BELGRAVE ROAD
OLDHAM

FINAL
PHASE 2 GEO-ENVIRONMENTAL INVESTIGATION, RISK ASSESSMENT AND REMEDIATION STRATEGY

Job Number: LKC 20 1964
Date: March 2024
Client: First Choice Homes Oldham

INCREASING LAND VALUE

LK GROUP

LK Consult Document Verification			
Site Address	Land at Belgrave Road, Oldham, OL8 2JT		
Report Title	Final Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy		
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R1	01/02/24	Client update	PD

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EXECUTIVE SUMMARY

Site Details

Site Location:	Land to the northeast of Belgrave Road, bounded by Thatcher Street to the southeast and Honeywell Lane to the north west, Oldham, Greater Manchester. Centred at approximate National Grid Reference 393280E 403610N.
Site Area:	4,400m^2.
Current Land Use:	Overgrown vegetated land with a number of derelict domestic garages.
Proposed Development:	Residential housing with gardens / soft landscaping.
Purpose of Report:	Contamination and Geotechnical Assessment.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in July 2021. Ref: LKC 20 1964
History:	Land undeveloped 1894-1954. Domestic garages covering most of site from 1966. Excavation works in the S 1932-1938.
Geology / Hydrogeology:	Diamicton Till (Secondary Undifferentiated Aquifer) over Pennine middle coal measures (Secondary A Aquifer).
Mining:	Site within a coal reporting area/developmental high-risk area.
Relevant Environmental Setting:	No pollution incidents within 500m Nearest surface abstraction 403m SW. Not within Source Protection Zone.
Preliminary Conceptual Model: PL=Pollutant Linkage	PL1 Direct Contact (Human Health): Moderate Risk (metals, PAHs), Low Risk (Petroleum Hydrocarbons). PL2 Inhalation of Vapours: Moderate Risk (volatile contaminants). PL3 Gas: High Risk (hazardous and ground gas). PL4 Controlled waters: Moderate Risk (mobile contaminants). PL5 Sulphate Attack: Low Risk (sulphate). PL6 Water Pipelines: Moderate Risk (organic contaminants). PL7 Phytotoxic: Low Risk (metals).
Recommendations:	Site Investigation was recommended to further assess all the above pollutant linkages

Ground Investigation Work Undertaken

Date of Investigation:	16th September 2021.
Intrusive Investigation Work Undertaken:	5no. window sample boreholes (WS101-WS105).
Monitoring Wells:	Installed in all boreholes.
Soil Sampling:	1no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. 5no. samples tested for metals, speciated PAHs, cyanide, pH, sulphate, asbestos, phenol, TPHCWG, BTEX, VOCs, SVOCs, PCBs and SOM. 2no. samples tested for TPHCWG, BTEX, MTBE and SOM. 2no. samples tested for pH and sulphate.
Monitoring:	6no. gas monitoring visits over 3 months.
Insitu and Laboratory Geotechnical Testing:	SPTs, shear vanes, plasticity.

Ground Conditions and Geotechnical Assessment

Location	General Ground conditions	Allowable Bearing Pressure	Anticipated Foundation Type	Other Considerations
Whole Site	Made Ground to approx. 0.7mbgl. Soft to firm consistency gravelly sandy CLAY to >2.0mbgl Stiff to very stiff consistency gravelly sandy CLAY to >5.45mbgl Groundwater at 0.62-3.0mbgl	152kN/m^2 at 1.0mbgl within the firm CLAY and increasing to 350kN/m^2 at 2.0mbgl within the very stiff CLAY, for a pad foundation. 77 kN/m^2 for a standard strip foundation.	Pad and strip foundations.	Consideration of effects of trees also needs to be considered. Temporary supports of excavations may be required. Detailed design should be carried out by structural engineer. Concrete Requirements DS1-AC-1s A design CBR of 15% is recommended for the Made ground.

Contamination Risk Assessment

The table below shows a summary of the risk assessments undertaken for each pollutant linkage, the revised conceptual model and recommendation for either remediation and / or further investigation.

	Pollutant Linkage	Risk	Recommendations
1	Contaminants posing a risk to site users, future residents and office site receptors via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	**Low**	No remediation required.
2	Volatile contaminants posing a risk to site users and future residents via the inhalation of vapours.	**Low**	No remediation required.
3	Gas posing a risk to buildings and site users, future residents, buildings and offsite land users via the migration of gas into building causing explosion and asphyxiation.	**High**	Gas protection measures in line with CS2.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	**Low**	No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	**Very Low**	Concrete classification DS-1 AC-1.
6	Organic contaminants posing a risk to water pipes.	**Moderate** (north)	UU risk assessment to be completed. The north of the site will likely require barrier piping.
		Low (remainder of site)	UU risk assessment to be completed. The remainder of the site will likely not require barrier pipe.
7	Phytotoxic metals posing a risk to flora via root uptake.	**Very Low**	No remediation required.

Recommendations and Remedial Strategy

The table below shows the remediation and validation requirements for the site. This information should be documented in a Site Completion Report for submission to the local authority.

Phase	PL	Remediation Requirements	Validation Requirements
Pre-Construction	**ALL**	Earthworks Inspections / Unexpected Contamination The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733[1].	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
	3	Gas Protection Measures In line with CS2 as per UK guidance[2,3]. This is likely to / should include: • Passive subfloor or active subfloor ventilation system. • Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions. • Minimum penetration of ground slab by services. • All joints and penetrations to be sealed. Depending on the type of building and foundation design the protection measures can vary. The gas protection measures will be detailed and approved with the Local Authority once the foundation design has been confirmed. LKC advise that final foundation details should be provided to the Local Authority for review.	Supply and review of foundation designs. Photographic evidence of sub-floor void, ventilation and suitably sealed gas membrane. Validation of gas protection measures should be in line with CIRIA 735[4]
	6	Potable Water Pipes It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is likely that barrier pipe will be required in the north of the site.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.
	1, 2, 4, 5, 7	No remediation anticipated with respect to PL1 (direct contact), PL2 (inhalation of vapours), PL4 (controlled waters), PL5 (sulphate) and PL7 (phytotoxicity); however, this needs to be confirmed once additional work has been completed.	TBC (dependant on findings of additional work).
Other Considerations		Further site work to be undertaken 3no. window sample borehole to be undertaken in the eastern side of site, once vegetation has been cleared.	
		Grubbing Out of In-Ground Structures It is recommended that in-ground structures are grubbed out as part of the groundworks. In-ground structures expected in west of the site associated with the garages in the south of the site.	

[1] CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.
[2] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665
[3] BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for new buildings." BS8485:2015.
[4] CIRIA (2014). "Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas". CIRIA C735.

	Re-use of site won material To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used [5]): 5,000 tonnes (*c.* 2,500m^3) treatment of crushed concrete / stone. 1,000 tonnes (*c.* 500^3) use of non-hazardous soil 5,000 tonnes (*c.* 2,500m^3) use of clays, sand, gravel, brick, concrete, stone etc. 50,000 tonnes (*c.* 25,000m^3) use of bituminous material to be used in roadways. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. This must be registered **before** material movement starts onsite. If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2.
	Topsoil Growing Medium Although no contamination was identified in the soils on site, the existing made ground is not expected to be a suitable growing medium given the nature of the soil and the undesirable material present (ash, clinker, brick and glass). A topsoil cover of approximately 150mm is recommended in gardens and soft landscaping areas. This is to be confirmed once additional site work has been completed.
	Health and Safety Considerations In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance[6]) should be adopted by all workers involved with site enabling and construction works.
	Asbestos Survey A Pre-Demolition and Major Refurbishment Asbestos Survey should be undertaken, and any ACMs removed and properly disposed of, prior to the demolition of the existing garage buildings, by a suitably qualified professional.

The remediation recommended in the table above should be validated to ensure it has been carried out appropriately. This should be documented in a Completion/Validation Report and submitted to the local authority for completion.

[5] https://www.gov.uk/guidance/waste-exemptions-using-waste
[6] HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

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FIGURES

APPENDICES

1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by First Choice Homes Oldham to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy for Belgrave Road, Oldham. The investigation was undertaken in support of a future planning application to develop the site for residential use.

The following work has previously been undertaken:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: CL-602-LKC 20 1964-01, dated July 2021).

This investigation has been undertaken to confirm the ground conditions below the site and to allow a contamination and geotechnical assessment to be undertaken.

The investigation will aim to confirm the risks of the potential pollutant linkages identified in the PRA and recommend further assessment / remediation, as required.

The aims of this report are also to establish the feasibility of developing this site, to demonstrate to the Local Planning Authority that in accordance with the National Planning Policy Framework (NPPF)[7] the site may be developed for a residential end use and that appropriate site investigation and risk assessment works are in place to allow conditional approval of any future planning application.

1.2 Site Details

A summary of the site details is presented in Table 1-1. Figures 1 indicates the site location and boundary. Figure 2 indicates the proposed development.

Location	Land to the north east of Belgrave Road, bounded by Thatcher Street to the south east and Honeywell Lane to the north west, Oldham, Greater Manchester. Centred at approximate National Grid Reference 393280E 403610N.
Area	4,400m^2.
Topography	160 metres Above Ordnance Datum (AOD). Site is topographically level but locally uneven ground was noted.
Land Use	Site Overgrown vegetated land with a number of derelict domestic garages Surrounding Area Southwest: Residential Properties. Northwest: Allotments. Northeast: Trees and Bowling Green. Southeast: Hare Hill Park.
Proposed Development	Residential houses including private gardens and parking.

Table 1-1. Summary of site details.

[7] "National Planning Policy Framework." Ministry of Housing, Communities and Local Government. July 2021.

2 Previous Work

2.1 Summary of Existing Information

A PRA report (Ref: CL-602-LKC 20 1964-01, dated July 2021) has previously been undertaken by LKC and is summarised in Section 2.2-2.6.

The conceptual model (Section 2.6) has been updated to be in line with LKC current risk assessment methodology.

2.2 Site History

Table 2-1 summarises historical features on site.

Table 2-2 summarises potentially contaminative land uses within approximately 50m and potentially infilled features within approximate 250m.

Site Features	Location on Site	Dates Present		Comments
		From	To	
Undeveloped Land	Majority of site	1894	1954	Footpath crosses the centre of the site.
Unreferenced Buildings	SE	1894	2021	Likely to be residential or commercial buildings. Annotated as 'Thatcher Street'.
Excavation	S	1932	1938	Excavation mostly offsite slightly extends on to the south of the site. No longer present by 1952 mapping, potentially infilled.
Domestic Garages	Majority of site	1966	2021	Line of domestic garages run up the length of the south side of the site. A number of the garages appear to be demolished by 1989 mapping.

Table 2-1: Summary of site features. Dates based on available historical map editions.

Surrounding Area Features	Distance (m)	Direction	Dates Present		Comments
			From	To	
Excavation	Adj.	SW	1932	1938	No longer present by 1952 mapping, potentially infilled.
Railway Lines with cutting	5	N	1848	1967	Annotated as 'dismantled railway' by 1975 mapping. Cutting appears infilled by 1990 mapping.
Cutting	5	N	1848	1983	Associated with railway lines. Cutting appears infilled by 1990 mapping.
3no. Allotment Gardens	12	SE	1932	1959	No longer present by 1967 mapping.
	22	NW	1932	1959	No longer present by 1967 mapping.
	32	NE	1932	1983	No longer annotated by 1990 mapping.
Old Clay Pit	75	SW	1892	1932	No longer annotated by 1909 mapping but still visible. Potentially infilled by 1953 mapping.
4no. Ponds	85	E	1909	1911	No longer present by 1922 mapping.
	90	E	1909	1911	No longer present by 1922 mapping.
	107	E	1909	1911	No longer present by 1922 mapping.
	125	E	1909	1911	No longer present by 1922 mapping.
Reservoir	150	NE	1909	1909	Associated with Brooks Cotton Mill. Potentially infilled by 1932 mapping.

Table 2-2: Summary of potentially contaminative features within 50m and potentially infilled features with 250m. Dates are based on available historical map editions.

2.3 Environmental Setting

The environmental setting is summarised in Table 2-3.

Categories(data sources)			Details
Geology	Artificial		- No artificial ground mapped on site from BGS records. - Area of made ground mapped to the north east.
	Superficial		- Till (diamicton).
	Bedrock		- Pennine Middle Coal Measures (mudstone, siltstone and sandstone).
	BGS Logs (<50m)		- None.
Hydro-geology	Aquifer Designation	- Superficial	- Secondary Undifferentiated Aquifer.
		- Bedrock	- Secondary A Aquifer.
	Source Protection Zone (SPZ)		- Site not within an SPZ.
	Groundwater Abstractions (100m)		- None.
Hydrology	Surface Water Courses (100m)		- None.
	Flooding risk		- Flood Zone 1.
	Surface Water Abstractions (100m)		- None.
	Discharge Consents (100m)		- None.
	Pollution Incidents		- None within 500m.
Minerals & Mining	Coal Mining		- Within a Coal Reporting Area. - Within a Development High Risk Area. See Table 2-4.
	Surface Mineral Extractions (250m)		- 246m NE, Glodwick Brook Coal Pit, operation now ceased.
	Non-Coal Mining Area		- Not within an area of conclusive metalliferous mining.
Ground Stability	Collapsible Ground		- Very low hazard.
	Compressible Ground		- No hazard.
	Ground Dissolution		- No hazard.
	Landslide		- Very low hazard.
	Running Sand		- Very low hazard.
	Shrinking / Swelling Clay		- Very low hazard.
Landfill Sites (250m)	Known / Registered		- 2m NE – 'Deanshut Clough'. Deposited Waste included Inert, Industrial, Commercial, Household and Special Waste, and Liquid Sludge. Operational 1960-1982. - 4m NE – 'Fittern Hill Railway'. No information on waste type or operation dates. May be the same landfill as the entry above but duplicated records. - 87m S – 'Belgrave Mill'. No information on waste type or operation dates. - 230m SW - 'Belgrave Mill'. No information on waste type or operation dates.
	Potentially Infilled Land (non-water and water), based on Envirocheck Report		- 19no. features: 87m-246m distance.
	Potentially infilled sites, based on LKC historical review		- 8no. features: See Table 2-1.

Table 2-3: Summary of the environmental setting.

Categories(data sources)		Details
Radon Potential		- <1% of homes above Action Level. No protective measures are necessary in the construction of new dwellings or extensions.
Designated Sites (50m)		- Adopted Green Belt 2m NE.
Contemporary Trade Directory (50m)		- None.
Fuel Station Entries (50m)		- None.
Unexploded Ordnance Risk (UXO)	Zetica Risk Map	- Low.

Table 2-3 (continued): Summary of the environmental setting.

As the site is within a development high risk area. A separate Coal Mining Risk Assessment (CMRA) has been carried out under separate cover. The risks identified in the CMRA are summarised in Table 2-4.

Coal Mining Issue	Potential Risk
Underground coal mining (recorded at shallow depths)	**X**
Underground coal mining (probable at shallow depths)	✓
Mine entries (shafts / adits)	**?**
Coal mining geology (fissures)	**X**
Record of past mine gas emissions	**X**
Recorded coal mining surface hazard	**?**
Surface mining (opencast workings)	**X**

Table 2-4: Summary of coal mining potential risks.
✓ = Risk identified; X = No risk identified; ? = Possible risk identified

2.4 Site Reconnaissance

A site reconnaissance was carried out on 13 July 2021. Hand dug trial holes were undertaken in accessible areas to confirm the shallow ground conditions.

Relevant features identified on site are summarised below:

- Site is located adjacent northeast of the terraced houses off Belgrave Road.
- Currently the site is accessible via a lockable gate down the back alley of the current houses.
- The site mostly comprises thick, overgrown vegetation (mostly trees and shrubs).
- In the south-eastern end, there are 7no. derelict garages presents, and vehicles parked in sporadic areas where vegetation has been cleared.
- The garages seem to be in use currently, however access could not be gained during the site visit, so the contents are unknown.
- Possible Asbestos contain materials (ACM) in the form of rooftiles were noted on all the garages present on site, no scrap pieces noted elsewhere on site.
- Rough, uneven ground is present across the whole of site, most areas are inaccessible due to uneven footing and thick vegetation.
- A tarmac pathway (poor condition) is present along the southern boundary, currently in use as access to the adjacent houses.
- Fly tipping (trampolines, wood, furniture, plastic waste and clothing waste) observed across site, mostly along the southern edge.
- No spillages of leakages observed from the vehicles parked on site.
- Vehicles can access the edge of site but no entry is current possible due to vegetation.
- The surrounding area comprises residential housing with a grassed area of land adjacent north.

2.5 Contamination Sources / Pathways and Receptors

Potential contamination sources are detailed in Table 2-5.

