.3 Assessment of PAH Data

The assessment of the non-metal data is presented hereunder:

Table 11: Assessment of PAH Data

Contaminant	LQM / CIEH S4UL (mg/kg)	Maximum (mg/kg)	Exceedances	
			(mg/kg)	Location
Naphthalene	5.6	0.59		
Acenaphthylene	420	0.07		
Acenaphthene	510	0.2		
Fluorene	400	0.11		
Phenanthrene	220	1.69		
Anthracene	5400	0.37		
Fluoranthene	560	3.07		
Pyrene	1200	3.06		
Benz(a)anthracene	11	1.65		
Chrysene	22	1.87		
Benzo(b)fluoranthene	3.3	2.11		
Benzo(k)fluoranthene	93	0.8		
Benzo(a)pyrene	2.7	2.02		
Indeno(123-cd)pyrene	36	1.46		
Dibenz(ah)anthracene	0.28	0.31	0.31	WS05
Benzo(ghi)perylene	340	1.72		

The above assessment confirms the presence of elevated concentration of Dibenz(ah)anthracene in soils recovered from borehole WS05. Hence a potential risk to human health is indicated.

10.4.4 Assessment of Petroleum Hydrocarbon Data

The assessment of the Petroleum Hydrocarbon (TPH) data is presented hereunder:

Table 12: Assessment of Hydrocarbon Data

Contaminant	LQM / CIEH S4UL (mg/kg)	Maximum (mg/kg)	Exceedances	
			(mg/kg)	Location
Aromatic EC5-EC7	140	<0.01		
Aromatic EC7-EC8	290	<0.01		
Aromatic EC8-EC10	83	<0.01		
Aromatic EC10-EC12	180	<1		
Aromatic EC12-EC16	330	5.26		
Aromatic EC16-EC21	540	20.4		
Aromatic EC21-EC35	1500	260		
Aliphatic EC5-EC6	78	<0.01		
Aliphatic EC6-EC8	230	<0.01		
Aliphatic EC8-EC10	65	<0.01		
Aliphatic EC10-EC12	330	1.27		
Aliphatic EC12-EC16	2400	2.38		
Aliphatic EC16-EC35	92000	18.03		

The above assessment confirms that no contaminant exceeds its respective guideline criterion. Hence, no risk to human health is indicated.

10.4.5 Assessment of Asbestos Data

Asbestos containing materials (ACM's) were not detected in any sample analysed and therefore no risk to human health is indicated.

10.4.6 Assessment of BTEX / MTBE Data

The appended laboratory contamination results confirm that all BTEX / MTBE compounds are below their limit of detection (LOD) and therefore no risk to human health is indicated.

10.4.7 Summary of Human Health Assessment

The above human health risk assessment confirms the presence of elevated concentrations of:

- Lead at 3nr locations
- Arsenic at 3nr locations
- Dibenz(ah)anthracene at 1nr location

..... hence a potential risk to human health is indicated.

Exposure risk associated with the above contaminants are via the ingestion, dermal and inhalation pathways and as such some remedial works in areas of proposed soft landscaping will be required to mitigate such risk.

In addition to the above, contractors must remain aware that disturbance of the ground may uncover unanticipated features which may give rise to considerations of contamination as far as the exposed conditions may have the potential to impact on receptors including inter alia humans, animals, controlled waters, or the fabric of buildings. Any such encounters will require the contractor to halt work, isolate the risk area, and summon **CCG** to site to determine the nature of the exposure and to determine an appropriate course of action. Any such incidents will be fully documented in a detailed site Remediation Report.

11.0 CONTROLLED WATERS RISK ASSESSMENT

11.1 Assessment of Soil Leachate Metals, Non-Metals & Polycyclic Aromatic Hydrocarbon (PAH) Data

In the absence of adequate quantities or perched and/or natural groundwater, leachates prepared on soil recovered from 1nr borehole position (WS03) were analysed for a broad range of contaminants including metals, non-metals, speciated PAH and TPH concentrations. The results were assessed against Environmental Quality Standards (AA-EQS) for freshwater as shown hereunder.

Table 13: Assessment of Soil Leachate Data

Contaminant	WS03 Result (ug/l)	AA-EQS (ug/l)
Naphthalene	0.12	2.4
Lead	<5	20
Fluoranthene	0.59	0.1
Phenanthrene	0.17	-
Anthracene	0.15	-
Acenaphthylene	0.04	-
Pyrene	0.55	-
Chrysene	0.36	-
Fluorene	0.02	-
Nickel	<5	150
Indeno(123-cd)pyrene	0.40	0.02
Benzo(ghi)perylene	0.46	0.02
Copper	<5	40
Benzo[a]pyrene	0.53	0.05
Benzo[a]anthracene	0.24	0.05
Benzo[k]fluoranthene	0.32	0.03
Benzo[b]fluoranthene	0.41	0.03
Boron	115	1000
Cyanide	<5	-
Arsenic	<5	25
Mercury	<0.1	1
Selenium	<5	-
Cadmium	<1	5
pH	7.1	-
Sulphate	26	400000

The above assessment confirms the presence of some PAH contaminants. Hence a potential risk to controlled waters is indicated.

11.2 Assessment of Soil Leachate Hydrocarbon Data

Speciated hydrocarbon results were assessed by comparison with AA-EQS values for inland waters. In case of determinants not covered by AA-EQS values, results were compared to EQS Freshwater Criteria values or where no EQS Freshwater Criterion is available, then WHO guidelines for Drinking Water are adopted.

Table 14: Assessment of Soil Leachate Hydrocarbon Data

Contaminant	WS03 Result (ug/l)	AA-EQS (ug/l)	WHO ug/l
Aromatic EC5-EC7 (benzene)	<1	-	10
Aromatic EC7-EC8 (toluene)	<1	-	700
Aromatic EC8-EC10 (ethyl benzene)	<5	-	300
Aromatic EC10-EC12	5.1	-	100
Aromatic EC12-EC16	<5	-	100
Aromatic EC16-EC21	<5	-	90
Aromatic EC21-EC35	<5	-	90
Aliphatic EC5-EC6	<1	-	15000

Aliphatic EC6-EC8	<1	-	15000
Aliphatic EC8-EC10	<5	-	300
Aliphatic EC10-EC12	13.1	-	300
Aliphatic EC12-EC16	15.2	-	300
Aliphatic EC16-EC21	8.8	-	(300)*
Aliphatic EC21-EC35	<5	-	(300)*

The above assessment confirms that all contaminants are below their respective AA-EQS – WHO acceptance criteria. Hence no risk to controlled waters and/or human health is indicated.

11.3 Summary of Controlled Waters Risk Assessment

The above controlled water risk assessment confirms the presence of some leachable PAH contaminants in soils recovered from borehole WS03. Hence potential risk to controlled waters and/or human health is indicated.

Notwithstanding the above, given the absence of nearby sensitive receptors (*i.e.*, *water abstraction points etc.*), and given the underlying solid geology is overlain by a clay aquiclude, it is concluded that the risk posed to the wider aquatic environment and/or human health is insignificant.

12.0 POST INVESTIGATION CONCEPTUAL MODEL

Based on the findings of the investigation, a post investigation conceptual model may be constructed illustrating proven pollution linkages and summarising the conceptual remediation recommendations discussed above, as tabulated hereunder.

Table 15: Post Investigation Conceptual Model

Source	Pathway	Receptor	Remedial Options
The above human health risk assessment confirms the presence of elevated concentrations of: Lead Arsenic Dibenz(ah)anthracene hence a potential risk to human health is indicated.	Oral / ingestion / dermal pathways	Construction works Future residential residents (adults / children)	No remedial works required under areas of permanent hard standing. Site levels in cultivated landscaping to be reduced to 600mm below proposed finished garden levels, with site levels then being reconstructed by the placement of 600mm of clean imported topsoil, placed under a strict validation regime comprising a 1nr analyses per 50m3 with a minimum of 4nr analyses per material source. Where made ground remaining in place beyond 600mm, imported topsoil is to be placed on a suitable geotextile fabric such as 'Terram 1000, or similar. Cover thickness on all gardens / soft landscaping is to be independently validated by excavation and photography for inclusion in a Validation Report. Imported soils are to comply with the analysis criteria contained in Appendix G. In addition to the above, contractors must remain aware that disturbance of the ground may uncover unanticipated features which may give rise to considerations of contamination as far as the exposed conditions may have the potential to impact on receptors including inter alia humans, animals, controlled waters, or the fabric of buildings. Any such encounters will require the contractor to halt work, isolate the risk area, and summon CCG to site to determine the nature of the exposure and to determine an appropriate course of action. Any such incidents will be fully documented in a detailed site Remediation Report.

13.0 PRELIMINARY WASTE CLASSIFICATION

A waste classification exercise was undertaken in relation to potential offsite disposal of excavation arisings. The first stage entailed the assessment of the basic soil contamination data via the **HAZWASTE** online program. The output data from this basic assessment is provided in Appendix H. This program generates the baseline 'Hazardous / Non-Hazardous' classification of soils.

The appended **HAZWASTE** report classifies all soils analysed classify as being 'Non-Hazardous Waste.' and therefore surplus spoil for off-site disposal from these positions may be disposed at a suitably licenced 'Non-Hazardous Waste' landfill facility.

It should be noted that the final decision on waste classification is at the discretion of the accepting landfill, and it is recommended that consultation with landfill operators be undertaken during the development of the waste management plan.

14.0 GEOTECHNICAL ASSESSMENT

14.1 Introduction

Following the demolition of a former public house (Farmers Arms) and subsequent site clearance works, it is understood that the site is to be redeveloped for residential land use by the construction of 2nr 2-storey apartment blocks, each constructed of traditional brick elevations under pitched roofing materials together with associated external works and areas of communal soft landscaping.

The proposed layout of the development is as shown on **Level 2 Architects** architectural drawings contained herein.

14.2 Observed Ground Conditions

This intrusive ground investigation confirms the presence of made ground deposits comprising loose fark brown sands and gravel locally interbedded with reworked clay deposits extending to depth varying between 0.8m – 2.5mbgl. The sequence thereafter continues in natural drift deposits generally comprising soft becoming firm then stiff boulder clay locally interbedded with loose locally medium dense clayey fine and medium grained sands, proven to 5mbgl.

All borehole positions were reported to be dry on completion of fieldworks with monitored standing water levels being in the order of 1.11m – 1.3mbgl during the initial rounds of gas – groundwater monitoring.

There was no visual and/or olfactory evidence of contamination and/or biodegradable materials affecting the made ground mass at any sampling position.

14.3 Foundations and Floor Slab Construction

The observed ground conditions are not suitable for the adoption of shallow spread foundations and piled foundations are the preferred founding solution. The observed ground conditions are suitable for the installation of steel cased bottom driven cast *in-situ* displacement piles. Piles would carry a 450mm x 450mm ground beam off which structural walls may be constructed. For the purposes of preliminary design, the structural carrying capacity of bottom driven piles may be taken as:

Table 16: Pile Carrying Capacity

Pile Diameter mm	Carrying Capacity kN
150	140
220	250

A piling layout and calculated pile loadings should be prepared and piling contractors must be required to provide dynamic installation set calculations corresponding to the actual loadings calculated to be imposed on each pile, and to provide pile installation records.

Given the variable thickness and densities of the underlying made ground deposits fully suspended passively vented block and beam floors

14.4 Excavations

Excavations in the observed made ground and natural drift soils may be undertaken by light hydraulic excavators.

Excavations in excess of 1.2mbgl will require side support.

14.5 Groundwater Management

All borehole positions were reported to be dry on completion of fieldworks with monitored standing water levels being in the order of 1.11m – 1.3mbgl during the initial rounds of gas – groundwater monitoring.

Taking into account the above groundwater observations, a prudent contractor would allow for pumping to maintain dry working conditions during foundation construction and/or service installations, particularly during periods of heavy / prolonged periods of precipitation.

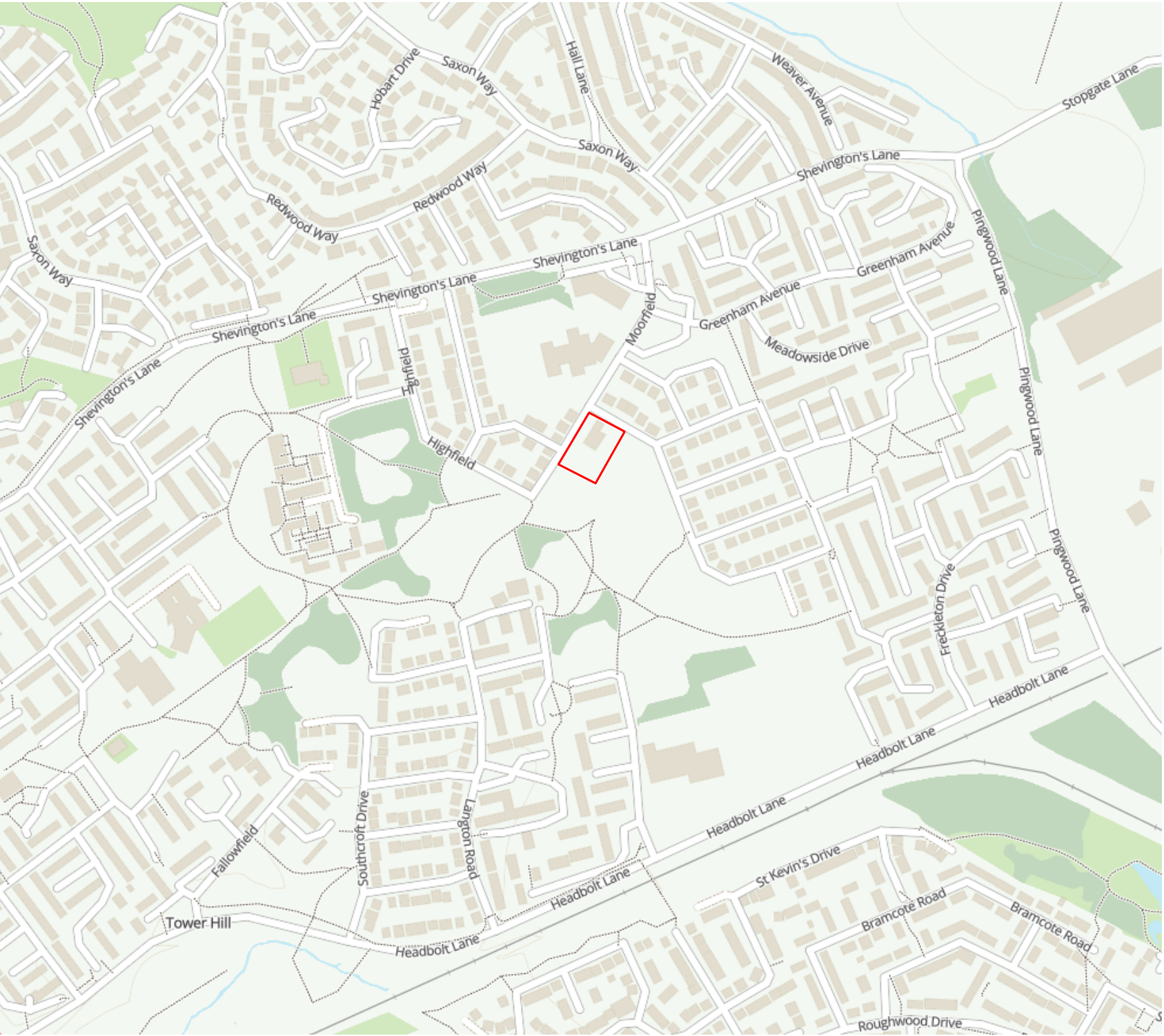
15.0 SUMMARY CONCLUSIONS

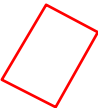
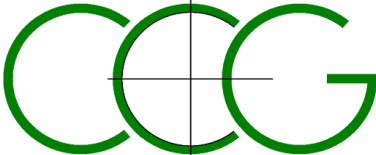
The recommendations hereunder are based on the salient sections of the report and should not be referred to in isolation of the relevant sections of the report. All recommendations are subject to Regulatory Local Authority review.

Table 17: Summary of Conclusions

Soil Contamination & Remediation	The above human health risk assessment confirms the presence of elevated concentrations of: • Lead • Arsenic • Dibenz(ah)anthracene hence a potential risk to human health is indicated. No remedial works required under areas of permanent hard standing. Site levels in all cultivated landscaping to be reduced to 600mm below proposed finished garden levels, with site levels then being reconstructed by the placement of 600mm of clean imported topsoil, placed under a strict validation regime comprising a 1nr analyses per 50m³ with a minimum of 4nr analyses per material source. Where made ground remaining in place beyond 600mm, imported topsoil is to be placed on a suitable geotextile fabric such as 'Terram 1000, or similar. Cover thickness on all gardens / soft landscaping is to be independently validated by excavation and photography for inclusion in a Validation Report. Imported soils are to comply with the analysis criteria contained in Appendix G In addition to the above, contractors must remain aware that disturbance of the ground may uncover unanticipated features which may give rise to considerations of contamination as far as the exposed conditions may have the potential to impact on receptors including inter alia humans, animals, controlled waters, or the fabric of buildings. Any such encounters will require the contractor to halt work, isolate the risk area, and summon CCG to site to determine the nature of the exposure and to determine an appropriate course of action. Any such incidents will be fully documented in a detailed site Remediation Report.
	The above controlled water risk assessment confirms the presence of some leachable PAH contaminants in soils recovered from borehole WS03. Hence potential risk to controlled waters and/or human health is indicated. Notwithstanding the above, given the absence of nearby sensitive receptors (i.e., water abstraction points etc.), and given the underlying solid geology is overlain by a clay aquiclude, it is concluded that the risk posed to the wider aquatic environment and/or human health is insignificant.
	The preliminary findings indicate that the soil concentrations of pertinent hydrocarbon contaminant species are above the permitted threshold concentrations specified by the UKWIR for the adoption of PE water mains. Hence PE-AL-PE mains must be deployed. Good practice requires that mains be laid in a remediated alignment comprising of clean granular fill extending to 600mm + pipe diameter and to 300mm below pipe underside. Pipes should be laid in accordance with BS EN 12201-2 'Plastic piping systems for water supply and for drainage and sewerage under pressure' as stated in UKWIR guidance.
	It should be noted that this recommendation is subject to the opinion of the water supplier, and in this instance the local water authority (UNITED UTILITIES) must be consulted to confirm that the proposals above accord with their interpretation of current guidance.
Preliminary Waste Classification	The appended Hazwaste report classifies all soils analysed classify as being '<i>Non-Hazardous Waste</i>.' and therefore surplus spoil for off-site disposal from these positions may be disposed at a suitably licenced '<i>Non-Hazardous Waste</i>' landfill facility.
Concrete specification	Concrete in the ground should be specified to conform to the compositional requirements of DC-1 as defined in BRE Special Digest 1: 2005
Gas Risk Assessment	After 1nr round of monitoring, a preliminary Gas Screening Value (GSV) of 0.00003l/hrs is calculated for CO₂, and <0.0001l/hr for CH₄. Using these GSV values, the risk to the proposed development was assessed in line with Situation A as defined in CIRIA C665, and on this basis the site complies with Characteristic Situation 1 (CS1) and based on this classification gas protection measures are not required. It must be borne in mind that a further 5nr rounds of monitoring are required to complete the ongoing gas- groundwater monitoring programme.
	See Section 14.0 for fuller discussion
Foundation Design	See Section 14.0 for fuller discussion
Floor Slabs	See Section 14.0 for fuller discussion
Groundwater Control	All borehole positions were reported to be dry on completion of fieldworks with monitored standing water levels being in the order of 1.11m – 1.3mbgl during the initial rounds of gas – groundwater monitoring. Taking into account the above groundwater observations, a prudent contractor would allow for pumping to maintain dry working conditions during foundation construction and/or service installations, particularly during periods of heavy / prolonged periods of precipitation.
	Excavations in the observed made ground and natural drift soils may be undertaken by light hydraulic excavators. Excavations in excess of 1.2mbgl will require side support.
Excavations	
Further work	• Complete the ongoing gas – groundwater monitoring programme • Update gas risk assessment • Prepare Phase III Remediation Strategy Report • Prepare Phase IV Validation Report

APPENDIX A: DRAWINGS

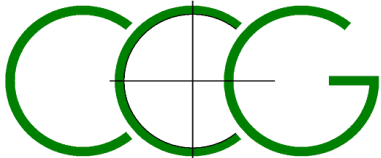


DO NOT SCALE	
Notes: Study Site	
	
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Client: The Built Group	
Project: Former Farmers Arms. Kirkby, L33	
Title: Aerial Photograph	
Scale: NTS	Issue: 01
Drawn by: DG	Date: May 2023
Project No. CCG-C-23-13931	Drawing No. 01
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Project:
Former Farmers Arms. Kirkby, L33

Title:
Aerial Photograph

Scale:
NTS

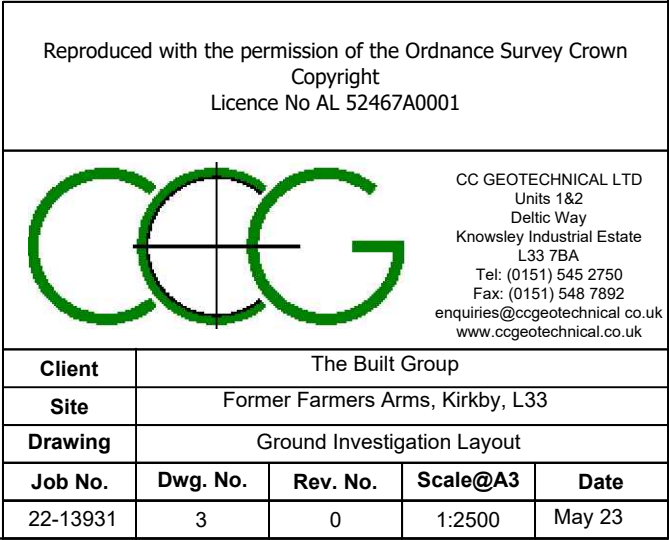
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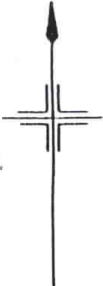
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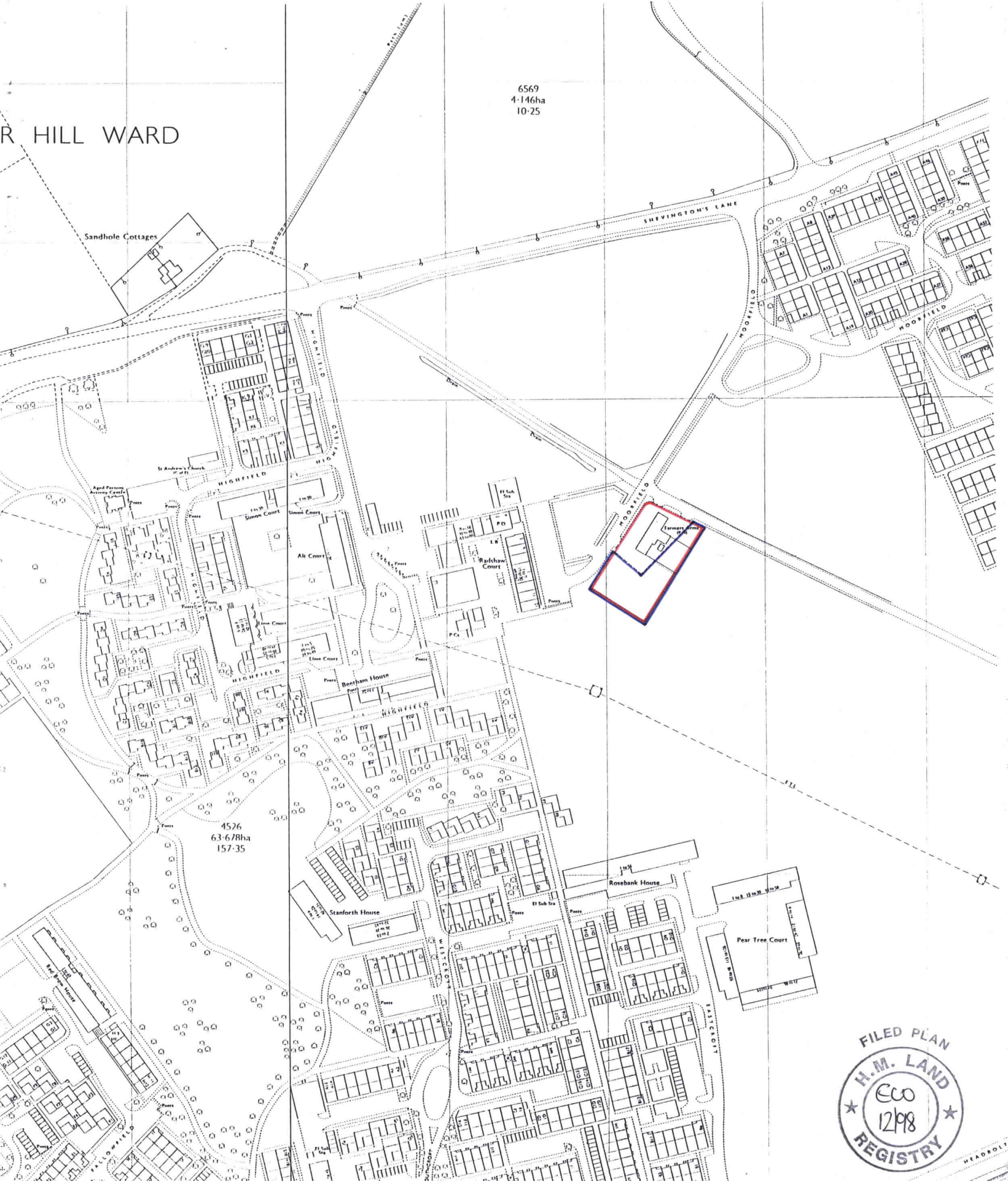
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H.M. LAND REGISTRY		TITLE NUMBER		
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ORDNANCE SURVEY PLANS REFERENCE	SD 4100	SECTION	Scale 1 / 2500	
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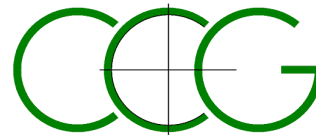


Existing site plan



Proposed site plan

APPENDIX B: SAMPLING METHODOLOGIES



SAMPLING, SAMPLE TRANSPORTATION, AND FIELD MONITORING PROTOCOLS

Soil, water and gas sampling and monitoring methodologies employed by **CC GEOTECHNICAL LTD** are presented hereunder.

SAMPLING OF SOIL FOR CHEMICAL ANALYSIS

Soil samples may be recovered from a variety of intrusive investigation methods including *inter alia* dynamic sampling boreholes, cable percussion boreholes, machine or manual excavation of trial pits.

All equipment which has the potential to introduce extraneous materials into soils – borehole casings, sampling drilling rods, borehole sampling tools, hand tools such as trowels and spades etc. – must be cleaned by jet washing before initial use and between sampling positions.

Cable Percussion Boreholes

In this method of investigation disturbed bulk and small disturbed samples are recovered at regular depth increments throughout the length of the borehole. Each bulk/small disturbed sample is uniquely labelled with the Project Name / Project No / Borehole No / Depth / Date. Where possible, samples are immediately scanned by PID.

Light Dynamic Sampling Boreholes

In this method of investigation samples are recovered in relatively undisturbed 1m long Perspex liners. Each liner is uniquely labelled with the Project Name / Project No / Borehole No / Depth / Date. The liner tubes are sealed by air tight caps fitted at each end, and are temporarily stored out of sunlight. Where possible, samples are immediately split, scanned by PID, logged and subsampled. In the event that splitting and logging on site is not practicable, then the liners are immediately transported to the laboratory where they are immediately split, scanned by PID, logged and subsampled.

Trial Pits

Samples are to be taken from the bucket of an excavator and placed in appropriate airtight containers. Each container is uniquely labelled with the Project No / Trial Pit No / Depth / Date. The samples are then immediately placed in a cool box chilled by ice packs, and the boxes are sealed for transportation to the chemical laboratory.