Potential Source	Contaminants
On Site	
Shallow Made Ground below some or all of site.	- Assuming predominantly reworked natural soils with possible demolition rubble, ash and clinker: Asbestos, heavy metals, sulphates, PAHs[8]. - Not expected to be a significant source of gas given anticipated depth and nature of Made Ground.
Domestic garages	- Small scale leaks and spillages of fuels and oils.
Demolished buildings	- Asbestos Containing Material (ACM).
Surrounding Area	
Adjacent railway line[9]	- PAH fall out. - Herbicides (including atrazine and simazine).
Allotment gardens	- Unlikely to be significant contamination sources to the site.
Landfills / offsite potentially infilled features within 250m	- Given size, distance and age of features, there is considered to be a source of hazardous gas (principally carbon dioxide and methane).
Underlying Geology	
Underlying Pennine Middle Coal Measures	- Ground Gas (principally carbon dioxide and methane). - Trencherbone seam (expected at shallow depth below the site) has the potential to spontaneously combustion when being entered, worked or disturbed[10].

Table 2-5: Potential contamination sources

[8] Defra (2002). "Potential Contaminants for the Assessment of Land". R&D Publication CLR 8.
[9] Department of the Environment Industry Profile – Railway Land (1995).
[10] http://www.coal.gov.uk/services/permissions/coal_seams_spon_com.cfm?jHighlights=coal%20seams.

Potential receptors are detailed in Table 2-6.

Receptors	
Human Health	- Future site users (including residents, visitors and site workers). - Offsite land users.
Controlled Waters	- Secondary Undifferentiated and Secondary A Aquifers. - No surface water within influencing distance.
Buildings and structures.	
Potable water pipes.	
Flora within future gardens and landscaping.	

Table 2-6: Potential receptors

Potential pathways are detailed in Table 2-7.

Pathways		
Soil	Human Health[11] (residential land use: houses with private gardens)	- Ingestion of soil. - Ingestion of soil-derived indoor dust. - Ingestion of contaminated vegetables. - Ingestion of soil attached to vegetables. - Dermal contact with soil. - Dermal contact with soil-derived indoor dust. - Inhalation of soil-derived outdoor dust. - Inhalation of soil-derived indoor dust. - Inhalation of vapours outside. - Inhalation of vapours inside.
	- Windblown dust and fibres to adjacent receptors.	
	- Direct contact with receptors (building foundations, services).	
	- Root uptake.	
Water	- Site is relatively flat and grassed; therefore, surface run-off will be limited.	
	- Infiltration into the ground, through potentially contaminated material (contamination possibly going into solution).	
Water and Gas	- Migration through potentially permeable strata and preferential pathways. - Superficial (Till) likely to be low permeability. - Bedrock (mudstone, siltstone, sandstone) likely to variably permeable. - Preferential pathways: drains, services, possible shallow worked coal seams.	
Gas	- Migration into buildings (e.g. via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).	

Table 2-7: Potential pathways

2.6 LKC Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in LCRM[12] has been summarised in Table 2-8.

The aim of the conceptual model is to provide a preliminary assessment of the likelihood of a pollutant linkage for each potential combination of contaminant, pathway and receptor. A conceptual model can be used to make an informed decision on the contamination risks associated with the site and determine what site investigation work is required.

[11] EA (2008). "Updated Technical Background to the CLEA Model". Science Report – SC050021/SR3.
[12] Land Contamination Risk Management (LCRM) https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm

The preliminary contamination conceptual model has identified seven generic potential pollutant linkages. Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552[13].

In order to assess the potential risk for each pollutant linkage, an assessment of the magnitude of the potential consequence (severity) of the risk occurring and the magnitude of the probability (likelihood) of the risk occurring has been considered and classified. This is based on the guidance provided in CIRIA C552 and further details including a risk matrix is provided in Appendix A.

Where LKC identified a low to very low risk, limited intrusive investigation work, a watching brief (during construction work) or no investigation work will be recommended. This will be dependent on the nature of the site and the proposed development.

Where the risk falls into the moderate/low risk, LKC will undertake an assessment to establish what category the pollutant linkage will fall into (i.e. moderate or low risk will be chosen).

Where LKC identifies a moderate or higher risk, intrusive work or precautionary remedial measures will be recommended.

The conceptual model is based on the future use of the site (post development), in line with proposed development scheme.

It should be noted that there may be risk from short term exposure from contaminated soil to site workers during development work. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors associated with the future use of the site. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance[14]) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

2.7 Recommendations

Based upon the Preliminary Contamination Conceptual Model a site investigation was recommended to assess the potential pollutant linkages further.

[13] CIRIA (2001). “Contaminated land risk assessment: A guide to good practice”. C552.
[14] HSE (1991). “Protection of Workers and the General Public During Development of Contaminated Land” London HMSO.

PL	Pathway	Receptor	Contaminants of Concern (CoC)	Probability	Consequence	Risk	Recommendations
1	- Dermal contact. - Inhalation of soil, fibres and dust. - Ingestion of soils, dust, vegetables, soil attached to vegetables. - Windblown dust.	- Future site users. - Offsite receptors.	- ACM. - Heavy metals. - PAHs.	Likely (given site history, site conditions and proposed end use)	Medium	**Moderate**	Intrusive investigation required. Soil analysis of CoC.
			- Petroleum hydrocarbons.	Low Likelihood (given site history, site conditions and proposed end use)	Medium	**Moderate** / Low (moderate assumed until ground conditions confirmed)	Intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered.
2	- Inhalation of vapours. - Migration via permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	- Volatile contaminants (TPHCWG, SVOC, VOCs).	Low Likelihood (given site history, site conditions and proposed end use)	Medium	**Moderate / Low** (moderate assumed until ground conditions confirmed)	Intrusive investigation required, to include PID testing. Soil analysis of CoC, subject to ground conditions encountered and PID testing.
3	- Inhalation of gas. - Migration via permeable strata and preferential pathways. - Explosion in confined spaces. - Exposure to radon.	- Future site users. - Buildings. - Offsite land users.	- Ground / hazardous gas (carbon dioxide, methane).	Likely (given proximity to viable gas source)	Severe	**High**	Gas monitoring required.
			- Radon	Unlikely (as <1% of homes above action level)	Medium	**Low**	(<1%) No protective measures are necessary in the construction of new dwellings or extensions.
4	- Surface run-off. - Migration via permeable strata and preferential pathways. - Perched waters migration.	- Groundwater (Secondary A & Secondary Undifferentiated Aquifers).	- Mobile contaminants such as metals, PAHs, hydrocarbons, volatile compounds.	Low Likelihood (only minimal mobile contamination anticipated with limited pathway)	Medium	**Moderate** / Low (moderate assumed until ground conditions confirmed)	Intrusive investigation required. Groundwater sampling, subject to ground conditions encountered. Analysis of CoC.
5	- Sulphate attack on concrete.	- Building structure.	- Sulphate.	Likely (given site history, site conditions, geology and direct contact / pathway)	Mild	**Moderate /** Low (moderate assumed until ground conditions confirmed)	Intrusive investigation required. Soil analysis of CoC.
6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	- Organic contaminants such as petroleum hydrocarbons, naphthalene, volatile compounds.	Low Likelihood (although some contamination may be present, significant contamination not expected at pipeline depth)	Medium	**Moderate** / Low (moderate risk assumed until ground conditions confirmed)	Intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered.
7	- Direct contact (plant uptake).	- Flora.	- Phytotoxic contaminants such as heavy metals.	Likely (given site history, site conditions and proposed end use)	Minor	**Low**	Intrusive investigation required. Soil analysis of CoC.

Table 2-8. Preliminary Contamination Conceptual Model.

3 Ground Investigation

3.1 Site Investigation Design and Methodology

In order to assess the ground conditions at the site and to investigate the potential pollutant linkages identified in the preliminary contamination conceptual model an intrusive investigation was undertaken.

The investigation was carried out on 16th September 2021 and comprised the following:

- 5no. window sample boreholes drilled to 3.33-5.45 metres below ground level (mbgl) (ref. WS101 to WS105).

All site investigation locations are shown in Figure 3.

The locations were chosen to allow a good spread across the site.

Areas where garages are still present in the southeast of site could not be accessed. Thick vegetation is present along the north side of the site. Further investigation is required in these areas.

The number of site investigation points corresponds to approximately one location per 18m square centres. This is considered to be a conservative sampling density and is in line with BS10175[15] for a 'main investigation'.

All profile logs are provided in Appendix B and are in line with BS14688-1[16] and BS5930[17].

3.2 Well Installations

All of the boreholes were installed with monitoring wells for gas and groundwater monitoring. Monitoring wells were installed in accordance with BS10175 and CIRIA C665[18] and generally comprised approximately 1m plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete.

The response zones for the window sample boreholes were installed along the entire length of the borehole with the exception of where certain strata need to be targeted, such as WS102 0.6-1.60mbgl (made ground).

Well installation details are provided in Profile Logs in Appendix B.

3.3 Sampling Protocol

3.3.1 Soil Sampling (Contamination)

Standard sampling protocol and preservation of samples was undertaken as described in the EA guidance on site investigation[19].

Soil was collected for onsite testing. A plastic zip bag was half filled with soil allowing a suitably sized headspace. The bag was sealed and stored for at least 20 minutes

[15] British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.
[16] British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.
[17] British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.
[18] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[19] EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

before being tested for total volatile organic compounds (TVOCs) using a PhoCheck Tiger photoionisation detector (PID). Results of the PID readings are presented on the profile logs (Appendix B). The on-site monitoring was carried out in line CIRIA C665[20] to aid in screening samples for volatile analysis.

Soil samples of approximately 500g were recovered in amber jars, amber vials for volatile analysis and plastic tubs. All the samples were labelled and stored in cool boxes prior to being collected by courier at the end of the day for delivery to the Chemtest laboratory in Newmarket for chemical testing. If collection was not possible the same day then samples were stored in the sample storage fridge at the LK Group offices below 4˚C. Samples were tracked using appropriate Chain of Custody forms provided by Chemtest.

Many of the contamination tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix C. Table 3-1 shows the soil testing undertaken.

Suites and Contaminants	No. Samples	Location & Depth	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	5	WS101 0.0-0.6m WS102 0.0-0.5m WS103 0.0-0.4m WS104 0.0-0.3m WS105 0.0-0.3m	A basic suite with a broad selection of contaminants tested on samples across the site where no significant evidence of contamination was identified (with the exception of occasional ash and clinker) and no TVOCs identified from the PID tests.
Metals / metalloids, pH, water soluble sulphate, cyanide suite, phenol, TPHCWG, BTEX, MTBE, speciated PAHs, SOM and asbestos screen.	1	WS101 0.7-1.0m	Organic clay identified in WS101 therefore detailed suite undertaken to confirm contamination risk and extent.
TPHCWG, BTEX, MTBE and SOM.	2	WS102 1.5-1.6m WS102 2.0-2.1m	WS102 1.5 - 1.6m and WS102 2.0-2.1m soils tested to confirm the extent of hydrocarbon contamination observed during site investigation.

Table 3-1. Summary of soil sample testing undertaken.

Notes:
If asbestos present during screen identification and quantification will be undertaken.
Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; TPHCWG=carbon banded and aromatic/aliphatic split petroleum hydrocarbons; PAH=polycyclic aromatic hydrocarbons, BTEX=benzene, toluene, ethylbenzene and xylenes; MTBE=Methyl tert-butyl ether, VOC=Volatile organic Compounds, SVOC= Semi Volatile Organic Compounds, SOM=Soil Organic Matter.

3.3.2 Water Sampling / Leaching Testing

Groundwater sampling was not carried out as part of this investigation.

A low risk was identified in the preliminary contamination conceptual model for controlled waters (pollutant linkage 4) and further action was only recommended if significant soil contamination was identified on site. Based on the site history, ground conditions encountered and environmental settings, LKC did not consider testing to be required. This is discussed further in Section 6.4.

[20] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

3.4 Gas Monitoring

Six gas monitoring visits have been undertaken over a 12-week period / 3-month period (8th October 2021 to 7th January 2021) in all installed boreholes.

Although this does not follow C665[21] for typical / idealised periods and frequency of monitoring for a higher gassing potential risk, this is a widely accepted industry standard (NHBC) for residential with a very low to moderate gas generation potential. LKC will consider increasing the period and / or frequency of monitoring depending on the findings of the monitoring.

Monitoring was undertaken using a Geotechnical Instruments GA5000 in accordance with the monitoring protocol outlined in CIRIA C665[22] (flow rate measured first). The monitoring was undertaken over a range of weather conditions (including low and falling barometric pressure and heavy rain) to demonstrate worst-case conditions.

The gas monitoring results, are reproduced in full in Appendix E.

3.5 Geotechnical Testing

3.5.1 In-situ Onsite Geotechnical Testing

In-situ geotechnical tests were performed in the boreholes to further characterise the sub-soil conditions. The following tests were undertaken:

- Standard Penetration Tests (SPTs) were performed in the window sample boreholes at approximately 1m intervals, generally within the natural strata.
- Pocket penetrometer tests (giving undrained shear strength) were performed in the window sample boreholes (to a maximum depth of 3mbgl), within the natural clay strata.

The SPT and shear vane readings are provided within the profile logs (Appendix B).

3.5.2 Laboratory Geotechnical Testing

Soil samples taken during the investigation were collected in tubs and bulk bags and sent to Murray Rix Laboratories and Chemtest for geotechnical testing.

Many of the tests are UKAS accredited and further details are given in the laboratory report presented in Appendix D. Table 3-2 shows the geotechnical testing undertaken.

Suites and Contaminants	No. Samples	Location & depth	Justification
pH and water-soluble sulphate	2	WS101 1.7-1.8m WS104 1.0-2.0m	Additional samples of natural ground taken across the site to assess the pH and sulphate for geotechnical purposes. pH and water-soluble sulphate are also included in Suites 1 and 5.
Atterberg Limits (plasticity testing)	4	WS101 SPT 3m WS102 SPT 2m WS104 SPT 2m WS105 SPT 2m	A selection of clay samples across the site were tested for Atterberg Limits to assess their shrinkability potential associated with current and proposed trees.

Table 3-2. Summary of geotechnical testing undertaken.

[21] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[22] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

4 Ground Conditions

4.1 Geology – Generalised Sequence

The ground conditions beneath the site comprised made ground underlain by natural sandy gravelly clay/sandy clay. A summary section of the logs is provided in Plate 4-1, with additional comments below.

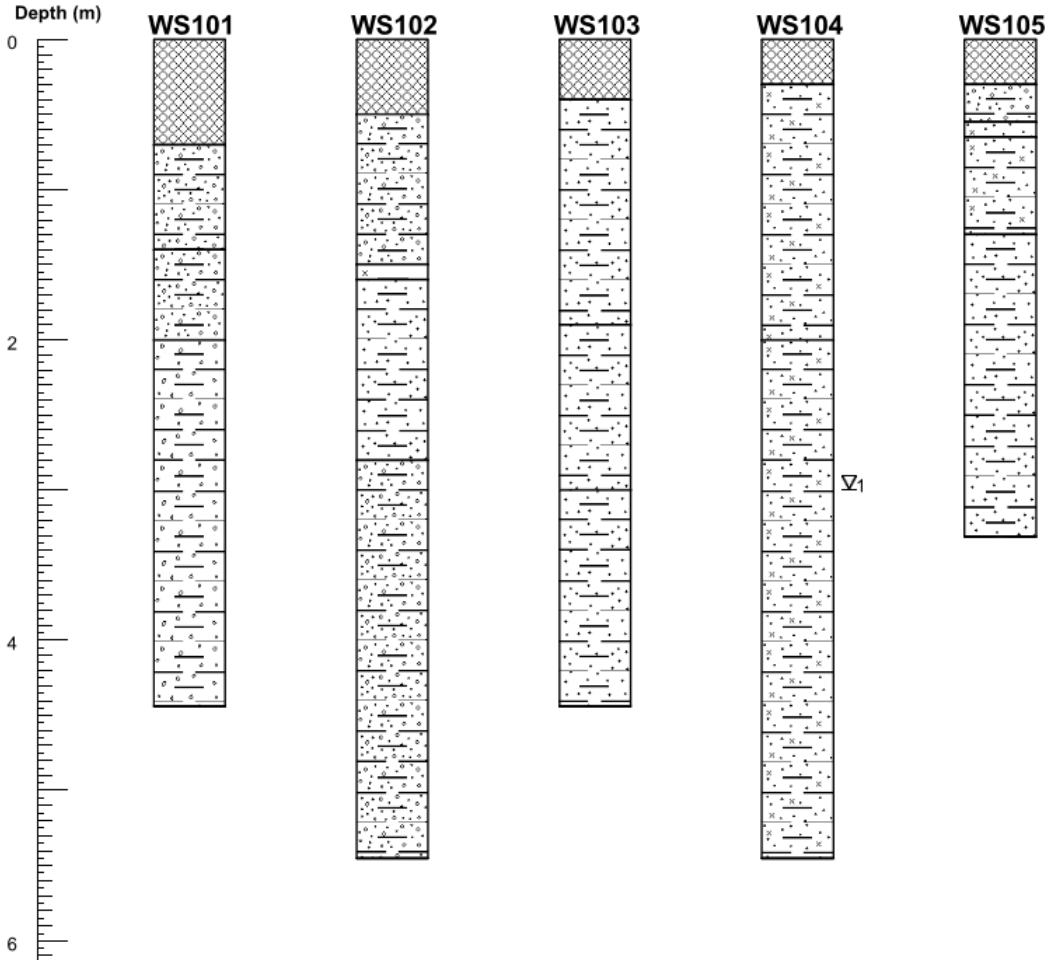


Plate 4-1: Summary of ground conditions.

Additional information on ground conditions:

- Made ground was recorded from depths of 0.3-0.7mbgl and generally consisted of sandy silty GRAVEL with brick, ash, clinker, plastic fragments and metal fragments.
- Organic smell was recorded in WS102 at 1.5-1.6mbgl which was thought to be attributed to organic clay found in this location.
- No visual / olfactory evidence of hydrocarbons or volatile contaminants in any locations.

Superficial deposits comprised gravelly sandy CLAY to the base of the boreholes. Occasional very sandy clay was encountered.

4.2 Groundwater

4.2.1 Groundwater Levels

Groundwater strikes were recorded during the investigation in boreholes. In addition, groundwater monitoring within the borehole wells have been undertaken. An oil-water interface probe (approximately 1cm detection limit) was used to detect the presence of free phase hydrocarbons within each borehole.

Results are summarised in Table 4-1.

BH/TP	Water Strike Depths (mbgl)	Well Response Zone (mbgl)	No. of Monitoring Visits	Monitoring Depths (mbgl)			Sample Taken?	Evidence of Contam?
				Min	Max	Base		
WS101	Dry	1.0-4.0 (C)	2	1.72	1.80	3.80	N	N
WS102	Dry	0.6-1.6 (MG)	2	0.80	0.95	1.50	N	N
WS103	Dry	1.0-4.0 (C)	2	1.14	1.52	3.90	N	N
WS104	3.0	1.0-5.0 (C)	2	1.78		4.70	N	N
WS105	Dry	1.0-3.0 (C)	2	0.62	0.90	2.70	N	N

Table 4-1: Summary of water strike depths within boreholes and trial pits.
Response Zones:
MG=Made Ground; C=Clay.

4.3 In-Situ Geotechnical Testing

4.3.1 Standard Penetration Tests

In-situ standard penetration tests (SPTs) were undertaken, predominantly in the natural ground. The results are summarised in Table 4-2 and provided within the profile logs in Appendix B.

Approximate Depth (mbgl)	SPT 'N' Values				
	WS101	WS102	WS103	WS104	WS105
1-2	8 (C)	6 (MG)	10 (C)	11 (C)	9 (C)
2-3	13 (C)	8 (C)	17 (C)	17 (C)	25 (C)
3-4	23 (C)	24 (C)	27 (C)	24 (C)	50 (C)
4-5	50 (C)	33 (C)	50 (C)	23 (C)	-
5-6	7 (C)	25 (C)	-	20 (C)	-
GW Level	1.72-1.80	0.80-0.95	1.14-1.52	1.78-3.00	0.62-0.90

Table 4-2: Summary of SPT (N) values.
Notes: MG=Made Ground; C=Clay.
Groundwater level based on strikes during investigation and monitoring data.

4.3.2 Pocket Penetrometers

Pocket penetrometer readings, recording undrained shear strength (s_u), were taken within the clay strata. The results are summarised in Table 4-3 and provided within the profile logs in Appendix B.

Approximate Depth (mbgl)	Average Undrained Shear Strength (kN/m^2)				
	WS101	WS102	WS103	WS104	WS105
0-1	-	73.60	-	215.80	137.30, 93.20
1-2	24.52	29.40	107.90	220.7	63.8 103
2-3	98.10	93.20	171.70	147.00	196.20, 220.73
3-4	85.83	220.73	-	-	-
GW Level	1.72-1.80	0.80-0.95	1.14-1.52	1.78-3.00	0.62-0.90

Table 4-3: Summary of average pocket penetrometer readings.
Notes: Groundwater level based on strikes during investigation and monitoring data. Pocket penetrometer readings can be influenced by coarse material including silt.

4.4 Geotechnical Laboratory Testing

4.4.1 Atterberg Limits

Representative samples of natural clay were subjected to Atterberg Limits (plasticity) and Moisture Content testing. Results are presented in Appendix D and summarised in Table 4-4.

Table 4-4 also includes the modified plasticity index as detailed in Chapter 4.2-D5 of the NHBC standards (modified plasticity index = plasticity index x % less than 425µm sieve / 100%).

Location	Depth (mbgl)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Class	Passing 425 micron (%)	Modified Plasticity Index (%)
WS101	3	11	30	12	18	CL	88	15.84
WS102	2	18	32	12	20	CL	90	18.00
WS104	2	14	30	11	19	CL	93	17.67
WS105	2	15	33	12	21	CL	91	19.11

Table 4-4: Summary of plasticity index testing.

The modified plasticity index is between 15.84% and 19.11%. This characterises the clay as having a low volume change potential.

4.4.2 Sulphate and pH

Water soluble sulphate and pH tests were carried out on soil samples. Full results are presented in Appendix C and summarised in Table 4-5

Strata	pH	Sulphate (g/l)
Made Ground	8.2-9.0	<0.01-0.13
Natural	8.3	<0.01

Table 4-5: Summary of pH and sulphate results.

5 Geotechnical Assessment

5.1 Proposed Development

It is understood that the proposed development will comprise several residential houses with private garden and car parking. Details of the proposed loadings are not known at this stage and therefore the preliminary geotechnical assessment will be based on the undrained shear strength for cohesive soils.

The finished ground levels have not been provided and it is therefore anticipated that they will not vary significantly from current levels. However, should the development proposals or finished levels be altered then the recommendations in this section may require revising.

The depths of any underground engineering works (sewers etc.) are unknown and therefore have not been taken into account in the following assessment. It is considered that any such works will be designed so as not to have an effect on, or compromise, proposed or existing foundations or ground stability.

Given the nature of the proposed development it is considered that the structure meets the criteria of Geotechnical Category 1 of Euro Code 7.

Given the nature of the development it is considered that acceptable risk from settlement is a total settlement value of 25mm for a masonry structure.

5.2 Summary of Ground Conditions

Ground conditions identified at the site are detailed in Section 4.1 and summarised in Table 5-1 below:

Strata	Typical Description	Min Depth to top of Strata (mbgl)	Max Depth to top of Strata (mbgl)	Max Thickness (m)
Made Ground	Dark brown sandy silty gravel.	0.00	0.7	0.7
Cohesive	Soft to firm consistency low to medium strength gravelly silty CLAY.	0.5	1.5	1.0
	Soft consistency low strength gravelly sandy organic CLAY.	1.4	2.0	0.6
	Firm to stiff consistency high strength gravelly sandy CLAY.	0.3	>4.44	>2.44
	Very stiff very high strength slightly gravelly sandy CLAY.	1.3	>5.45	>3.45

Table 5-1: Summary of ground conditions.

5.3 Site Preparation

The site should be cleared and any vegetation below areas of proposed development stripped in accordance with Series 200 of the Specification for Highway Works. This should include:

- Roots present below the footprint of proposed structures and infrastructure should be grubbed out and the resulting void infilled with suitable compacted engineered fill;
- Redundant services should be sealed off and grubbed out and replaced with suitable compacted engineered fill; and,
- Buried structures and old foundations are present on site. These should be excavated from below the proposed development foot print with the resulting void backfilled.

The near surface soils may potentially be disturbed by weathering and site traffic. Precautions should be taken to avoid this, as excessive disturbance may result in more onerous floor slab design, road cap thickness and increased amount of site disposal etc.

Most of the site is covered by grass, bushed and trees with hardstanding present on the access path and consists of Tarmacadam.

5.4 Foundation Conditions and Bearing Capacity

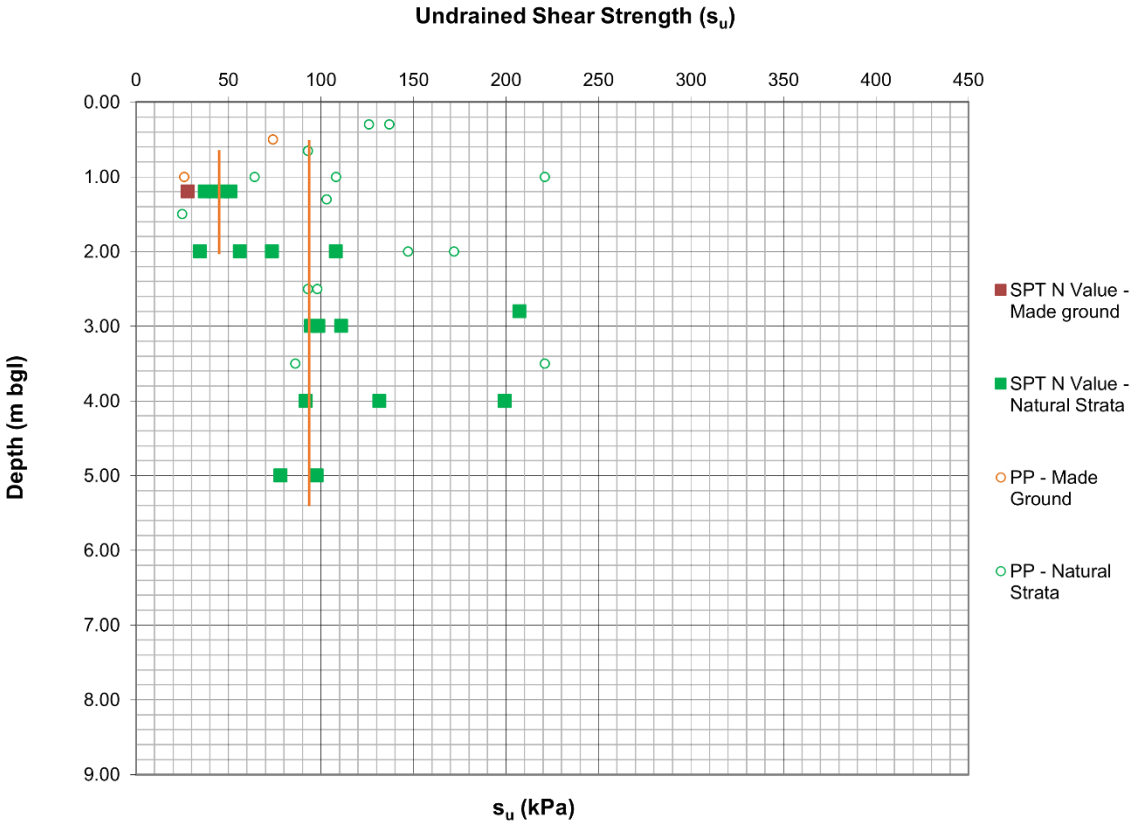
5.4.1 General

It is considered that the Made ground is not suitable for a founding material due to the inherent variability of the material. The loading should be transferred to the firm, increasing to very stiff with depth, CLAY from a depth of 0.3mbgl. Any soft consistency and organic CLAY should be removed and replaced with suitable engineering fill in compacted layer to the proposed level.

Foundation options will be dependent upon the exact loading imposed by the development at present two options considered to be potentially viable are proposed:

- Conventional strip foundations on the underlying cohesive soils of the natural strata supporting walls; and,
- Pad footings supporting column loads.

An assessment of the undrained shear strength (s_u) has been undertaken using data obtained from in-situ geotechnical tests. This data is shown in Graph 5-1.



Graph 5-1: Summary of s_u vs depth from in-situ SPT and PP testing.

From Graph 5-1 it can be seen that the strength of the cohesive deposits typically increase with depth with the results of the pocket penetrometer (PP) testing in agreement with the SPT N-values derived s_u.

A conservative s_u of 45kPa is assigned to the cohesive soils of low to medium strength from a depth of approximately 0.5mbgl, mostly located on the N area of the proposed site. A s_u value of 95kPa is assigned to the high to very high strength cohesive soils of the natural strata from a depth of 0.3mbgl.

Groundwater levels were recorded at WS104 at a depth of 3.0mbgl during site works and rising to a depths of 0.62-1.80mbgl during monitoring. At this depth the soil is cohesive and as such consideration should be given to effective stress instead of total stress.

The option of different foundations types on site under the same load or by imposing different load across the footprint can give rise to a differential consolidation/settlement over the entire site, potentially affecting the adjacent structures. This will need to be assessed by the design engineer.

These options are discussed in the following Sections.

5.4.2 Strip Foundations

Strip foundations should be constructed at least 150mm into the underlying firm to stiff CLAY. At a depth of 1.0mbgl with a standard foundation width of 0.75m, an allowable bearing capacity of 77kN/m² has been calculated using a Factor of Safety (FoS) of 3 and an undrained shear strength of 45kN/m² taken from Graph 5-1.

Atterberg limits determinations, summarised in Table 4-4 show the clay to be of low plasticity and as such the sides of the foundations is unlikely to require any protection.

Foundation depths should take account of the presence of existing and proposed trees with foundations deepened locally in accordance with the requirements of NHBC Standards for a clay of low plasticity and a modified plasticity index of low change. It is recommended that at working drawing stage a foundation schedule is prepared for the development taking account of the soil plasticity and the locations of trees.

5.4.3 Pad Foundations

Based upon the s_u obtained from the in-situ and laboratory testing of the cohesive natural strata, an assessment has been made on a pad foundation supporting column loads. For preliminary assessment purposes, one size of pad ($1m^2$) has been considered at depths of 1.0mbgl and 2.0mbgl.

The ABC incorporates a FoS of 3 for conservatism results are shown in Table 5-1. An undrained shear strength values of 45 and 95kN/m² were used as the average value at 1.0 and 2.0mbgl, respectively, taken from Graph 5-1. The ABC values were calculated applying the Design Approach 1 of the Eurocode 7[23] with Combinations 1 and 2, where partial factors were applied to actions and ground strength.

Pad Size	Pad Depth (mbgl)	Allowable Bearing Capacity (kN)	s_u (kPa)
$1m^2$ (1.00m x 1.00m)	1.0	152	45
$2m^2$ (1.42m x 1.42m)	2.0	320	95

Table 5-1: Summary of pad ABC in cohesive soils.

The pads show an ABC of 152kN for a pad foundation of $1m^2$ increasing to 320kN at a depth of 1.0 and 2.0mbgl, respectively, within the target stratum of firm increasing to very stiff CLAY. Considering the proposed loadings and anticipated depths provided by the Structural Engineer for the extension, the level foundation on natural strata within the firm to very stiff consistency CLAY has significant benefit to ABC from 1.0 to 2.0mbgl.

The above is for assessment purposes only, foundation design should be undertaken by a specialist contractor.

5.5 Ground Floor Slabs

Due to the presence of varying MG thickness, typically to a depth of 0.7mbgl across the site at the proposed building location, it is considered that suitable preparation of the sub-grade, by a combination of excavation and re-compaction, a suspended floor slab should prove suitable for the proposed buildings.

Floor slabs should be designed by a suitably experienced structural engineer.

Where suspended floor slabs are employed ventilation of the under floor void will be required to address condensation issues. This would also assist in the mitigation of potential gas ingress issues.

[23] Eurocode 7: Geotechnical design - Part 1: General rules. EN 1997-1:2004.

5.6 Pavement Construction

An assessment of the likely California Bearing Ratio (CBR) for the Made Ground has been assessed from the following sources:

- Description of the materials encountered in the exploratory holes.

Based on this it is considered that a CBR of at least 2% if the subgrade is the CLAY of the natural strata can be considered for the design of the car park, which equating to a subgrade surface modulus of 27.42MPa. The Made ground at the proposed parking areas show to consist of gravel to a max depth of 0.7mbgl. The CBR value is in the order of 15%, which equating to a subgrade surface modulus of 99MPa.

5.7 Drainage

The presence of Made Ground across the site may result in settlement. It is therefore recommended that drain runs are designed using steeper gradients and flexible joints to allow for some differential settlement.

5.8 Concrete Durability

Based upon the results of the chemical analyses summarised in Table 4-5 it is considered that subsurface concrete can be designed in accordance with Design Sulphate Class DS-1, Aggressive Chemical Environment for Concrete Classification (ACEC) AC-1s in accordance with the recommendations provided in BRE Special Digest 1 (2005).