Sampling Containers

Containers used to store soil samples are selected dependant on the required analysis. The testing laboratory will be consulted should there be any doubt as to the correct sampling container. Typically, a minimum of 1nr 1kg plastic tub, 1nr 500g plastic tub, 1nr 250g amber glass jar and 2nr glass vials are taken at each sample depth. Samples held on site awaiting same day courier collection are stored at 4°C in a cool box. Only in circumstances where same day collection cannot be arranged are samples held overnight, and in this event all samples are refrigerated at 4 °C either on site (if a refrigerator is available) or at CC GEOTECHNICAL soil laboratory. Courier collection is then arranged for immediate pick up the following day.

Chain of Custody records

A Chain of Custody Record (CoC) is to be sent with each batch of samples submitted to the testing laboratory. A copy of the CoC will be made available for inspection by the client, their agents, or any requesting regulatory authority.

HEADSPACE ANALYSES

Duplicate subsamples of all soil samples selected for laboratory analysis may be taken for headspace analyses.

Headspace analysis is undertaken using a MiniRae 2000 Photo Ionisation Detector (PID). In the test method, an amber glass jar is half filled with soil, and the lid is sealed with aluminium foil secured by an elastic band. The jar and contents are agitated for 30 seconds and left for a minimum of 30 minutes out of direct sunlight for the headspace to achieve equilibrium. The PID then pierces the seal and the maximum reading is recorded. Prevailing weather conditions and ambient air temperature are also recorded.

The PID headspace results are recorded on the exploratory borehole or trial pit logs.

PID headspace data is then used to inform the chemical testing schedule for volatile organic compounds analyses.

SAMPLING OF GROUNDWATER FOR CHEMICAL ANALYSIS

Groundwater is sampled from standpipes or piezometers installed during borehole drilling. On completion of the construction of the standpipe, the installation is initially developed by removing up to 10 x the internal volume of the

installation. The volume of water purged is recorded. The installation is then typically left for a week for hydraulic equilibrium to be restored.

Prior to sampling the standpipe, the depth to the water table, and the depth to the base of the installation are monitored using an electronic dipmeter. In circumstances where free phase product is suspected to be present, then an 'Interface Meter' is used to determine the free phase film thickness.

A minimum of 3 x the installation volume is then removed. The pH of the water is then monitored and the sample is taken when the change in pH between any two consecutive extracts is less than 10%. The volume of water removed is recorded.

A sample comprises of a minimum of 3 litres. Two litres are taken in amber glass bottles, and one litre in a plastic bottle.

To avoid cross-contamination one bailer is used per position.

The samples are uniquely labelled with Project Name / Project No / Borehole No / Depth / Date Sampled. They are placed in a cool box chilled by ice packs, and the containers are sealed for transportation to the laboratory.

Once the samples are received in the **CC GEOTECHNICAL LTD** laboratory, the samples are stored in a refrigerator and returned to the cool boxes once collected.

Water taken from the installations are taken back to the **CC GEOTECHNICAL LTD** laboratory and disposed.

Other data recorded in the sampling comprises:

- Volume of water removed during development of well
- Volume of water removed during purging of the well
- Results of on-site pH analyses
- Sample appearance – colour, suspended solids

MONITORING OF GAS

Prior to embarking on a gas-monitoring round, all equipment is checked for functionality and the calibration status is confirmed.

At the commencement of the monitoring round, the prevailing weather conditions, air temperature, barometric pressure and direction of movement of barometric pressure are recorded.

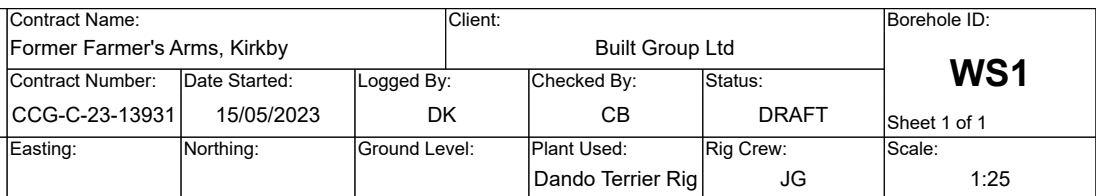
The flow meter is first attached to the standpipe valve, and the flow rate is measured (peak and steady flow) for 1 minute. The results are recorded in l.hr^{-1} . The flow meter tube is protected from the effects of wind by aligning the exhaust downwind.

Following measurement of borehole flow rate, the installation is left for a minimum of 10 minutes for the headspace to restore equilibrium.

Once the gas in the installation has regained equilibrium, the gas analyser is connected and monitoring commences. The peak and steady state readings for CH_4 , CO_2 , CO , H_2S and CO are recorded. The steady state is monitored for a minimum of one minute, and possibly up to a maximum of 10 minutes where fluctuations continue.

When the monitoring is complete, the depth to the water table, and the depth to the base of the well are monitored using an electronic dipmeter. In circumstances where free phase product is suspected to be present, then an 'Interface Meter' is used to determine the free phase film thickness.

APPENDIX C: BOREHOLE LOGS

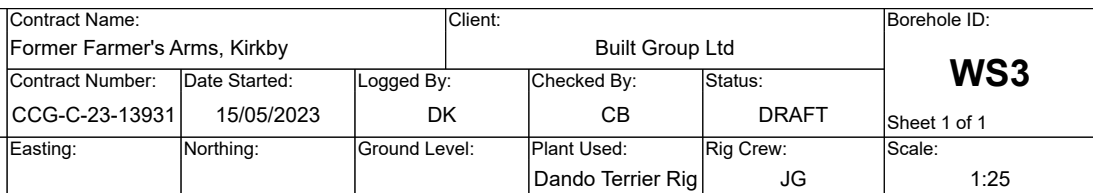


Weather:	Termination:	SPT Hammer: N/R, Energy Ratio: N/R
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Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.30	B			(0.80)		Dark brown very sandy silty GRAVEL with high cobble content. Gravel is fine to coarse angular to subround of brick coal limestone and cinders (MADE GROUND)		
0.50	ES							
0.60	B							
1.00	B			0.80		Loose dark brown clayey gravelly SAND with frequent pockets of clay. Gravel is fine to coarse angular to subround of sandstone	1	
1.00 - 2.00	U	SPT(S)N=7 (1,1/1,2,3,1)	(0.90)					
			1.70					
2.00 - 3.00	U	SPT(S)N=6 (1,1/2,1,1,2)		(0.30)		Soft black slightly sandy slightly gravelly CLAY/SILT. Gravel is fine to coarse angular to subround of coal		
		HVP=20	2.00					
3.00 - 4.00	U	SPT(S)N=8 (2,1/2,2,2,2)		(3.00)		Soft becoming soft to firm locally stiff brown slightly gravelly slightly sandy silty CLAY. Gravel is fine to coarse subangular to subround of sandstone	2	
		HVP=90						
		HVP=110						
4.00 - 5.00	U	SPT(S)N=9 (1,2/3,2,2,2)					3	
		HVP=110						
		HVP=110						
		HVP=110					4	
		SPT(S)N=9 (2,2/3,2,2,2)						
							5	
		HVP=110						
		HVP=110						
							5	
		HVP=110						
		SPT(S)N=9 (2,2/3,2,2,2)	5.00					
						End of Borehole at 5.00m		

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit					
Chiselling					Installation				Water Strikes					
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
					0.00	0.50	PLAIN	50	1.30			0		MSWL
					0.50	4.00	SLOTTED	50						
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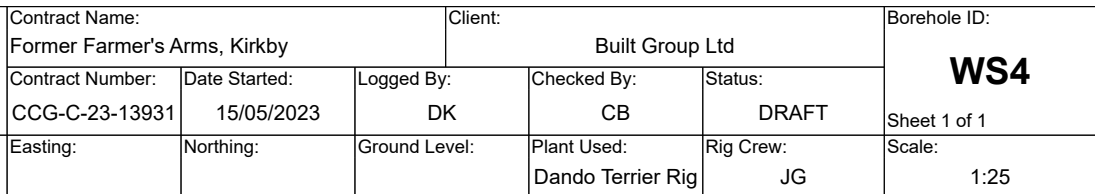
	Contract Name: Former Farmer's Arms, Kirkby			Client: Built Group Ltd			Borehole ID: WS2		
	Contract Number: CCG-C-23-13931	Date Started: 15/05/2023	Logged By: DK	Checked By: CB	Status: DRAFT	Sheet 1 of 1			
	Dynamic Sampling Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: JG	Scale: 1:25	
Weather:			Termination:			SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.30	B			(0.45)		Dark brown gravelly silty SAND. Gravel is fine to coarse angular to sub-angular brick, cinders and coal (MADE GROUND)			
0.50	ES			0.45					
0.60	B			(0.35)		Brown very gravelly silty SAND. Gravel is fine to coarse sub-angular brick, coal and cinders (MADE GROUND)			
				0.80					
1.00	B					Loose dark brown slightly silty fine to medium grained SAND	1		
1.00 - 2.00	U	SPT(S)N=6 (1,1/1,2,1,2)		(0.80)					
				1.60					
		HVP=90		(0.40)		Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse sub-rounded sandstone			
2.00 - 3.00	U	SPT(S)N=9 (2,2/3,2,2,2)		2.00			2		
				(0.50)		Loose to medium dense dark brown slightly silty fine to medium grained SAND			
				2.50					
		HVP=90		(0.50)		Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse sub-rounded sandstone			
3.00 - 4.00	U	SPT(S)N=10 (2,3/3,3,2,2)		3.00			3		
				(0.30)		Medium dense dark brown very silty gravelly fine to medium grained SAND. Gravel is fine to medium sub-rounded sandstone			
				3.30					
		HVP=110		(0.70)		Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone			
		HVP=110							
4.00 - 5.00	U	SPT(S)N=13 (3,3/3,4,3,3)		4.00			4		
				(0.50)		Medium dense brown very silty fine to medium grained SAND			
				4.50					
		HVP=110		(0.50)		Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone			
		HVP=110							
				5.00		End of Borehole at 5.00m	5		
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit
Chiselling					Installation				Water Strikes
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)
				0.00	0.50	PLAIN	50	1.27	
				0.50	4.00	SLOTTED	50		
									Sealed (m)
									Time (mins)
									Rose to (m)
									Remarks
									MSWL
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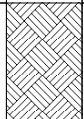
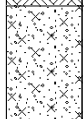
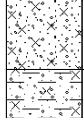
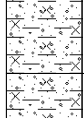
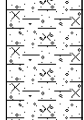
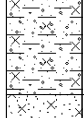
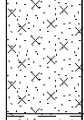
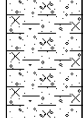
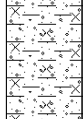
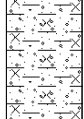
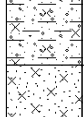
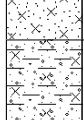
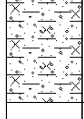
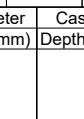
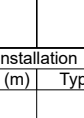
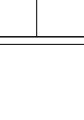
Weather:	Termination:	SPT Hammer: N/R, Energy Ratio: N/R
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Samples & In Situ Testing			Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation
0.00 - 1.00	U					Dark brown very silty very gravelly SAND. Gravel is fine to coarse sub-angular brick, coal and cinders (MADE GROUND)		
0.50	ES			(1.00)				
1.00 - 2.00	U	SPT(S)N=6 (1,1/2,1,2,1)		1.00		Dark brown slightly silty fine to medium grained SAND	1	
				1.20		Loose greyish brown very clayey fine to medium grained SAND with frequent pockets of clay		
				1.40		Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone		
		HVP=50		(0.60)				
2.00 - 3.00	U	SPT(S)N=7 (2,1/2,2,1,2)		2.00		Medium dense brown silty fine to medium grained SAND	2	
				(0.30)				
				2.30		Firm to stiff locally soft brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone		
		HVP=80						
		HVP=110						
3.00 - 4.00	U	SPT(S)N=8 (1,2/3,2,1,2)		(1.70)			3	
		HVP=110						
		HVP=110						
4.00 - 5.00	U	SPT(S)N=8 (2,1/2,2,2,2)		4.00		Loose brown silty fine to medium grained SAND	4	
				(0.60)				
				4.60		Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone		
		HVP=110		(0.40)				
		SPT(S)N=10 (3,2/3,3,2,2)		5.00		End of Borehole at 5.00m	5	

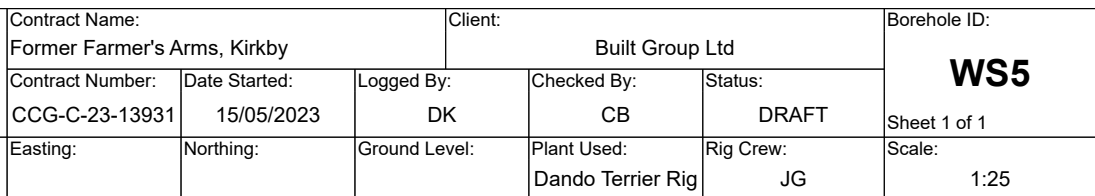
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:					
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit					
									Water Strikes					
									Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks
Chiselling					Installation									
From (m)	To (m)	Duration	Remarks		Top (m)	Base (m)	Type	Dia (mm)						
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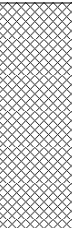
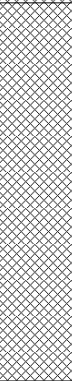
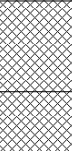
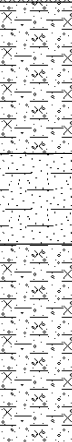
Samples & In Situ Testing	Strata Details	Groundwater
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Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description		Water Strike	Backfill/ Installation
0.30	B			(0.40)		Grassed TOPSOIL. Recovered as dark brown gravelly silty SAND. Gravel is fine to coarse sub-angular sandstone			
0.50	ES			0.40		Dark brown silty slightly gravelly fine to medium grained SAND. Gravel is fine to medium sub-rounded sandstone			
0.60	B			(0.60)					
1.00	B			1.00		Soft greyish brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone	1		
1.00 - 2.00	U	SPT(S)N=8 (1,2/2,2,2,2)		(0.40)					
		HVP=70		1.40		Firm brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone			
		HVP=70		(0.85)					
2.00 - 3.00	U	SPT(S)N=11 (2,3/3,2,3,3)		2.25		Brown very silty fine to medium grained SAND	2		
				(0.45)					
		HVP=90		2.70		Soft to firm varying to soft then stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone			
3.00 - 4.00	U	SPT(S)N=9 (3,3/2,3,2,2)		(1.40)			3		
		HVP=40							
		HVP=80							
4.00 - 5.00	U	SPT(S)N=13 (3,3/4,4,3,2)		4.10		Medium dense brown very silty fine to medium grained SAND			
				(0.30)					
		HVP=80		4.40		Stiff brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium rounded sandstone			
		HVP=90		(0.60)					
		SPT(S)N=9 (3,2/2,3,2,2)		5.00					
						End of Borehole at 5.00m	5		

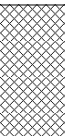
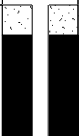
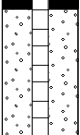
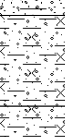
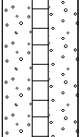
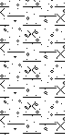
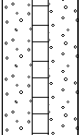
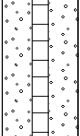
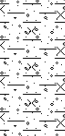
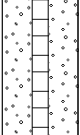
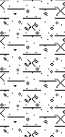
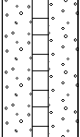
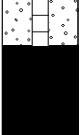
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks: 1 hour hand excavating 1.20mbgl service avoidance pit Water Strikes <table><thead><tr><th>Strike (m)</th><th>Casing (m)</th><th>Sealed (m)</th><th>Time (mins)</th><th>Rose to (m)</th><th>Remarks</th></tr></thead><tbody><tr><td></td><td></td><td></td><td></td><td></td><td></td></tr></tbody></table> CC GEOTECHNICAL LTD 0151 545 2750 www.ccgeotechnical.com	Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks						
Strike (m)	Casing (m)	Sealed (m)	Time (mins)	Rose to (m)	Remarks																
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)													
Chiselling				Installation																	
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)														



Weather:	Termination:	SPT Hammer: N/R, Energy Ratio: N/R
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Samples & In Situ Testing				Strata Details				Groundwater		
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/ Installation		
0.00 - 1.00	U	SPT(S)N=5 (1,1/2,1,1,1)		(0.75)		Dark brown very gravelly silty SAND. Gravel is fine to coarse sub-angular brick, coal, cinders and concrete (MADE GROUND)	1			
0.50	ES			0.75		Loose brown gravelly silty SAND. Gravel is fine to coarse sub-angular brick and sandstone (MADE GROUND)				
1.00 - 2.00	U			(1.25)		2.00			2	Loose reddish brown very sandy slightly silty GRAVEL. Gravel is fine to coarse angular to sub-angular brick, coal, cinders and concrete (MADE GROUND)
2.00 - 3.00	U			2.30		Soft brown sandy silty CLAY. High organic content (MADE GROUND)				
		2.50		2.50		3	Firm greyish brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to coarse sub-rounded sandstone			
		(0.50)		3.00			Loose greyish brown very clayey sandy GRAVEL. Gravel is fine to coarse angular to sub-angular of sandstone			
3.00 - 4.00	U	SPT(S)N=6 (1,2/2,1,2,1)		3.00		Soft to firm brown slightly sandy slightly gravelly silty CLAY with occasional thin sand horizons. Gravel is fine to medium sub-rounded sandstone	4			
			3.30							
		HVP=40								
		HVP=90								
4.00 - 5.00	U	SPT(S)N=7 (2,2/3,1,2,2)		(1.70)		End of Borehole at 5.00m	5			
		SPT(S)N=10 (2,3/3,2,3,2)	5.00							

Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks: 1 hour hand excavating 1.20mbgl service avoidance pit
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	Contract Name: Former Farmer's Arms, Kirkby			Client: Built Group Ltd			Borehole ID: WS6		
	Contract Number: CCG-C-23-13931	Date Started: 15/05/2023	Logged By: DK	Checked By: CB	Status: DRAFT	Sheet 1 of 1			
	Dynamic Sampling Borehole Log		Easting:	Northing:	Ground Level:	Plant Used: Dando Terrier Rig	Rig Crew: JG	Scale: 1:25	
Weather:			Termination:			SPT Hammer: N/R, Energy Ratio: N/R			
Samples & In Situ Testing				Strata Details				Groundwater	
Depth	Sample ID	Test Result	Level (mAOD)	Depth (m) (Thickness)	Legend	Strata Description	Water Strike	Backfill/Installation	
0.30	B			(0.45)		Brown very gravelly slightly silty SAND. High cobble content. Gravel is fine to coarse angular to sub-angular brick, concrete and cinders (MADE GROUND)			
0.50	ES			0.45					
0.60	B			(0.35)		Dark brown gravelly silty SAND. Gravel is fine to coarse sub-angular brick, coal and cinders (MADE GROUND)			
1.00	B			0.80					
1.00 - 2.00	U	SPT(S)N=9 (1,2/2,2,2,3)		1.00		Dark brown very clayey slightly gravelly fine to medium grained SAND with frequent pockets of clay. Gravel is fine to medium sub-rounded sandstone	1		
				(0.30)		Firm greyish brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone			
				1.30					
		HVP=80		(0.70)		Soft to firm becoming stiff light brown slightly sandy slightly gravelly silty CLAY. Gravel is fine to medium sub-rounded sandstone			
2.00 - 3.00	U	SPT(S)N=10 (2,3/3,2,2,3)		2.00			2		
		HVP=90							
		HVP=100							
3.00 - 4.00	U	SPT(S)N=11 (3,3/3,2,3,3)		(3.00)			3		
		HVP=110							
		HVP=110							
4.00 - 5.00	U	SPT(S)N=13 (3,2/3,4,3,3)					4		
		HVP=110							
		HVP=110							
		HVP=110							
		SPT(S)N=13 (3,3/4,4,3,2)		5.00			5		
						End of Borehole at 5.00m			
Start & End of Shift Observations					Borehole Diameter		Casing Diameter		Remarks:
Date	Time	Depth (m)	Casing (m)	Water (m)	Depth (m)	Dia (mm)	Depth (m)	Dia (mm)	1 hour hand excavating 1.20mbgl service avoidance pit
Chiselling					Installation				Water Strikes
From (m)	To (m)	Duration	Remarks	Top (m)	Base (m)	Type	Dia (mm)	Strike (m)	Casing (m)
				0.00	0.50	PLAIN	50	1.11	
				0.50	4.00	SLOTTED	50		
									Sealed (m)
									Time (mins)
									Rose to (m)
									Remarks
									MSWL
CC GEOTECHNICAL LTD 0151 545 2750 www.ccgeotechnical.com									

APPENDIX D: GAS – GROUNDWATER MONITORING

GAS AND WATER MONITORING RESULTS



	Date:	06-Jun-23											
	Visit Number	1											
	Atmos Press mb	1022											
	Pressure Trend	Steady											
	Air Temp °C	17											
	Cloud cover	Clear											
	Wind velocity	Light breeze											
	Precipitation	Dry											
	State of Ground	Dry											
WS01	CH4 (%):	Nil											
	CO2 (%):	0.3											
	O2 (%):	20.5											
	H2S (ppm):	Nil											
	CO (ppm):	Nil											
	PID (ppm):	0.0											
	Flow (l/hr):	<0.1											
WS02	Water Level (mbgl):	1.30											
	CH ₄ (%):	Nil											
	CO ₂ (%):	0.2											
	O ₂ (%):	20.3											
	H ₂ S (ppm):	Nil											
	CO (ppm):	Nil											
	PID (ppm):	0.0											
WS06	Flow (l/hr):	<0.1											
	Water Level (mbgl):	1.27											
	CH4 (%):	Nil											
	CO2 (%):	<0.1											
	O2 (%):	21.1											
	H2S (ppm):	Nil											
	CO (ppm):	Nil											
	PID (ppm):	0.0											
	Flow (l/hr):	<0.1											
	Water Level (mbgl):	1.11											
	CH4 (%):	Nil											
	CO2 (%):	<0.1											
	O2 (%):	21.1											
	H2S (ppm):	Nil											

CCG-CMS-FO-129

Issue 2

Job No: CCG-C-22-13931

Site: Farmers Arms, Kirkby

Instrument:

GFM436

TEST DATE AND CONDITIONS			
Date		13/02/2023	
Atmospheric Pressure Ambient Temperature EnviroNics Serial No.		1013	mB
		19.7	°C
		5089	

**GFM436 Final Inspection & Calibration
Check Certificate**

GAS DATA LTD	
Unit 4, Fairfield Court	
Seven Stars Estate	
Wheler Rd	
Coventry	
CV3 4LJ	
Tel 02476303311	Fax 02476307711



GAS DATA
LISTEN • ANALYSE • INFORM

Customer	C C Geotechnical
Certificate Number	123929
Order Number	333366

Serial Number	12667
Software Version	G436-00.0027/0010

Recalibration DUE Date
13/02/24

Instrument Checks					
Keyboard	✓		Display Contrast	✓	
Pump Flow In	450	Accept > 200 cc/min	Pump Flow @ -200mB	250	Accept > 200 cc/min
Clock Set / Running	✓		Labels Fitted	✓	

Gas Checks						
Sensor	CH ₄		CO ₂		O ₂	
	Instrument Gas	True Gas Value %	Instrument Gas	True Gas Value %	Instrument Gas	True Gas Value %
	Readings %		Readings %		Readings %	
	60.2	60	40.2	40	20.9	20.9
	Accept ±3.0		Accept ±3.0		Accept ±0.5	
	4.9	5	4.9	5	6.0	6
Zero Reading 100% N ₂	0.0	0	0.0	0	0.0	0
	Accept ±0.0		Accept ±0.0		Accept ±0.1	

Optional Gas Checks						
Applied Gas & Range		Concentration Tested @ (ppm)	Instrument Readings (ppm)			
Gas Type	Range (ppm)		Zero Reading		Instrument Gas Reading	
H ₂ S	5000	1500	0	Accept ±0.0	1500	Accept ±5.0
CO	2000	1000	0	Accept ±0.0	1000	Accept ±5.0
Hexane	2.0%	2.0%	0	Accept ±0.0	1.99	Accept ±10.0

Cross Gas Effects									
Applied Gas (ppm)		Instrument Readings (ppm)							
Gas Type	Concentration	Toxic 1:	H2S	Toxic 2:	CO	Toxic 3:	HEX		
H2S	1500	1500		0		0			
CO	1000	70		1000		0			
Hexane	2.0%	0		0		1.99			

Pressure Checks			
Atmospheric Pressure [AP] (mB)			
Current Atmospheric Pressure (mB)		Instrument Atmospheric Pressure Reading (mB)	
AP Open Ports		1013	Accept ± 2.0
AP Port (Internal)	+800 mB	800	Accept ± 5.0
	+1200mb	1200	Accept ± 5.0

Flow Checks					
Borehole Flow			Differential Pressure		
Applied Reading (l/h)	Instrument Reading (l/h)		Applied Pressure (Pa)	Instrument Reading (Pa)	
-30	-30.6	Accept ± 3.0	-423	-435	Accept ± 50
-3	-3.0	Accept ± 1.0	-17	-18	Accept ± 6.0
0	0.0	Accept ± 0.0	0	0	Accept ± 0.5
3	3.0	Accept ± 0.5	14	13	Accept ± 3.0
30	30.4	Accept ± 3.0	318	325	Accept ± 50
60	59.6	Accept ± 6.0	968	955	Accept ± 130
90	90.1	Accept ± 9.0	1925	1956	Accept ± 250

Temperature Checks		
Calibration Temperature	Instrument Temperature Reading $^{\circ}\text{C}$	
Applied Temperature $^{\circ}\text{C}$		
-10	-10.0	Accept ± 2.0
0	0.0	Accept ± 1.0
30	30.0	Accept ± 1.0
60	60.0	Accept ± 1.0
100	100.0	Accept ± 1.0

Technician:
Jack Rutland

Date Tested:
13/02/2023

The instrument identified by the serial number stated above has been tested by Gas Data personnel for calibration accuracy on the date and under the ambient conditions stated. Gas Data Ltd internal BS EN ISO9001:2015, BS EN ISO14001:2015, BS EN ISO45001:2018 compliant workshop procedures were followed to apply known calibration test gases, gas flow rates, pressures and temperatures of the values stated.

The results displayed on the instrument at each stage are recorded above.

Gas Data Ltd is certified to BS EN ISO9001:2015, BS EN ISO14001:2015, BS EN ISO45001:2018.



CUSTOMER: CC Geotechnical Ltd

FIRMWARE: 5.12
UPGRADED TO: 6.1

TESTS	Pre Service	Post Service
Charger Test		OK
Battery charge Test		OK
Lamp Test		OK
Air Flow Test ≥ 220ml/min		269ml/min
Block Flow Test ≤ 15ml/min		10ml/min
Moisture Sensitivity = 0.0ppm		0.00ppm
Switch Test		OK
Sensor Test		OK
Alarm Test		OK
PC Comms Test		OK
Datalog Test		OK
Display Test		OK
Physical Inspection		OK
PAT Test		OK
Firmware Upgrade		OK
Software Upgrade (usb)	N/A	
Function Test		OK
Run time		39hrs51mins

Firmware upgraded to latest version V6.1
Replaced LT stack, sensor seal, inlet/outlet filters and PTFE filter as per service
Cleaned lamp with aluminium oxide
Flow rate 269ml/min, Block 10ml/min
Instrument calibrated and bump tested
Power supply PAT tested, Charging cradle function tested

DATE: 24-May-22



Life-saving solutions

CERTIFICATE OF CALIBRATION

Phocheck Tiger

CALIBRATION CERTIFICATE NO:

73754

ISSUED BY: SHAWCITY LIMITED

DATE: 24-May-22

APPROVED SIGNATORY:

NAME: Joe Herbert

CUSTOMER: CC Geotechnical Ltd

INSTRUMENT: PhoCheck Tiger

SERIAL NUMBER: T-110194

CALIBRATION METHOD: CM03

AMBIENT CONDITIONS: 20°C ± 2°C and 50% (± 20%) RH

Prior to calibration the instrument was allowed to stabilise in the laboratory for at least 30 minutes.

The instrument was calibrated by exposing the sensor to known values of gas concentrations.

All gases were sampled through the complete probe and in line filter, where applicable.

The reference value is that generated by the certified source and the indicated value is that measured by the instrument.