5.9 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, however while not detected during investigation works, obstructions may be encountered. It is anticipated that if present any obstructions will be grubbed out during the reduced level dig for the sub structure works.

Due to the variability of the Made ground it is considered that all excavations are supported or battered back in accordance with guidance contained in CIRIA R97[24].

Groundwater strike was recorded during the site investigation works and subsequent monitoring works at many borehole locations at depth of 0.62-3.0mbgl within the cohesive strata as perched. It is considered that conventional sump pumping should be adequate to dewater any excavations, if required. Made ground is predominantly granular in nature and dewatering may need to be considered during construction works.

5.10 Construction Activity and Inspection

The following activities and inspections should be incorporated in to the site works:

- Due to the variability of the soils at the site it is recommended that sufficient allowance is made for the inspection of formation and sub formations to foundations and pavement construction;
- Excavations where access is required should be subject to a risk assessment from a competent person and where appropriate mitigation measures such as benching back the sides or use of support systems in accordance with CIRIA

[24] CIRIA Report 97 – Trenching Practice – Second Edition (2001 revision)

R97[25] utilised. Where access to confined spaces is required, appropriate mitigation measures should be addressed within the Construction Stage Health and Safety Plan. Particular account should be taken of the gas results;

- It is considered that de-watering may be required, especially following periods of heavy rainfall or where groundwater was encountered. Removal of surface water and water within trenches should be possible with conventional sump pumping. Discharge of any water should be agreed with the relevant regulatory body and be undertaken under a trade effluent discharge, where required. Measures to remove silt and suspended solids may be required and consideration should be given to provision of space for settling tanks or an attenuation pond;
- The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

The presence of potential contamination and mitigation measures should be addressed as part of the Construction Stage Health and Safety Plan and should include measures to design out the risks, reduce their impact and finally the use of Personnel Protective Equipment (PPE).

[25] CIRIA R97: Trenching Practice. 2nd edition (2001 revision).

6 Generic Risk Assessment

6.1 Introduction

Current good practice requires that the findings from a site investigation should be evaluated on a site-specific basis, using a risk-based approach. Risk assessment involves identification and evaluation of the hazards presented by the concentrations of contaminants measured followed by an evaluation of the risks which are associated with these hazards (LCRM[26]). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 6.3.

6.2 Soil Risk Assessment

6.2.1 Methodology

With regards to the soil risk assessment LKC will use the following hierarchy:

- Category 4 Screening Levels (C4SLs).
- LQM Suitable 4 Use Levels (S4ULs).
- ATRISK Soil Screening Values (SSVs) and CL:AIRE Generic Assessment Criteria (GACs).

C4SLs were published in 2013[27,28]. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))[29] used to generate Soil Guideline Values (SGVs) to 'low' (referred to as Lowest Level of Toxicological Concern (LLTCs)). The policy companion document and supporting letter by Defra, dated 3rd September 2014, states that C4SLs *'could be used under the planning regime, as well as within Part 2A'.* Based on these comments LKC considers the justifications and assumptions used to generate 'low' risk are suitable for the planning regime.

Where no C4SLs have been generated LKC will use the LQM S4ULs[30]. Similar assumptions and land uses to C4SLs have been used. However, toxicological information has been based on 'minimal risk' as per previous guidelines and assumptions[31,32,33,34].

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs[35]. These follow the 'minimal' risk principle and more stringent exposure parameters and will be conservative.

LKC consider the main risk drivers for PAHs are benzo(a)pyrene (B(a)P) and naphthalene. This is due to B(a)P possibly being a carcinogen and most toxic of the

[26] Land Contamination Risk Management (LCRM) https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm
[27] Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."
[28] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[29] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[30] LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."
[31] EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.
[32] EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.
[33] EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.
[34] EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.
[35] CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

PAHs[36,37] and naphthalene the most volatile and soluble[38]. The new C4SLs indicate B(a)P as a surrogate marker for carcinogenic PAHs, if it falls within appropriate limits, since the risk from other non-carcinogenic PAHs are considered negligible[39]. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)[40] and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The proposed development is for residential houses with gardens, therefore the assessment criteria for residential with plant uptake has been used.

All criteria have been generated using the CLEA V1.06 model[41] based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

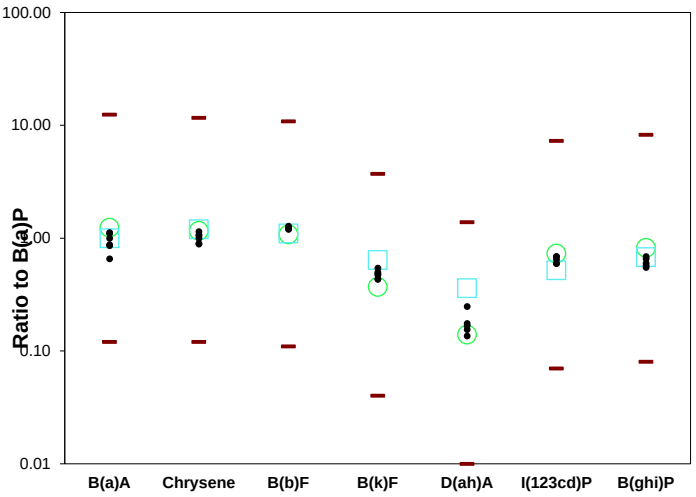
A summary of the generic assessment criteria is provided in Appendix F. ATRISK SSVs and CL:AIRE GACs were not required for this dataset and have not been included.

[36] EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.
[37] USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."
[38] EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.
[39] CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."
[40] HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.
[41] EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.

B(a)P as Surrogate Marker

Based on the above assumption for PAHs, LKC undertook an assessment of the data for the site with regards to using B(a)P as a surrogate marker for carcinogenic PAHs as per HPA and CL:AIRE guidelines. The primary toxicological study related to Culp *et.al*[42], which was based on coal tar mixtures (>80,000mg/kg of total PAHs) fed in food to mice over a two-year carcinogenicity study.

Graph 6-1 summarises the study site data with respect to how the ratios of carcinogenic PAHs relate to B(a)P, within the confidence limits provided in the HPA document.



Graph 6-1: The ratio of PAH to B(a)P in soil for all available data at the site based on 6 samples (where values were >LOD to allow the calculation of a ratio).

Notes:
B(a)P = Benzo(a)pyrene; D(ah)A = Dibenzo(ah)anthracene; B(a)A = Benzo(a)anthracene; B(b)F = Benzo(b)fluoranthene;
B(k)F = benzo(k)fluoranthene; I(123cd)P = Indeno(123cd)pyrene; B(ghi)P = Benzo(ghi)perylene
● = Ratio to B(a)P for all data ○ = Mean ratio to B(a)P for Culp data △ = Mean ratio to B(a)P from all data at the site
□ = Mean ratio to B(a)P for UK data presented by HPA ▬ = Upper and Lower limits (order of magnitude from Culp data)

All the data points that could be used to calculate ratios fall inside the upper or lower limits.

Based on this distribution of data LKC considers B(a)P can be used as a surrogate marker for carcinogenic PAHs and the C4SL criteria is suitable for this dataset.

6.2.2 Soil Results Comparison against Assessment Criteria

All analysis sheets are presented in Appendix C. All the data has been compared to relevant assessment criteria. Elevated and pertinent results are presented in Table 6-1.

[42] Culp, S; Gaylor, D; Sheldon, W; Goldstein, L and Beland, F (1998). " A Comparison of Tumours Induced by Coal Tar and Benzo-a-pyrene in a 2-Year Bioassay." Carcinogenesis. **Vol 19**, no. 1, pp. 117-124.

Contaminant	Units	No. of samples	Elevated Results	Sample Location	Criteria	Source of Criteria
Metals						
Zinc	mg/kg	8	6400	WS104 (0.0-0.3m)	3700	LQM
GENERAL						
pH	pH	8	Range 8.1 to 9.0			
SOM	%	8	Range 0.74 to 15			

Table 6-1: Summary of elevated and pertinent analytical results.
Notes:
Only results that exceeded assessment criteria have been shown and results from **all depths** are noted.
Results have been compared to the nearest appropriate SOM.

No asbestos was identified in any soil samples analysed.

6.2.3 Direct Contact Risk – Pollutant Linkage 1

Elevated zinc has been identified on site in one location only and zinc concentrations in all other samples were considerably lower. Given the number and location of elevated samples, the contamination is considered to be isolated.

Fly tipping was noted on site and it is suspected the elevated Zinc is from an unknown source within the materials fly tipped.. LKC consider the elevated zinc was caused by an unknown source from fly tipping, therefore not considered to be representative of the soils across site.

At the remaining concentrations identified, the contaminants are not considered to pose a potential risk to future site users (residents) in gardens and soft landscaped areas, where made ground may be exposed / in contact with vegetables. The principal pathways are the ingestion pathways (soil, dust and vegetables) and dermal contact.

The probability of metal contamination affecting site users is unlikely. With a medium consequence, the risk is considered to be low and remediation is not recommended.

No asbestos was identified in any of the samples, therefore the probability of asbestos affected site users is considered to be unlikely. With a severe consequence, the risk is moderate / low. At this stage, a low risk is assumed (as no asbestos identified) and remediation is not required. However, as a precaution, construction workers should be and vigilant for any suspected ACM during groundworks (discussed further in Section 9.2).

No elevated TPHCWG, BTEX, MTBE and PAHs were identified, therefore the probability of these contaminants posing a risk to site users in considered unlikely. With a medium consequence, the risk is considered to be low and no remediation is recommended.

6.2.4 Risk from Inhalation of Vapours – Pollutant Linkage 2

Organic odour from organic clay was identified during the site investigation (WS102).,however, the PID did not detect any TVOCs. Confirmatory soil analysis did not detect any VOCs / SVOCs above detection limits.

LKC therefore consider the probability of volatile contaminants affecting site users as unlikely. The consequence is expected to be medium, giving a low risk and no remediation is required with respect to pollutant linkage 2.

6.3 Gas Risk Assessment

6no. gas monitoring visits have been undertaken on the study site. Gas monitoring results in full are presented in Appendix E. Following guidance set out in CIRIA C665[43] and BS8485[44] peak methane and carbon dioxide concentrations have been used in the gas risk assessment. In addition, and as per guidance, flow rates were measured first.

All gas concentrations, flow, pressure and groundwater levels are shown on Table 6-2.

Boreholes	Visit	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	H_2S (ppm)	CO (ppm)	Flow (l/h)	Groundwater (mbgl)	Pressure (mb)
WS101	1	**4.9**	**6.3**	0.1	<1	12 (3)	7.6	1.80	1007 (r)
	2	<0.1	0.7	19.7	<1	4 (<1)	<0.1	1.72	985 (f)
	3	**3.3 (2.7)**	4.2 (3.6)	10.4	<1	<1	<0.1	1.61	1002 (r)
	4	<0.1	**5.4** (0.9)	18.2	<1	<1	<0.1	1.03	977 (r)
	5	<0.1	3.6 (0.6)	20.3	<1	<1	<0.1	1.62	1010 (r/s)
	6	<0.1	3.5 (0.7)	20.4	<1	<1	<0.1	1.20	985 (r)
WS102	1	<0.1	2.1	17.0	<1	8 (<1)	1.9	0.80	1009 (r)
	2	<0.1	2.6	17.9	<1	4 (<1)	<0.1	0.95	985 (f)
	3	<0.1	2.3	17.9	<1	<1	<0.1	1.70	1003 (r)
	4	<0.1	2.1 (1.0)	20.3	<1	<1	0.2	0.46	977 (r)
	5	<0.1	1.7 (1.6)	19.1	<1	<1	<0.1	1.18	1011 (r/s)
	6	<0.1	1.6 (1.5)	20.4	<1	<1	<0.1	1.05	985 (r)
WS103	1	<0.1	3.9	15.5	<1	7 (1)	0.1	1.52	1009 (r)
	2	<0.1	4.2	13.4	<1	4 (<1)	<0.1	1.14	985 (f)
	3	<0.1	3.1 (2.6)	18.1	<1	<1	0.7	1.09	1003 (r)
	4	<0.1	0.4	21.0	<1	<1	0.1	0.63	977 (r)
	5	<0.1	2.6 (2.5)	18.2	<1	1	1.0	0.76	1011 (r/s)
	6	<0.1	3.1 (2.8)	18.7	<1	<1	10.7 (3.9)	0.70	985 (r)
WS104	1	<0.1	1.8	18.7	<1	15 (1)	2.2	1.78	1009 (r)
	2	<0.1	1.8	19.3	<1	2 (<1)	<0.1	1.78	986 (r)
	3	UR	UR	UR	<1	UR	UR	UR	UR
	4	<0.1	2.2 (2.0)	19.3	<1	<1	<0.1	1.09	976 (r)
	5	<0.1	2.0	18.4	<1	<1	<0.1	1.30	1011 (r/s)
	6	<0.1	2.0	20.5	<1	2 (<1)	<0.1	0.25	985 (r)
WS105	1	<0.1	0.1	20.8	<1	4 (1)	1.2	0.90	1009 (r)
	2	<0.1	0.1	20.9	<1	<1	<0.1	0.62	986 (r)
	3	<0.1	1.4 (0.4)	21.1	<1	<1	0.1	1.60	1003 (r)
	4	<0.1	0.3 (0.1)	21.3	<1	<1	0.2	0.20	977 (r)
	5	<0.1	0.3 (0.1)	22.0	<1	<1	<0.1	0.65	1011 (r/s)
	6	<0.1	1.3 (0.3)	22.5	<1	<1	<0.1	0.81	985 (r)

Table 6-2: Summary of gas monitoring.

Notes:
If concentrations / flow is zero, then equipment detection limits are assumed.
Table shows peak concentrations of CH_4, CO_2, O_2, H_2S and CO.
Where peak CO_2 differs significantly to the steady, steady is shown in brackets.
Where peak flow differs significantly to the steady, steady is shown in brackets.
Bold where CO_2 exceeds 5%v/v and CH_4 exceeds 1%v/v.
Atmospheric pressure (over past 24hrs): r=rising, s=steady; r/s=rising then steady.

[43] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[44] BSI (2019). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings." BS8485:2015+A1 2019.

High flow was recorded in WS101, WS102, WS103, WS104 and WS105 (maximum 7.6l/hr). In the majority of cases, high flow rate was recorded alongside high groundwater (i.e. above the response zone). Where groundwater has been recorded to rise in the sealed part of the well, RB17[45] indicates it can cause an increase in pressure that is released on opening to give a brief peak flow. This is shown in Plate 6-1 below.

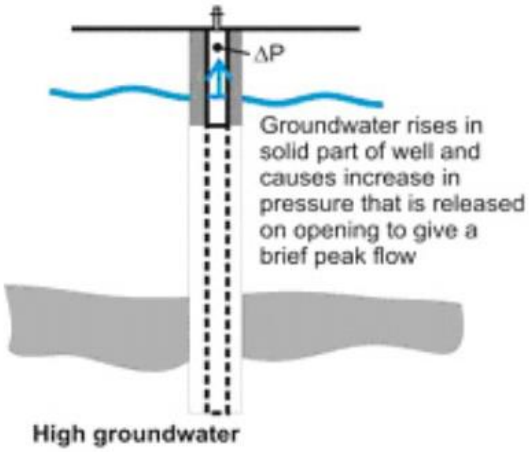


Plate 6-1 Extracted from: RB17.

Brief peak flow was recorded (max 10.7l/hr) as a result of high groundwater in WS103 which subsequently reduced to a 3.9l/hr. The steady reading has been used for the below assessment.

It is considered likely that the flow recorded in WS102, WS104 and WS105 are not representative of the site conditions. Flow was recorded at <0.1 l/hr for the remaining visits. This coincided with low barometric pressure and is therefore considered to be more representative of the site conditions and these values have been used in the below assessment.

The elevated methane concentrations in WS101 were recorded on the first and third visit. The following visit with low barometric pressure recorded <0.1%v/v for methane. LKC considers this initial high result was likely from a small volume of gas trapped into the borehole from the initial drilling. The subsequent small reservoir of gas was depleted during subsequent monitoring visits until gas reading was 0.1%v/v during the last visit. It is known, for example, that the bentonite could produce low concentrations of hazardous gas and that ash is not particularly degradable and will not generate significant concentrations[46].

Carbon monoxide was >1ppm in all boreholes. The maximum concentration was recorded as 15ppm (WS104). This did not appear to correlate with significant oxygen depletion in any of these locations.

Only workplace exposure limits defined by the HSE are available for carbon monoxide and are not fully applicable to a residential setting. A Short-Term Exposure Limit of 200ppm (15-minute period) and Long-Term Exposure Limit of 30ppm have been defined (8-hour period).

[45] CL:AIRE (2012). "RB17 - A Pragmatic Approach to Ground Gas Risk Assessment."
[46] CL:AIRE (2012). "A Pragmatic Approach to Ground Gas Risk Assessment." RB 17.

Based on the above exposure limits, carbon monoxide is not expected to pose a significant risk to the proposed site receptors.

Gas Screening Value

In accordance with CIRIA C665[47], a Gas Screening Value (GSV) may be calculated. Assuming worst-case scenario maximum gas concentrations and flow for each borehole have been used to calculate the GSV. The GSV can be used to determine the characteristic situation (CS).

Table 6-3 shows the maximum GSV for each borehole and the appropriate characteristic situation (based on GSV only). An overall site assessment (WS101-WS105) has also been included (worst case values across the site).

Boreholes	Max GSV (l/hr)	CS / TL
WS101	0.4788	CS2 / Amber 1
WS102	0.0052	CS1 / Green
WS103	0.1638	CS2 / Amber 1
WS104	0.0020	CS1 / Green
WS105	0.0028	CS1 / Green

Table 6-3: Summary of worst-case Gas Screening Values (GSV).
Notes:
CS – Characteristic Situation; TL= Traffic Light.

In addition, in accordance with CIRIA C665[48], if carbon dioxide and methane are recorded above 5%v/v and 1%v/v respectively, you should consider upgrading the characteristic situation from CS1 to CS2.

Given the above GSV values and the small scale of the site area, CS2 gas protection measures are required across the whole site.

6.4 Controlled Water Assessment

The PRA identified a low risk with respect to controlled waters as no significant source of mobile contamination was anticipated. Furthermore, the site presents non-sensitive environmental settings and the clay below site will limit migration.

The site investigation did not identify any significant sources of likely mobile contamination within the soils. This confirms an unlikely probability of onsite contamination affecting controlled waters. With a medium consequence the risk is anticipated to be low, and no remediation is required.

6.5 Additional Risk Assessments

6.5.1 Concrete (Pollutant Linkage 5)

As stated in Section 5, sulphate resistant concrete will not be required at the site. The site was classified as DS-1 AC-1.

Based on the above, the probability of sulphate concentrations affecting buildings is unlikely. Given the consequence is considered to be mild, the risk (pollutant linkage 5) is anticipated to be low, and no remediation is required.

[47] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.
[48] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

This should be confirmed with the structural engineer.

6.5.2 Potable Water Supply (Pollutant Linkage 6)

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination[49]. Only contaminants of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed. The following contaminants were not considered to be a risk and therefore not included in the analysis suites: chlorinated compounds, cresols, ethers, nitrobenzene, ketones, aldehydes and amines.

The following elevated contaminants were identified:

- Elevated TVOCs (inc. naphthalene) in made ground in the north of the site.

It is likely that barrier pipe will be required in the northern area of the site and may be required across the site subject to the depth and location of the water pipes and in consultation with UU.

Once details of the pipeline location and depths are known a UU Risk Assessment should be undertaken.

At this stage, the probability of organic contaminants affecting potable water pipes is likely in the north of the site. Given the consequence is considered to be medium, the risk (pollutant linkage 6) is anticipated to be low risk and remediation (i.e. barrier pipe). This will be confirmed once additional site work has been undertaken.

6.5.3 Phytotoxicity (Pollutant Linkage 7)

Soil results were compared to phytotoxic guideline values as outlined in BS3882[50].

Elevated zinc (maximum concentration 6400mg/kg) was identified in one location. As discussed in section 6.2.3; fly tipping was noted on site and it is suspected the elevated Zinc is from an unknown source within the discarded material. LKC, therefore do not consider it to be representative of the soils across site.

Given this, the probability of phytotoxic contaminants affecting vegetation is considered to be unlikely. With a minor consequence, the risk (pollutant linkage 7) is anticipated to be very low. No remediation is required.

6.6 Revised Contamination Conceptual Model

The preliminary contamination conceptual model (Table 2-3) has been revised following the risk assessments undertaken in Sections 6.1-6.5. The revised contamination conceptual model follows the same methodology and guidance used in the preliminary contamination conceptual model. The risk matrix is provided in Appendix A.

The revised contamination conceptual model is presented in Table 6-3.

Where a very low risk is identified no specific remediation is required.

[49] UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."
[50] BS (2015). "Specifications for Topsoil and Requirements for Use." BS3882:2015.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk is identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Further details of the remedial proposals and a remedial option appraisal are given in Section 9.

Pollutant Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL1	– Dermal contact. – Inhalation of soil, fibres and dust. – Ingestion of soils, dust, vegetables, soil attached to vegetables. – Windblown dust.	- Future site users. - Offsite receptors.	– ACM. – Heavy metals. – PAHs. – Petroleum hydrocarbons	Unlikely	Medium	**Low**	– Unlikely as no ACM and no elevated contaminants identified in the soils analysed, which could come into contact with site users in gardens / soft landscaping areas. – **Recommendation***1 *2**:** No remediation required.
PL2	– Inhalation of vapours. – Migration through permeable strata and preferential pathways.	– Future site users. – Offsite receptors.	Volatile Contaminants: - None identified.	Unlikely	Medium	**Low**	– No elevated volatile contaminants across the site. – **Recommendation:** No remediation required.
PL3	– Inhalation of gas. – Migration through permeable strata and preferential pathways. – Explosion in confined spaces (methane only).	- Future site users. – Offsite receptors. - Buildings.	- Carbon dioxide & Methane	Likely	Severe	**High**	– Elevated CO_2 (max 6.3%v/v) and CH_4 (max 4.9%v/v) recorded in WS101. – Max GSV value 0.4788l/hr (including WS101 and WS103). – **Recommendation**: Gas protection measures in line with CS2 required.
PL4	– Surface Run-off. – Migration through permeable strata and preferential pathways – Perched waters migration.	– Groundwater (Secondary A & Secondary Undifferentiated Aquifers).	Mobile contaminants: - None identified.	Unlikely	Medium	**Low**	– No elevated contaminants identified in the soils analysed. – **Recommendation**: No remediation required.

Table 6-3: Revised Contamination Conceptual Model.

Notes

*1 Although no ACM identified, contractors should be vigilant during earthworks of any potential ACM. This is discussed further in Section 9.2.

*2 The conceptual model only takes into consideration the future use of the site and long-term exposure. Consideration should also be given to the short-term exposure of construction workers and nearby land users to ACM containing soils during groundworks. This is discussed further in Section 9.2.

*3 Although no phytotoxic contaminants identified in soils, the characteristics of the made ground should also be taken into account if it is to be used as a topsoil / growing medium for flora. The material should be assessed against the parameters outlined in Table 1 of BS3882 (not included within this assessment).

Pollutant Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL5	- Sulphate attack on concrete.	- Building structure.	- Sulphate	Unlikely	Mild	**Very Low**	- No elevated sulphate identified in soils or groundwater. - **Recommendation**: No remediation required. Concrete classification DS1-AC1
PL6	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	Organic Contaminants: - Naphthalene.	Likely (north)	Medium	**Moderate**	- Likely probability in the north of the site, as elevated naphthalene encountered which could permeate water pipes and contaminate water supply. - **Recommendation:** UU risk assessment to be undertaken. Barrier piping likely to be required.
				Unlikely (remainder of site)	Medium	**Low**	- No elevated contaminants identified across the remainder of site. - **Recommendation:** Barrier piping unlikely to be required. However, this will need to be confirmed once UU risk assessment undertaken.
PL7	- Direct Contact (plant uptake).	- Flora.	Phytotoxic Contaminants: - Zinc.	Unlikely	Minor	**Very Low**	- Although elevated Zinc identified in one sample of the soils analysed, source is likely to be from an unknown source from fly tipping and not representative of the soils. - **Recommendation**: No remediation required.

Table 6-3 (continued): Revised Contamination Conceptual Model.

Notes

*[1] Although no ACM identified, contractors should be vigilant during earthworks of any potential ACM. This is discussed further in Section 9.1.

*[2] The conceptual model only takes into consideration the future use of the site and long-term exposure. Consideration should also be given to the short-term exposure of construction workers and nearby land users to ACM containing soils during groundworks. This is discussed further in Section 9.1.

*[3] Although no phytotoxic contaminants identified in soils, the characteristics of the made ground should also be taken into account if it is to be used as a topsoil / growing medium for flora. The material should be assessed against the parameters outlined in Table 1 of BS3882 (not included within this assessment).

7 Waste Disposal Assessment

The soil contamination results as presented in Appendix C have been used to help determine the waste classification of material for off-site disposal.

As an initial screen the soil results were inputted into Hazwaste Online™. This is a web-based facility that allows an assessment waste as either hazardous or non-hazardous waste based on relevant guidance and legislation[51, 52 ,53,54 ,55 ,56, 57, 58, 59].

Hazwaste Online™. has been designed to cover, amongst other waste types, the European Waste List of Waste (LoW) code number 17 "Construction and Demolition Waste (Including Excavated Soil from Contaminated Sites)".

Where less than limits of detection (LOD) were recorded, the value of the LOD was inputted.

Where applicable, appropriate metal species based on hazard statements/ molecular weight, site history, ground conditions and likely species present in soils were used (e.g. metal oxides relating to an ash-based source).

The output sheet is presented in Appendix G and summarised in Table 7-1.

Sampling Location	Depth	Hazardous Waste Y/N	LoW Code	Hazard (Risk Phrase)	Contaminants
WS102	0.0-0.5	N	17-05-04	-	-
WS101	0.0-0.6	N	17-05-04	-	-
WS101	0.0-1.0	N	17-05-04	-	-
WS101	1.7-1.8	N	17-05-04	-	-
WS102	1.5-1.6	N	17-05-04	-	-
WS102	2.0-2.1	N	17-05-04	-	-
WS103	0.0-0.4	N	17-05-04	-	-
WS104	0.0-0.3	Y	17 05 03	HP14 (ecotoxic)	Zinc Oxide
WS104	1.0-2.0	N	17-05-04	-	-
WS105	0.0-0.3	N	17-05-04	-	-

Table 7-1: Summary of Hazwaste Online ™ findings.

[51] EA (2018). "Guidance on the Classification and Assessment of Waste (1st Edition v1.1)". Technical Guidance WM3.
[52] CLP Regulation - Regulation 1272/2008/EC of 16 December 2008.
[53] 1st ATP - Regulation 790/2009/EC of 10 August 2009
[54] Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013
[55] WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014
[56] Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014
[57] 13th ATP - Regulation (EU) 2018/1480 of 4 October 2018
[58] POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004
[59] 2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

Hazardous waste has been identified in WS104, however as discussed in section 6.2.3 the contaminant is likely from an unknown source from fly tipped material. The soil onsite should therefore be classified as NON-HAZARDOUS WASTE LoW code “17-05-03 - soil and stones containing hazardous substances”.

8 Conclusions

8.1 Geotechnical

It is considered that the made ground is not suitable for a founding material due to the inherent variability of the material. The loading should be transferred to the firm to very stiff CLAY, from a depth of 0.3mbgl.

Foundation options will be dependent upon the exact loading imposed by the development at present two options considered to be potentially viable are proposed:

- Pad footings supporting column loads for the proposed structure; and
- Srip foundations for supporting walls.

A conservative c_u of 45kPa is assigned to the firm CLAY of the natural strata and increasing to 95kPa for the very stiff CLAY.

The pad foundation of $1m^2$ show an ABC value of $152kN/m^2$ at approx. 1.0mbgl within the firm CLAY and increasing to $320kN/m^2$ at 2.0mbgl within the very stiff CLAY.

The above is for assessment purposes only, any foundation design should be undertaken by a specialist contractor.

Groundwater was recorded at 0.62-3.0mbgl within natural cohesive strata during the site works and subsequent monitoring; it is considered that conventional sump pumping should be adequate to dewater any excavations, if required.

The concrete classification in accordance with BRE Special Digest 1 (2005) is DS-1 AC1s.

8.2 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-2 below (more detailed model provided in Section 6).

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to site users, future residents and office site receptors via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	**Low**	- No remediation required.
2	Volatile contaminants posing a risk to site users and future residents via the inhalation of vapours.	**Low**	- No remediation required.
3	Gas posing a risk to buildings and site users, future residents, buildings and offsite land users via the migration of gas into building causing explosion and asphyxiation.	**High**	- Gas protection measures in line with CS2 required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	**Low**	- No remediation required.
5	Sulphate posing a risk to building via direct contact (sulphate attack).	**Very Low**	- Concrete classification DS-1 AC-1.
6	Organic contaminants posing a risk to water pipes.	**Moderate** (north)	- UU risk assessment to be completed. The north of the site will likely require barrier piping.
		Low (remainder of site)	- UU risk assessment to be completed. The remainder of the site will likely not require barrier pipe.
7	Phytotoxic metals posing a risk to flora via root uptake.	**Very Low**	- No remediation required.

Table 8-2: Summary Risk Table.

Remedial recommendations are presented in Section 9.

9 Recommendations and Remedial Strategy

The recommendations provided below are considered appropriate for the site based on the site investigation work undertaken. LKC should stress that no remediation, enabling works or designing works should take place until Regulatory approval has been obtained.

9.1 Remediation and Validation Recommendations

Table 9-1 details the further works and remedial recommendations / requirements. The table shows work required post-demolition of building(s), pre-construction (i.e. during earthworks) and during / post construction.

Phase	PL	Remediation Requirements	Validation Requirements
Pre-Construction	ALL	Earthworks Inspections / Unexpected Contamination The relevant contractors should be briefed that during development works at the site should any unusual ground conditions and / or visual or olfactory evidence of contamination (including asbestos containing material) be encountered at the site, LKC and the Local Authority should be informed, and further assessment of the material may be required. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733[60].	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
	3	Gas Protection Measures In line with CS2 as per UK guidance[61,62]. This is likely to / should include: • Passive subfloor or active subfloor ventilation system. • Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions. • Minimum penetration of ground slab by services. • All joints and penetrations to be sealed. Depending on the type of building and foundation design the protection measures can vary. The gas protection measures will be detailed and approved with the Local Authority once the foundation design has been confirmed. LKC advise that final foundation details should be provided to the Local Authority for review.	Supply and review of foundation designs. Photographic evidence of sub-floor void, ventilation and suitably sealed gas membrane. Validation of gas protection measures should be in line with CIRIA 735[63]
	6	Potable Water Pipes	Delivery Notes of Pipe Material.

[60] CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.
[61] CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665
[62] BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for new buildings." BS8485:2015.
[63] CIRIA (2014). "Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas". CIRIA C735.

		It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is likely that barrier pipe will be required in the north of the site.	Photographs of the Installed Pipe.
	1, 2, 3, 4, 5, 7	No remediation anticipated with respect to PL1 (direct contact), PL2 (inhalation of vapours), PL4 (controlled waters), PL5 (sulphate) and PL7 (phytotoxicity).	
Other Considerations		<u>Grubbing Out of In-Ground Structures</u> It is recommended that in-ground structures are grubbed out as part of the groundworks. In-ground structures expected in southwest of the site associated with the current garages.	
		<u>Re-use of site won material</u> To ensure material is compliant with appropriate waste regulations, any site won material re-used onsite should be in recourse to appropriate exemptions. A U1 and T5 exemption should be registered. This will allow the following to be used onsite or brought in for use onsite (refer to guidance for types of waste that can be used [64]): 5,000 tonnes (*c.* 2,500m^3) <u>treatment</u> of crushed concrete / stone. 1,000 tonnes (*c.* 500^3) <u>use of</u> non-hazardous soil 5,000 tonnes (*c.* 2,500m^3) <u>use of</u> clays, sand, gravel, brick, concrete, stone etc. 50,000 tonnes (*c.* 25,000m^3) <u>use of</u> bituminous material to be used in roadways. A Materials Management Plan (MMP) with recourse to the CL:AIRE Code of Practice may be required if volumes exceed exemption limits. This must be registered **<u>before</u>** material movement starts onsite. If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2.	
		<u>Topsoil Growing Medium</u> Although no contamination was identified in the soils on site, the existing made ground is not expected to be a suitable growing medium given the nature of the soil and the undesirable material present (ash, clinker, brick and glass). A topsoil cover of approximately 150mm is recommended in gardens and soft landscaping areas. This is to be confirmed once additional site work has been completed.	
		<u>Health and Safety Considerations</u> In working with, removing or treating any contaminating material it is important that any potential risks associated with the actual site works are mitigated by good environmental management of the site during the remedial phases. Standard health and safety precautions (as per HSE guidance[65]) should be adopted by all workers involved with site enabling and construction works.	
		<u>Asbestos Survey</u> A Pre-Demolition and Major Refurbishment Asbestos Survey should be undertaken, and any ACMs removed and properly disposed of, prior to the demolition of the existing garage buildings, by a suitably qualified professional.	