CALIBRATION RESULTS

GAS	LOT No	REF. VALUE	INDICATED VALUE
Isobutylene	WO347195-1	100 ppm	100 ppm
Isobutylene	WO188023-1	5000ppm	5000ppm

COMMENTS:

The reported uncertainty is based on a standard uncertainty multiplied by a coverage factor of $k=2$.

This provides a level of confidence of uncertainty of approximately 95%.

The uncertainty of measurement is $\pm 2\%$

The results indicate that the instrument conforms to the applicable parts of the published specification.

HEALTH & SAFETY, OCCUPATIONAL HYGIENE AND ENVIRONMENTAL MONITORING INSTRUMENTS

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www.shawcity.co.uk

Instrument House, 91-92 Shrivenham Hundred Business Park

Watchfield, Oxfordshire, SN6 8TY

Fax: 01793 784466

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APPENDIX E: SOIL CLASSIFICATION REPORT

APPENDIX F: SOIL CONTAMINATION REPORT



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TN38 9BY
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THE ENVIRONMENTAL LABORATORY LTD

Analytical Report Number: 23-48124

Issue: 1

Date of Issue: 30/05/2023

Contact: Tony Gerrard

Customer Details: CC Geotechnical Ltd
Unit 1 & 2 Deltic Place
Deltic Way
Liverpool
Merseyside L33 7BA

Quotation No: Q22-03450

Order No: 23-13921

Customer Reference: 23-13921

Date Received: 17/05/2023

Date Approved: 30/05/2023

Details: Former Farmer Arms PH, Kirkby

Approved by:

Tim Reeve, Quality Officer

Any comments, opinions or interpretations expressed herein are outside the scope of UKAS accreditation (Accreditation Number 2683)

This report may only be reproduced in full



Sample Summary

Report No.: 23-48124, issue number 1

Elab No.	Client's Ref.	Date Sampled	Date Scheduled	Description	Deviations
322108	WS01 0.50	15/05/2023	17/05/2023	Sandy loam	
322109	WS02 0.50	15/05/2023	17/05/2023	Sandy loam	
322110	WS03 0.50	15/05/2023	17/05/2023	Loamy sand	
322111	WS04 0.50	15/05/2023	17/05/2023	Sandy loam	
322112	WS05 0.50	15/05/2023	17/05/2023	Sandy loam	
322113	WS06 0.50	15/05/2023	17/05/2023	Sandy silty loam	



Results Summary

2683

Report No.: 23-48124, issue number 1

ELAB Reference	322108	322109	322110	322111	322112	322113
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS01	WS02	WS03	WS04	WS05	WS06
Sample Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
Sampling Date	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023

Determinand	Codes	Units	LOD						
Soil sample preparation parameters									
Moisture Content	N	%	0.1	9.4	9.0	11.0	12.8	7.5	16.0
Material removed	N	%	0.1	49.4	53.0	35.0	< 0.1	62.4	17.8
Description of Inert material removed	N		0	Stones	Stones	Stones	None	Stones	Stones
Metals									
Antimony	N	mg/kg	2.5	12.9	15.4	6.6	2.7	14.3	3.5
Arsenic	M	mg/kg	1	52.1	59.2	16.2	9.5	61.7	12.9
Cadmium	M	mg/kg	0.5	0.9	1.0	< 0.5	< 0.5	1.1	< 0.5
Chromium	M	mg/kg	5	42.8	41.7	21.8	15.5	44.6	20.7
Copper	M	mg/kg	5	326	365	113	38.6	369	60.8
Lead	M	mg/kg	5	466	509	136	97.6	555	114
Mercury	M	mg/kg	0.5	0.7	0.7	0.5	< 0.5	0.7	< 0.5
Molybdenum	N	mg/kg	0.5	7.8	8.2	2.3	0.7	8.9	1.7
Nickel	M	mg/kg	5	52.8	58.9	26.4	16.2	61.5	24.4
Selenium	M	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Zinc	M	mg/kg	5	353	387	120	62.2	393	108
Anions									
Water Soluble Sulphate	M	g/l	0.02	0.04	0.03	< 0.02	< 0.02	0.03	< 0.02
Inorganics									
Free Cyanide	N	mg/kg	1	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0	< 1.0
Hexavalent Chromium	N	mg/kg	0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8	< 0.8
Total Sulphide	N	mg/kg	2	24	37	24	< 2	58	5
Acid Soluble Sulphate (SO4)	U	%	0.02	0.16	0.18	0.05	0.02	0.21	0.03
Water Soluble Boron	N	mg/kg	0.5	< 0.5	< 0.5	< 0.5	< 0.5	< 0.5	1.4
Miscellaneous									
pH	M	pH units	0.1	7.9	7.9	8.0	7.5	8.1	7.0
Soil Organic Matter	U	%	0.1	6.1	6.1	2.4	3.7	7.2	6.8



Results Summary

2683

Report No.: 23-48124, issue number 1

ELAB Reference	322108	322109	322110	322111	322112	322113
Customer Reference						
Sample ID						
Sample Type	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Location	WS01	WS02	WS03	WS04	WS05	WS06
Sample Depth (m)	0.50	0.50	0.50	0.50	0.50	0.50
Sampling Date	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023	15/05/2023

Determinand	Codes	Units	LOD						
Polyaromatic hydrocarbons									
Naphthalene	MS	mg/kg	0.02	0.42	0.40	0.59	< 0.02	0.44	0.06
Acenaphthylene	MS	mg/kg	0.02	0.05	0.05	0.02	< 0.02	0.07	< 0.02
Acenaphthene	MS	mg/kg	0.02	0.12	0.15	0.03	0.05	0.20	0.13
Fluorene	US	mg/kg	0.02	0.07	0.07	< 0.02	0.03	0.11	0.08
Phenanthrene	MS	mg/kg	0.02	1.27	1.42	0.56	0.33	1.69	1.01
Anthracene	US	mg/kg	0.02	0.30	0.34	0.10	0.04	0.37	0.19
Fluoranthene	MS	mg/kg	0.02	2.36	2.71	0.84	0.47	3.07	1.49
Pyrene	MS	mg/kg	0.02	2.22	2.57	0.81	0.45	3.06	1.35
Benzo(a)anthracene	US	mg/kg	0.02	1.23	1.31	0.45	0.22	1.65	0.63
Chrysene	MS	mg/kg	0.02	1.40	1.51	0.54	0.29	1.87	0.81
Benzo(b)fluoranthene	MS	mg/kg	0.02	1.59	1.58	0.60	0.27	2.11	0.70
Benzo(k)fluoranthene	MS	mg/kg	0.03	0.58	0.73	0.23	0.11	0.80	0.28
Benzo(a)pyrene	US	mg/kg	0.02	1.56	1.55	0.55	0.25	2.02	0.68
Indeno(1,2,3-cd)pyrene	MS	mg/kg	0.02	1.13	1.07	0.42	0.14	1.46	0.36
Dibenzo(a,h)anthracene	MS	mg/kg	0.02	0.24	0.23	0.09	0.03	0.31	0.08
Benzo[g,h,i]perylene	MS	mg/kg	0.02	1.30	1.29	0.51	0.16	1.72	0.41
Total PAH(16)	NS	mg/kg	0.34	15.9	17.0	6.36	2.83	20.9	8.27
BTEX									
Benzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Toluene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Ethylbenzene	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
Xylenes	M	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0
MTBE	U	ug/kg	10	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0	< 10.0

Results Summary

2683

Report No.: 23-48124, issue number 1

ELAB Reference	322110
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	WS03
Sample Depth (m)	0.50
Sampling Date	15/05/2023

Determinand	Codes	Units	LOD	
Metals				
Arsenic 10:1 extract	N	ug/l	5	< 5
Boron 10:1 extract	N	ug/l	5	115
Cadmium 10:1 extract	N	ug/l	1	< 1
Calcium 10:1 extract	N	ug/l	100	8340
Chromium 10:1 extract	N	ug/l	5	< 5
Copper 10:1 extract	N	ug/l	5	< 5
Lead 10:1 extract	N	ug/l	5	< 5
Magnesium 10:1 extract	N	ug/l	100	233
Mercury 10:1 extract	N	ug/l	0.1	< 0.1
Nickel 10:1 extract	N	ug/l	5	< 5
Selenium 10:1 extract	N	ug/l	5	< 5
Zinc 10:1 extract	N	ug/l	5	< 5
Anions				
Sulphate 10:1 extract	N	mg/l	1	26
Inorganics				
Free Cyanide	N	ug/l	5	< 5
Sulphide 10:1 extract	N	mg/l	0.1	< 0.1
Miscellaneous				
Dissolved organic carbon	N	mg/l	1.5	4.1
pH (10:1 extract)	N	pH units	0.1	7.1
Hardness (CaCO3)	N	mg/l CaCO3	0.1	22
Polyaromatic hydrocarbons				
Naphthalene Leachate GCMS	N	ug/l	0.01	0.12
Acenaphthylene Leachate GCMS	N	ug/l	0.01	0.06
Acenaphthene Leachate GCMS	N	ug/l	0.01	0.04
Fluorene Leachate GCMS	N	ug/l	0.01	0.02
Phenanthrene Leachate GCMS	N	ug/l	0.01	0.17
Anthracene Leachate GCMS	N	ug/l	0.01	0.15
Fluoranthene Leachate GCMS	N	ug/l	0.01	0.59
Pyrene Leachate GCMS	N	ug/l	0.01	0.55
Benzo (a) anthracene Leachate GCMS	N	ug/l	0.01	0.24
Chrysene Leachate GCMS	N	ug/l	0.01	0.36
Benzo (b) fluoranthene Leachate GCMS	N	ug/l	0.01	0.41
Benzo (k) fluoranthene Leachate GCMS	N	ug/l	0.01	0.32
Benzo (a) pyrene Leachate GCMS	N	ug/l	0.01	0.53
Indeno (1,2,3-cd) pyrene Leachate GCMS	N	ug/l	0.01	0.40
Dibenzo(a,h)anthracene Leachate GCMS	N	ug/l	0.01	0.13
Benzo(ghi)perylene Leachate GCMS	N	ug/l	0.01	0.46
Total PAH(16) Leachate GCMS	N	ug/l	0.01	4.55



Results Summary

2683

Report No.: 23-48124, issue number 1

ELAB Reference	322110
Customer Reference	
Sample ID	
Sample Type	SOIL
Sample Location	WS03
Sample Depth (m)	0.50
Sampling Date	15/05/2023

Determinand	Codes	Units	LOD	
TPH CWG				
>C5-C6 Aliphatic in Leachate (HS_1D_MS)	N	ug/l	1	< 1.0
>C6-C8 Aliphatic in Leachate (HS_1D_MS)	N	ug/l	1	< 1.0
>C8-C10 Aliphatic Leachate (EH_CU_1D_AL)	N	ug/l	5	< 5.0
>C10-C12 Aliphatic Leachate (EH_CU_1D_AL)	N	ug/l	5	13.1
>C12-C16 Aliphatic Leachate (EH_CU_1D_AL)	N	ug/l	5	15.2
>C16-C21 Aliphatic Leachate (EH_CU_1D_AL)	N	ug/l	5	8.8
>C21-C35 Aliphatic Leachate (EH_CU_1D_AL)	N	ug/l	5	< 5.0
>C35-C40 Aliphatic Leachate (EH_CU_1D_AL)	N	ug/l	5	< 5.0
Total (>C5-C40) Aliphatic Leachate (HS_1D_MS+EH_CU_1D_AL)	N	ug/l	5	37.1
>C5-C7 Aromatic in Leachate (HS_1D_MS)	N	ug/l	1	< 1.0
>C7-C8 Aromatic in Leachate (HS_1D_MS)	N	ug/l	1	< 1.0
>C8-C10 Aromatic Leachate (EH_CU_1D_AR)	N	ug/l	5	< 5.0
>C10-C12 Aromatic Leachate (EH_CU_1D_AR)	N	ug/l	5	5.1
>C12-C16 Aromatic Leachate (EH_CU_1D_AR)	N	ug/l	5	< 5.0
>C16-C21 Aromatic Leachate (EH_CU_1D_AR)	N	ug/l	5	< 5.0
>C21-C35 Aromatic Leachate (EH_CU_1D_AR)	N	ug/l	5	< 5.0
>C35-C40 Aromatic Leachate (EH_CU_1D_AR)	N	ug/l	5	< 5.0
Total (>C5-C40) Aromatic Leachate (HS_1D_MS+EH_CU_1D_AR)	N	ug/l	5	5.1
Total (>C5-C40) Ali/Aro Leachate (HS_1D_MS+EH_CU_1D_Total)	N	ug/l	5	42.2



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Results Summary

Report No.: 23-48124, issue number 1

Asbestos Results

Analytical result only applies to the sample as submitted by the client. Any comments, opinions or interpretations (marked #) in this report are outside UKAS accreditation (Accreditation No2683). They are subjective comments only which must be verified by the client.

Elab No	Depth (m)	Clients Reference	Description of Sample Matrix #	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)
322108	0.50	WS01	Brown Sandy Soil,Stones,Brick	No asbestos detected	n/t	n/t	n/t	n/t
322109	0.50	WS02	Brown Sandy Soil,Stones,Brick,Clinker	No asbestos detected	n/t	n/t	n/t	n/t
322110	0.50	WS03	Brown sandy Soil,Stones,Clinker	No asbestos detected	n/t	n/t	n/t	n/t
322111	0.50	WS04	Brown sandy Soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t
322112	0.50	WS05	Brown sandy Soil,Stones,Brick	No asbestos detected	n/t	n/t	n/t	n/t
322113	0.50	WS06	Brown Sandy Soil,Stones	No asbestos detected	n/t	n/t	n/t	n/t

Method Summary

Report No.: 23-48124, issue number 1

Parameter	Codes	Analysis Undertaken On	Date Tested	Method Number	Technique
Soil					
Aliphatic hydrocarbons in leachate	N		22/05/2023		GC-FID
Aliphatic/Aromatic hydrocarbons in leach	N		22/05/2023		GC-FID
Aromatic hydrocarbons in leachate	N		22/05/2023		GC-FID
Carbon in leachates	N		23/05/2023		IR
Leachate cyanide 10:1 extract	N		22/05/2023		Colorimetry
Leachate sulphide 10:1 extract	N		30/05/2023		Colorimetry
pH of leachates	N		25/05/2023		Electromeric
Leachate metals 10:1 extract	N		22/05/2023	101	ICPMS
Free cyanide	N	As submitted sample	18/05/2023	107	Colorimetry
Sulphide	N	As submitted sample	19/05/2023	109	Colorimetry
Hexavalent chromium	N	As submitted sample	19/05/2023	110	Colorimetry
pH	M	Air dried sample	23/05/2023	113	Electromeric
Acid Soluble Sulphate	U	Air dried sample	24/05/2023	115	Ion Chromatography
Aqua regia extractable metals	M	Air dried sample	19/05/2023	300	ICPMS
PAHs and/or PCBs in leachates	N		22/05/2023	135	GC-MS
Water soluble anions	M	Air dried sample	19/05/2023	172	Ion Chromatography
Low range Aliphatic hydrocarbons soil	N	As submitted sample	22/05/2023	181	GC-MS
Low range Aromatic hydrocarbons soil	N	As submitted sample	22/05/2023	181	GC-MS
BTEX in solids	M	As submitted sample	22/05/2023	181A	GC-MS
Low range Aliphatic hydrocarbons leachat	N		22/05/2023	200	GC-MS
Low range Aromatic hydrocarbons leachate	N		22/05/2023	200	GC-MS
Water soluble boron	N	Air dried sample	19/05/2023	202	Colorimetry
Asbestos identification	U	Air dried sample	19/05/2023	281	Microscopy
Anions in leachates	N		22/05/2023	305	Ion Chromatography
Soil organic matter	U	Air dried sample	24/05/2023	BS1377:P3	Titrimetry
Water					
Hardness in soil leachates	N		26/05/2023	APHA	ICPMS

Tests marked N are not UKAS accredited

Report Information

Report No.: 23-48124, issue number 1

Key

U	hold UKAS accreditation
M	hold MCERTS and UKAS accreditation
N	do not currently hold UKAS accreditation
^	MCERTS accreditation not applicable for sample matrix
*	UKAS accreditation not applicable for sample matrix
S	Subcontracted to approved laboratory UKAS Accredited for the test
SM	Subcontracted to approved laboratory MCERTS/UKAS Accredited for the test
NS	Subcontracted to approved laboratory. UKAS accreditation is not applicable.
I/S	Insufficient Sample
U/S	Unsuitable sample
n/t	Not tested
<	means "less than"
>	means "greater than"
LOD	LOD refers to limit of detection, except in the case of pH soils and pH waters where it means limit of discrimination. Soil sample results are expressed on an air dried basis (dried at < 30°C), and are uncorrected for inert material removed. ELAB are unable to provide an interpretation or opinion on the content of this report. The results relate only to the sample received. PCB congener results may include any coeluting PCBs Uncertainty of measurement for the determinands tested are available upon request Unless otherwise stated, sample information has been provided by the client. This may affect the validity of the results.

Deviation Codes

a	No date of sampling supplied
b	No time of sampling supplied (Waters Only)
c	Sample not received in appropriate containers
d	Sample not received in cooled condition
e	The container has been incorrectly filled
f	Sample age exceeds stability time (sampling to receipt)
g	Sample age exceeds stability time (sampling to analysis)

Where a sample has a deviation code, the applicable test result may be invalid.

Sample Retention and Disposal

All soil samples will be retained for a period of one month
 All water samples will be retained for 7 days following the date of the test report
 Charges may apply to extended sample storage

TPH Classification - HWOL Acronym System

HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
2D	GC-GC - Double coil gas chromatography
#1	EH_Total but with humics mathematically subtracted
#2	EH_Total but with fatty acids mathematically subtracted
_	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative e.g. EH+HS_Total or EH_CU+HS_Total
MS	Mass Spectrometry



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The Environmental Laboratory Ltd
Unit A2, Windmill Road
Ponswood Industrial Estate
St. Leonards on Sea
East Sussex
TN38 9BY

Attention: Customer Services

CERTIFICATE OF ANALYSIS

Date of report Generation: 25 May 2023
Customer: The Environmental Laboratory Ltd
Sample Delivery Group (SDG): 230519-82
Your Reference: 23-48124
Location:
Report No: 690171
Order Number: 11454

We received 6 samples on Friday May 19, 2023 and 6 of these samples were scheduled for analysis which was completed on Thursday May 25, 2023. Accredited laboratory tests are defined within the report, but opinions, interpretations and on-site data expressed herein are outside the scope of ISO 17025 accreditation.

Should this report require incorporation into client reports, it must be used in its entirety and not simply with the data sections alone.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden.

All sample data is provided by the customer. The reported results relate to the sample supplied, and on the basis that this data is correct.

Incorrect sampling dates and/or sample information will affect the validity of results.

The customer is not permitted to reproduce this report except in full without the approval of the laboratory.

Approved By:

Sonia McWhan

Operations Manager





CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-82
Client Ref.: 23-48124

Report Number: 690171
Location:

Superseded Report:

Received Sample Overview

Lab Sample No(s)	Customer Sample Ref.	AGS Ref.	Depth (m)	Sampled Date
28021070	322108/WS01		0.50	15/05/2023
28021071	322109/WS02		0.50	15/05/2023
28021072	322110/WS03		0.50	15/05/2023
28021073	322111/WS04		0.50	15/05/2023
28021074	322112/WS05		0.50	15/05/2023
28021075	322113/WS06		0.50	15/05/2023

Only received samples which have had analysis scheduled will be shown on the following pages.



CERTIFICATE OF ANALYSIS

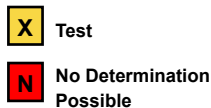
Validated

SDG: 230519-82
Client Ref.: 23-48124

Report Number: 690171
Location:

Superseded Report:

Results Legend



Sample Types -

S - Soil/Solid
UNS - Unspecified Solid
GW - Ground Water
SW - Surface Water
LE - Land Leachate
PL - Prepared Leachate
PR - Process Water
SA - Saline Water
TE - Trade Effluent
TS - Treated Sewage
US - Untreated Sewage
RE - Recreational Water
DW - Drinking Water Non-regulatory
UNL - Unspecified Liquid
SL - Sludge
G - Gas
OTH - Other

Results Legend	Lab Sample No(s)		28021070	28021071	28021072	28021073	28021074	28021075
	Customer Sample Reference		322108WMS01	322109WMS02	322110WMS03	322111WMS04	322112WMS05	322113WMS06
	AGS Reference							
	Depth (m)		0.50	0.50	0.50	0.50	0.50	0.50
	Container		120g Amber Jar (ALE217)	120g Amber Jar (ALE217)	120g Amber Jar (ALE217)	120g Amber Jar (ALE217)	120g Amber Jar (ALE217)	120g Amber Jar (ALE217)
	Sample Type		S	S	S	S	S	S
EPH CWG GC (S)	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
GRO by GC-FID (S)	All	NDPs: 0 Tests: 6		X	X	X	X	X
Sample description	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
TPH CWG GC (S)	All	NDPs: 0 Tests: 6	X	X	X	X	X	X
VOC MS (S)	All	NDPs: 0 Tests: 6		X	X	X	X	X



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-82
Client Ref.: 23-48124

Report Number: 690171
Location:

Superseded Report:

Sample Descriptions

Grain Sizes

very fine	<0.063mm	fine	0.063mm - 0.1mm	medium	0.1mm - 2mm	coarse	2mm - 10mm	very coarse	>10mm
-----------	----------	------	-----------------	--------	-------------	--------	------------	-------------	-------

Lab Sample No(s)	Customer Sample Ref.	Depth (m)	Colour	Description	Inclusions	Inclusions 2
28021070	322108/WS01	0.50	Dark Brown	Loamy Sand	Stones	None
28021071	322109/WS02	0.50	Dark Brown	Sand	Stones	None
28021072	322110/WS03	0.50	Dark Brown	Sand	Stones	None
28021073	322111/WS04	0.50	Dark Brown	Loamy Sand	Stones	Vegetation
28021074	322112/WS05	0.50	Dark Brown	Sand	Stones	None
28021075	322113/WS06	0.50	Dark Brown	Loamy Sand	Stones	None

These descriptions are only intended to act as a cross check if sample identities are questioned, and to provide a log of sample matrices with respect to MCERTS validation. They are not intended as full geological descriptions.

We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample.

Other coarse granular materials such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

SDG: 230519-82

Report Number: 690171

Superseded Report:

Client Ref.: 23-48124

Location:

[illegible]

SDG: 230519-82
Client Ref.: 23-48124

Report Number: 690171
Location:

Superseded Report:

TPH CWG (S)

[illegible]



CERTIFICATE OF ANALYSIS

Validated

SDG: 230519-82
Client Ref.: 23-48124

Report Number: 690171
Location:

Superseded Report:

Table of Results - Appendix

Method No	Description
PM024	Soil preparation including homogenisation, moisture screens of soils for Asbestos Containing Material
TM089	Determination of Gasoline Range Hydrocarbons (GRO) by Headspace GC-FID (C4-C12)
TM116	Determination of Volatile Organic Compounds by Headspace / GC-MS
TM414	Determination of Speciated Extractable Petroleum Hydrocarbons in Soils by GCxGC-FID

NA = not applicable.

Chemical testing (unless subcontracted) performed at ALS Laboratories (UK) Limited Hawarden (Method codes TM).



CERTIFICATE OF ANALYSIS

SDG: 230519-82
Client Ref.: 23-48124Report Number: 690171
Location:

Superseded Report:

Test Completion Dates

Lab Sample No(s)	28021070	28021071	28021072	28021073	28021074	28021075
Customer Sample Ref.	322108/WS01	322109/WS02	322110/WS03	322111/WS04	322112/WS05	322113/WS06
AGS Ref.						
Depth	0.50	0.50	0.50	0.50	0.50	0.50
Type	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)	Soil/Solid (S)
EPH CWG GC (S)	24-May-2023	24-May-2023	24-May-2023	24-May-2023	24-May-2023	24-May-2023
GRO by GC-FID (S)	23-May-2023	25-May-2023	22-May-2023	22-May-2023	23-May-2023	22-May-2023
Sample description	19-May-2023	19-May-2023	19-May-2023	19-May-2023	19-May-2023	19-May-2023
TPH CWG GC (S)	24-May-2023	25-May-2023	24-May-2023	24-May-2023	24-May-2023	24-May-2023
VOC MS (S)	22-May-2023	22-May-2023	22-May-2023	22-May-2023	22-May-2023	22-May-2023



CERTIFICATE OF ANALYSIS

SDG: 230519-82
Client Ref: 23-48124

Report Number: 690171
Location:

Superseded Report:

Appendix

1. Results are expressed on a dry weight basis (dried at 35°C) for all soil analyses except for the following: NRA and CEN Leach tests, flash point LOI, pH, ammonium as NH₄ by the BRE method, VOC TICs and SVOC TICs.

2. If sufficient sample is received a sub sample will be retained free of charge for 15 days after analysis is completed (e-mailed) for all sample types unless the sample is destroyed on testing. The prepared soil sub sample that is analysed for asbestos will be retained for a period of 6 months after the analysis date. All bulk samples will be retained for a period of 6 months after the analysis date. All samples received and not scheduled will be disposed of one month after the date of receipt unless we are instructed to the contrary. Once the initial period has expired, a storage charge will be applied for each month or part thereof until the client cancels the request for sample storage. ALS reserve the right to charge for samples received and stored but not analysed.

3. With respect to turnaround, we will always endeavour to meet client requirements wherever possible, but turnaround times cannot be absolutely guaranteed due to so many variables beyond our control.

4. We take responsibility for any test performed by sub-contractors (marked with an asterisk). We endeavour to use UKAS/MCERTS Accredited Laboratories, who either complete a quality questionnaire or are audited by ourselves. For some determinands there are no UKAS/MCERTS Accredited Laboratories, in this instance a laboratory with a known track record will be utilised.

5. If no separate volatile sample is supplied by the client, or if a headspace or sediment is present in the volatile sample, the integrity of the data may be compromised. This will be flagged up as an invalid VOC on the test schedule and the result marked as deviating on the test certificate.

6. NDP - No determination possible due to insufficient/unsuitable sample.

7. Results relate only to the items tested.

8. LoDs (Limit of Detection) for wet tests reported on a dry weight basis are not corrected for moisture content.

9. **Surrogate recoveries** - Surrogates are added to your sample to monitor recovery of the test requested. A % recovery is reported, results are not corrected for the recovery measured. Typical recoveries for organics tests are 70-130%. Recoveries in soils are affected by organic rich or clay rich matrices. Waters can be affected by remediation fluids or high amounts of sediment. Test results are only ever reported if all of the associated quality checks pass; it is assumed that all recoveries outside of the values above are due to matrix affect.

10. Stones/debris are not routinely removed. We always endeavour to take a representative sub sample from the received sample.

11. In certain circumstances the method detection limit may be elevated due to the sample being outside the calibration range. Other factors that may contribute to this include possible interferences. In both cases the sample would be diluted which would cause the method detection limit to be raised.

12. For dried and crushed preparations of soils volatile loss may occur e.g volatile mercury.

13. For leachate preparations other than Zero Headspace Extraction (ZHE) volatile loss may occur.

14. For the BSEN 12457-3 two batch process to allow the cumulative release to be calculated, the volume of the leachate produced is measured and filtered for all tests. We therefore cannot carry out any unfiltered analysis. The tests affected include volatiles GCFID/GCMS and all subcontracted analysis.

15. Analysis and identification of specific compounds using GCFID is by retention time only, and we routinely calibrate and quantify for benzene, toluene, ethylbenzenes and xylenes (BTEX). For total volatiles in the C5-C12 range, the total area of the chromatogram is integrated and expressed as ug/kg or ug/l. Although this analysis is commonly used for the quantification of gasoline range organics (GRO), the system will also detect other compounds such as chlorinated solvents, and this may lead to a falsely high result with respect to hydrocarbons only. It is not possible to specifically identify these non-hydrocarbons, as standards are not routinely run for any other compounds, and for more definitive identification, volatiles by GCMS should be utilised.