[64] https://www.gov.uk/guidance/waste-exemptions-using-waste
[65] HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

Table 9-1: Further work, remediation and validation requirements
Notes: See Table 6-1 for pollutant linkage (PL) details.

9.2 Validation of Subsoil / Topsoil

Chemical validation of all imported soils to be used on site in gardens and soft landscaping areas should be undertaken. Imported soils should be accompanied by a certificate of analysis and source details.

A summary of the required imported material sampling requirements is presented in Table 9-2. Ideally, the material should be sampled at source to prevent double handling if soil fails. However, where this is not possible then material imported should be segregated based on source and soil type. Validation samples should be taken prior to placement in gardens to ensure suitability for use.

Material Type	Source	Suite of Analysis	Sampling Rate*
Topsoil	Greenfield	Suite A	1 sample per 50m^3
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 150m^3
	Site won natural material / greenfield	Suite A	
Physical Stone Break Layer	First Generation i.e. quarried sand (subsoil) or stone (break layer)	No testing is required. Certification of material provenance is required.	
	Recycled Stone (6F2 / screened)	Suite B	1 sample per 500m^3

Table 9-2: Sampling requirements for imported soils.
Notes:
Suite A - Heavy metals, pH, water soluble sulphate, speciated PAH, soil organic matter and asbestos screen.
Suite B - Heavy metals, pH, water soluble sulphate, speciated PAH, phenol, total and free cyanide, soil organic matter, asbestos screen, banded petroleum hydrocarbons (TPH CWG), BTEX, MTBE.
*Minimum sampling rate of 3 samples per source.

Any soil with visual or olfactory evidence of hydrocarbons should be rejected.

In addition, it should be ensured that the matrix of the topsoil is suitable as a growing medium and no undesirable material is present (in line with BS3882[66]). LKC advise this information is provided by the supplier before material is imported onto site.

Imported material to be used in gardens will be compared against residential with plant uptake criteria (as used in the contamination risk assessment (Section 6-1)). Appropriate remedial target criteria are presented in Appendix F.

9.3 Site Completion Report

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

- Details of the demolition of the current garage buildings within a Pre-Demolition and Major Refurbishment Asbestos Survey.

[66] BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

- Validation of gas protection measures installed or assessment of the gas risk after monitoring.
- Provision of waste transfer documents.
- Verification testing of all imported soil for garden and soft landscaping areas.
- Information on the installation of protective pipes and / or sterile trenches.
- Details of any unexpected contamination identified onsite, suitably risk assessed and / or validated.

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

Figures

Client: First Choice Homes Oldham				Title: Site Location & Boundary Plan	LK CONSULT
Site: Belgrave Road, Oldham				Scale (see scale bar): 1:10,000 & 1:1,500 @ A4	Figure: 1
Job No.: LKC 20 1964	Drawn By: BR	Checked By: FP	Drawn: March 2024		Revision:

Extract from: Nicol Thomas
Drawing Ref: Proposed Site Layout, No.04, Rev:B (October 2020)

KEY

Site Boundary

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: First Choice Homes Oldham

Site: Belgrave Road, Oldham

Title: Proposed Development Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 20 1964	See Scale Bar	2	

Drawn By:	Checked By:	Drawn:
AC	CH	March 2024

Extract from: Nicol Thomas
Drawing Ref: Proposed Site Layout, No.04, Rev:B (October 2020)

KEY

Site Boundary

Window Sample Borehole (WS)

Sampling Locations and features annotated by LK Consult Ltd are approximate and are based upon observed measurements unless otherwise stated. Do not scale from this drawing and work from marked dimensions only. All dimensions and features should be confirmed on site by the Contractor. Where this drawing includes information provided to LK Consult Ltd by others, LK Consult Ltd gives no warranty, representation or assurance as to the accuracy of such information.

LK CONSULT LIMITED

Client: Brierstone Ltd

Site: Belgrave Road, Oldham

Title: Site Investigation Location Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 20 1964	See Scale Bar	3	

Drawn By:	Checked By:	Drawn:
AC	FP	March 2024

Appendix A

Risk Matrix

Risk Evaluation

The method for risk evaluation is a qualitative method of interpreting the output from the risk estimation stage of the assessment, based on CIRIA 552[67]. It involves the classification of the:

- Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- Magnitude if the probability (likelihood) of the risk occurring (Table B).

Consequence (Severity)		
Classification	**Definition**	**Example**
Severe	- Short term (acute) risk to human health likely to results in 'significant harm' as defined by the Environment Protection Act 1990, Part IIA. - Short term risk of pollution (note: water Resources Act contains no scope for considering significance of pollution) of sensitive water resource. - Catastrophic damage to buildings/properties. - A short-term risk to a particular ecosystem, or organism forming part of such ecosystem (note: the definition of ecological systems within the Draft Circular on Contaminated Land, DETR, 2000).	- High Concentrations of cyanide on the surface of an informal recreation area. - Major spillage of contaminants from site into controlled waters. - Explosion, causing building collapse (can also equate to short term human health risk if buildings are occupied).
Medium	- Chronic damage to Human Health ('significant harm' as defined in DETR, 2000). - Pollution of sensitive water resources (note Water Resources Act contains no scope for considering significance of pollution). - A significant change in a particular ecosystem, or organism forming part of such ecosystem.	- Concentrations of a contaminant from site exceed generic, or site-specific assessment criteria. - Leaching of contaminants from a site to a major or minor aquifer (Principal and Secondary). - Death of a species within a designated nature reserve.
Mild	- Pollution of non-sensitive water resources. - Significant damage to crops, buildings, structures and services ('significant harm' as defined in DETR, 2000). - Damage to sensitive buildings/structures/services or the environment.	- Pollution of non-classified groundwater. - Damage to building rendering it unsafe to occupy (e.g. foundation damage resulting in instability).
Minor	- Harm, although not necessarily significant harm, which may result in a financial loss, or expenditure to resolve. - Non-permanent health effects to human health (easily prevented by means such as personal protective clothing etc). - Easily repairable damage to buildings, structures and services.	- The presence of contaminants at such concentrations that protective equipment is required during site works. - The loss of plants in a landscaping scheme. - Discoloration of concrete.

Table A. Classification of Consequence

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

Table B. Classification of Probability.

[67] CIRIA C552 (2001) Contaminated Land Risk Assessment - A Guide to Good Practice.

These classifications are then compared to indicate the risk presented by each pollutant linkage (Table C). It is important that this classification is only applied where there is a possibility (which can range from high likelihood to unlikely) of a pollutant linkage existing.

		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 C. Comparison of Consequence against Probability

Once the risk has been determined the corresponding action can be assessed (Table D).

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

Table D. Description of the Classification and Likely Action Required.

Where a very low risk is identified no specific remediation is required.

Where a low risk is identified, some form of remediation may be required depending on the pollutant linkage, the type and concentration of contaminants present and the proposed development.

Where there is a moderate/low risk is identified, an assessment will be undertaken to establish what category the pollutant linkage will fall into.

Where LKC identifies a moderate or higher risk, remediation or further investigation work is recommended.

Appendix B

Profile Logs

Window Sample Logs

LK CONSULT LTD

Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS
Tel: 0161 763 7200 web: www.thelkgroup.com

Site	Number
Belgrave Road, Oldham	WS101

Excavation Method	Dimensions	Ground Level (mOD)	Client	Job Number
Drive-in Windowless Sampler	101mm to 1.00m	170.00	Brierstone Ltd	LKC 20 1964

Location	Dates	Project Contractor	Sheet
393203 E 403674 N	16/09/2021	LK Group	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.60	ES1 PID=0.1ppm				(0.70)	MADE GROUND: Dark brown sandy silty GRAVEL with occasional brick, ash, clinker and rare metal. Sand and gravel is fine to coarse and gravel is angular to subrounded comprising mixed lithologies.			
				169.30	0.70				
0.70-1.00	ES2				(0.70)	Soft consistency greyish black gravelly sandy silty CLAY. Sand is fine to coarse and gravel is fine to medium and angular to subrounded comprising mixed lithologies. Probable reworked material.			
1.20-1.65	SPT N=8		1,1/2,2,2,2	168.60	1.40				
1.20-1.65	X3								
1.50-2.00	PP 24.52 kPa				(0.60)	Soft consistency low strength grey brown gravelly sandy organic CLAY. Sand is fine to coarse. Gravel is fine to coarse, angular to subangular comprising mixed lithologies.			
1.70-1.80	ES4			168.00	2.00				
2.00-2.45	SPT N=13		2,3/3,3,3,4			Firm to stiff consistency high strength gravelly CLAY. Gravel is fine to medium, angular to subangular comprising mixed lithologies.			
2.00-2.45	X5								
2.50-3.00	PP 98.10 kPa								
3.00-3.45	SPT N=23		3,4/5,5,6,7						
3.00-3.45	X6				(2.44)				
3.50-4.00	PP 85.83 kPa								
4.00-4.44	SPT 50/290		6,10/13,12,12,13						
4.00-4.45	X7								
				165.56	4.44	Terminated at 4.44m			

Remarks
Location and elevation from handheld GPS.
Sampler refusal at 4.00mbgl, SPT refusal at 4.44mbgl in very stiff clay.
Organic clay identified between 1.40-2.00mbgl.
No groundwater was encountered.
Borehole stable.

Scale (approx)	Logged By
1:50	JW

Figure No.
LKC 20 1964.WS101

LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** Belgrave Road, Oldham	**Number** **WS102**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler	101mm to 1.00m	170.00	Brierstone Ltd	LKC 20 1964
	Location 393238 E 403641 N	**Dates** 16/09/2021	**Project Contractor** LK Group	**Sheet** 1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.50	ES1 PID=<0.1pm				(0.50)	MADE GROUND. Dark brown, sandy silty GRAVEL with occasional brick, ash, clinker and rare metal. Sand and gravel is fine to coarse and gravel is angular to sub-rounded.			
0.50-1.00	ES2			169.50	0.50				
0.50-1.00	PP 73.6 kPa					Firm consistency low to medium strength orangeish grey gravelly sandy CLAY. Sand is fine to coarse and gravel is fine to medium and angular to sub rounded.			
1.00-1.50	PP 29.4 kPa				(1.00)				
1.20-1.65	SPT N=6		1,1/1,1,2,2						
1.50-1.60	ES4			168.50	1.50				
1.60-2.00	B3			168.40	1.60	Soft consistency low strength orangey brown silty organic CLAY. Slight hydrocarbon odour noted.			
2.00-2.45	SPT N=8		1,2/2,2,2,2			Firm to stiff consistency high strength orangey brown very sandy CLAY. Sand is fine to coarse.			
2.50-3.00	PP 93.2 kPa				(1.20)				
3.00-3.45	SPT N=24		3,4/4,6,6,8	167.20	2.80	Very high strength orangey dark brown slightly gravely sandy CLAY. Sand is fine to coarse and gravel is fine to medium and angular to subrounded.			
3.50-4.00	PP 220.7 kPa								
4.00-4.45	SPT N=33		4,5/7,8,8,10		(2.65)				
5.00-5.45	SPT N=25		4,5/5,6,7,7						
				164.55	5.45	Complete at 5.45m			

Remarks
Borehole stable.
Slight hydrocarbon odour noted at 1.5-1.6mbgl, in organic clay.
Borehole complete at 5.45mbgl.
Pocket penetrometer readings between 3.5-4.0mbgl exceeds maximum, therefore are recorded 220.73 kPa.
Location and elevation from handheld GPS.
Organic clay identified between 1.40-2.00mbgl.
No groundwater was encountered.

Scale (approx)	**Logged By**
1:50	JW

Figure No.
LKC 20 1964.WS102

LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** Belgrave Road, Oldham	**Number** **WS103**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler	101mm to 1.00m	169.00	Brierstone Ltd	LKC 20 1964
	Location	**Dates**	**Project Contractor**	**Sheet**
	393268 E 403610 N	16/09/2021	LK Group	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.40	ES1 PID=0.2ppm			168.60	(0.40) 0.40	MADE GROUND. Dark brown, sandy silty GRAVEL with occasional brick. Sand and gravel is fine to coarse and gravel is angular to sub-rounded.			
1.00-2.00	PP 107.9 kPa				(1.50)	Stiff consistency high strength light brown with orange mottling sandy CLAY. Sand is fine to coarse.			
1.20-1.65 1.20	SPT N=10 X		1,1/2,2,3,3						
2.00-2.45 2.00 2.00-3.00	SPT N=17 X PP 171.7 kPa		2,3/3,4,5,5	167.10	1.90 (1.10)	Stiff to very stiff consistency very high strength orangey brown sandy CLAY with occasional sand lenses. Sand is fine to medium.			
3.00-3.45 3.00	SPT N=27 X		4,4/5,7,7,8	166.00	3.00 (1.44)	Very stiff consistency oangey dark brown sandy CLAY. Sand is fine to medium.			
4.00-4.44	SPT 50/285		7,10/12,13,13,12	164.56	4.44	Terminated at 4.44m			

Remarks
Borehole complete at 4.44mbgl.
Monitoring well installed to 4m.
Location from gridreferencefinder.com and accurate to 3-5m, elevation sourced from Google Earth.
No groundwater encountered.
Borehole stable.
SPT refusal at 4.44mbgl in stiff clay.

Scale (approx)	**Logged By**
1:50	JW

Figure No.
LKC 20 1964.WS103

LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** Belgrave Road, Oldham	**Number** **WS104**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler		169.00	Brierstone Ltd	LKC 20 1964
	Location	**Dates**	**Project Contractor**	**Sheet**
	393298 E 403581 N	16/09/2021	LK Group	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.30	ES1				(0.30)	MADE GROUND. Dark brown, sandy silty GRAVEL with occasional plastic pieces, brick, ash, and clinker. Sand and gravel is fine to coarse and gravel is angular to subrounded.			
0.30-1.00	ES2			168.70	0.30				
0.30-1.00	PP 215.8 kPa					Very stiff consistency very high strength grey brown sandy silty CLAY. Sand is fine to coarse.			
1.00-2.00	ES3				(1.70)				
1.00-2.00	PP 220.73 kPa								
1.20-1.65	SPT N=11		1,1/2,3,3,3						
1.20	X								
2.00-2.45	SPT N=17		2,3/4,5,4,4	167.00	2.00	Stiff to very stiff consistency high strength dark brown sandy silty CLAY. Sand is fine to coarse.			
2.00	X								
2.00-3.00	ES4								
2.00-3.00	PP 147 kPa								
3.00	X		Water strike(1) at 3.00m.					▽1	
3.00-3.45	SPT N=24		4,5/5,6,6,7		(3.45)				
4.00-4.45	SPT N=23		3,4/4,5,7,7						
5.00-5.45	SPT N=20		2,3/4,5,5,6						
				163.55	5.45	Complete at 5.45m			

Remarks
Borehole stable.
Borehole complete at 5.45mbgl.
Monitoring well installed to 5m.
Location from gridreferencefinder.com and accurate to 3-5m, elevation sourced from Google Earth.
Pocket penetrometer values exceeded maximum 1 - 2m depth, therefore recorded as 220.73kPa.

Scale (approx)	**Logged By**
1:50	JW

Figure No.
LKC 20 1964.WS104

LK GROUP	**LK CONSULT LTD** Eton Business Park, Eton Hill Road, Radcliffe, M26 2ZS Tel: 0161 763 7200 web: www.thelkgroup.com	**Site** Belgrave Road, Oldham	**Number** **WS105**

Excavation Method	**Dimensions**	**Ground Level (mOD)**	**Client**	**Job Number**
Drive-in Windowless Sampler	101mm to 1.00m	168.00	Brierstone Ltd	LKC 20 1964
	Location	**Dates**	**Project Contractor**	**Sheet**
	393320 E 403559 N	16/09/2021	LK Group	1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-0.30	ES1				(0.30)	MADE GROUND. Dark brown, sandy silty GRAVEL with occasional brick, ash, and clinker. Sand and gravel is fine to coarse and gravel is angular to sub-rounded.			
0.30-0.55	PP 137.3 kPa			167.70	0.30				
					(0.25)				
				167.45	0.55				
0.60-0.60	ES PID: <0.1			167.35	0.65	Stiff consistency high strength dark brown gravelly sandy CLAY. Sand is fine to coarse and gravels are fine to medium and angular to subrounded.			
0.65-1.00	PP 93.2 kPa								
					(0.65)				
1.00-1.30	PP 63.8 kPa					Black very sandy silty CLAY. Sand is fine to coarse.			
1.20-1.65	SPT N=9		1,1/2,2,2,3	166.70	1.30	Firm to stiff consistency medium strength orangeish brown with grey mottling sandy silty CLAY. Sand is fine to coarse.			
1.30-2.00	PP 103 kPa								
						Very stiff consistency very high strength orangeish dark brown sandy CLAY. Sand is fine to coarse.			
2.00-2.45	SPT N=25		4,4/5,6,7,7						
2.00-2.40	PP 196.2 kPa								
					(2.01)				
2.40-2.80	PP 220.7 kPa								
2.80-3.31	SPT 50/360		7,9/11,13,14,12						
				164.69	3.31	Terminated at 3.31m			

Remarks
SPT refusal at 3.31mbgl in stiff clay.
Borehole complete at 3.31mbgl
Monitoring well installed to 2.8m
Pocket penetrometer values only measured up to 220.7 kPa. Maximum value exceeded at 2.4 - 2.8m depth.
Location from gridreferencefinder.com and accurate to 3-5m, elevation sourced from Google Earth.
No groundwater encountered.
Borehole stable.

Scale (approx)	**Logged By**
1:50	JW

Figure No.
LKC 20 1964.WS105

Appendix C

Certificates of Analysis – Soil

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-32613-1
Initial Date of Issue:	24-Sep-2021
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Chris Hughes Contaminated Land
Project	LKC 20 1964

Quotation No.:		**Date Received:**	20-Sep-2021
Order No.:	739042	**Date Instructed:**	20-Sep-2021
No. of Samples:	9		
Turnaround (Wkdays):	5	**Results Due:**	24-Sep-2021
Date Approved:	24-Sep-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: LKC 20 1964

Client: LK Consult			**Chemtest Job No.:**		21-32613	21-32613	21-32613	21-32613	21-32613	21-32613	21-32613	21-32613	21-32613
Quotation No.:			**Chemtest Sample ID.:**		1282603	1282604	1282605	1282607	1282608	1282609	1282610	1282612	1282614
			Client Sample ID.:		WS101	WS101	WS101	WS102	WS102	WS103	WS104	WS104	WS105
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.00	0.0	1.70	1.50	2.00	0.00	0.00	1.00	0.00
			Bottom Depth (m):		0.60	1.00	1.80	1.60	2.10	0.40	0.30	2.00	0.30
			Date Sampled:		16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021
			Asbestos Lab:		DURHAM	DURHAM		DURHAM	DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
ACM Type	U	2192		N/A	-	-		-	-	-	-		-
Asbestos Identification	U	2192		N/A	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected	No Asbestos Detected	No Asbestos Detected	No Asbestos Detected		No Asbestos Detected
Moisture	N	2030	%	0.020	6.5	16	13	16	14	9.5	9.2	10	9.9
Soil Colour	N	2040		N/A	Brown	Black	Brown	Black	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Roots and Stones	Stones, plants, plastic and Roots	Stones	Stones and plant
Soil Texture	N	2040		N/A	Sand	Clay	Clay	Clay	Sand	Sand	Gravel	Clay	Gravel
Chromatogram (TPH)	N			N/A		See Attached							
pH	M	2010		4.0	9.0	8.5	8.3			8.2	8.3	8.3	8.3
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40		1.3							
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.033	0.020	< 0.010			0.13	0.015	< 0.010	< 0.010
Cyanide (Free)	M	2300	mg/kg	0.50		< 0.50							
Cyanide (Total)	M	2300	mg/kg	0.50		0.50							
Arsenic	M	2450	mg/kg	1.0	16	21				10	6.4		9.2
Cadmium	M	2450	mg/kg	0.10	0.40	< 0.10				0.15	0.11		< 0.10
Chromium	M	2450	mg/kg	1.0	13	16				13	12		9.1
Copper	M	2450	mg/kg	0.50	52	61				37	25		27
Mercury	M	2450	mg/kg	0.10	0.13	0.18				< 0.10	< 0.10		0.11
Nickel	M	2450	mg/kg	0.50	22	23				18	35		19
Lead	M	2450	mg/kg	0.50	120	110				49	29		40
Selenium	M	2450	mg/kg	0.20	0.25	0.70				< 0.20	< 0.20		< 0.20
Vanadium	U	2450	mg/kg	5.0	30	34				16	13		20
Zinc	M	2450	mg/kg	0.50	78	60				92	6400		47
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50				< 0.50	< 0.50		< 0.50
Organic Matter	M	2625	%	0.40	13	15		5.2	0.74	13	8.0		5.1
Diesel Present	N	2670		N/A		False		False	False				
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0		170		< 1.0	< 1.0				
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0		170		< 5.0	< 5.0				
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				

Results - Soil

Project: LKC 20 1964

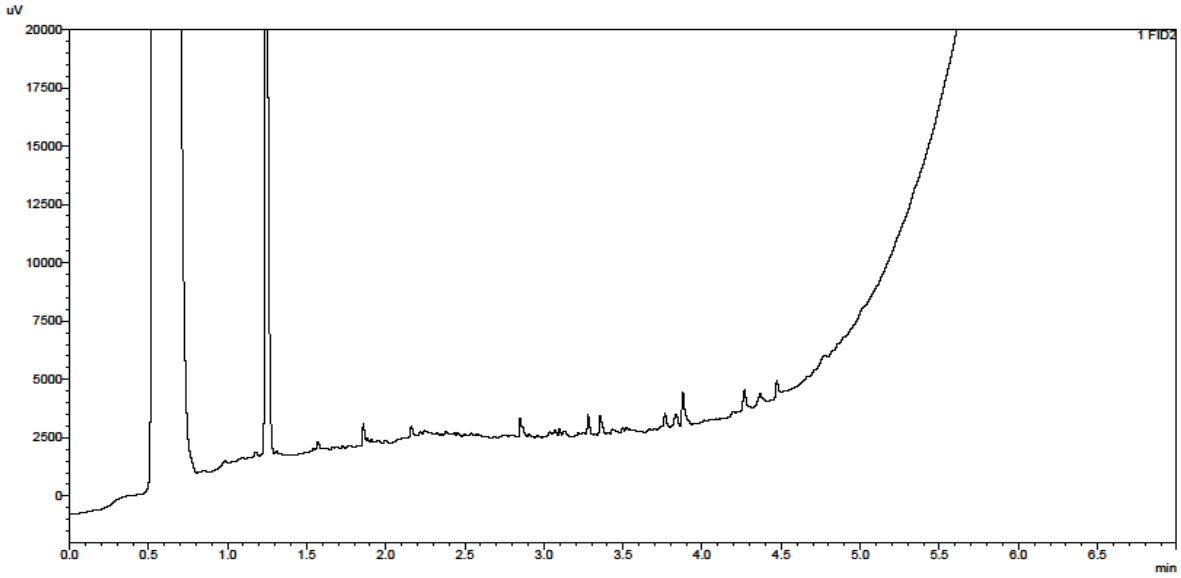
Client: LK Consult			**Chemtest Job No.:**		21-32613	21-32613	21-32613	21-32613	21-32613	21-32613	21-32613	21-32613	21-32613
Quotation No.:			**Chemtest Sample ID.:**		1282603	1282604	1282605	1282607	1282608	1282609	1282610	1282612	1282614
			Client Sample ID.:		WS101	WS101	WS101	WS102	WS102	WS103	WS104	WS104	WS105
			Sample Type:		SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
			Top Depth (m):		0.00	0.60	1.70	1.50	2.00	0.00	0.00	1.00	0.00
			Bottom Depth (m):		0.60	1.00	1.80	1.60	2.10	0.40	0.30	2.00	0.30
			Date Sampled:		16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021	16-Sep-2021
			Asbestos Lab:		DURHAM	DURHAM		DURHAM	DURHAM	DURHAM	DURHAM		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**									
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0		230		< 1.0	< 1.0				
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0		< 1.0		< 1.0	< 1.0				
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0		230		< 5.0	< 5.0				
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0		410		< 10	< 10				
Benzene	M	2760	µg/kg	1.0		< 1.0		< 1.0	< 1.0				
Toluene	M	2760	µg/kg	1.0		< 1.0		3.4	< 1.0				
Ethylbenzene	M	2760	µg/kg	1.0		< 1.0		< 1.0	< 1.0				
m & p-Xylene	M	2760	µg/kg	1.0		2.1		1.9	< 1.0				
o-Xylene	M	2760	µg/kg	1.0		1.3		1.2	< 1.0				
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0		< 1.0		< 1.0	< 1.0				
Naphthalene	M	2800	mg/kg	0.10	0.65	1.1				0.33	< 0.10		< 0.10
Acenaphthylene	N	2800	mg/kg	0.10	0.20	0.24				0.28	< 0.10		< 0.10
Acenaphthene	M	2800	mg/kg	0.10	0.19	0.54				0.30	< 0.10		< 0.10
Fluorene	M	2800	mg/kg	0.10	0.23	0.48				0.39	< 0.10		< 0.10
Phenanthrene	M	2800	mg/kg	0.10	2.1	3.1				3.4	< 0.10		12
Anthracene	M	2800	mg/kg	0.10	0.72	1.4				0.88	< 0.10		3.4
Fluoranthene	M	2800	mg/kg	0.10	4.8	7.9				4.4	0.33		11
Pyrene	M	2800	mg/kg	0.10	4.8	7.2				3.8	0.35		9.6
Benzo[a]anthracene	M	2800	mg/kg	0.10	3.0	4.4				2.0	0.19		4.7
Chrysene	M	2800	mg/kg	0.10	3.1	4.3				2.1	0.26		4.8
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	4.3	4.8				2.5	0.37		5.1
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	1.9	1.9				0.87	0.14		2.1
Benzo[a]pyrene	M	2800	mg/kg	0.10	3.5	4.0				2.0	0.29		4.2
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	2.4	2.4				1.3	< 0.10		2.5
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.87	0.67				0.31	< 0.10		0.57
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	2.3	2.2				1.2	< 0.10		2.4
Total Of 16 PAH's	N	2800	mg/kg	2.0	35	47				26	< 2.0		62
Total Phenols	M	2920	mg/kg	0.10		< 0.10							

TPH Chromatogram on Soil Sample: 1282604

<Sample Information>

Sample Name : 1282604 21-32613
Data Filename : 21 September 2021_21092021_1282604 21-32613_138.gcd
Method Filename : TPH 12m Fast OSv2.gcm
Sample # : 144
Date Acquired : 22/09/2021 06:44:42
Date Processed : 22/09/2021

<Chromatogram>



TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
21-32613	1282604	S			WS101	0.0	No	Lube Oil
21-32613	1282607	S			WS102	1.50	No	N/A
21-32613	1282608	S			WS102	2.00	No	N/A

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Allkaline extraction followed by colorimetric determination using Automated Flow Injection Analyser.
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2670	Total Petroleum Hydrocarbons (TPH) in Soils by GC-FID	TPH (C6–C40); optional carbon banding, e.g. 3-band – GRO, DRO & LRO*TPH C8–C40	Dichloromethane extraction / GC-FID
2680	TPH A/A Split	Aliphatics: >C5–C6, >C6–C8,>C8–C10, >C10–C12, >C12–C16, >C16–C21, >C21–C35, >C35– C44Aromatics: >C5–C7, >C7–C8, >C8– C10, >C10–C12, >C12–C16, >C16– C21, >C21– C35, >C35– C44	Dichloromethane extraction / GCxGC FID detection
2760	Volatile Organic Compounds (VOCs) in Soils by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics.(cf. USEPA Method 8260)*please refer to UKAS schedule	Automated headspace gas chromatographic (GC) analysis of a soil sample, as received, with mass spectrometric (MS) detection of volatile organic compounds.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS
2920	Phenols in Soils by HPLC	Phenolic compounds including Resorcinol, Phenol, Methylphenols, Dimethylphenols, 1-Naphthol and TrimethylphenolsNote: chlorophenols are excluded.	60:40 methanol/water mixture extraction, followed by HPLC determination using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
N	Unaccredited
S	This analysis has been subcontracted to a UKAS accredited laboratory that is accredited for this analysis
SN	This analysis has been subcontracted to a UKAS accredited laboratory that is not accredited for this analysis
T	This analysis has been subcontracted to an unaccredited laboratory
I/S	Insufficient Sample
U/S	Unsuitable Sample
N/E	not evaluated
<	"less than"
>	"greater than"
SOP	Standard operating procedure
LOD	Limit of detection

Comments or interpretations are beyond the scope of UKAS accreditation
The results relate only to the items tested
Uncertainty of measurement for the determinands tested are available upon request
None of the results in this report have been recovery corrected
All results are expressed on a dry weight basis

The following tests were analysed on samples as received and the results subsequently corrected to a dry weight basis TPH, BTEX, VOCs, SVOCs, PCBs, Phenols

For all other tests the samples were dried at < 37°C prior to analysis
All Asbestos testing is performed at the indicated laboratory
Issue numbers are sequential starting with 1 all subsequent reports are incremented by 1

Sample Deviation Codes

A - Date of sampling not supplied
B - Sample age exceeds stability time (sampling to extraction)
C - Sample not received in appropriate containers
D - Broken Container
E - Insufficient Sample (Applies to LOI in Trommel Fines Only)

Sample Retention and Disposal

All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Eurofins Chemtest Ltd
Depot Road
Newmarket
CB8 0AL
Tel: 01638 606070
Email: info@chemtest.com

Final Report

Report No.:	21-32697-1
Initial Date of Issue:	24-Sep-2021
Client	LK Consult
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS
Contact(s):	Chris Hughes Contaminated Land
Project	LKC 20 1964 Belgrave Road, Oldham

Quotation No.:		**Date Received:**	21-Sep-2021
Order No.:	739042	**Date Instructed:**	20-Sep-2021
No. of Samples:	1		
Turnaround (Wkdays):	5	**Results Due:**	24-Sep-2021
Date Approved:	24-Sep-2021		

Approved By:

Details: Glynn Harvey, Technical Manager

Results - Soil

Project: LKC 20 1964 Belgrave Road, Oldham

Client: LK Consult		**Chemtest Job No.:**			21-32697
Quotation No.:		**Chemtest Sample ID.:**			1283033
		Sample Location:			WS102
		Sample Type:			SOIL
		Top Depth (m):			0.00
		Bottom Depth (m):			0.50
		Date Sampled:			16-Sep-2021
		Asbestos Lab:			DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
ACM Type	U	2192		N/A	-
Asbestos Identification	U	2192		N/A	No Asbestos Detected
Moisture	N	2030	%	0.020	12
Soil Colour	N	2040		N/A	Brown
Other Material	N	2040		N/A	Stones, Roots and Wood
Soil Texture	N	2040		N/A	Sand
pH	M	2010		4.0	8.1
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.022
Arsenic	M	2450	mg/kg	1.0	17
Cadmium	M	2450	mg/kg	0.10	0.32
Chromium	M	2450	mg/kg	1.0	22
Copper	M	2450	mg/kg	0.50	72
Mercury	M	2450	mg/kg	0.10	< 0.10
Nickel	M	2450	mg/kg	0.50	36
Lead	M	2450	mg/kg	0.50	64
Selenium	M	2450	mg/kg	0.20	0.25
Vanadium	U	2450	mg/kg	5.0	42
Zinc	M	2450	mg/kg	0.50	160
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50
Organic Matter	M	2625	%	0.40	8.3
Naphthalene	M	2800	mg/kg	0.10	0.46
Acenaphthylene	N	2800	mg/kg	0.10	0.10
Acenaphthene	M	2800	mg/kg	0.10	0.14
Fluorene	M	2800	mg/kg	0.10	0.14
Phenanthrene	M	2800	mg/kg	0.10	1.6
Anthracene	M	2800	mg/kg	0.10	0.47
Fluoranthene	M	2800	mg/kg	0.10	2.8
Pyrene	M	2800	mg/kg	0.10	2.6
Benzo[a]anthracene	M	2800	mg/kg	0.10	1.4
Chrysene	M	2800	mg/kg	0.10	1.6
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	2.0
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.69
Benzo[a]pyrene	M	2800	mg/kg	0.10	1.6
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	1.1
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.28
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	1.1

Results - Soil

Project: LKC 20 1964 Belgrave Road, Oldham

Client: LK Consult			**Chemtest Job No.:**		21-32697
Quotation No.:			**Chemtest Sample ID.:**		1283033
			Sample Location:		WS102
			Sample Type:		SOIL
			Top Depth (m):		0.00
			Bottom Depth (m):		0.50
			Date Sampled:		16-Sep-2021
			Asbestos Lab:		DURHAM
Determinand	**Accred.**	**SOP**	**Units**	**LOD**	
Total Of 16 PAH's	N	2800	mg/kg	2.0	18

Test Methods

SOP	Title	Parameters included	Method summary
2010	pH Value of Soils	pH	pH Meter
2030	Moisture and Stone Content of Soils(Requirement of MCERTS)	Moisture content	Determination of moisture content of soil as a percentage of its as received mass obtained at <37°C.
2040	Soil Description(Requirement of MCERTS)	Soil description	As received soil is described based upon BS5930
2120	Water Soluble Boron, Sulphate, Magnesium & Chromium	Boron; Sulphate; Magnesium; Chromium	Aqueous extraction / ICP-OES
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2450	Acid Soluble Metals in Soils	Metals, including: Arsenic; Barium; Beryllium; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Vanadium; Zinc	Acid digestion followed by determination of metals in extract by ICP-MS.
2490	Hexavalent Chromium in Soils	Chromium [VI]	Soil extracts are prepared by extracting dried and ground soil samples into boiling water. Chromium [VI] is determined by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazide.
2625	Total Organic Carbon in Soils	Total organic Carbon (TOC)	Determined by high temperature combustion under oxygen, using an Eltra elemental analyser.
2800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Soil by GC-MS	Acenaphthene*; Acenaphthylene; Anthracene*; Benzo[a]Anthracene*; Benzo[a]Pyrene*; Benzo[b]Fluoranthene*; Benzo[ghi]Perylene*; Benzo[k]Fluoranthene; Chrysene*; Dibenz[ah]Anthracene; Fluoranthene*; Fluorene*; Indeno[123cd]Pyrene*; Naphthalene*; Phenanthrene*; Pyrene*	Dichloromethane extraction / GC-MS

Report Information

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All soil samples will be retained for a period of 30 days from the date of receipt
All water samples will be retained for 14 days from the date of receipt
Charges may apply to extended sample storage

If you require extended retention of samples, please email your requirements to:
customerservices@chemtest.com

Appendix D

Certificates of Analysis - Geotechnical

MURRAY RIX
CONSULTANCY, SITE INVESTIGATION
CONSTRUCTION MATERIALS TESTING

TEST REPORT

Client LK Consult Ltd

Address Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Greater Manchester
M26 2ZS

Contract LKC 20 1964 -
Belgrave Road, Oldham

Job Number MRN 4066/193
Date of Issue 28 October 2021
Pages 1 of 5

Approved Signatories

S J Hutchings, O P Davies

Notes

1 All remaining samples and remnants from this contract will be disposed 28 days from the date of this report unless you notify us to the contrary.