16. We are accredited to MCERTS for sand, clay and loam/topsoil, or any of these materials - whether these are derived from naturally occurring soil profiles, or from fill/made ground, as long as these materials constitute the major part of the sample. Other coarse granular material such as concrete, gravel and brick are not accredited if they comprise the major part of the sample.

17 Data retention. All records, communications and reports pertaining to the analysis are archived for seven years from the date of issue of the final report.

General

18. **Tentatively Identified Compounds (TICs)** are non-target peaks in VOC and SVOC analysis. All non-target peaks detected with a concentration above the LoD are subjected to a mass spectral library search. Non-target peaks with a library search confidence of >75% are reported based on the best mass spectral library match. When a non-target peak with a library search confidence of <75% is detected it is reported as "mixed hydrocarbons". Non-target compounds identified from the scan data are semi-quantified relative to one of the deuterated internal standards, under the same chromatographic conditions as the target compounds. This result is reported as a semi-quantitative value and reported as Tentatively Identified Compounds (TICs). TICs are outside the scope of UKAS accreditation and are not moisture corrected.

19. Sample Deviations

If a sample is classed as deviated then the associated results may be compromised.

1	Container with Headspace provided for volatiles analysis
2	Incorrect container received
3	Deviation from method
4	Matrix interference
♦	Sample holding time exceeded in laboratory
@	Sample holding time exceeded due to late arrival of instructions or samples
§	Sampled on date not provided

20. Asbestos

When requested, the individual sub sample scheduled will be analysed in house for the presence of asbestos fibres and asbestos containing material by our documented in house method TM048 based on HSG 248 (2021), which is accredited to ISO17025. If a specific asbestos fibre type is not found this will be reported as "Not detected". If no asbestos fibre types are found all will be reported as "Not detected" and the sub sample analysed deemed to be clear of asbestos. If an asbestos fibre type is found it will be reported as detected (for each fibre type found). Testing can be carried out on asbestos positive samples, but, due to Health and Safety considerations, may be replaced by alternative tests or reported as No Determination Possible (NDP). The quantity of asbestos present is not determined unless specifically requested.

Identification of Asbestos in Bulk Materials & Soils

The results for identification of asbestos in bulk materials and soils are obtained from supplied bulk materials and soils which have been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining, based on HSG 248 (2021).

The results for identification of asbestos in soils are obtained from a homogenised sub sample which has been examined to determine the presence of asbestos fibres using ALS (Hawarden) in-house method of transmitted/polarised light microscopy and central stop dispersion staining.

Asbestos Type	Common Name
Chrysotile	White Asbestos
Amosite	Brown Asbestos
Crocidolite	Blue Asbestos
Fibrous Actinolite	-
Fibrous Anthophyllite	-
Fibrous Tremolite	-

Visual Estimation Of Fibre Content

Estimation of fibre content is not permitted as part of our UKAS accredited test other than: - Trace - Where only one or two asbestos fibres were identified.

Respirable Fibres

Respirable fibres are defined as fibres of <3 µm diameter, longer than 5 µm and with aspect ratios of at least 3:1 that can be inhaled into the lower regions of the lung and are generally acknowledged to be most important predictor of hazard and risk for cancers of the lung.

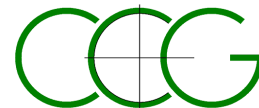
Further guidance on typical asbestos fibre content of manufactured products can be found in HSG 264.

The identification of asbestos containing materials and soils falls within our schedule of tests for which we hold UKAS accreditation, however opinions, interpretations and all other information contained in the report are outside the scope of UKAS accreditation.

APPENDIX G: SOIL CONTAMINATION SUMMARY TABLES

SOIL ASSESSMENT CRITERIA FOR RESIDENTIAL LAND USE (WITH HOMEGROWN PRODUCE)

(Updated: January 2023)



Contaminant	Assessment Criteria for Residential at 1% SOM (mg/kg)	Assessment Criteria for Residential at 2.5% SOM (mg/kg)	Assessment Criteria for Residential at 6% SOM (mg/kg)
Metals			
Arsenic	37	37	37
Boron	290	290	290
Cadmium	11	11	11
Chromium III	910	910	910
Chromium VI	6	6	6
Copper	2400	2400	2400
*Lead	200	200	200
Mercury	1.2	1.2	1.2
Nickel	130	130	130
Selenium	250	250	250
Vanadium	410	410	410
Zinc	3700	3700	3700
Non-Metals			
Phenol	120	200	380
Polyaromatic Hydrocarbons (PAH)			
Acenaphthene	210	510	1100
Acenaphthylene	170	420	920
Anthracene	2400	5400	11000
Benz[a]anthracene	7.2	11	13
Benzo[a]pyrene	2.2	2.7	3.0
Benzo[b]fluoranthene	2.6	3.3	3.7
Benzo[ghi]perylene	320	340	350
Benzo[k]fluoranthene	77	93	100
Chrysene	15	22	27
Dibenz[ah]anthracene	0.24	0.28	0.3
Fluoranthene	280	560	890
Fluorene	170	400	860
Indeno[123-cd]pyrene	27	36	41
Naphthalene	2.3	5.6	13
Phenanthrene	95	220	440
Pyrene	620	1200	2000
Coal Tar [Bap as surrogate marker]	0.79	0.98	1.1
Petroleum Hydrocarbons			
Aliphatic EC 5-6	42	78	160
Aliphatic EC >6-8	100	230	530
Aliphatic EC >8-10	27	65	150
Aliphatic EC >10-12	130	330	760
Aliphatic EC >12-16	1100	2400	4300
Aliphatic EC >16-35	65000	92000	110000
Aliphatic EC >35-44	65000	92000	110000
Aromatic EC 5-7 (Benzene)	70	140	300
Aromatic EC >7-8 (Toluene)	130	290	660
Aromatic EC >8-10	34	83	190
Aromatic EC >10-12	74	180	380
Aromatic EC >12-16	140	330	660
Aromatic EC >16-21	260	540	930
Aromatic EC >21-35	1100	1500	1700
Aromatic EC >35-44	1100	1500	1700
Aliphatic – Aromatic EC >44-70	1600	1800	1900
Other			
Asbestos Containing Materials (ACM)	No Detection	No Detection	No Detection

Copyright: Land Quality Management Limited (LQM)

The above is based on criteria contained in publication LQM/CIEH S4UL's for Human Health Risk Assessment (2015) (CCG Licence No. S4UL3233), applicable to the "Residential" land use (with home grown produce) scenario for soil organic matter (SOM) content of 1% - 6%.

*This document does not provide criteria for Lead, for which the results were compared to the C4SL published by DEFRA SP1010 Development of Category 4 Screening Levels.

METALS DATA SUMMARY AND RISK ASSESSMENT SHEET

Job number: **23-13931**

Site name: **Former Farmers Arms PH,
Kirkby**

Prepared by: **TG**

Authorised by: **CB**

Proposed land use: **Residential with plant uptake**

SOM % used: **2.5**

 = **Threshold exceeded**

 = **Below Limit of detection**

n/t = **Not tested**

			Metals							
Contaminants			Cadmium	Chromium III	Chromium VI	Copper	Lead	Mercury (elemental)	Nickel	Zinc
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Limit of Detection			0.5	5.0	0.8	5.0	5.0	0.5	5.0	5.0
Human Health Risk Assessment (GAC)			11	910	6	2400	200	1.2	180	3700
Sample Location	Sample Depth (m)	Sample type								
WS01	0.50	SOIL	0.9	42.8	< 0.8	326	466	0.7	52.8	353
WS02	0.50	SOIL	1	41.7	< 0.8	365	509	0.7	58.9	387
WS03	0.50	SOIL	< 0.5	21.8	< 0.8	113	136	0.5	26.4	120
WS04	0.50	SOIL	< 0.5	15.5	< 0.8	38.6	97.6	< 0.5	16.2	62.2
WS05	0.50	SOIL	1.1	44.6	< 0.8	369	555	0.7	61.5	393
WS06	0.50	SOIL	< 0.5	20.7	< 0.8	60.8	114	< 0.5	24.4	108
Human Health Risk Assessment (GAC)			11	910	6	2400	200	1.2	180	3700

SEMI-METALS, NON-METALS, INORGANICS AND OTHER DATA SUMMARY AND RISK ASSESSMENT SHEET

Job number: 23-13931
Site name: Former Farmers Arms PH, Kirkby
Prepared by: TG
Authorised by: CB
Proposed land use: Residential with plant uptake
SOM % used: 2.5

= **Threshold exceeded**
 = **Below Limit of detection**
 n/t = **Not tested**

			Semi/non-metals				Inorganics		Other	
Contaminants			Arsenic	Boron	Selenium	Cyanide (free)	Sulphate (water soluble)	Sulphate (water soluble)	pH (units)	Soil Organic Matter %
Units			mg/kg	mg/kg	mg/kg	mg/kg	g/l	mg/l	units	units
Limit of Detection			1.0	0.5	1.0	1.0	0.02	20.0	0.1	0.1
Human Health Risk Assessment (GAC)			37	290	250	22	NA	NA	NA	NA
Sample Location	Sample Depth (m)	Sample type								
WS01	0.50	SOIL	52.1	< 0.5	< 1.0	< 1.0	0.04	n/t	7.9	6.1
WS02	0.50	SOIL	59.2	< 0.5	< 1.0	< 1.0	0.03	n/t	7.9	6.1
WS03	0.50	SOIL	16.2	< 0.5	< 1.0	< 1.0	< 0.02	n/t	8	2.4
WS04	0.50	SOIL	9.5	< 0.5	< 1.0	< 1.0	< 0.02	n/t	7.5	3.7
WS05	0.50	SOIL	61.7	< 0.5	< 1.0	< 1.0	0.03	n/t	8.1	7.2
WS06	0.50	SOIL	12.9	1.4	< 1.0	< 1.0	< 0.02	n/t	7	6.8
Human Health Risk Assessment (GAC)			37	290	11	22	NA	NA	NA	NA



SPECIATED PAH'S DATA SUMMARY AND RISK ASSESSMENT SHEET

Job number: 23-13931

Site name: Former Farmers Arms PH,
Kirkby

Prepared by: TG

Authorised by: CB

Proposed land use: Residential with plant uptake

SOM % used: 2.5

 = Threshold exceeded = Below Limit of detection

n/t = Not tested

			PAH's																
Contaminants			Acenapthene	Acenapthylene	Anthracene	Benz[a]anthracene	Benzo[a]pyrene	Benzo[b]fluoranthene	Benzo[ghi]perylene	Benzo[k]fluoranthene	Chrysene	Dibenzo[ah]anthracene	fluoranthene	fluorene	Indeno[123-cd]pyrene	Napthalene	Pheanthrene	Pyrene	Total PAH's
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Limit of Detection			0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.4
Human Health Risk Assessment (GAC)			510	420	5400	11	2.7	3.3	340	93	22	0.28	560	400	36	5.6	220	1200	NA
Sample Location	Sample Depth (m)	Sample type																	
WS01	0.50	SOIL	0.12	0.05	0.3	1.23	1.56	1.59	1.3	0.58	1.4	0.24	2.36	0.07	1.13	0.42	1.27	2.22	15.9
WS02	0.50	SOIL	0.15	0.05	0.34	1.31	1.55	1.58	1.29	0.73	1.51	0.23	2.71	0.07	1.07	0.4	1.42	2.57	17
WS03	0.50	SOIL	0.03	0.02	0.1	0.45	0.55	0.6	0.51	0.23	0.54	0.09	0.84	< 0.02	0.42	0.59	0.56	0.81	6.36
WS04	0.50	SOIL	0.05	< 0.02	0.04	0.22	0.25	0.27	0.16	0.11	0.29	0.03	0.47	0.03	0.14	< 0.02	0.33	0.45	2.83
WS05	0.50	SOIL	0.2	0.07	0.37	1.65	2.02	2.11	1.72	0.8	1.87	0.31	3.07	0.11	1.46	0.44	1.69	3.06	20.9
WS06	0.50	SOIL	0.13	< 0.02	0.19	0.63	0.68	0.7	0.41	0.28	0.81	0.08	1.49	0.08	0.36	0.06	1.01	1.35	8.27
Human Health Risk Assessment (GAC)			510	420	11	11	2.7	3.3	340	93	22	0.28	560	400	36	5.6	220	1200	NA



SPECIATED TPH'S DATA SUMMARY AND RISK ASSESSMENT SHEET

Job number: 23-13931

Site name: Former Farmers Arms PH,
Kirkby

Prepared by: TG

Authorised by: CB

Proposed land use: Residential with plant uptake

SOM % used: 2.5

	=	Threshold exceeded
	=	Below Limit of detection
n/t	=	Not tested

			Speciated TPH's																
			Aromatics							Aliphatics									
Contaminants			EC5-7	EC7-8	EC8-10	EC10-12	EC12-16	EC16-21	EC21-35	EC35-44	EC5-6	EC6-8	EC8-10	EC10-12	EC12-16	EC16-35	EC35-44	TOTAL TPH'S	
Units			mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
Limit of Detection			0.01	0.01	1.0	1.0	1.0	1.0	1.0	1.0	0.01	0.01	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Human Health Risk Assessment (GAC)			140	290	83	180	330	540	1500	1500	78	230	65	330	2400	92000	92000	NA	
Sample Location	Sample Depth (m)	Sample type																	
WS01	0.50	SOIL	<0.01	<0.01	<0.01	<1	5.26	20.4	241	135	<0.01	<0.01	<0.01	1.27	2.38	6.45	<1	411	
WS02	0.50	SOIL	<0.01	<0.01	<0.01	<1	<1	6.54	114	698	<0.01	<0.01	<0.01	<1	<1	2.99	<1	190	
WS03	0.50	SOIL	<0.01	<0.01	<0.01	<1	<1	8	132	78.6	<0.01	<0.01	<0.01	<1	<1	1.06	<1	218	
WS04	0.50	SOIL	<0.01	<0.01	<0.01	<1	<1	2.12	16.1	2.9	<0.01	<0.01	<0.01	<1	<1	8.05	<1	31	
WS05	0.50	SOIL	<0.01	<0.01	<0.01	<1	2.08	16.7	260	130	<0.01	<0.01	<0.01	<1	2.02	4.77	<1	382	
WS06	0.50	SOIL	<0.01	<0.01	<0.01	<1	<1	3.88	45.3	16.8	<0.01	<0.01	<0.01	<1	<1	18.03	2.78	86.9	
Human Health Risk Assessment (GAC)			140	290	11	180	330	540	1500	1500	78	230	65	330	2400	92000	92000	NA	



BTEX DATA SUMMARY AND RISK ASSESSMENT SHEET

Job number: **23-13931**

Site name: **Former Farmers Arms PH,
Kirkby**

Prepared by: **TG**

Authorised by: **CB**

Proposed land use: **Residential with plant uptake**

SOM % used: **2.5**

 = **Threshold exceeded**

 = **Below Limit of detection**

n/t = **Not tested**

			BTEX			
Contaminants			Benzene	Toluene	Ethylbenzene	Total Xylenes
Units			µg/kg	µg/kg	µg/kg	µg/kg
Limit of Detection			10	10	10	10
Human Health Risk Assessment (GAC)			170	290000	110000	130000
Sample Location	Sample Depth (m)	Sample type				
WS01	0.50	SOIL	< 10.0	< 10.0	< 10.0	< 10.0
WS02	0.50	SOIL	< 10.0	< 10.0	< 10.0	< 10.0
WS03	0.50	SOIL	< 10.0	< 10.0	< 10.0	< 10.0
WS04	0.50	SOIL	< 10.0	< 10.0	< 10.0	< 10.0
WS05	0.50	SOIL	< 10.0	< 10.0	< 10.0	< 10.0
WS06	0.50	SOIL	< 10.0	< 10.0	< 10.0	< 10.0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
0	0	0	0	0	0	0
Human Health Risk Assessment (GAC)			170	11	110000	130000

ASBESTOS ASSESSMENT SHEET							
Job number: 23-13931 Site name: Former Farmers Arms PH, Kirkby Prepared by: TG Authorised by: CB							
Sample Location	Sample Depth (m)	Asbestos Identification	Gravimetric Analysis Total (%)	Gravimetric Analysis by ACM Type (%)	Free Fibre Analysis (%)	Total Asbestos (%)	Assessment
WS01	0.50	No asbestos detected	n/t	n/t	n/t	n/t	No asbestos detected
WS02	0.50	No asbestos detected	n/t	n/t	n/t	n/t	No asbestos detected
WS03	0.50	No asbestos detected	n/t	n/t	n/t	n/t	No asbestos detected
WS04	0.50	No asbestos detected	n/t	n/t	n/t	n/t	No asbestos detected
WS05	0.50	No asbestos detected	n/t	n/t	n/t	n/t	No asbestos detected
WS06	0.50	No asbestos detected	n/t	n/t	n/t	n/t	No asbestos detected

Job Number:	23-13931	Site Name:	Former Farmers Arms PH, Kirkby
Prepared by:	TG	Approved by:	CB

[illegible]

Soil Concrete Specification Data Sheet	
Is the site Brownfield or Greenfield?	Brownfield
Is the water table Static or Mobile	Static
Highest water-soluble Sulphate results	40
Lowest pH result	7
Design Sulphate Class	DS-1
ACEC Class	AC-1s
Intended Working Life	50 Years
Design Chemical Classification	DC-1

Water Concrete Specification Data Sheet	
Is the site Brownfield or Greenfield?	N/a
Is the water table Static or Mobile	N/a
Highest water-soluble Sulphate results	
Lowest pH result	
Design Sulphate Class	
ACEC Class	
Intended Working Life	N/a
Design Chemical Classification	

Conclusions

Based on the soil data, concrete should be specified to conform to the compositional requirements of DC-1 as defined in BRE Special Digest 1: 2005.

Based on the water data, concrete should be specified to conform to the compositional requirements of as defined in BRE Special Digest 1: 2005.

APPENDIX H: PRELIMINARY WASTE CLASSIFICATION REPORT



Waste Classification Report

HazWasteOnline™ classifies waste as either **hazardous** or **non-hazardous** based on its chemical composition, related legislation and the rules and data defined in the current UK or EU technical guidance (Appendix C) (note that HP 9 Infectious is not assessed). It is the responsibility of the classifier named below to:

- understand the origin of the waste
- select the correct List of Waste code(s)
- confirm that the list of determinands, results and sampling plan are fit for purpose
- select and justify the chosen metal species (Appendix B)
- correctly apply moisture correction and other available corrections
- add the meta data for their user-defined substances (Appendix A)
- check that the classification engine is suitable with respect to the national destination of the waste (Appendix C)



K29WG-DAP85-7Z6MY

To aid the reviewer, the laboratory results, assumptions and justifications managed by the classifier are highlighted in pale yellow.

Job name

Farmers Arms, Kirkby

Description/Comments

Project

Farmers Arms, Kirkby

Site

Farmers Arms, Kirkby

Classified by

Name:

Tony Gerrard

Date:

30 May 2023 15:09 GMT

Telephone:

0151 545 2750

Company:

CC Geotechnical Ltd

HazWasteOnline™ provides a two day, hazardous waste classification course that covers the use of the software and both basic and advanced waste classification techniques. Certification has to be renewed every 3 years.

HazWasteOnline™ Certification:

-

Course

Hazardous Waste Classification

Date

-

Purpose of classification

2 - Material Characterisation

Address of the waste

Farmers Arms, Kirkby

Post Code N/A

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Redevelopment

Description of the specific process, sub-process and/or activity that created the waste

Waste generated during site prep' works

Description of the waste

Granular MG



Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS01	0.50	Non Hazardous		3
2	WS02	0.50	Non Hazardous		8
3	WS03	0.50	Non Hazardous		13
4	WS04	0.50	Non Hazardous		18
5	WS05	0.50	Non Hazardous		23
6	WS06	0.50	Non Hazardous		28

Related documents

#	Name	Description
1	CCG SOIL A 2020	waste stream template used to create this Job

Report

Created by: Tony Gerrard

Created date: 30 May 2023 15:09 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	33
Appendix B: Rationale for selection of metal species	36
Appendix C: Version	37



Classification of sample: WS01

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name: **WS01** LoW Code: **17: Construction and Demolition Wastes (including excavated soil from contaminated sites)**
Sample Depth: **0.50 m** Chapter: **17 05 04 (Soil and stones other than those mentioned in 17 05 03)**
Entry:

Hazard properties

None identified

Determinands

Moisture content: **0% No Moisture Correction applied (MC)**

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				52.1	mg/kg	1.32	68.789	mg/kg	0.00688 %		
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				0.9	mg/kg	1.142	1.028	mg/kg	0.000103 %		
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				42.8	mg/kg	1.462	62.555	mg/kg	0.00626 %		
		215-160-9	1308-38-9									
4	copper { dicopper oxide; copper (I) oxide }				326	mg/kg	1.126	367.04	mg/kg	0.0367 %		
	029-002-00-X	215-270-7	1317-39-1									
5	lead { lead chromate }			1	466	mg/kg	1.56	726.874	mg/kg	0.0466 %		
	082-004-00-2	231-846-0	7758-97-6									
6	mercury { mercury dichloride }				0.7	mg/kg	1.353	0.947	mg/kg	0.0000947 %		
	080-010-00-X	231-299-8	7487-94-7									
7	nickel { nickel chromate }				52.8	mg/kg	2.976	157.147	mg/kg	0.0157 %		
	028-035-00-7	238-766-5	14721-18-7									
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
9	zinc { zinc oxide }				353	mg/kg	1.245	439.384	mg/kg	0.0439 %		
	030-013-00-7	215-222-5	1314-13-2									
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5											
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
12	boron { diboron trioxide; boric oxide }				<0.5	mg/kg	3.22	<1.61	mg/kg	<0.000161 %		<LOD
	005-008-00-8	215-125-8	1303-86-2									
13	pH				7.9	pH		7.9	pH	7.9 pH		
14	phenol				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	604-001-00-2	203-632-7	108-95-2									
15	naphthalene				0.42	mg/kg		0.42	mg/kg	0.000042 %		
	601-052-00-2	202-049-5	91-20-3									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	acenaphthylene	205-917-1	208-96-8		0.05 mg/kg		0.05 mg/kg	0.000005 %		
17	acenaphthene	201-469-6	83-32-9		0.12 mg/kg		0.12 mg/kg	0.000012 %		
18	fluorene	201-695-5	86-73-7		0.07 mg/kg		0.07 mg/kg	0.000007 %		
19	phenanthrene	201-581-5	85-01-8		1.27 mg/kg		1.27 mg/kg	0.000127 %		
20	anthracene	204-371-1	120-12-7		0.3 mg/kg		0.3 mg/kg	0.00003 %		
21	fluoranthene	205-912-4	206-44-0		2.36 mg/kg		2.36 mg/kg	0.000236 %		
22	pyrene	204-927-3	129-00-0		2.22 mg/kg		2.22 mg/kg	0.000222 %		
23	benzo[a]anthracene	601-033-00-9	200-280-6		1.23 mg/kg		1.23 mg/kg	0.000123 %		
24	chrysene	601-048-00-0	205-923-4		1.4 mg/kg		1.4 mg/kg	0.00014 %		
25	benzo[b]fluoranthene	601-034-00-4	205-911-9		1.59 mg/kg		1.59 mg/kg	0.000159 %		
26	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.58 mg/kg		0.58 mg/kg	0.000058 %		
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		1.56 mg/kg		1.56 mg/kg	0.000156 %		
28	indeno[123-cd]pyrene	205-893-2	193-39-5		1.13 mg/kg		1.13 mg/kg	0.000113 %		
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.24 mg/kg		0.24 mg/kg	0.000024 %		
30	benzo[ghi]perylene	205-883-8	191-24-2		1.3 mg/kg		1.3 mg/kg	0.00013 %		
31	benzene	601-020-00-8	200-753-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
32	toluene	601-021-00-3	203-625-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
33	ethylbenzene	601-023-00-4	202-849-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
34	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	TPH (C6 to C40) petroleum group		TPH		411 mg/kg		411 mg/kg	0.0411 %		
36	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
37	polychlorobiphenyls; PCB	602-039-00-4	215-648-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
38	asbestos	650-013-00-6	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
39	antimony { antimony trioxide }	051-005-00-X	215-175-0		12.9 mg/kg	1.197	15.443 mg/kg	0.00154 %		
40	beryllium { beryllium oxide }	004-003-00-8	215-133-1		<0.1 mg/kg	2.775	<0.278 mg/kg	<0.0000278 %		<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
41	manganese { manganese sulphate }				<0.1 mg/kg	2.749	<0.275 mg/kg	<0.0000275 %			<LOD
	025-003-00-4	232-089-9	7785-87-7								
42	molybdenum { molybdenum(VI) oxide }				7.8 mg/kg	1.5	11.701 mg/kg	0.00117 %			
	042-001-00-9	215-204-7	1313-27-5								
43	1,1-dichloroethane and 1,2-dichloroethane (combined)				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
		203-458-1, 200-863-5	107-06-2, 75-34-3								
44	tetrachloroethylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
	602-028-00-4	204-825-9	127-18-4								
45	carbon tetrachloride; tetrachloromethane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
	602-008-00-5	200-262-8	56-23-5								
46	trichloroethylene; trichloroethene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
	602-027-00-9	201-167-4	79-01-6								
47	vinyl chloride; chloroethylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-023-00-7	200-831-0	75-01-4								
48	DDT (ISO); clofenotane (INN); dicophane; 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane; dichlorodiphenyltrichloroethane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-045-00-7	200-024-3	50-29-3								
49	chlordan (ISO); 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-047-00-8	200-349-0	57-74-9								
50	hexachlorocyclohexanes, including lindane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-043-00-6	210-168-9, 200-401-2, 206-270-8, 206-271-3	58-89-9, 319-84-6, 319-85-7, 608-73-1								
51	dieldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-049-00-9	200-484-5	60-57-1								
52	endrin (ISO); 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-051-00-X	200-775-7	72-20-8								
53	heptachlor (ISO); 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-046-00-2	200-962-3	76-44-8								
54	hexachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-065-00-6	204-273-9	118-74-1								
55	chlordecone (ISO); perchloropentacyclo[5,3,0,02,6,03,9,04,8]decan-5-one; decachloropentacyclo[5,2,1,02,6,03,9,05,8]decan-4-one				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	606-019-00-6	205-601-3	143-50-0								
56	aldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-048-00-3	206-215-8	309-00-2								
57	pentachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-074-00-5	210-172-0	608-93-5								
58	dodecachloropentacyclo[5.2.1.02,6.03,9.05,8]decane; mirex				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-077-00-1	219-196-6	2385-85-5								
59	camphechlor (ISO); toxaphene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	602-044-00-1	232-283-3	8001-35-2								
60	hexabromobiphenyl				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		252-994-2	36355-01-8								
61	2,3,7,8-TeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %			<LOD
		217-122-7	1746-01-6								
62	1,2,3,7,8-PeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %			<LOD
			40321-76-4								
63	1,2,3,4,7,8-HxCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %			<LOD
			39227-28-6								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
64	1,2,3,6,7,8-HxCDD		57653-85-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
65	1,2,3,7,8,9-HxCDD		19408-74-3		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
66	1,2,3,4,6,7,8-HpCDD		35822-46-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
67	OCDD		3268-87-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
68	2,3,7,8-TeCDF		51207-31-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
69	1,2,3,7,8-PeCDF		57117-41-6		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
70	2,3,4,7,8-PeCDF		57117-31-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
71	1,2,3,4,7,8-HxCDF		70648-26-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
72	1,2,3,6,7,8-HxCDF		57117-44-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
73	1,2,3,7,8,9-HxCDF		72918-21-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
74	2,3,4,6,7,8-HxCDF		60851-34-5		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
75	1,2,3,4,6,7,8-HpCDF		67562-39-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
76	1,2,3,4,7,8,9-HpCDF		55673-89-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
77	OCDF		39001-02-0		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
78	petrol (gasoline) petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
79	diesel petroleum group		68334-30-5; 68476-34-6; 94114-59-7; 1159170-26-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
80	heavy/residual fuel oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
81	crude oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
82	kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened	232-366-4; 265-184-9; 294-799-5	8008-20-6; 64742-81-0; 91770-15-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.203 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered flammable risk



Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0411%)



Classification of sample: WS02



Non Hazardous Waste
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
WS02	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.50 m	

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				59.2 mg/kg	1.32	78.163 mg/kg	0.00782 %			
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				1 mg/kg	1.142	1.142 mg/kg	0.000114 %			
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				41.7 mg/kg	1.462	60.947 mg/kg	0.00609 %			
		215-160-9	1308-38-9								
4	copper { dicopper oxide; copper (I) oxide }				365 mg/kg	1.126	410.949 mg/kg	0.0411 %			
	029-002-00-X	215-270-7	1317-39-1								
5	lead { lead chromate }			1	509 mg/kg	1.56	793.946 mg/kg	0.0509 %			
	082-004-00-2	231-846-0	7758-97-6								
6	mercury { mercury dichloride }				0.7 mg/kg	1.353	0.947 mg/kg	0.0000947 %			
	080-010-00-X	231-299-8	7487-94-7								
7	nickel { nickel chromate }				58.9 mg/kg	2.976	175.302 mg/kg	0.0175 %			
	028-035-00-7	238-766-5	14721-18-7								
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405 mg/kg	<0.000141 %			<LOD
	034-002-00-8										
9	zinc { zinc oxide }				387 mg/kg	1.245	481.704 mg/kg	0.0482 %			
	030-013-00-7	215-222-5	1314-13-2								
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884 mg/kg	<0.000188 %			<LOD
	006-007-00-5										
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.8 mg/kg	1.923	<1.538 mg/kg	<0.000154 %			<LOD
	024-001-00-0	215-607-8	1333-82-0								
12	boron { diboron trioxide; boric oxide }				<0.5 mg/kg	3.22	<1.61 mg/kg	<0.000161 %			<LOD
	005-008-00-8	215-125-8	1303-86-2								
13	pH				7.9 pH		7.9 pH	7.9 pH			
			PH								
14	phenol				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	604-001-00-2	203-632-7	108-95-2								
15	naphthalene				0.4 mg/kg		0.4 mg/kg	0.00004 %			
	601-052-00-2	202-049-5	91-20-3								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	acenaphthylene	205-917-1	208-96-8		0.05 mg/kg		0.05 mg/kg	0.000005 %		
17	acenaphthene	201-469-6	83-32-9		0.15 mg/kg		0.15 mg/kg	0.000015 %		
18	fluorene	201-695-5	86-73-7		0.07 mg/kg		0.07 mg/kg	0.000007 %		
19	phenanthrene	201-581-5	85-01-8		1.42 mg/kg		1.42 mg/kg	0.000142 %		
20	anthracene	204-371-1	120-12-7		0.34 mg/kg		0.34 mg/kg	0.000034 %		
21	fluoranthene	205-912-4	206-44-0		2.71 mg/kg		2.71 mg/kg	0.000271 %		
22	pyrene	204-927-3	129-00-0		2.57 mg/kg		2.57 mg/kg	0.000257 %		
23	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	1.31 mg/kg		1.31 mg/kg	0.000131 %		
24	chrysene	601-048-00-0	205-923-4	218-01-9	1.51 mg/kg		1.51 mg/kg	0.000151 %		
25	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	1.58 mg/kg		1.58 mg/kg	0.000158 %		
26	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.73 mg/kg		0.73 mg/kg	0.000073 %		
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	1.55 mg/kg		1.55 mg/kg	0.000155 %		
28	indeno[123-cd]pyrene	205-893-2	193-39-5		1.07 mg/kg		1.07 mg/kg	0.000107 %		
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.23 mg/kg		0.23 mg/kg	0.000023 %		
30	benzo[ghi]perylene	205-883-8	191-24-2		1.29 mg/kg		1.29 mg/kg	0.000129 %		
31	benzene	601-020-00-8	200-753-7	71-43-2	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
32	toluene	601-021-00-3	203-625-9	108-88-3	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
33	ethylbenzene	601-023-00-4	202-849-4	100-41-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
34	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	TPH (C6 to C40) petroleum group		TPH		190 mg/kg		190 mg/kg	0.019 %		
36	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
37	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
38	asbestos	650-013-00-6	-----	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
39	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4	15.4 mg/kg	1.197	18.435 mg/kg	0.00184 %		
40	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9	<0.1 mg/kg	2.775	<0.278 mg/kg	<0.0000278 %		<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
41	manganese { manganese sulphate }				<0.1 mg/kg	2.749	<0.275 mg/kg	<0.0000275 %		<LOD
	025-003-00-4	232-089-9	7785-87-7							
42	molybdenum { molybdenum(VI) oxide }				8.2 mg/kg	1.5	12.302 mg/kg	0.00123 %		
	042-001-00-9	215-204-7	1313-27-5							
43	1,1-dichloroethane and 1,2-dichloroethane (combined)				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
		203-458-1, 200-863-5	107-06-2, 75-34-3							
44	tetrachloroethylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-028-00-4	204-825-9	127-18-4							
45	carbon tetrachloride; tetrachloromethane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-008-00-5	200-262-8	56-23-5							
46	trichloroethylene; trichloroethene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-027-00-9	201-167-4	79-01-6							
47	vinyl chloride; chloroethylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-023-00-7	200-831-0	75-01-4							
48	DDT (ISO); clofenotane (INN); dicophane; 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane; dichlorodiphenyltrichloroethane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-045-00-7	200-024-3	50-29-3							
49	chlordan (ISO); 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-047-00-8	200-349-0	57-74-9							
50	hexachlorocyclohexanes, including lindane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-043-00-6	210-168-9, 200-401-2, 206-270-8, 206-271-3	58-89-9, 319-84-6, 319-85-7, 608-73-1							
51	dieldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-049-00-9	200-484-5	60-57-1							
52	endrin (ISO); 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-051-00-X	200-775-7	72-20-8							
53	heptachlor (ISO); 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-046-00-2	200-962-3	76-44-8							
54	hexachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-065-00-6	204-273-9	118-74-1							
55	chlordecone (ISO); perchloropentacyclo[5.3.0.02,6.03,9.04,8]decan-5-one; decachloropentacyclo[5.2.1.02,6.03,9.05,8]decan-4-one				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	606-019-00-6	205-601-3	143-50-0							
56	aldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-048-00-3	206-215-8	309-00-2							
57	pentachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-074-00-5	210-172-0	608-93-5							
58	dodecachloropentacyclo[5.2.1.02,6.03,9.05,8]decane; mirex				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-077-00-1	219-196-6	2385-85-5							
59	camphechlor (ISO); toxaphene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-044-00-1	232-283-3	8001-35-2							
60	hexabromobiphenyl				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		252-994-2	36355-01-8							
61	2,3,7,8-TeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
		217-122-7	1746-01-6							
62	1,2,3,7,8-PeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			40321-76-4							
63	1,2,3,4,7,8-HxCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			39227-28-6							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
64	1,2,3,6,7,8-HxCDD		57653-85-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
65	1,2,3,7,8,9-HxCDD		19408-74-3		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
66	1,2,3,4,6,7,8-HpCDD		35822-46-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
67	OCDD		3268-87-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
68	2,3,7,8-TeCDF		51207-31-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
69	1,2,3,7,8-PeCDF		57117-41-6		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
70	2,3,4,7,8-PeCDF		57117-31-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
71	1,2,3,4,7,8-HxCDF		70648-26-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
72	1,2,3,6,7,8-HxCDF		57117-44-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
73	1,2,3,7,8,9-HxCDF		72918-21-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
74	2,3,4,6,7,8-HxCDF		60851-34-5		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
75	1,2,3,4,6,7,8-HpCDF		67562-39-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
76	1,2,3,4,7,8,9-HpCDF		55673-89-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
77	OCDF		39001-02-0		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
78	petrol (gasoline) petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
79	diesel petroleum group		68334-30-5, 68476-34-6, 94114-59-7, 1159170-26-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
80	heavy/residual fuel oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
81	crude oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
82	kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened	232-366-4; 265-184-9; 294-799-5	8008-20-6; 64742-81-0; 91770-15-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.197 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered flammable risk



Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.019%)



Classification of sample: WS03

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name: **WS03** LoW Code: **17: Construction and Demolition Wastes (including excavated soil from contaminated sites)**
Sample Depth: **0.50 m** Chapter: **17 05 04 (Soil and stones other than those mentioned in 17 05 03)**
Entry:

Hazard properties

None identified

Determinands

Moisture content: **0% No Moisture Correction applied (MC)**

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				16.2	mg/kg	1.32	21.389	mg/kg	0.00214 %		
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				<0.5	mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<LOD
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				21.8	mg/kg	1.462	31.862	mg/kg	0.00319 %		
		215-160-9	1308-38-9									
4	copper { dicopper oxide; copper (I) oxide }				113	mg/kg	1.126	127.225	mg/kg	0.0127 %		
	029-002-00-X	215-270-7	1317-39-1									
5	lead { lead chromate }			1	136	mg/kg	1.56	212.135	mg/kg	0.0136 %		
	082-004-00-2	231-846-0	7758-97-6									
6	mercury { mercury dichloride }				0.5	mg/kg	1.353	0.677	mg/kg	0.0000677 %		
	080-010-00-X	231-299-8	7487-94-7									
7	nickel { nickel chromate }				26.4	mg/kg	2.976	78.573	mg/kg	0.00786 %		
	028-035-00-7	238-766-5	14721-18-7									
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
9	zinc { zinc oxide }				120	mg/kg	1.245	149.366	mg/kg	0.0149 %		
	030-013-00-7	215-222-5	1314-13-2									
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5											
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
12	boron { diboron trioxide; boric oxide }				<0.5	mg/kg	3.22	<1.61	mg/kg	<0.000161 %		<LOD
	005-008-00-8	215-125-8	1303-86-2									
13	pH				8	pH		8	pH	8pH		
			PH									
14	phenol				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	604-001-00-2	203-632-7	108-95-2									
15	naphthalene				0.59	mg/kg		0.59	mg/kg	0.000059 %		
	601-052-00-2	202-049-5	91-20-3									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	acenaphthylene	205-917-1	208-96-8		0.02 mg/kg		0.02 mg/kg	0.000002 %		
17	acenaphthene	201-469-6	83-32-9		0.03 mg/kg		0.03 mg/kg	0.000003 %		
18	fluorene	201-695-5	86-73-7		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
19	phenanthrene	201-581-5	85-01-8		0.56 mg/kg		0.56 mg/kg	0.000056 %		
20	anthracene	204-371-1	120-12-7		0.1 mg/kg		0.1 mg/kg	0.00001 %		
21	fluoranthene	205-912-4	206-44-0		0.84 mg/kg		0.84 mg/kg	0.000084 %		
22	pyrene	204-927-3	129-00-0		0.81 mg/kg		0.81 mg/kg	0.000081 %		
23	benzo[a]anthracene	601-033-00-9	200-280-6		0.45 mg/kg		0.45 mg/kg	0.000045 %		
24	chrysene	601-048-00-0	205-923-4		0.54 mg/kg		0.54 mg/kg	0.000054 %		
25	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.6 mg/kg		0.6 mg/kg	0.00006 %		
26	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.23 mg/kg		0.23 mg/kg	0.000023 %		
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.55 mg/kg		0.55 mg/kg	0.000055 %		
28	indeno[123-cd]pyrene	205-893-2	193-39-5		0.42 mg/kg		0.42 mg/kg	0.000042 %		
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.09 mg/kg		0.09 mg/kg	0.000009 %		
30	benzo[ghi]perylene	205-883-8	191-24-2		0.51 mg/kg		0.51 mg/kg	0.000051 %		
31	benzene	601-020-00-8	200-753-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
32	toluene	601-021-00-3	203-625-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
33	ethylbenzene	601-023-00-4	202-849-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
34	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	TPH (C6 to C40) petroleum group		TPH		218 mg/kg		218 mg/kg	0.0218 %		
36	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
37	polychlorobiphenyls; PCB	602-039-00-4	215-648-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
38	asbestos	650-013-00-6	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
39	antimony { antimony trioxide }	051-005-00-X	215-175-0		6.6 mg/kg	1.197	7.901 mg/kg	0.00079 %		
40	beryllium { beryllium oxide }	004-003-00-8	215-133-1		<0.1 mg/kg	2.775	<0.278 mg/kg	<0.0000278 %		<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
41	manganese { manganese sulphate }				<0.1 mg/kg	2.749	<0.275 mg/kg	<0.0000275 %		<LOD
	025-003-00-4	232-089-9	7785-87-7							
42	molybdenum { molybdenum(VI) oxide }				2.3 mg/kg	1.5	3.45 mg/kg	0.000345 %		
	042-001-00-9	215-204-7	1313-27-5							
43	1,1-dichloroethane and 1,2-dichloroethane (combined)				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
		203-458-1, 200-863-5	107-06-2, 75-34-3							
44	tetrachloroethylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-028-00-4	204-825-9	127-18-4							
45	carbon tetrachloride; tetrachloromethane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-008-00-5	200-262-8	56-23-5							
46	trichloroethylene; trichloroethene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-027-00-9	201-167-4	79-01-6							
47	vinyl chloride; chloroethylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-023-00-7	200-831-0	75-01-4							
48	DDT (ISO); clofenotane (INN); dicophane; 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane; dichlorodiphenyltrichloroethane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-045-00-7	200-024-3	50-29-3							
49	chlordanes (ISO); 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-047-00-8	200-349-0	57-74-9							
50	hexachlorocyclohexanes, including lindane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-043-00-6	210-168-9, 200-401-2, 206-270-8, 206-271-3	58-89-9, 319-84-6, 319-85-7, 608-73-1							
51	dieldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-049-00-9	200-484-5	60-57-1							
52	endrin (ISO); 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-051-00-X	200-775-7	72-20-8							
53	heptachlor (ISO); 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-046-00-2	200-962-3	76-44-8							
54	hexachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-065-00-6	204-273-9	118-74-1							
55	chlordecone (ISO); perchloropentacyclo[5,3,0,02,6,03,9,04,8]decan-5-one; decachloropentacyclo[5,2,1,02,6,03,9,05,8]decan-4-one				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	606-019-00-6	205-601-3	143-50-0							
56	aldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-048-00-3	206-215-8	309-00-2							
57	pentachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-074-00-5	210-172-0	608-93-5							
58	dodecachloropentacyclo[5.2.1.02,6.03,9.05,8]decane; mirex				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-077-00-1	219-196-6	2385-85-5							
59	camphechlor (ISO); toxaphene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-044-00-1	232-283-3	8001-35-2							
60	hexabromobiphenyl				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		252-994-2	36355-01-8							
61	2,3,7,8-TeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
		217-122-7	1746-01-6							
62	1,2,3,7,8-PeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			40321-76-4							
63	1,2,3,4,7,8-HxCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			39227-28-6							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
64	1,2,3,6,7,8-HxCDD		57653-85-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
65	1,2,3,7,8,9-HxCDD		19408-74-3		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
66	1,2,3,4,6,7,8-HpCDD		35822-46-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
67	OCDD		3268-87-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
68	2,3,7,8-TeCDF		51207-31-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
69	1,2,3,7,8-PeCDF		57117-41-6		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
70	2,3,4,7,8-PeCDF		57117-31-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
71	1,2,3,4,7,8-HxCDF		70648-26-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
72	1,2,3,6,7,8-HxCDF		57117-44-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
73	1,2,3,7,8,9-HxCDF		72918-21-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
74	2,3,4,6,7,8-HxCDF		60851-34-5		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
75	1,2,3,4,6,7,8-HpCDF		67562-39-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
76	1,2,3,4,7,8,9-HpCDF		55673-89-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
77	OCDF		39001-02-0		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
78	petrol (gasoline) petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
79	diesel petroleum group		68334-30-5; 68476-34-6; 94114-59-7; 1159170-26-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
80	heavy/residual fuel oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
81	crude oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
82	kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened	232-366-4; 265-184-9; 294-799-5	8008-20-6; 64742-81-0; 91770-15-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.0791 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered flammable risk



Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0218%)



Classification of sample: WS04

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
WS04	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.50 m	

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				9.5 mg/kg	1.32	12.543	mg/kg	0.00125 %		
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				<0.5 mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<LOD
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				15.5 mg/kg	1.462	22.654	mg/kg	0.00227 %		
		215-160-9	1308-38-9								
4	copper { dicopper oxide; copper (I) oxide }				38.6 mg/kg	1.126	43.459	mg/kg	0.00435 %		
	029-002-00-X	215-270-7	1317-39-1								
5	lead { lead chromate }			1	97.6 mg/kg	1.56	152.238	mg/kg	0.00976 %		
	082-004-00-2	231-846-0	7758-97-6								
6	mercury { mercury dichloride }				<0.5 mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
7	nickel { nickel chromate }				16.2 mg/kg	2.976	48.215	mg/kg	0.00482 %		
	028-035-00-7	238-766-5	14721-18-7								
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
9	zinc { zinc oxide }				62.2 mg/kg	1.245	77.421	mg/kg	0.00774 %		
	030-013-00-7	215-222-5	1314-13-2								
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5										
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.8 mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
12	boron { diboron trioxide; boric oxide }				<0.5 mg/kg	3.22	<1.61	mg/kg	<0.000161 %		<LOD
	005-008-00-8	215-125-8	1303-86-2								
13	pH				7.5 pH		7.5	pH	7.5 pH		
			PH								
14	phenol				<0.1 mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	604-001-00-2	203-632-7	108-95-2								
15	naphthalene				<0.02 mg/kg		<0.02	mg/kg	<0.000002 %		<LOD
	601-052-00-2	202-049-5	91-20-3								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	acenaphthylene	205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %		<LOD
17	acenaphthene	201-469-6	83-32-9		0.05 mg/kg		0.05 mg/kg	0.000005 %		
18	fluorene	201-695-5	86-73-7		0.03 mg/kg		0.03 mg/kg	0.000003 %		
19	phenanthrene	201-581-5	85-01-8		0.33 mg/kg		0.33 mg/kg	0.000033 %		
20	anthracene	204-371-1	120-12-7		0.04 mg/kg		0.04 mg/kg	0.000004 %		
21	fluoranthene	205-912-4	206-44-0		0.47 mg/kg		0.47 mg/kg	0.000047 %		
22	pyrene	204-927-3	129-00-0		0.45 mg/kg		0.45 mg/kg	0.000045 %		
23	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.22 mg/kg		0.22 mg/kg	0.000022 %		
24	chrysene	601-048-00-0	205-923-4	218-01-9	0.29 mg/kg		0.29 mg/kg	0.000029 %		
25	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.27 mg/kg		0.27 mg/kg	0.000027 %		
26	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.11 mg/kg		0.11 mg/kg	0.000011 %		
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.25 mg/kg		0.25 mg/kg	0.000025 %		
28	indeno[123-cd]pyrene	205-893-2	193-39-5		0.14 mg/kg		0.14 mg/kg	0.000014 %		
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.03 mg/kg		0.03 mg/kg	0.000003 %		
30	benzo[ghi]perylene	205-883-8	191-24-2		0.16 mg/kg		0.16 mg/kg	0.000016 %		
31	benzene	601-020-00-8	200-753-7	71-43-2	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
32	toluene	601-021-00-3	203-625-9	108-88-3	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
33	ethylbenzene	601-023-00-4	202-849-4	100-41-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
34	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	TPH (C6 to C40) petroleum group		TPH		31 mg/kg		31 mg/kg	0.0031 %		
36	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
37	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
38	asbestos	650-013-00-6	-----	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
39	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4	2.7 mg/kg	1.197	3.232 mg/kg	0.000323 %		
40	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9	<0.1 mg/kg	2.775	<0.278 mg/kg	<0.0000278 %		<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
41	manganese { manganese sulphate }				<0.1 mg/kg	2.749	<0.275 mg/kg	<0.0000275 %		<LOD
	025-003-00-4	232-089-9	7785-87-7							
42	molybdenum { molybdenum(VI) oxide }				0.7 mg/kg	1.5	1.05 mg/kg	0.000105 %		
	042-001-00-9	215-204-7	1313-27-5							
43	1,1-dichloroethane and 1,2-dichloroethane (combined)				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
		203-458-1, 200-863-5	107-06-2, 75-34-3							
44	tetrachloroethylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-028-00-4	204-825-9	127-18-4							
45	carbon tetrachloride; tetrachloromethane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-008-00-5	200-262-8	56-23-5							
46	trichloroethylene; trichloroethene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-027-00-9	201-167-4	79-01-6							
47	vinyl chloride; chloroethylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-023-00-7	200-831-0	75-01-4							
48	DDT (ISO); clofenotane (INN); dicophane; 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane; dichlorodiphenyltrichloroethane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-045-00-7	200-024-3	50-29-3							
49	chlordan (ISO); 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-047-00-8	200-349-0	57-74-9							
50	hexachlorocyclohexanes, including lindane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-043-00-6	210-168-9, 200-401-2, 206-270-8, 206-271-3	58-89-9, 319-84-6, 319-85-7, 608-73-1							
51	dieldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-049-00-9	200-484-5	60-57-1							
52	endrin (ISO); 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-051-00-X	200-775-7	72-20-8							
53	heptachlor (ISO); 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-046-00-2	200-962-3	76-44-8							
54	hexachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-065-00-6	204-273-9	118-74-1							
55	chlordecone (ISO); perchloropentacyclo[5.3.0.02,6.03,9.04,8]decan-5-one; decachloropentacyclo[5.2.1.02,6.03,9.05,8]decan-4-one				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	606-019-00-6	205-601-3	143-50-0							
56	aldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-048-00-3	206-215-8	309-00-2							
57	pentachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-074-00-5	210-172-0	608-93-5							
58	dodecachloropentacyclo[5.2.1.02,6.03,9.05,8]decane; mirex				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-077-00-1	219-196-6	2385-85-5							
59	camphechlor (ISO); toxaphene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-044-00-1	232-283-3	8001-35-2							
60	hexabromobiphenyl				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		252-994-2	36355-01-8							
61	2,3,7,8-TeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
		217-122-7	1746-01-6							
62	1,2,3,7,8-PeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			40321-76-4							
63	1,2,3,4,7,8-HxCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			39227-28-6							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
64	1,2,3,6,7,8-HxCDD		57653-85-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
65	1,2,3,7,8,9-HxCDD		19408-74-3		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
66	1,2,3,4,6,7,8-HpCDD		35822-46-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
67	OCDD		3268-87-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
68	2,3,7,8-TeCDF		51207-31-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
69	1,2,3,7,8-PeCDF		57117-41-6		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
70	2,3,4,7,8-PeCDF		57117-31-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
71	1,2,3,4,7,8-HxCDF		70648-26-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
72	1,2,3,6,7,8-HxCDF		57117-44-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
73	1,2,3,7,8,9-HxCDF		72918-21-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
74	2,3,4,6,7,8-HxCDF		60851-34-5		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
75	1,2,3,4,6,7,8-HpCDF		67562-39-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
76	1,2,3,4,7,8,9-HpCDF		55673-89-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
77	OCDF		39001-02-0		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
78	petrol (gasoline) petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
79	diesel petroleum group		68334-30-5, 68476-34-6, 94114-59-7, 1159170-26-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
80	heavy/residual fuel oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
81	crude oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
82	kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened	232-366-4; 265-184-9; 294-799-5	8008-20-6; 64742-81-0; 91770-15-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.0351 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered flammable risk



Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0031%)



Classification of sample: WS05

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name: **WS05** LoW Code: **17: Construction and Demolition Wastes (including excavated soil from contaminated sites)**
Sample Depth: **0.50 m** Chapter: **17 05 04 (Soil and stones other than those mentioned in 17 05 03)**
Entry:

Hazard properties

None identified

Determinands

Moisture content: **0% No Moisture Correction applied (MC)**

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
1	arsenic { arsenic trioxide }				61.7	mg/kg	1.32	81.464	mg/kg	0.00815 %		
	033-003-00-0	215-481-4	1327-53-3									
2	cadmium { cadmium oxide }				1.1	mg/kg	1.142	1.257	mg/kg	0.000126 %		
	048-002-00-0	215-146-2	1306-19-0									
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				44.6	mg/kg	1.462	65.185	mg/kg	0.00652 %		
		215-160-9	1308-38-9									
4	copper { dicopper oxide; copper (I) oxide }				369	mg/kg	1.126	415.453	mg/kg	0.0415 %		
	029-002-00-X	215-270-7	1317-39-1									
5	lead { lead chromate }			1	555	mg/kg	1.56	865.697	mg/kg	0.0555 %		
	082-004-00-2	231-846-0	7758-97-6									
6	mercury { mercury dichloride }				0.7	mg/kg	1.353	0.947	mg/kg	0.0000947 %		
	080-010-00-X	231-299-8	7487-94-7									
7	nickel { nickel chromate }				61.5	mg/kg	2.976	183.04	mg/kg	0.0183 %		
	028-035-00-7	238-766-5	14721-18-7									
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1	mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8											
9	zinc { zinc oxide }				393	mg/kg	1.245	489.173	mg/kg	0.0489 %		
	030-013-00-7	215-222-5	1314-13-2									
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1	mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5											
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.8	mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<LOD
	024-001-00-0	215-607-8	1333-82-0									
12	boron { diboron trioxide; boric oxide }				<0.5	mg/kg	3.22	<1.61	mg/kg	<0.000161 %		<LOD
	005-008-00-8	215-125-8	1303-86-2									
13	pH				8.1	pH		8.1	pH	8.1 pH		
			PH									
14	phenol				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	604-001-00-2	203-632-7	108-95-2									
15	naphthalene				0.44	mg/kg		0.44	mg/kg	0.000044 %		
	601-052-00-2	202-049-5	91-20-3									



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
16	acenaphthylene	205-917-1	208-96-8		0.07 mg/kg		0.07 mg/kg	0.000007 %		
17	acenaphthene	201-469-6	83-32-9		0.2 mg/kg		0.2 mg/kg	0.00002 %		
18	fluorene	201-695-5	86-73-7		0.11 mg/kg		0.11 mg/kg	0.000011 %		
19	phenanthrene	201-581-5	85-01-8		1.69 mg/kg		1.69 mg/kg	0.000169 %		
20	anthracene	204-371-1	120-12-7		0.37 mg/kg		0.37 mg/kg	0.000037 %		
21	fluoranthene	205-912-4	206-44-0		3.07 mg/kg		3.07 mg/kg	0.000307 %		
22	pyrene	204-927-3	129-00-0		3.06 mg/kg		3.06 mg/kg	0.000306 %		
23	benzo[a]anthracene	601-033-00-9	200-280-6		1.65 mg/kg		1.65 mg/kg	0.000165 %		
24	chrysene	601-048-00-0	205-923-4		1.87 mg/kg		1.87 mg/kg	0.000187 %		
25	benzo[b]fluoranthene	601-034-00-4	205-911-9		2.11 mg/kg		2.11 mg/kg	0.000211 %		
26	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.8 mg/kg		0.8 mg/kg	0.00008 %		
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		2.02 mg/kg		2.02 mg/kg	0.000202 %		
28	indeno[123-cd]pyrene	205-893-2	193-39-5		1.46 mg/kg		1.46 mg/kg	0.000146 %		
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.31 mg/kg		0.31 mg/kg	0.000031 %		
30	benzo[ghi]perylene	205-883-8	191-24-2		1.72 mg/kg		1.72 mg/kg	0.000172 %		
31	benzene	601-020-00-8	200-753-7		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
32	toluene	601-021-00-3	203-625-9		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
33	ethylbenzene	601-023-00-4	202-849-4		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
34	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]		<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
35	TPH (C6 to C40) petroleum group		TPH		382 mg/kg		382 mg/kg	0.0382 %		
36	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
37	polychlorobiphenyls; PCB	602-039-00-4	215-648-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
38	asbestos	650-013-00-6	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
39	antimony { antimony trioxide }	051-005-00-X	215-175-0		14.3 mg/kg	1.197	17.119 mg/kg	0.00171 %		
40	beryllium { beryllium oxide }	004-003-00-8	215-133-1		<0.1 mg/kg	2.775	<0.278 mg/kg	<0.0000278 %		<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
41	manganese { manganese sulphate }				<0.1 mg/kg	2.749	<0.275 mg/kg	<0.0000275 %		<LOD
	025-003-00-4	232-089-9	7785-87-7							
42	molybdenum { molybdenum(VI) oxide }				8.9 mg/kg	1.5	13.352 mg/kg	0.00134 %		
	042-001-00-9	215-204-7	1313-27-5							
43	1,1-dichloroethane and 1,2-dichloroethane (combined)				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
		203-458-1, 200-863-5	107-06-2, 75-34-3							
44	tetrachloroethylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-028-00-4	204-825-9	127-18-4							
45	carbon tetrachloride; tetrachloromethane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-008-00-5	200-262-8	56-23-5							
46	trichloroethylene; trichloroethene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-027-00-9	201-167-4	79-01-6							
47	vinyl chloride; chloroethylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-023-00-7	200-831-0	75-01-4							
48	DDT (ISO); clofenotane (INN); dicophane; 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane; dichlorodiphenyltrichloroethane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-045-00-7	200-024-3	50-29-3							
49	chlordanes (ISO); 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-047-00-8	200-349-0	57-74-9							
50	hexachlorocyclohexanes, including lindane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-043-00-6	210-168-9, 200-401-2, 206-270-8, 206-271-3	58-89-9, 319-84-6, 319-85-7, 608-73-1							
51	dieldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-049-00-9	200-484-5	60-57-1							
52	endrin (ISO); 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4,5,8-dimethanonaphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-051-00-X	200-775-7	72-20-8							
53	heptachlor (ISO); 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-046-00-2	200-962-3	76-44-8							
54	hexachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-065-00-6	204-273-9	118-74-1							
55	chlordecone (ISO); perchloropentacyclo[5,3,0,02,6,03,9,04,8]decan-5-one; decachloropentacyclo[5,2,1,02,6,03,9,05,8]decan-4-one				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	606-019-00-6	205-601-3	143-50-0							
56	aldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-048-00-3	206-215-8	309-00-2							
57	pentachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-074-00-5	210-172-0	608-93-5							
58	dodecachloropentacyclo[5.2.1.02,6.03,9.05,8]decane; mirex				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-077-00-1	219-196-6	2385-85-5							
59	camphechlor (ISO); toxaphene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-044-00-1	232-283-3	8001-35-2							
60	hexabromobiphenyl				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		252-994-2	36355-01-8							
61	2,3,7,8-TeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
		217-122-7	1746-01-6							
62	1,2,3,7,8-PeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			40321-76-4							
63	1,2,3,4,7,8-HxCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			39227-28-6							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
64	1,2,3,6,7,8-HxCDD		57653-85-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
65	1,2,3,7,8,9-HxCDD		19408-74-3		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
66	1,2,3,4,6,7,8-HpCDD		35822-46-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
67	OCDD		3268-87-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
68	2,3,7,8-TeCDF		51207-31-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
69	1,2,3,7,8-PeCDF		57117-41-6		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
70	2,3,4,7,8-PeCDF		57117-31-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
71	1,2,3,4,7,8-HxCDF		70648-26-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
72	1,2,3,6,7,8-HxCDF		57117-44-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
73	1,2,3,7,8,9-HxCDF		72918-21-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
74	2,3,4,6,7,8-HxCDF		60851-34-5		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
75	1,2,3,4,6,7,8-HpCDF		67562-39-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
76	1,2,3,4,7,8,9-HpCDF		55673-89-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
77	OCDF		39001-02-0		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
78	petrol (gasoline) petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
79	diesel petroleum group		68334-30-5; 68476-34-6; 94114-59-7; 1159170-26-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
80	heavy/residual fuel oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
81	crude oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
82	kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened	232-366-4; 265-184-9; 294-799-5	8008-20-6; 64742-81-0; 91770-15-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.223 %		

Key	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered flammable risk



Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0382%)



Classification of sample: WS06

✔ **Non Hazardous Waste**
Classified as **17 05 04**
in the List of Waste

Sample details

Sample name:	LoW Code:
WS06	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.50 m	

Hazard properties

None identified

Determinands

Moisture content: 0% No Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				12.9 mg/kg	1.32	17.032	mg/kg	0.0017 %		
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				<0.5 mg/kg	1.142	<0.571	mg/kg	<0.0000571 %		<LOD
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				20.7 mg/kg	1.462	30.254	mg/kg	0.00303 %		
		215-160-9	1308-38-9								
4	copper { dicopper oxide; copper (I) oxide }				60.8 mg/kg	1.126	68.454	mg/kg	0.00685 %		
	029-002-00-X	215-270-7	1317-39-1								
5	lead { lead chromate }			1	114 mg/kg	1.56	177.819	mg/kg	0.0114 %		
	082-004-00-2	231-846-0	7758-97-6								
6	mercury { mercury dichloride }				<0.5 mg/kg	1.353	<0.677	mg/kg	<0.0000677 %		<LOD
	080-010-00-X	231-299-8	7487-94-7								
7	nickel { nickel chromate }				24.4 mg/kg	2.976	72.621	mg/kg	0.00726 %		
	028-035-00-7	238-766-5	14721-18-7								
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<1 mg/kg	1.405	<1.405	mg/kg	<0.000141 %		<LOD
	034-002-00-8										
9	zinc { zinc oxide }				108 mg/kg	1.245	134.429	mg/kg	0.0134 %		
	030-013-00-7	215-222-5	1314-13-2								
10	cyanides { salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex }				<1 mg/kg	1.884	<1.884	mg/kg	<0.000188 %		<LOD
	006-007-00-5										
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<0.8 mg/kg	1.923	<1.538	mg/kg	<0.000154 %		<LOD
	024-001-00-0	215-607-8	1333-82-0								
12	boron { diboron trioxide; boric oxide }				1.4 mg/kg	3.22	4.508	mg/kg	0.000451 %		
	005-008-00-8	215-125-8	1303-86-2								
13	pH				7 pH		7	pH	7pH		
			PH								
14	phenol				<0.1 mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
	604-001-00-2	203-632-7	108-95-2								
15	naphthalene				0.06 mg/kg		0.06	mg/kg	0.000006 %		
	601-052-00-2	202-049-5	91-20-3								



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
16	acenaphthylene	205-917-1	208-96-8		<0.02 mg/kg		<0.02 mg/kg	<0.000002 %			<LOD
17	acenaphthene	201-469-6	83-32-9		0.13 mg/kg		0.13 mg/kg	0.000013 %			
18	fluorene	201-695-5	86-73-7		0.08 mg/kg		0.08 mg/kg	0.000008 %			
19	phenanthrene	201-581-5	85-01-8		1.01 mg/kg		1.01 mg/kg	0.000101 %			
20	anthracene	204-371-1	120-12-7		0.19 mg/kg		0.19 mg/kg	0.000019 %			
21	fluoranthene	205-912-4	206-44-0		1.49 mg/kg		1.49 mg/kg	0.000149 %			
22	pyrene	204-927-3	129-00-0		1.35 mg/kg		1.35 mg/kg	0.000135 %			
23	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.63 mg/kg		0.63 mg/kg	0.000063 %			
24	chrysene	601-048-00-0	205-923-4	218-01-9	0.81 mg/kg		0.81 mg/kg	0.000081 %			
25	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.7 mg/kg		0.7 mg/kg	0.00007 %			
26	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.28 mg/kg		0.28 mg/kg	0.000028 %			
27	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.68 mg/kg		0.68 mg/kg	0.000068 %			
28	indeno[123-cd]pyrene	205-893-2	193-39-5		0.36 mg/kg		0.36 mg/kg	0.000036 %			
29	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.08 mg/kg		0.08 mg/kg	0.000008 %			
30	benzo[ghi]perylene	205-883-8	191-24-2		0.41 mg/kg		0.41 mg/kg	0.000041 %			
31	benzene	601-020-00-8	200-753-7	71-43-2	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
32	toluene	601-021-00-3	203-625-9	108-88-3	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
33	ethylbenzene	601-023-00-4	202-849-4	100-41-4	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
34	xylene	601-022-00-9	202-422-2 [1] 203-396-5 [2] 203-576-3 [3] 215-535-7 [4]	95-47-6 [1] 106-42-3 [2] 108-38-3 [3] 1330-20-7 [4]	<0.01 mg/kg		<0.01 mg/kg	<0.000001 %			<LOD
35	TPH (C6 to C40) petroleum group		TPH		86.9 mg/kg		86.9 mg/kg	0.00869 %			
36	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
37	polychlorobiphenyls; PCB	602-039-00-4	215-648-1	1336-36-3	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
38	asbestos	650-013-00-6	-----	12001-28-4 132207-32-0 12172-73-5 77536-66-4 77536-68-6 77536-67-5 12001-29-5	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
39	antimony { antimony trioxide }	051-005-00-X	215-175-0	1309-64-4	3.5 mg/kg	1.197	4.19 mg/kg	0.000419 %			
40	beryllium { beryllium oxide }	004-003-00-8	215-133-1	1304-56-9	<0.1 mg/kg	2.775	<0.278 mg/kg	<0.0000278 %			<LOD



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
41	manganese { manganese sulphate }				<0.1 mg/kg	2.749	<0.275 mg/kg	<0.0000275 %		<LOD
	025-003-00-4	232-089-9	7785-87-7							
42	molybdenum { molybdenum(VI) oxide }				1.7 mg/kg	1.5	2.55 mg/kg	0.000255 %		
	042-001-00-9	215-204-7	1313-27-5							
43	1,1-dichloroethane and 1,2-dichloroethane (combined)				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
		203-458-1, 200-863-5	107-06-2, 75-34-3							
44	tetrachloroethylene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-028-00-4	204-825-9	127-18-4							
45	carbon tetrachloride; tetrachloromethane				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-008-00-5	200-262-8	56-23-5							
46	trichloroethylene; trichloroethene				<0.01 mg/kg		<0.01 mg/kg	<0.000001 %		<LOD
	602-027-00-9	201-167-4	79-01-6							
47	vinyl chloride; chloroethylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-023-00-7	200-831-0	75-01-4							
48	DDT (ISO); clofenotane (INN); dicophane; 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane; dichlorodiphenyltrichloroethane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-045-00-7	200-024-3	50-29-3							
49	chlordan (ISO); 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-4,7-methanoindan				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-047-00-8	200-349-0	57-74-9							
50	hexachlorocyclohexanes, including lindane				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-043-00-6	210-168-9, 200-401-2, 206-270-8, 206-271-3	58-89-9, 319-84-6, 319-85-7, 608-73-1							
51	dieldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-049-00-9	200-484-5	60-57-1							
52	endrin (ISO); 1,2,3,4,10,10-hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4:5,8-dimethanonaphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-051-00-X	200-775-7	72-20-8							
53	heptachlor (ISO); 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-046-00-2	200-962-3	76-44-8							
54	hexachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-065-00-6	204-273-9	118-74-1							
55	chlordecone (ISO); perchloropentacyclo[5.3.0.02,6.03,9.04,8]decan-5-one; decachloropentacyclo[5.2.1.02,6.03,9.05,8]decan-4-one				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	606-019-00-6	205-601-3	143-50-0							
56	aldrin (ISO)				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-048-00-3	206-215-8	309-00-2							
57	pentachlorobenzene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-074-00-5	210-172-0	608-93-5							
58	dodecachloropentacyclo[5.2.1.02,6.03,9.05,8]decane; mirex				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-077-00-1	219-196-6	2385-85-5							
59	camphechlor (ISO); toxaphene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	602-044-00-1	232-283-3	8001-35-2							
60	hexabromobiphenyl				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
		252-994-2	36355-01-8							
61	2,3,7,8-TeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
		217-122-7	1746-01-6							
62	1,2,3,7,8-PeCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			40321-76-4							
63	1,2,3,4,7,8-HxCDD				<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
			39227-28-6							



#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
64	1,2,3,6,7,8-HxCDD		57653-85-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
65	1,2,3,7,8,9-HxCDD		19408-74-3		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
66	1,2,3,4,6,7,8-HpCDD		35822-46-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
67	OCDD		3268-87-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
68	2,3,7,8-TeCDF		51207-31-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
69	1,2,3,7,8-PeCDF		57117-41-6		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
70	2,3,4,7,8-PeCDF		57117-31-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
71	1,2,3,4,7,8-HxCDF		70648-26-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
72	1,2,3,6,7,8-HxCDF		57117-44-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
73	1,2,3,7,8,9-HxCDF		72918-21-9		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
74	2,3,4,6,7,8-HxCDF		60851-34-5		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
75	1,2,3,4,6,7,8-HpCDF		67562-39-4		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
76	1,2,3,4,7,8,9-HpCDF		55673-89-7		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
77	OCDF		39001-02-0		<0.1 ng/kg		<1.0e-07 mg/kg	<1.0e-11 %		<LOD
78	petrol (gasoline) petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
79	diesel petroleum group		68334-30-5, 68476-34-6, 94114-59-7, 1159170-26-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
80	heavy/residual fuel oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
81	crude oils petroleum group				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
82	kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened	232-366-4; 265-184-9; 294-799-5	8008-20-6; 64742-81-0; 91770-15-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.0552 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
CLP: Note 1	Only the metal concentration has been used for classification

Supplementary Hazardous Property Information

HP 3(i): Flammable "flammable liquid waste: liquid waste having a flash point below 60°C or waste gas oil, diesel and light heating oils having a flash point > 55°C and <= 75°C"

Force this Hazardous property to non hazardous because Concentrations too low to be considered flammable risk



Hazard Statements hit:

Flam. Liq. 3; H226 "Flammable liquid and vapour."

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.00869%)



Appendix A: Classifier defined and non GB MCL determinands

■ **chromium(III) oxide (worst case)** (EC Number: 215-160-9, CAS Number: 1308-38-9)

Description/Comments: Data from C&L Inventory Database

Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex**

GB MCL index number: 006-007-00-5

Description/Comments: Conversion factor based on a worst case compound: sodium cyanide

Additional Hazard Statement(s): EUH032 >= 0.2 %

Reason for additional Hazards Statement(s):

20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

■ **pH** (CAS Number: PH)

Description/Comments: Appendix C4

Data source: WM3 1st Edition 2015

Data source date: 25 May 2015

Hazard Statements: None.

■ **acenaphthylene** (EC Number: 205-917-1, CAS Number: 208-96-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

■ **acenaphthene** (EC Number: 201-469-6, CAS Number: 83-32-9)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

■ **fluorene** (EC Number: 201-695-5, CAS Number: 86-73-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **phenanthrene** (EC Number: 201-581-5, CAS Number: 85-01-8)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 06 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

■ **anthracene** (EC Number: 204-371-1, CAS Number: 120-12-7)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 17 Jul 2015

Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **fluoranthene** (EC Number: 205-912-4, CAS Number: 206-44-0)

Description/Comments: Data from C&L Inventory Database

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **pyrene** (EC Number: 204-927-3, CAS Number: 129-00-0)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014

Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>

Data source date: 21 Aug 2015

Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410



■ **indeno[123-cd]pyrene** (EC Number: 205-893-2, CAS Number: 193-39-5)

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Carc. 2; H351

■ **benzo[ghi]perylene** (EC Number: 205-883-8, CAS Number: 191-24-2)

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 28/02/2015
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 23 Jul 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ **ethylbenzene** (EC Number: 202-849-4, CAS Number: 100-41-4)

GB MCL index number: 601-023-00-4
Description/Comments:
Additional Hazard Statement(s): Carc. 2; H351
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 2; H351 hazard statement sourced from: IARC Group 2B (77) 2000

■ **TPH (C6 to C40) petroleum group** (CAS Number: TPH)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , Aquatic Chronic 2; H411

■ **polychlorobiphenyls; PCB** (EC Number: 215-648-1, CAS Number: 1336-36-3)

GB MCL index number: 602-039-00-4
Description/Comments: Worst Case: IARC considers PCB Group 1; Carcinogenic to humans;

POP specific threshold from ATP1 (Regulation 756/2010/EU) to POPs Regulation (Regulation 850/2004/EC). Where applicable, the calculation method laid down in European standards EN 12766-1 and EN 12766-2 shall be applied.
Additional Hazard Statement(s): Carc. 1A; H350
Reason for additional Hazards Statement(s):
20 Nov 2021 - Carc. 1A; H350 hazard statement sourced from: IARC Group 1 (23, Sup 7, 100C) 2012

■ **1,1-dichloroethane and 1,2-dichloroethane (combined)** (EC Number: 203-458-1, 200-863-5, CAS Number: 107-06-2, 75-34-3)

Description/Comments: Combines the hazard statements and risk phrases for 1,1-dichloroethane and 1,2-dichloroethane
Data source: N/a
Data source date: 14 Oct 2016
Hazard Statements: Flam. Liq. 2; H225 , Acute Tox. 4; H302 , Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 1B; H350 , Aquatic Chronic 3; H412

■ **hexabromobiphenyl** (EC Number: 252-994-2, CAS Number: 36355-01-8)

Description/Comments:
Data source: POP specific threshold from ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004).
Data source date: 01 Jul 2013
Hazard Statements: POP >= 0.005 %

■ **2,3,7,8-TeCDD** (EC Number: 217-122-7, CAS Number: 1746-01-6)

Description/Comments: 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD)
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=1)

■ **1,2,3,7,8-PeCDD** (CAS Number: 40321-76-4)

Description/Comments: 1,2,3,7,8-pentachlorodibenzo-p-dioxin
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=1)

■ **1,2,3,4,7,8-HxCDD** (CAS Number: 39227-28-6)

Description/Comments: 1,2,3,4,7,8-hexachlorodibenzo-p-dioxin
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)



▪ **1,2,3,6,7,8-HxCDD** (CAS Number: 57653-85-7)

Description/Comments: 1,2,3,6,7,8-hexachlorodibenzo-p-dioxin
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)

▪ **1,2,3,7,8,9-HxCDD** (CAS Number: 19408-74-3)

Description/Comments: 1,2,3,7,8,9-hexachlorodibenzo-p-dioxin
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)

▪ **1,2,3,4,6,7,8-HpCDD** (CAS Number: 35822-46-9)

Description/Comments: 1,2,3,4,6,7,8-heptachlorodibenzo-p-dioxin
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.01)

▪ **OCDD** (CAS Number: 3268-87-9)

Description/Comments: octachlorodibenzo-p-dioxin
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.0003)

▪ **2,3,7,8-TeCDF** (CAS Number: 51207-31-9)

Description/Comments: 2,3,7,8-tetrachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)

▪ **1,2,3,7,8-PeCDF** (CAS Number: 57117-41-6)

Description/Comments: 1,2,3,7,8-pentachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.03)

▪ **2,3,4,7,8-PeCDF** (CAS Number: 57117-31-4)

Description/Comments: 2,3,4,7,8-pentachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.3)

▪ **1,2,3,4,7,8-HxCDF** (CAS Number: 70648-26-9)

Description/Comments: 1,2,3,4,7,8-hexachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)

▪ **1,2,3,6,7,8-HxCDF** (CAS Number: 57117-44-9)

Description/Comments: 1,2,3,6,7,8-hexachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)

▪ **1,2,3,7,8,9-HxCDF** (CAS Number: 72918-21-9)

Description/Comments: 1,2,3,7,8,9-hexachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)

▪ **2,3,4,6,7,8-HxCDF** (CAS Number: 60851-34-5)

Description/Comments: 2,3,4,6,7,8-hexachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.1)



■ **1,2,3,4,6,7,8-HpCDF** (CAS Number: 67562-39-4)

Description/Comments: 1,2,3,4,6,7,8-heptachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.01)

■ **1,2,3,4,7,8,9-HpCDF** (CAS Number: 55673-89-7)

Description/Comments: 1,2,3,4,7,8,9-heptachlorodibenzofuran
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.01)

■ **OCDF** (CAS Number: 39001-02-0)

Description/Comments: octachlorodibenzo[b,d]furan
Data source: ATP1 (Regulation (EU) 756/2010) to POPs Regulation (Regulation (EC) 850/2004)
Data source date: 24 Aug 2010
Hazard Statements: PCDD/PCDF (TEF=0.0003)

■ **petrol (gasoline) petroleum group**

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 1; H224 , Skin Irrit. 2; H315 , Muta. 1B; H340 , Carc. 1B; H350 , Repr. 2; H361d , STOT SE 3; H336 , Asp. Tox. 1; H304 , Aquatic Chronic 2; H411

■ **diesel petroleum group** (CAS Number: 68334-30-5, 68476-34-6, 94114-59-7, 1159170-26-9)

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 3; H226 , Skin Irrit. 2; H315 , Acute Tox. 4; H332 , Carc. 2; H351 , Asp. Tox. 1; H304 , STOT RE 2; H373 , Aquatic Chronic 2; H411

■ **heavy/residual fuel oils petroleum group**

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Muta. 1B; H340 , Carc. 1B; H350 , Acute Tox. 4; H332 , Repr. 2; H361d , STOT RE 2; H373 , Aquatic Chronic 2; H411

■ **crude oils petroleum group**

Description/Comments: Hazard statements taken from WM3 1st Edition 2015; Risk phrases: WM2 3rd Edition 2013
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: Flam. Liq. 2; H225 , Carc. 1B; H350 , Eye Irrit. 2; H319 , Asp. Tox. 1; H304 , STOT RE 2; H373 , STOT SE 3; H336 , Aquatic Chronic 2; H411

■ **kerosine petroleum group including kerosine (petroleum); kerosine (petroleum) hydrosulphurised; kerosine (petroleum) sweetened** (EC Number: 232-366-4; 265-184-9; 294-799-5, CAS Number: 8008-20-6; 64742-81-0; 91770-15-9)

Description/Comments: Review of ECHA Registered Substances database; Concawe report: hazard classification and labelling of petroleum substances in the European Economic Area - 2012; REACH compliant SDS from Total, Petrobras; Petrochem; Shell; ESS
Data source: <http://echa.europa.eu/information-on-chemicals/registered-substances>;
Hazard classification and labelling of petroleum substances in the European Economic Area - 2012 (CONCAWE); SDS: company websites
Data source date: 21 Jan 2014
Hazard Statements: Flam. Liq. 3; H226 , Skin Irrit. 2; H315 , Asp. Tox. 1; H304 , Aquatic Chronic 2; H411

Appendix B: Rationale for selection of metal species

arsenic {arsenic trioxide}

Reasonable case CLP species based on hazard statements/molecular weight and most common (stable) oxide of arsenic. Industrial sources include: smelting; main precursor to other arsenic compounds (edit as required)

cadmium {cadmium oxide}

Reasonable case CLP species based on hazard statements/molecular weight, very low solubility in water. Industrial sources include: electroplating baths, electrodes for storage batteries, catalysts, ceramic glazes, phosphors, pigments and nematocides. (edit as required) Worst case compounds in CLP: cadmium sulphate, chloride, fluoride & iodide not expected as either very soluble and/or compound's industrial usage not related to site history (edit as required)

chromium in chromium(III) compounds {chromium(III) oxide (worst case)}

Reasonable case species based on hazard statements/molecular weight. Industrial sources include: tanning, pigment in paint, inks and glass (edit as required)



copper {dicopper oxide; copper (I) oxide}

Reasonable case CLP species based on hazard statements/molecular weight and insolubility in water. Industrial sources include: oxidised copper metal, brake pads, pigments, antifouling paints, fungicide. (edit as required) Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected. (edit as required)

lead {lead chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

nickel {nickel chromate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

selenium {selenium compounds with the exception of cadmium sulposelenide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case. Pigment cadmium sulposelenide not likely to be present in this soil. No evidence for the other CLP entries: sodium selenite, nickel II selenite and nickel selenide, to be present in this soil. (edit as required)

zinc {zinc oxide}

Not enough chrome present to warrant zinc-chromate classification

cyanides {salts of hydrogen cyanide with the exception of complex cyanides such as ferrocyanides, ferricyanides and mercuric oxycyanide and those specified elsewhere in this Annex}

Harmonised group entry used as most reasonable case as complex cyanides and those specified elsewhere in the annex are not likely to be present in this soil: [Note conversion factor based on a worst case compound: sodium cyanide] (edit as required)

chromium in chromium(VI) compounds {chromium(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight. Industrial sources include: production stainless steel, electroplating, wood preservation, anti-corrosion agents or coatings, pigments (edit as required)

boron {diboron trioxide; boric oxide}

Reasonable case CLP species based on hazard statements/ molecular weight, physical form and low solubility. Industrial sources include: fluxing agent for glass/enamels; additive for fibre optics, borosilicate glass (edit as required)

antimony {antimony trioxide}

Worst case CLP species based on hazard statements/molecular weight and low solubility. Industrial sources include: flame retardants in electrical apparatus, textiles and coatings (edit as required)

beryllium {beryllium oxide}

Reasonable case CLP species based on hazard statements/molecular weight. Industrial sources include: most common (non alloy) form, used in ceramics (edit as required)

manganese {manganese sulphate}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

molybdenum {molybdenum(VI) oxide}

Worst case CLP species based on hazard statements/molecular weight (edit as required)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.2.GB - Oct 2021

HazWasteOnline Classification Engine Version: 2023.111.5569.10274 (22 Apr 2023)

HazWasteOnline Database: 2023.111.5569.10274 (22 Apr 2023)



This classification utilises the following guidance and legislation:

WM3 v1.2.GB - Waste Classification - 1st Edition v1.2.GB - Oct 2021

CLP Regulation - Regulation 1272/2008/EC of 16 December 2008

1st ATP - Regulation 790/2009/EC of 10 August 2009

2nd ATP - Regulation 286/2011/EC of 10 March 2011

3rd ATP - Regulation 618/2012/EU of 10 July 2012

4th ATP - Regulation 487/2013/EU of 8 May 2013

Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

5th ATP - Regulation 944/2013/EU of 2 October 2013

6th ATP - Regulation 605/2014/EU of 5 June 2014

WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

Revised List of Waste 2014 - Decision 2014/955/EU of 18 December 2014

7th ATP - Regulation 2015/1221/EU of 24 July 2015

8th ATP - Regulation (EU) 2016/918 of 19 May 2016

9th ATP - Regulation (EU) 2016/1179 of 19 July 2016

10th ATP - Regulation (EU) 2017/776 of 4 May 2017

HP14 amendment - Regulation (EU) 2017/997 of 8 June 2017

13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

14th ATP - Regulation (EU) 2020/217 of 4 October 2019

15th ATP - Regulation (EU) 2020/1182 of 19 May 2020

The Chemicals (Health and Safety) and Genetically Modified Organisms (Contained Use)(Amendment etc.) (EU Exit)

Regulations 2020 - UK: 2020 No. 1567 of 16th December 2020

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK:

2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

APPENDIX I: CURRENT GUIDANCE & LEGISLATIONS

CURRENT CONTAMINATED LAND LEGISLATION / GUIDANCE & ENVIRONMENTAL RISK ASSESSMENT **METHODOLOGY**

LEGISLATION OVERVIEW

This report includes hazard identification and risk assessment in line with the risk-based methods referred to in relevant UK legislation and guidance. Government environmental policy is based upon a "suitable for use approach". When considering the current use of land, Part IIA of the Environment Protection Act 1990 (EPA 1990) provides the regulatory regime, which was introduced by Section 57 of the Environment Act 1995, which came into force in England on 1 April 2000. The main objective of introducing the Part IIA regime is to provide an improved system for the identification and remediation of land where contamination is causing unacceptable risks to human health or the wider environment given the current use and circumstances of the land.

Part IIA provides a statutory definition of contaminated land under Section 78A(2) as:

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

- (a) Significant harm is being caused or there is a significant possibility of such harm being caused;
- or
- (b) Pollution of controlled waters is being, or is likely to be, caused."

Part IIA provides a statutory definition of the pollution of controlled waters under Section 78A(9) as:

*"the entry into controlled waters of **any** poisonous, noxious or polluting matter or **any** solid waste matter".*

In order to assist in establishing if there is a "significant possibility of significant harm" there must be a "significant pollutant linkage" for potential harm to exist. That means there must be a source(s) of contamination, sensitive receptors present and a connection or pathway between the two. This combination of source-pathway-receptor is termed a "pollutant linkage or SPR linkage."

Part IIA of The Environmental Protection Act 1990 is supported by a substantial quantity of guidance and other Regulations, especially DEFRA Circular 01/2006 Contaminated Land (this replaces DETR Circular 02/2000). Part IIA defines the duties of Local Authorities in dealing with it. With the exception of situations of very high pollution risk, Part IIA places contaminated land responsibility on the planning and redevelopment process. In situations where there is very high pollution risk direct action from the Local Authority is usually necessary. Planning Policy Statement 23 (PPS23) provides guidance on the planning process and requires that sites which have been developed shall not be capable of being determined "contaminated land" under Part IIA.

The criteria for assessing levels of pollutants and hence determining whether a site represents a hazard are based on a range of techniques, models and guidance. Within this context it is relevant to note that Government objectives are:

- (a) to identify and remove unacceptable risks to human health and the environment;
- (b) to seek to bring damaged land back into beneficial use;
- (c) to seek to ensure that the cost burdens faced by individuals, companies and society as a whole are proportionate, manageable and economically sustainable.

These three objectives underlie the "suitable for use" approach to remediation of contaminated land. The "suitable for use" approach focuses on the risks caused by land contamination. The approach recognises that the risks presented by any given level of contamination will vary greatly according to the use of the land and a wide range of other factors, such as the underlying geology of the site. Risks therefore should be assessed on a site-by-site basis.

The "suitable for use" approach then consists of three elements:

- (a) ensuring that land is suitable for its current use - in other words, identifying any land where contamination is causing unacceptable risks to human health and the environment, assessed on the basis of the current use and circumstances of the land, and returning such land to a condition where such risks no longer arise; the contaminated land regime provides the regulatory mechanisms to achieve this;
- (b) ensuring that land is made suitable for any new use, as planning permission is given for that new use - in other words, assessing the potential risks from contamination, on the basis of the proposed future use and circumstances, before official permission is given for the development and, where necessary to avoid unacceptable risks to human health and the environment, remediating the land before the new use commences; this is the role of the town and country planning and building control regimes; and
- (c) limiting requirements for remediation to the work necessary to prevent unacceptable risks to human health or the environment in relation to the current use or future use of the land for which planning permission is being sought - in other words, recognising that the risks from contaminated land can be satisfactorily assessed only in the context of specific uses of the land (whether current or proposed), and that any attempt to guess what might be needed at some time in the future for other uses is likely to result either in premature work (thereby running the risk of distorting social, economic and environmental priorities) or in unnecessary work (thereby wasting resources).

The mere presence of pollutants does not therefore necessarily warrant action, and consideration must be given to the scale of risk involved for the current and proposed end use of the site.

RISK ASSESSMENT METHODOLOGY

Current practice recommends that the determination of potential liabilities that could arise from land contamination be carried out using the process of risk assessment, whereby "risk" is defined as:

- "(a) The probability, or frequency, or occurrence of a defined hazard; and
- (b) The magnitude (including the seriousness) of the consequences."

The UK's approach to the assessment of environmental risk is set out in by the Department of the Environment (2000) publication "A Guide to Risk Assessment and Risk Management for Environmental Protection." This established an iterative, systematic staged process which comprises:

- (a) Hazard identification
- (b) Hazard assessment
- (c) Risk estimation
- (d) Risk evaluation
- (e) Risk Assessment

At each stage during the investigation process the above steps are repeated as more detailed information becomes available for the site.

Land contamination risk management' (LCRM) (2020)), a document published by the Department for Environment, Food and Rural Affairs (DEFRA) and the Environment Agency (EA) outlines a tiered approach to the assessment of risks posed by contaminated land, as summarised hereunder:

Tier 1: Preliminary Risk Assessment

A Preliminary Risk Assessment is usually undertaken as part of a desk study, outlines potential risks posed by potential contamination to all receptors by defining plausible "pollution linkages" and developing a preliminary conceptual model (PCM). The purpose of this model is to define all possible complete pollution linkages, where the requisite source – pathway – target elements are present, and these elements being defined as:

- a contaminant (source) is a hazardous substance or agent, present at levels that have the potential to cause harm or damage a receptor
- a pathway is the means by or through which a contaminant comes into contact with, or otherwise affects, the receptor
- a receptor (target) is an entity (human being, aquatic environment, flora and fauna etc) that is vulnerable to the adverse effects of the contaminant

This relationship is termed a "pollution linkage". It should be recognised that for a health or environmental risk to exist, all three elements of the relationship or linkage must be present, i.e.

- if there is no contaminant, or contaminant present at levels below those considered to be harmful or damaging to a receptor, then there can be no adverse effect on a receptor
- if there is no receptor present that can be adversely affected by a contaminant, no harm or damage can arise
- even where both a contaminant and a receptor are present, no harm or damage will occur if there is no pathway by or through which a linkage between the two can be established

The absence of one or more of each component (source, pathway, receptor) would prevent a pollutant linkage being established and there would be no significant environmental risk.

The PCM is subject to continual refinement as additional data becomes available. As part of a Phase I Investigation (Desk Study and site walk over) a PCM is formed. Based on the PCM, potential pollutant linkages can be assessed. If the PCM and hazard assessment indicate that a pollution linkage is not of significance then no further assessment or action is required due to this linkage. For each significant and possible linkage a risk assessment is carried out. The linkages which potentially pose significant risks may require a variety of responses ranging from immediate remedial action or risk management or, more commonly, further investigation and risk assessment. This next stage is usually termed a Phase II Main Site Investigation and should provide additional data to allow refinement of the PCM and assess the level of risk from each pollutant linkage. Risk assessment will usually include Tier 2 Generic Quantitative Risk Assessment and / or, if necessary, a Tier 3 Detailed Quantitative Risk Assessment.

Tier 2: Generic Quantitative Risk Assessment (GQRA)

GQRA requires an intrusive investigation in order to characterise the site assisting in the re-assessment of the source-pathway receptor linkage. The conceptual model should be refined accordingly.

Upon completion of an intrusive investigation it must be decided whether Generic Assessment Criteria (GAC) are suitable for assessing the risk posed by observed contamination at the site. If GAC are deemed unacceptable for risk assessment purposes or cannot be developed, a Tier 3 Detailed Quantitative Risk Assessment (DQRA) is required.

If GQRA reveals that unacceptable risks are not present then no further action is required. If GQRA identifies a possibility of risk, a decision must be made whether further work is required or necessary for the purposes of risk assessment. If further risk assessment is deemed not suitable not required an Options Appraisal should be undertaken. If further risk assessment is required, the scope nature of further risk assessment must be decided – it is possible that a Tier 3 DQRA will be undertaken in this scenario.

Where the Environment Agency have published an SGV for a contaminant, this will be used in the GQRA. For contaminants where an SGV has not been published and an S4UL has been published by LQM/CIEH S4UL's, then this S4UL will be used.

Where an SGV or an S4UL is not available, and a DEFRA C4SL is available, then this C4SL will be used. In house derived GAC's will only be used for contaminants where there is no SGV or LQM S4UL or DEFRA C4SL.

Tier 3: Detailed Quantitative Risk Assessment (DQRA)

DQRA is used when pollutant linkages require further assessment. DQRA is often undertaken for pollutant linkages where GAC are unavailable or inappropriate for or more conservative than the actual circumstances of the site. Site specific data is used to create Site Specific Assessment Criteria (SSAC) and enable a more accurate assessment of the risks. Further investigation may or may not be required to formulate SSAC depending on the site specific conditions and information already obtained.

If DQRA reveals that unacceptable risks are not present then no further action is required. If DQRA identifies a possibility of risk, a decision must be made whether further work is required or necessary for the purposes of risk assessment. If further risk assessment is deemed not suitable not required an Options Appraisal should be undertaken. If further risk assessment is required, the scope and nature of further risk assessment must be decided at this point.

NOTE: A Tier 1 Preliminary Risk Assessment is undertaken as part of a Desk Study Report and a Preliminary Conceptual Model is developed for all pollutant linkages. However, the methodologies for assessing the risks to human health, risks to controlled waters and risk posed by ground gas using quantitative techniques vary considerably, therefore GQRA and DQRA for human health, controlled waters and ground gas must be undertaken separately. The risk assessment methodologies where quantitative assessment is used for risks to human health, risks to controlled waters and risks posed by ground gas, if relevant, are described hereunder.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED TO HUMAN HEALTH

Background

In March 2002, the Department for Environment, Food and Rural Affairs (DEFRA) and the EA published the Contaminated Land Exposure Assessment (CLEA) Model and a series of related reports. These were designed to provide a scientifically based framework for the assessment of chronic risks to human health from contaminated land. These reports (CLR7-10) together with associated "SGV" documents have since been withdrawn (August 2008) and the following documents have been published as revised guidance to the CLEA assessment:

- Environment Agency : 2008: Updated Technical Background to the CLEA model Science Report SC050021/SR3
- Environment Agency : 2008: Human Health Toxicological Assessment of Contaminants in Soil SC050021/SR2

Additional guidance on statistical assessment replacing CLR 7 is provided in:

- CL:AIRE :2008 Guidance on Comparing Data With a Critical Concentration

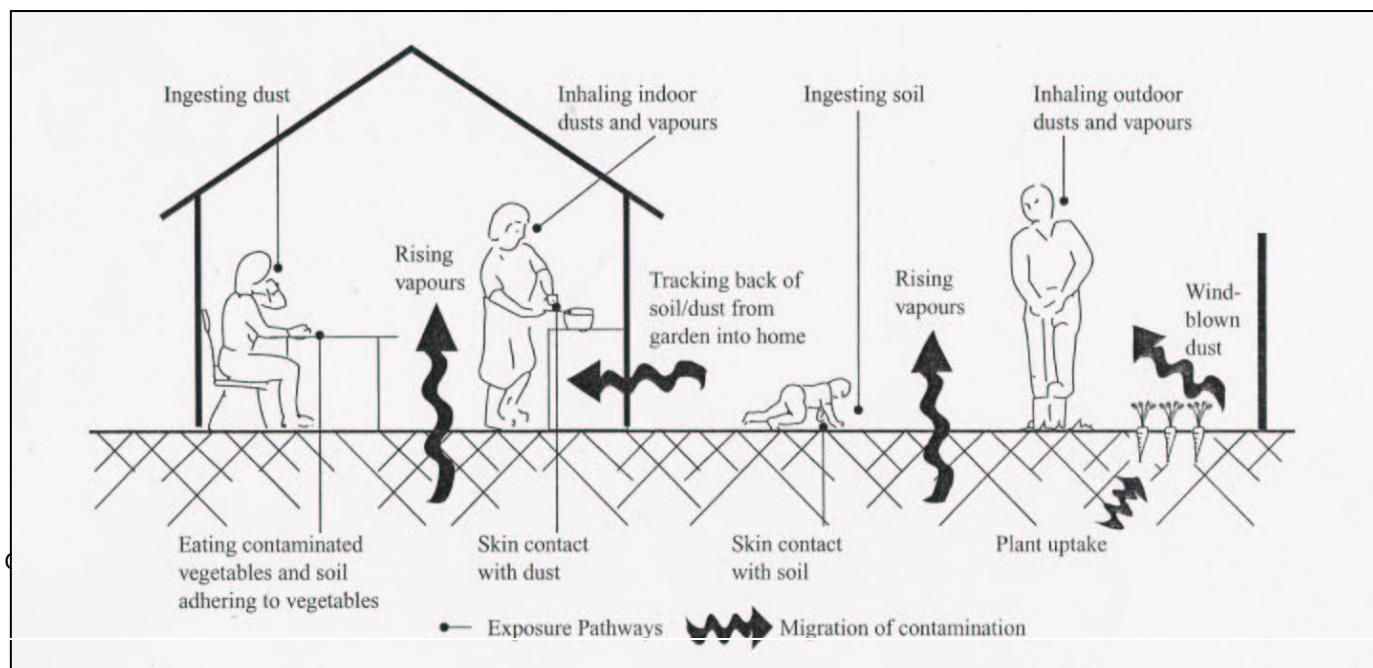
Other guidance/software used in spatial / statistical assessment is provided in:

- USEPA 2006: Data Quality Assessment: Statistical Methods for Practitioners
- Spatial Analysis and Decision Assistance (SADA) – The University of Tennessee

A different approach to the statistical appraisal of data is required depending on whether the assessment of risk is to assess whether land is Contaminated Land in accordance with regulations, or whether the assessment is to determine whether the site is suitable for new development in according with Planning guidance. This is discussed further in CL:AIRE :2008 "Guidance on Comparing Data With a Critical Concentration".

A program for the derivation of GAC's based on the above guidance is provided by the Environment Agency and is entitled "CLEA Software Version 1.06".

The CLEA model has been developed to calculate an estimated tolerable daily soil intake (TDSI) for site users given a set 'default' exposure pathways. Ten human exposure pathways are covered in the CLEA model as presented below:



(

Ingestion

- ingestion of outdoor soil
- ingestion of indoor dust
- ingestion of home grown produce
- ingestion of soil attached to home grown produce

Dermal Contact

- dermal contact with outdoor soil
- dermal contact with indoor dust

Inhalation

- inhalation of outdoor dust
- inhalation of indoor dust
- inhalation of outdoor soil vapour
- inhalation of indoor soil vapour

It should be noted that there are other potential exposure pathways on some sites not included in the CLEA model e.g. certain organic compounds can pass through plastic water pipes into drinking water supply.

Where contaminated water is present at a depth less than 2mbgl and there is a potential risk of inhalation of vapours (only when volatile compounds are present) the risk from inhalation of vapours from soil water will be assessed using a UK compliant version of BP Risc v4.02.

The presence and/or significance of each of the above exposure pathways are dependent on the type of land use being considered and the nature of the contaminant under scrutiny. Accordingly, the CLEA model considers for principle 'default' land use types and makes a series of 'default' assumptions with regard to human exposure frequency, duration and critical human target groups for each land use considered:

- residential
- allotments
- commercial / industrial land use

The above land use categories defined in the CLEA are detailed below:

Residential: This generic scenario assumes a typical residential property consisting of a two-storey house built on a ground-bearing slab with a private garden consisting of lawn, flowerbeds, and a small fruit and vegetable patch. The occupants are assumed to be parents with young children, who make regular use of the garden area.

Allotments: This generic scenario assumes a plot of open space (about 250 m²), commonly made available by the local authority to tenants to grow fruit and vegetables for their own consumption. There are usually several plots to a site and the overall site area may cover more than a hectare. The tenants are assumed to be parents or grandparents and that young children make occasional accompanied visits to the plot.

Commercial/Industrial: There are many different kinds of workplace and work-related activities. This generic scenario assumes a typical commercial or light industrial property consisting of a threestorey building at which employees spend most time indoors and are involved in officebased or relatively light physical work.

Human Health Risk Assessment Methodology

Assessment of risk for the protection of human health is undertaken using the methodology as outlined previously, and summarised hereunder:

- Tier 1 Preliminary Risk Assessment
- Tier 2 Generic Quantitative Risk Assessment
- Tier 3 Detailed Quantitative Risk Assessment

The Tier 1 Preliminary Risk Assessment is undertaken as part of the desk study report and includes the development of a Preliminary Conceptual Model. Tier 2 and Tier 3 Quantitative Risk Assessments are undertaken in order to develop and refine the Preliminary Conceptual Model aiding a more detailed assessment of the risk posed by contaminants revealed by site investigation and soil / soil water chemical analyses.

The methods used by **CC GEOTECHNICAL LTD** to derive assessment criteria, to statistically analyse chemical data and to compare chemical data to the derived assessment criteria are discussed herunder.

Derivation of Generic Assessment Criteria (GAC) and Site Specific Assessment Criteria (SSAC)

GAC's are derived on the basis of the proposed land use and the associated applicable exposure pathways. It should be noted that there are difficulties in establishing soil concentrations of contaminants beyond which risks from exposure to these contaminants would be 'unacceptable' and the GAC value does not necessarily equate to the level for "significant possibility of significant harm" as defined in Part IIA of The Environmental Protection Act (1990) to determine whether land is "contaminated." This ultimately requires detailed 'toxicological' information of the health effects of individual contaminants and also a scientific judgement on what constitutes an 'unacceptable' risk. The primary purpose of the CLEA derived GAC's are as 'minimal risk thresholds' for the assessment of human health risks in relation to land use.

Minimal risk thresholds calculated using generic input parameters for each of the above land uses are termed Generic Assessment Criteria (GAC) and are used for Generic Quantitative Risk Assessment (GQRA). However, further assessment may be required taking into consideration site specific factors such as the way the land is used, the soil type, the building

characteristics and the exact nature of the receptor, to determine whether there is a significant possibility of risk to human health to site users. Such an assessment is known as a Detailed Quantitative Risk Assessment (DQRA) and the resultant threshold concentrations are known as Site Specific Assessment Criteria (SSAC). Such assessments should be conducted with the agreement of the local authority (or the Environment Agency) since it is the authority that determines whether land is Contaminated Land or whether Planning Permission for a new development may be granted.

For the purposes of this report, assessment criteria have been derived in accordance with current guidance based on the conceptual model for the proposed land use using the CLEA v1.06 software. These criteria are not intended to indicate whether the site may be contaminated land nor do they replace any published soil guideline values. However, the values are intended to provide guidance for the local authority on whether the site may be considered uncontaminated. If, based on the site's proposed future use, the site would be considered by the local authority to be uncontaminated and therefore, on the basis of soil concentrations, fit for purpose, then no further risk assessment based on soil concentrations and the risk to human health would be necessary. However, should these criteria be exceeded or the conceptual site model vary from the model used in the risk assessment to derive these values then the risk assessment should be updated accordingly.

For contaminants routinely analysed where inhalation is a significant pathway (naphthalene, phenanthrene, Aromatic EC5-EC7, Aromatic EC7-EC8, Aromatic EC8-EC10, Aromatic EC10-EC12, Aromatic EC12-EC16, Aliphatic EC5-EC6, Aliphatic EC8-EC10, Aliphatic EC10-EC12, Aliphatic EC12-EC16), plots of the GAC as a function of Soil Organic Matter (SOM) are used to determine if they pose a potential risk to human health, which are presented hereunder. Where there is an exceedance further assessment may be undertaken.

Statistical Assessment of Soil Contamination Data & Comparison of Contamination Data to Threshold Values

In any site investigation only a small fraction of the soil on the site is analysed. Therefore the mean derived from the contamination data for a contaminant may not be the same as the true mean for the contaminant distribution on the site. To improve the reliability of any assessment a statistical analysis is undertaken in line with the CL:AIRE document "Guidance on Comparing Soil Contamination Data with a Critical Concentration".

Statistical assessment of soil data is undertaken using programs based on the guidance in the CL:AIRE document or the USEPA software ProUCL v4.0.

Where the number of results in a dataset is less than four, a statistical assessment is not undertaken, and the assessment is performed by comparison of the maximum value(s) with a Health Criteria Value (HCV), such as Generic Assessment Criteria value(s).

For the Planning situation, the regulator needs to check whether the concentration of contaminants is low compared to the HCV. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is lower than the HCV.

For the Part IIA scenario the regulator needs to determine whether the concentration of contaminants is greater than the HCV. This decision is based on whether there is at least a 95% confidence level that the true mean of the dataset is higher than the HCV. However, the regulator may proceed with determination if there is just a 51% probability, "on the balance of probabilities".

The Outlier Test used in the statistical assessment may not be able to identify separate populations if numerous populations are present. In order to ensure that this is not the case a spatial assessment of the data will be undertaken using SADA.

If the screening levels are exceeded then more sophisticated quantitative risk assessment or remedial action may be undertaken. The benefits of undertaking a quantitative risk assessment must be weighed against the likelihood that it will bring about cost savings in the proposed remediation.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED TO CONTROLLED WATER

Definition of Controlled Waters

The term 'controlled waters' is defined in Section 104 of the Water Resources Act 1991 as:

"Territorial Waters...which extend seawards for three miles..., coastal waters..., inland freshwaters, waters in any relevant lake or pond or of so much of any relevant river or watercourse as is above the freshwater limit, and ground waters, that is to say, any waters contained in underground strata."

Note that the definition of groundwater under the Water Resources Act 1991 includes all water within underground strata (including soil / pore water in the unsaturated zone). The definition of groundwater under the Groundwater Directive however is limited to water in the saturated zone. For the purposes of Part IIA of the Environmental Protection Act 1990, the Environment Agency recommends that the groundwater within the saturated zone only is considered as the receptor (rather than soil / pore water).

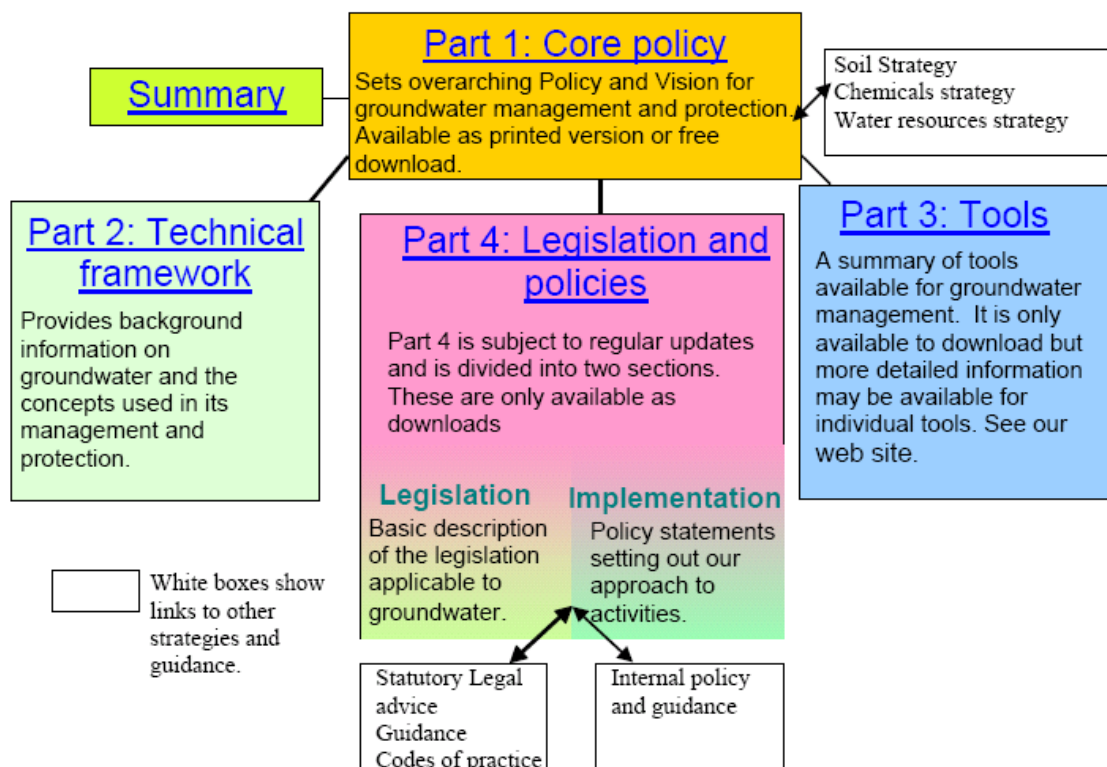
Environment Agency Guidance

Legislation and guidance surrounding the protection of controlled waters in the UK is abundant and can be complex. The Environment Agency's overall position on groundwater is *"To protect and manage groundwater resources for present and future generation in ways that are appropriate for the risks that we identify"* (Groundwater Protection : Policy and Practice GP3, 2006). In brief, the core objectives of the existing legislation serve to enforce this position.

In 1992, the National Rivers Authority published their Policy and Practice for the Protection of Groundwater (PPPG), this document was influential as it provided a focus for key developments such as Source Protection Zones (SPZs) and

Groundwater Vulnerability Maps. The Policy was then revised in 1998, since which there have been substantial changes in legislation, driven by Europe. Key European Directives relating to groundwater include the Groundwater Directive (80/68/EEC) and the Water Framework Directive (2000/60/EC). Aspects of these directives are controlled by primary UK legislation such as the Water Resources Act 1991. Further to legislative changes, gaps identified in the 1998 PPPG required addressing. These changes are reflected in the forthcoming Environment Agency Policy document entitled *Groundwater Protection : Policy and Practice (GP3)*, a draft version of which was available for public consultation (Parts 1 to 3) ending July 2006 with Part 4 issued in March 2008. Part 4 includes a section on key groundwater legislation and the Environment Agency's interpretation of it.

The following gives a breakdown of the structure of the document (taken from the Environment Agency GP3 draft consultation document, 2006)



Controlled Water Risk Assessment Methodology

The risk posed to controlled water is assessed by **CC GEOTECHNICAL** in accordance with current guidance as outlined hereunder.

In order for a developer of a potentially contaminated site to fulfil their obligations under the legislation, a site assessment would be required to be undertaken in order to identify any potential risks to controlled waters and to derive suitable clean-up criteria if necessary to ensure the protection of controlled waters. The general approach for Groundwater Protection is detailed further in Part 3 of GP3.

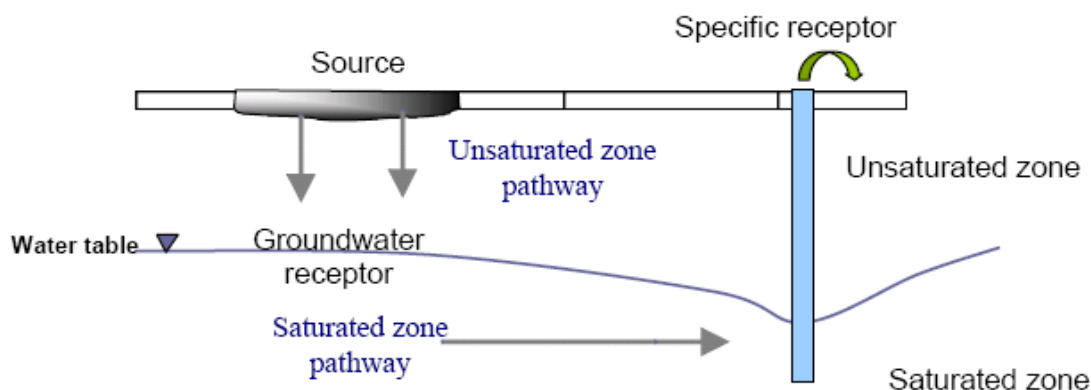
When assessing groundwater impact the Environment Agency advocate the application of their framework methodology "Remedial Targets Methodology – Hydrogeological Risk Assessment for Land Contamination" Environment Agency (2006). The methodology has four levels of assessment as described below:

- **Level 1** considers whether contaminant concentrations in "pore water" in contaminated soil are sufficient to impact on the receptor, ignoring dilution, dispersion and attenuation along the pathway. The "pore water" concentration is determined from:
 - i) measured "pore water" concentrations or perched water quality
 - ii) soil leaching tests
 - iii) theoretical calculations based on soil/water partitioning equations
- **Level 2** considers dilution by the receiving groundwater or surface water body and whether this is sufficient to reduce contaminant concentrations to acceptable levels. The remedial target is defined as the target concentration multiplied by a dilution factor (DF).
- **Levels 3 and 4** consider whether natural attenuation (including dispersion, retardation and degradation) of the contaminant as it moves through the unsaturated and saturated zones to the receptor are sufficient to reduce contaminant concentrations to acceptable levels. The remedial target is defined as target concentration multiplied by a dilution factor (DF) and attenuation factor (AF). In **Level 3** simple analytical models are used to calculate the significance of attenuation. The Environment Agency has released a "Remedial targets worksheet v3.1" to carry out basic calculations using a conservative approach up to **Level 3** using basic principles assuming a simple migration of contaminants from the

source zone into the aquifer receptor. **Level 4** assessment uses more sophisticated numerical models, and allows for the introduction of additional geological horizons and is used mainly to determine whether soil contaminants will reach their target within a specified timeframe. Use of such software should only be used once agreement has been obtained from the Environment Agency.

Three main stages apply to any risk assessment of controlled waters, these are:

- 1. Risk Screening (Tier 1 Preliminary Risk Assessment):** The understanding of the Conceptual Site Model (CSM) is the key to assessing any site. Using a robust CSM, potential pathways or receptors may be screened out from any further assessment at an early stage. For example if the pathway through the unsaturated zone is blocked by the presence of a significant thickness of low permeability clay. A greater understanding of the CSM is achieved with each tier of risk assessment. An example of a basic CSM is given below (taken from the Environment Agency GP3 draft consultation document, 2006):



- 2. Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Level 1):** When undertaking the Generic Hydrogeological Risk Assessment (EA Remedial Targets Methodology Tier 1), comparison of chemical analytical results is made with screening criteria. Published values of screening criteria with which chemical test results can be compared are published in the following guidance:

- Water Supply (Water Quality) Regulations 2000
- The Private Water Supplies Regulations 1991
- Environmental Quality Standards for surface waters based on The EC Dangerous Substances Directive (76/464/EEC and Daughter Directives)
- The Surface Waters (Abstraction for Drinking Water Classification) Regulations 1996
- World Health Organisation Drinking Water Standards 2004

Should the Level 1 assessment indicate threshold levels to be exceeded, then there are three alternative ways in which to proceed:

- To devise suitable remedial solutions
- To carry out more investigation, sampling and analysis
- To conduct a site specific Detailed Quantitative Risk Assessment (DQRA) to determine if the materials are suitable for their proposed use, or devise site specific clean-up level

- 3. Detailed Quantitative Risk Assessment (EA Remedial Targets Methodology Levels 2 to 4):** The decision to carry out a DQRA will be dependant on the extent and implications of the initial qualitative and generic assessment. The scope of any such assessment will be accurately defined by the outcomes of the previous levels of assessment. The conceptual model will be sufficiently refined by this stage that only certain contaminants of concern, certain pathways and certain receptors will require further assessment, the remainder having been screened out.

Additional site specific data is normally required for this stage of assessment, as explained above, more processes that are capable of affecting contaminant concentrations are considered (such as dilution and attenuation).

Remediation criteria, if derived, will therefore be specific to each site and will be based on a detailed assessment of the potential impact at the identified receptor or *compliance point*. A greater level of confidence can be placed on the predicted impact on the compliance point following a DQRA.

BACKGROUND INFORMATION, CURRENT GUIDANCE AND RISK ASSESSMENT METHODOLOGY FOR RISKS POSED BY GROUND GAS

Background

Origin of Ground and Landfill Gases

When carrying out a ground gas risk assessment, the origin or source of the gases is important as potential risks will vary depending on the source. This Appendix relates to the risk of the two main ground gases of concern; methane and carbon dioxide, and does not apply to other ground gases (e.g. radon or vapours from hydrocarbon spills). Methane and carbon dioxide are major constituents of landfill gas but can also occur from a variety of anthropogenic and natural sources, as summarised in Table 5 below:

Gas	Source	Comments
Landfill Gas	Anaerobic decomposition of degradable waste within landfill sites. Typically 60% methane and 40% carbon dioxide during methanogenic phase.	Composition varies over time, particularly in early stages. Contains a range of minor constituents (particularly carbon monoxide and hydrogen sulphide).
Landfill Associated Gases	- Anaerobic degradation of leachate external to the site; - Degassing of dissolved gases in groundwater; - Evolution of gases following interaction between leachate and groundwater	Can result in secondary (external) production of methane or carbon dioxide.
Made Ground	Anaerobic degradation of organic components	Very variable depending on source
Sewer Gas, Cess Pits	Anaerobic degradation of organic components of sewage producing methane and carbon dioxide.	Often characterised by hydrogen sulphide odour.
Mains Gas	Leakage from underground pipework or storage tanks. Mainly methane but often contains higher alkanes.	An odouriser is added to permit detection of leaks. Typically 90% CH ₄ , but 1 to 27% C ₂ -C ₄ alkanes, May also contain other trace gases e.g. CO, helium and CO ₂ (from degradation of CH ₄ in the ground).
Other Anthropogenic Sources	- Degradation of leaked or spilled hydrocarbons or other industrial chemicals; - Anaerobic degradation of organic contaminants in groundwaters (e.g. silage liquor); - Reactions between monitoring well construction components and environment; - Burial grounds/cemeteries.	Hydrocarbon spillages often have an 'oily' odour. Fuel spillages common – Petrol or Diesel and can contain a wide range of VOC's. Can degrade to produce methane / carbon dioxide.
Alluvium / Marsh / Peat Gas	Anaerobic microbial degradation of organic material (usually waterlogged vegetation / peat). Often associated with the presence of alluvial deposits or dredgings.	
Geogenic Gas	Natural seepages of carbon dioxide and hydrocarbon gases derived from geologic sources such as coal seams and deep oil / gas source formations. Can be present in solution in groundwaters.	Methane most common but can contain carbon dioxide and higher alkanes.
Mine Gases	Various types. Most common is "fire damp" with high methane, produced by the desorption of gas trapped in coal. "Black damp" (Stythe gas) with high carbon dioxide and denser than air. "White damp" is high in carbon monoxide.	Methane most common. Can contain higher alkanes, carbon dioxide and carbon monoxide. Often low in oxygen.
Natural Shallow Ground Gas	Various types - high carbon dioxide formed by subsurface aerobic activity leading to depleted oxygen and elevated carbon dioxide; - chemical degradation of rocks (e.g. carbonates) producing carbon dioxide; - carbon dioxide production in root zone of soils by plants.	Gases can be emitted from ground under falling barometric pressure conditions.

Table 5. Potential Sources of Ground Gases

This Appendix does not provide guidance for the assessment of risk when other gases are present due to 'Other Sources' from the above table (particularly organic compounds such as BTEX and VOC's or for the risk from radon or hydrogen sulphide).

To determine the origin of the gas a range of factors must be considered together, including;

1. Proximity of likely sources
2. Ground conditions (geology, hydrogeology, anthropogenic pathways etc)
3. Properties of gases present including:
 - Chemical composition
 - Physical properties
 - Ratios of components e.g. methane : carbon dioxide
4. Timeframe of activities such as infilling periods, capping works, installation of gas control systems etc

Identification of the originating source may be problematic given that there may be more than one source present and trace gas analysis may be required. Identification of the sources of the gases encountered during monitoring is usually carried out through a process of eliminating the most unlikely potential sources (given the site setting) and selecting those which are most likely.

Hazards Associated with Presence of Methane

Methane gas is combustible and potentially explosive. When the concentration of methane in air is between the limits of 5.0%v/v and 15.0%v/v an explosive mixture is formed. The Lower Explosive Limit (LEL) of methane is 5.0%v/v, which is equivalent to 100% LEL. The 15.0%v/v limit is known as the Upper Explosive Limit (UEL), but concentrations above this level cannot be assumed to represent safe concentrations. Further, the LEL and UEL will vary (up and down) depending upon the proportion of other gases (including oxygen). However, the fact that methane is a colourless, odourless gas means that there

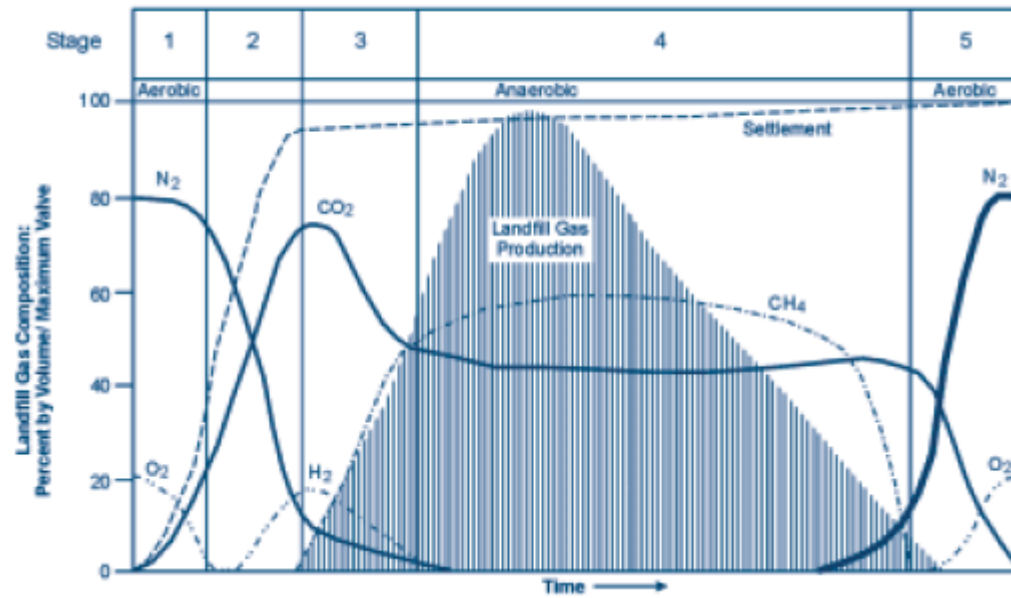
is no simple indicator of the presence of the gas until such a time as explosive limits are reached and an incident occurs. Methane is lighter than air and has a low toxicity. However, at high concentrations it can result in asphyxiation due to oxygen displacement.

Hazards Associated with Presence of Carbon Dioxide

Carbon dioxide is a colourless, odourless gas, which, although non-flammable, is both toxic and an asphyxiant. As carbon dioxide is denser than air, it will collect in low points and depressions. The UK Health & Safety Executive (HSE) has published information relating to concentrations of carbon dioxide that humans may be exposed to, which uses concentrations contained in the Control of Substances Hazardous to Health Regulations 2002 (as amended). These are the Long Term Occupational Exposure Limit (LTOEL, 8 hour period) and the Short Term Occupational Exposure Limit (STOEL, 15 minute period), which are 0.5% and 1.5% carbon dioxide, respectively.

Parameters Influencing the Rate of Ground Gas Production

The figure below is taken from EA guidance document LFTGN 03 illustrates typical ground gas generation curves from biodegradable materials:



The production of methane and carbon dioxide at a landfill site may be expected to be considerable and ongoing. Concentrations of methane will eventually decrease, followed by concentrations of carbon dioxide, but the duration and rate of gas production can vary markedly between sites. Five distinct phases of gas production occur during the process which are, in order of event as marked above, as follows:

1. An aerobic phase involving oxygen depletion and temperature increase through aerobic respiration;
2. The establishment of anaerobic conditions and the evolution of carbon dioxide and hydrogen through acidogenic activity;
3. Commencement of methanogenic activity; the establishment of populations of methanogenic bacteria;
4. A phase of stable methanogenic activity, which may go on for many tens of years;
5. A phase of decreasing methanogenic activity, representing depletion of the organic material and a return to aerobic conditions.

The time scale for the return to the normal ground gas concentrations will be highly variable, depending upon the types and quantities of materials present. In addition, the optimum parameters influencing the rate of decomposition and ground gas production within the ground at a site are as follows:

- High water content with adequate rainfall and water infiltration to provide moisture content between approximately 20 to 26%;
- Conditions that either are or are very close to anaerobic;
- High proportion of biodegradable materials;
- A pH between 6.5 and 8.5, ideally verging slightly on the acidic between pH 6 to 7;
- Temperature between 25°C and 55°C;
- The ratio of the biochemical and chemical oxygen demands (BOD:COD);
- High permeability;
- Small particle size, as finer subsurface materials possess a greater surface area to provide a growing 'face' for the micro-organisms but high fines levels reduces permeability and reduces decomposition rate.

For this reason, it is vital that sources of methane and carbon dioxide are identified prior to the commencement of any work on a construction site, and that the ground gas regime is characterised at the worst temporal conditions a site may experience. From this, a risk assessment is carried out to identify the risk at the site from ground gases so that suitable protection measures can be designed and incorporated into a development to prevent a dangerous build-up of gas occurring.

Factors Influencing the Migration and Behaviour of Ground Gases

There are many factors that influence the migration of ground gases which can effect the risk from a gassing source:

- driving force – pressure differential along a pathway, diffusion and dissolved in solution;
- meteorological conditions – short term and seasonal conditions including atmospheric pressure changes (e.g. rapidly falling pressure causes gas to expand increasing emission rates), rainfall, frozen ground and thawing, temperature;
- geological and groundwater conditions – these can have the over riding influence on the direction/pathways and quantity of migrating gas;
- anthropogenic influences – man-made pathways include mine shafts, service runs/drains, foundation piles, underground voids/pits/basements, foundation/building design/construction

Current Guidance

Previous versions of Building Regulations Approved Document C provided statutory guidance stating that consideration should be given to appropriate action and / or specific solutions in situations where methane concentration exceeded 1%v/v or carbon dioxide concentrations exceeded 5%v/v. The latest Building Regulations Approved Document C (DoE 2004) no longer endorses this approach and recommends the use of a risk based approach to interpreting a gas monitoring survey. This is in line with current EA guidance for landfill gas (LFTGN 03, 2004) which recommends the use of a structured risk based approach similar to that outlined in CLR 11. On this basis, recent guidance has been produced in 2006 and 2007 with the aim of providing up to date advice in relation to residential and commercial development. The guidance does not address issues associated with gas derived from landfills, for this refer to "*Guidance on the Management of Landfill Gas*" (Environment Agency 2004) for an overview.

Recent guidance relevant to gas assessments for residential and commercial development includes;

- **Wilson et al. (CIRIA C665, December 2007) "Assessing Risks Posed by Hazardous Ground Gases for Buildings."**
This document provides up to date advice on all aspects of ground gas risk assessment such as investigation, monitoring programmes, data collection and interpretation. The guidance presents separate methodologies for the characterisation of:
 - All development types except low rise housing with gardens (Situation A)
 - Low rise housing with gardens (Situation B)
- **Boyle and Witherington (NHBC / RSK Group, Report 10627-R01(04) January 2007) "Guidance on the Evaluation of Development Proposals on Sites where Methane and Carbon Dioxide are Present."**
This document presents the "Traffic Lights System" detailed below and is relevant only for low rise properties (e.g. bungalows and town houses) that have a ventilated sub-floor void (i.e. Situation B as described in CIRIA C665).
- **British Standard (BS 8485 2015 +A1 2019) "Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings"**
This document provides an overview of gas characterisation and assessment. The Standard is intended to be used by designers of gas protection measures and regulators involved in the assessment of design solutions.

Further guidance, **Wilson and Card (CIEH) "Ground Gas Handbook for Designers and Regulators"** providing practical guidance on ground gas assessments and the design and evaluation of protection measures, is expected to be published in March 2009.

Each of these documents continues to highlight the importance of, and give further guidance towards, carrying out a tiered risk-based decision-making process in accord with government policy on dealing with contamination from historic or natural sources and highlight the importance of the Conceptual Model in site characterisation.

Ground Gas Risk Assessment Methodology

Assessment of risk posed by ground gas is undertaken using the methodology as outlined previously, and summarised hereunder:

- Tier 1 Preliminary Risk Assessment
- Tier 2 Generic Quantitative Risk Assessment
- Tier 3 Detailed Quantitative Risk Assessment

The methodology used in each of the above assessments with concern to ground gas is discussed hereunder.

Tier 1 Preliminary Risk Assessment

All potential sources of methane and carbon dioxide are identified in the Preliminary Conceptual Model and the generation potential determined. The background information discussed earlier is referred to in order to determine the potential for a source to generate ground gas.

CIRIA C665 provides idealised monitoring frequency / period dependant upon generation potential of gas source and sensitivity of the proposed land use as below:

Idealised Frequency and Period of Monitoring (after Table 5.5a and 5.5b, CIRIA C665)

		Generation Potential of Source				
		Very Low	Low	Moderate	High	Very High
Sensitivity of Development	Low (Commercial)	4/1	6/2	6/3	12/6	12/12
	Moderate (Flats)	6/2	6/3	9/6	12/12	24/24
	High (Residential with Gardens)	6/3	9/6	12/6	24/12	24/24

Notes

1. First number is the number of readings and the second is the minimum period in months (e.g. 6/2 – six sets of readings over two months).
2. At least two sets of readings must be at low (preferably under 1,000 mb) and falling pressure.

The monitoring programme is decided using the above table prior to the intrusive site investigation. However, if the intrusive investigation reveals that a the potential source is better or worse than anticipated the monitoring programme should be modified accordingly. For example, if the made ground contains no evidence of organic material and comprises entirely granular brick fill, the potential for that made ground to generate ground gas is reduced considerably.

Tier 2 Generic Quantitative Risk Assessment

Generic Quantitative Risk Assessment is undertaken upon completion of the required gas monitoring period.

All three current guidance documents propose that both ground gas concentrations and flow rates are used to calculate the limiting gas well gas volume flow rates for methane and carbon dioxide, based on the ground gas conditions monitored for during the worse-case temporal conditions. This limiting gas well volume flow rate is termed the Gas Screening Value (GSV, note that this was termed borehole gas volume flow), and is calculated as follows:

$$\text{GSV (l/hr)} = \frac{[\text{gas well gas concentration (\%v/v)}] \times [\text{gas well flow rate (l/hr)}]}{100}$$

GSV's are compared to typical max concentrations and limiting gas screening values derived for either Situation A - All development except low rise housing with gardens, or Situation B low rise housing with gardens (NHBC Traffic Light System). Table 8.5 from CIRIA C665 is used for comparison of gas screening values for "Situation A Developments" and is presented hereunder:

Characteristic Situation (CIRIA R149)	Comparable Partners in Technology gas Regime (see Box 8.2)	Risk Classification	Gas Screening Value (CH ₄ or CO ₂) (l/hr) ¹	Additional Factors	Typical Source of Generation
1	A	Very low risk	<0.07	Typically methane ≤ 1% and/or carbon dioxide ≤ 5%. Otherwise consider increase to Situation 2	Natural soils with low organic content "Typical" made ground
2	B	Low risk	<0.7	Borehole air flow rate not to exceed 70l/hr. Otherwise consider increase to characteristic Situation 3	Natural soil, high peat/organic content. "Typical" made ground
3	C	Moderate risk	<3.5		Old landfill, inert waste, mineworking flooded
4	D	Moderate to high risk	<15	Quantitative risk assessment required to evaluate scope of protective measures.	Mineworking susceptible to flooding, completed landfill (WMP 26B criteria)
5	E	High risk	<70		Mineworking unflooded inactive with shallow workings near surface
6	F	Very high risk	>70		Recent landfill site

Table 8.5 from CIRIA C665 Modified Wilson and Card Classification

Table 8.7 is used for comparison of gas screening values for "Situation B Developments" and is presented herunder:

Traffic Light	Methane ¹		Carbon Dioxide ²	
	Typical max concentration ³ (% by volume)	Gas screening value ^{2,4} (litres/hour)	Typical max concentration ³ (% by volume)	Gas screening value ^{2,4} (litres/hour)
Green				
Amber 1	1	0.13	5	0.78
Amber 2	5	0.63	10	1.60
Red	20	1.60	30	3.10

Notes:

1. The worst-case ground gas regime identified on the site, either methane or carbon dioxide, at the worst-case temporal conditions that the site may be expected to encounter will be the decoder as to what Traffic Light is allocated;
2. Borehole Gas Volume Flow Rate, in litres per hour as defined in Wilson and Card (1999), is the borehole flow rate multiplied by the concentration in the air stream of the particular gas being considered;
3. The Typical Maximum Concentration can be exceeded in certain circumstances should the Conceptual Site Model indicate it is safe to do so;
4. The Gas Screening Value thresholds should not generally be exceeded without the completion of a detailed ground gas risk assessment taking into account site-specific conditions.

Table 8.7 from CIRIA C665 - NHBC Traffic light system for 150 mm void

Dependant on the outcome of the assessment of risk posed by ground gas it is determined whether gas protection measures are required for the proposed development, and or whether a detailed quantitative risk assessment is required for the site.

Selection & Design of Protective Measures

Table 8.6 and Box 8.4 of CIRIA C665 contain information on the detailed design of protection measures and were initially intended for the purposes of determining then level of protection measures a development requires. These tables and related text include some useful information on the design of gas protection measures, however BS8485:2007, which supersedes the guidance included within CIRIA C665, is used for selection of gas protection measures.

BS8485:2015 +A1 2019 uses a scoring system dependant on the Characteristic Situation / NHBC Traffic Light and proposed end use of the site. The scoring system is summarised in BS8485:2015 + A1 2019 Table 2 as presented hereunder:

Characteristic gas situation, CS	NHBC traffic light	Required gas protection			
		Non-managed property e.g. private housing	Public building (a)	Commercial buildings	Industrial buildings (b)
1	Green	0	0	0	0
2	Amber 1	3	3	2	1 (c)
3	Amber 2	4	3	2	2
4	Red	6 (d)	5(d)	4	3
5			6(e)	5	4
6				7	6

NOTE Traffic light indications are taken from NHBC Report no.:10627-RO1 (04) and are mainly applicable to low-rise residential housing¹. These are for comparative purposes but the boundaries between the traffic light indications and CS values do not coincide.

a) Public buildings include, for example, managed apartments, schools and hospitals.

b) Industrial buildings are generally open and well ventilated. However, areas such as office pods might require a separate assessment and may be classified as commercial buildings and require a different scope of gas protection to the main building.

c) Maximum methane concentration 20% otherwise consider and increase to CS3.

d) Residential building on higher traffic light/CS sites is not recommended unless the type of construction or site circumstances allow additional levels of protection to be incorporated, e.g. high-performance ventilation or pathway intervention measures, and an associated sustainable system of management of maintenance of the gas control system, e.g. in institutional and/or fully serviced contractual situations.

e) Consideration of issues such as ease of evacuation and how false alarms will be handled are needed when completing the design specification of any gas protection scheme

¹ The NHBC guidance and CIRIA C665 guidance refers to low rise housing (which is up to three storeys without lifts) that is constructed with a 150mm ventilated sub-floor void.

BS8485:2015 A1 +2019 Table 2 Required gas protection by characteristic gas situation and type of building

Once a score is assigned, a combination of protection systems / elements is chosen from BS8485:2015 +A1 2019 Table 3 shown below:

PROTECTION ELEMENT /SYSTEM		SCORE	COMMENTS
a) Venting/dilution (See Annex A BS8485)			
Passive sub floor ventilation (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.) ^A	Very good performance	2.5	Ventilation performance in accordance with Annex A (BS8485) If passive ventilation is poor this is generally unacceptable and some form of active system will be required. There have to be robust management systems in place to ensure the continued maintenance of any ventilation system. Active ventilation can always be designed to meet good performance. Mechanically assisted systems come in two forms: extraction and positive pressurization.
	Good performance	1	
Subfloor ventilation with active abstraction/pressurization (venting layer can be a clear void or formed using gravel, geocomposites, polystyrene void formers, etc.) ^A		2.5	
Ventilated car park (basement or undercroft)		4	
b) Barriers			
Floor slabs			
Block and beam floor slab		0	It is good practice to install ventilation in all foundation systems to effect pressure relief as a minimum. Breaches in floor slabs such as joints have to be effectively sealed against gas ingress in order to maintain these performances.
Reinforced concrete ground bearing slab		0.5	
Reinforced concrete ground bearing foundation raft with limited service penetrations that are cast into slab		1.5	
Reinforced concrete cast in situ suspended floor slab with minimal service penetrations and water bars around all slab penetrations and at joints		1.5	
Fully tanked basement		2	
c) Membranes			
Taped and sealed membrane to reasonable levels of workmanship/in line with current good practice with validation ^{B,C}		0.5	The performance of membranes is heavily dependent on the quality of design of the installation, resistance to damage after installation, and the integrity of joints.
Proprietary gas resistant membrane to reasonable levels of workmanship /in line with good practice under independent inspection (CQA) ^{B,C}		1	
Proprietary gas resistant membrane installed to reasonable levels of workmanship/in line with current good practice under CQA with integrity testing and independent validation		2	
d) Monitoring and detection (not applicable to non-managed property, or in isolation)			
Intermittent monitoring using hand held equipment		0.5	Where fitted, permanent monitoring systems ought to be installed in the underfloor venting/dilution system in the first instance but can also be provided within the occupied space as a fail safe.
Permanent monitoring and alarm system ^A	Installed in the underfloor venting/dilution system	2	
	Installed in the building	1	
e) Pathway Intervention			
Pathway intervention		-	This can consist of site protection measures for off-site or on-site sources (see Annex A, BS8485)
NOTE In practice the choice of materials might well rely on factors such as construction method and the risk of damage after installation. It is important to ensure that the chosen combination gives an appropriate level of protection			
A) It is possible to test ventilation systems by installing monitoring probes for post installation validation.			
B) If a 1 200g DPM material is to function as a gas barrier it should be installed according to BRE 212 /BRE 414 being taped and sealed to all penetrations			
C) Polymeric Materials> 1200 g (proportional to thickness) but their physical properties mean that they are more robust and resistant to damage.			

BS8485:2015 + A1 2019 Table 3 Solution Scores

Where the gas situation is 4 or more (and for NHBC Red situations) the site requires a comprehensive risk assessment to confirm the scope of protection measures. These are higher risk sites and reliance on Table 2 and 3 alone is not sufficient.

For a site which is impacted by migratory gases from an off site source, the development may be protected by imposing pathway intervention methods, which if successfully validated, could also remove the need for further analysis. It is essential that the gas regime in these circumstances has been fully characterised and that the only source impacting the site is located off site and that the pathway is clearly defined and its interception equally proven before construction commences. Pathway intervention methods may include vertical membrane installations, venting trenches, rows of stone columns, activated trenches and various proprietary systems. These systems are particularly relevant to domestic housing where there is limited scope for foundation type solutions.

CURRENT GUIDANCE ON REMEDIATION

When risk assessment of the site has been completed and it indicates that remedial works are required, the main guidance in managing this process is set out in the DEFRA/EA publication LCRM (2020)) "*Model Procedures for the Management of Land Contamination.*" The stages of managing remediation are as follows:

- (a) Options Appraisal and develop Remediation Strategy;
- (b) Develop Implementation Plan and Verification Plan;
- (c) Remediation, Verification and Monitoring.

The Remediation Strategy sets out the remediation targets, identifies technically feasible remedial solutions and presents an evaluation of the options so that these can be assessed enabling that the most suitable solution is adopted. An outline of the proposed remedial method should be presented. Agreement should be sought of the appropriate statutory bodies for the Remediation Strategy before proceeding to the next stage.

The Implementation Plan is a detailed method statement setting out how the remediation is to be carried out including stating how the site will be managed, welfare procedures, health and safety considerations together with practical measures such as details of temporary works, programme of works, waste management licences and regulatory consents required. Agreement should again be sought of the appropriate statutory bodies for this Plan.

The Verification Plan sets out the requirements for gathering data to demonstrate that the remediation has met the required remediation objectives and criteria. The Verification Plan presents the requirements for a wide range of issues including the level of supervision, sampling and testing regimes for treated materials, waste and imported materials, required monitoring works during and post remediation, how compliance with all licenses and consents will be checked etc. Agreement should again be sought of the appropriate statutory bodies for the Verification Plan. On completion of the remediation a Verification Report should be produced to provide a complete record of all remediation activities on site and the data collected as required in the Verification Plan. The Verification Report should demonstrate that the remediation has met the remedial targets to show that the site is suitable for the proposed use.

APPENDIX J: NOTES ON LIMITATIONS

Standard Terms and Conditions of Engagement

Notes on Limitations For Geoenvironmental and Geotechnical Consultancy Services

General

CC GEOTECHNICAL LTD has prepared this report solely for the use of the Client and those parties with whom a warranty agreement has been executed, or with whom an assignment has been agreed. Should any third party wish to use or rely upon the contents of the report, written approval must be sought from CC GEOTECHNICAL LTD and a charge may be levied against such approval.

CC GEOTECHNICAL LTD accepts no responsibility or liability for:

the consequences of this document being used for any purpose or project other than for which it was commissioned and/or

the consequences of use of this document by any party with whom an agreement has not been executed.

Phase I Environmental Audits / Desk Studies

The work undertaken to provide the basis of a Phase 1 Desk Study report comprises a study of available documented information from a variety of sources (including the client), together with (where appropriate) a walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in a Desk Study report have been dictated by finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in the report, CC GEOTECHNICAL LTD reserves the right to review such information and to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out with the intention of providing sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated to potential human targets, building materials, the environment (including adjacent land), and surface and groundwater.

The amount of exploratory work and chemical testing undertaken may have been restricted by the timescale available, and the locations of the exploratory holes may have been restricted to areas unoccupied by the building(s) on the site, and further restricted by the existence of buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues may need to be resolved.

For those reasons, if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised "hotspots" of contamination where concentrations may be significantly higher than those actually encountered.

Geoenvironmental Ground Investigations

The investigation of the site has been carried out to provide sufficient information within the agreed scope of the investigation, under the general headings of type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions, to provide a reasonable assessment of the environmental risks together with engineering and development implications.

If costs have been included in relation to the site remediation, these must be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of the site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions present on the site which have not been disclosed by this investigation, and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal, weather, or other effects.

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.