2 Result certificates, in this report, not bearing a UKAS mark, are not included in our UKAS accreditation schedule.

3 Opinions and interpretations expressed herein are outside the scope of our UKAS accreditation.

4 Certified that the samples have been examined and tested in accordance with the terms of the contract/order and unless otherwise stated conform to the standards/specifications quoted.

5 The results included within the report are representative of the samples submitted for analysis.

6 This certificate should not be reproduced, except in full, without the express permission of the laboratory.

MURRAY RIX

Andrew House, Hadfield Street,
Dukinfield, Cheshire SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

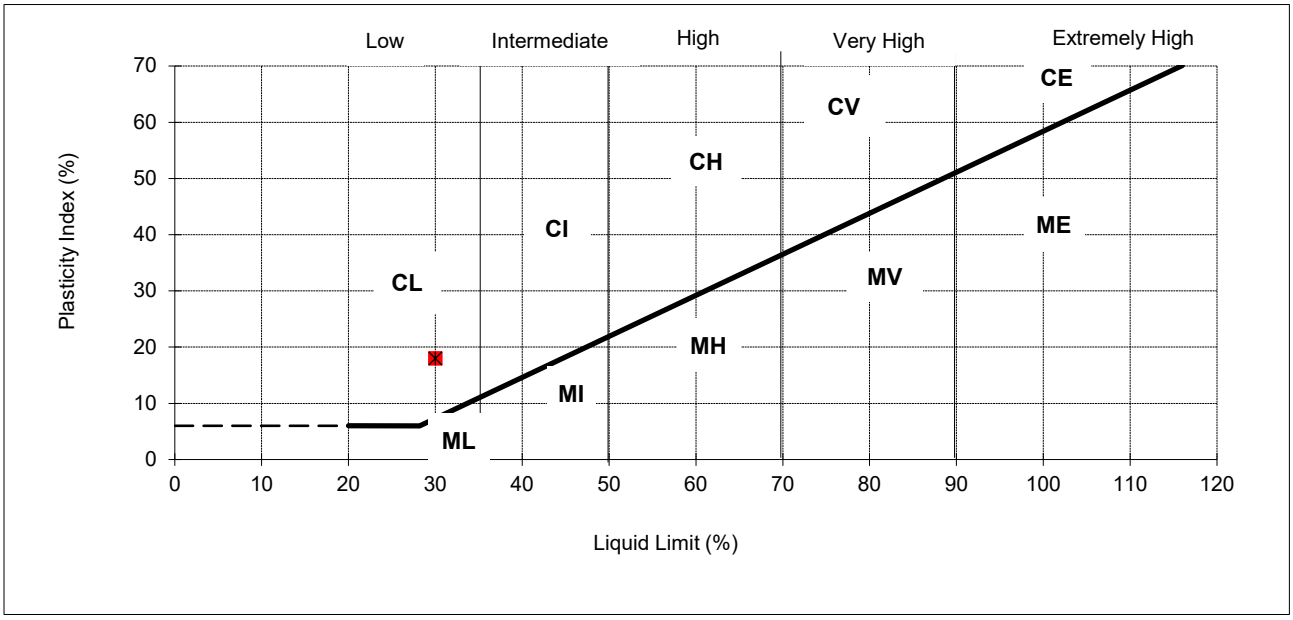
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 20 1964 - Belgrave Road, Oldham
JOB NUMBER	MRN 4066/193

SAMPLE LABEL	WS101 SPT 3m	DATE SAMPLED	Not advised
SAMPLE No.	105224	DATE RECEIVED	06-Oct-21
DATE TESTED	09-Oct-21	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
11	30	12	18	88



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 28-Oct-21

MURRAY RIX

Andrew House, Hadfield Street,
Dukinfield, Cheshire SK16 4QX
TEL 0161 475 0870

UKAS TESTING
1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

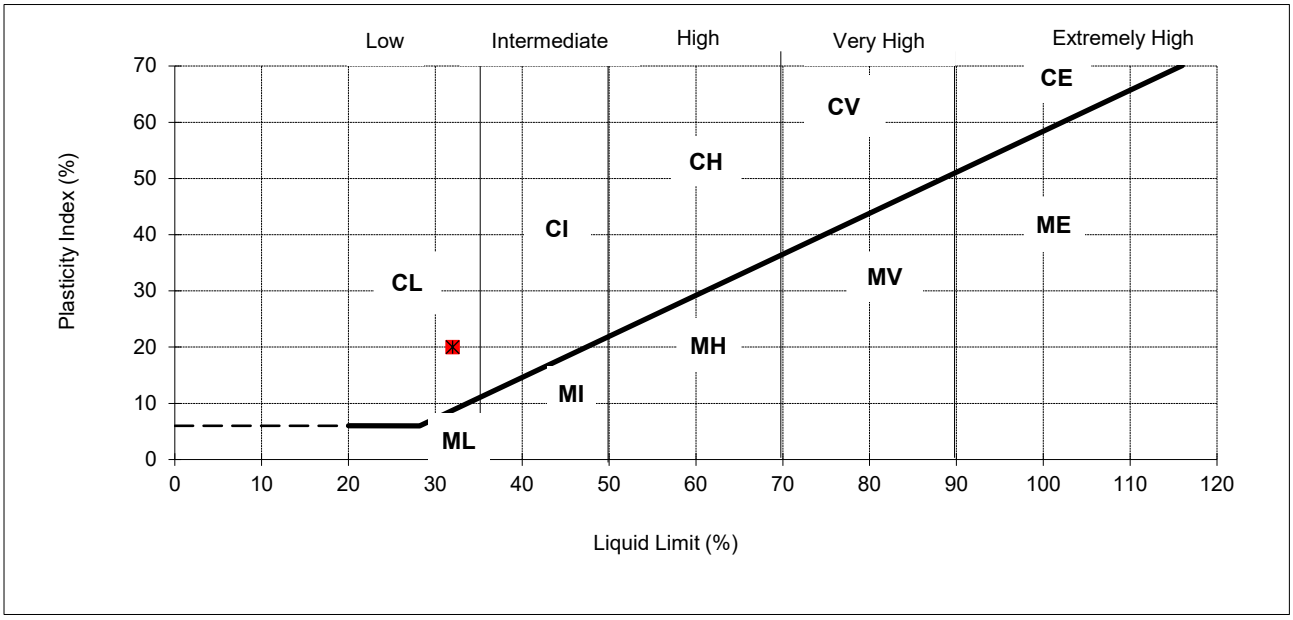
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 20 1964 - Belgrave Road, Oldham
JOB NUMBER	MRN 4066/193

SAMPLE LABEL	WS102 SPT 2m	DATE SAMPLED	Not advised
SAMPLE No.	105225	DATE RECEIVED	06-Oct-21
DATE TESTED	09-Oct-21	SAMPLED BY	Client

MATERIAL	Firm brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
18	32	12	20	90



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 28-Oct-21

MURRAY RIX

Andrew House, Hadfield Street,
Dukinfield, Cheshire SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

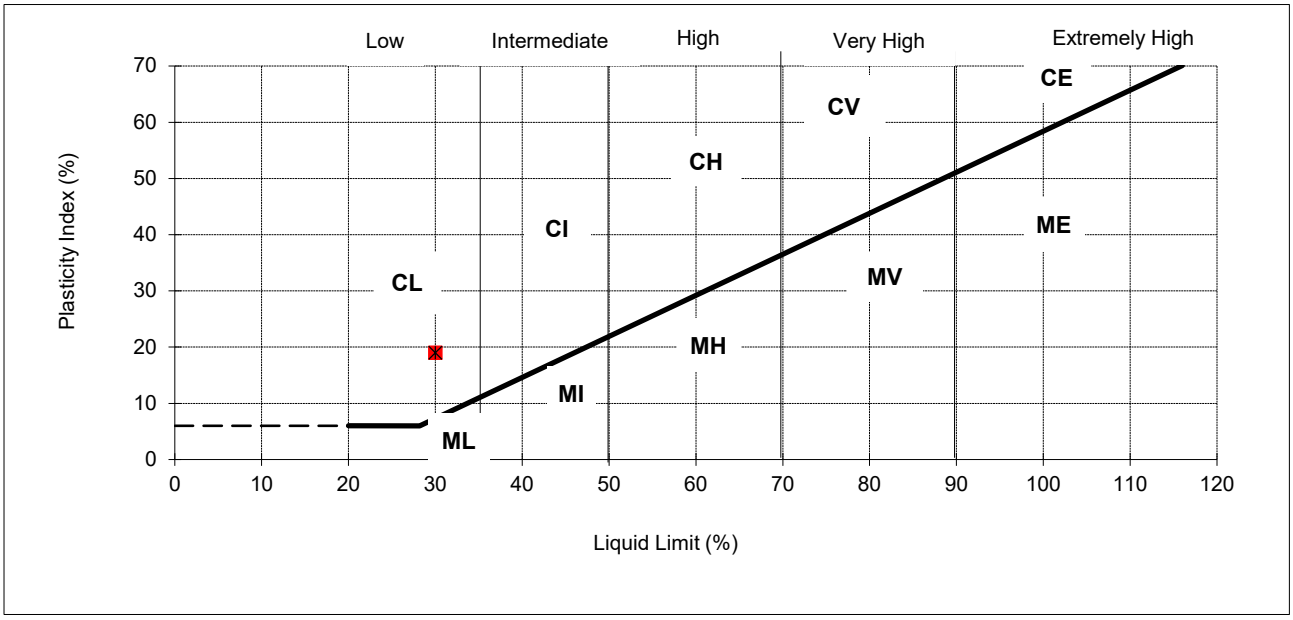
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 20 1964 - Belgrave Road, Oldham
JOB NUMBER	MRN 4066/193

SAMPLE LABEL	WS104 SPT 2m	DATE SAMPLED	Not advised
SAMPLE No.	105226	DATE RECEIVED	06-Oct-21
DATE TESTED	09-Oct-21	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
14	30	11	19	93



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 28-Oct-21

MURRAY RIX

Andrew House, Hadfield Street,
Dukinfield, Cheshire SK16 4QX
TEL 0161 475 0870

UKAS TESTING 1580

TEST CERTIFICATE

LIQUID AND PLASTIC LIMIT

BS 1377: PART 2: 1990 Clause 4.4 ONE POINT METHOD & Clause 5.3

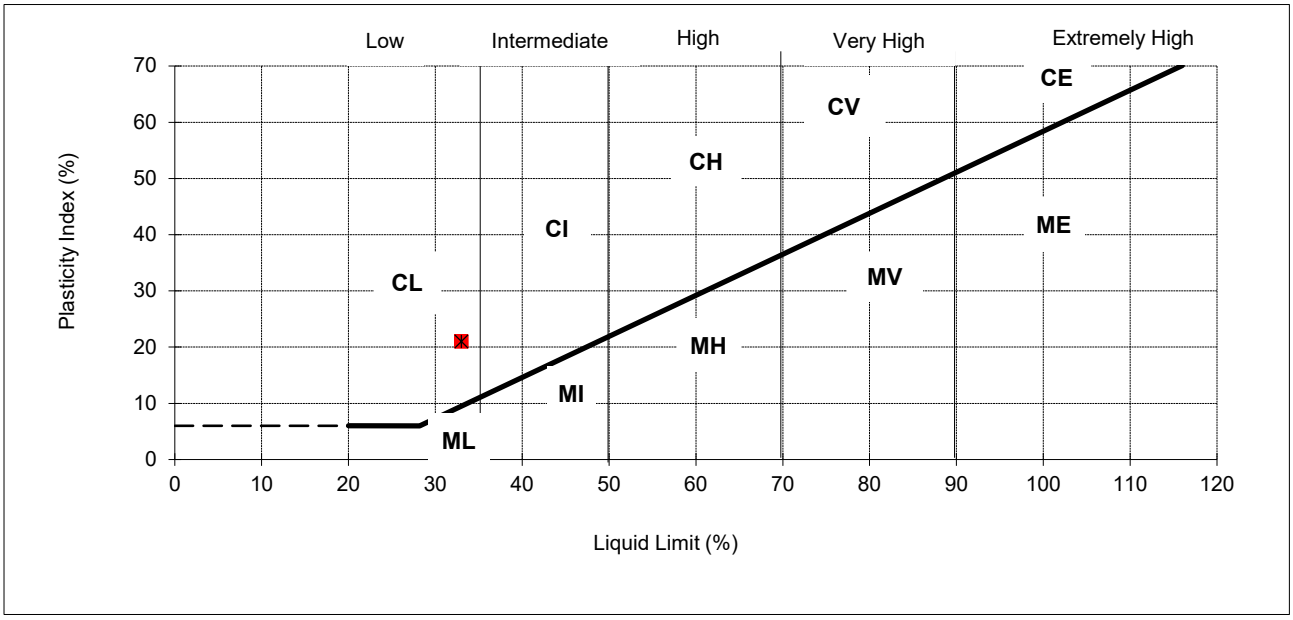
MOISTURE CONTENT METHOD BS 1377: PART 2: 1990 Clause 3.2

CLIENT	LK Consult Ltd
SITE	LKC 20 1964 - Belgrave Road, Oldham
JOB NUMBER	MRN 4066/193

SAMPLE LABEL	WS105 SPT 2m	DATE SAMPLED	Not advised
SAMPLE No.	105227	DATE RECEIVED	06-Oct-21
DATE TESTED	09-Oct-21	SAMPLED BY	Client

MATERIAL	Stiff brown silty sandy CLAY with rare gravel
ADVISED SOURCE	Site Investigation Sample

Moisture Content (Natural) (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
15	33	12	21	91



REMARKS
Sample tested in natural condition

SIGNED

NAME O.P. Davies BA (Hons)
(Laboratory Manager)

DATE 28-Oct-21

Appendix E

Gas Monitoring Results

LK CONSULT LTD

GAS MONITORING RECORD

Site	Belgrave Road
Job Number	LKC 20 1964
Date	08/10/2021
Engineer	JT
Visit	1 of 5

Equipment[1]		
Instrument	**Serial Number**	**Comments**
Gas Analyser GA5000	G502417	Serviced, calibrated, gas checked.
HydroTechnik	HT-01	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Rising
Weather Conditions	Sun with clouds, calm
Ground Conditions	Dry

Borehole ID	**Date & Time**	**CH_4 (%v/v)**	**CO_2 (%v/v)**	**O_2 (%v/v)**	**Peak CH_4 (%v/v)**	**Peak CO_2 (%v/v)**	**% LEL[2]**	**CO Pod (ppm)**	**H_2S Pod (ppm)**	**Balance (%)**	**Barometric Pressure (mb)**	**Internal Flow[3] (l/hr)**	**Standing water level (mbgl)**	**Installation base depth (mbgl)**	**Notes**
WS101	08/10/2021 10:35	4.90	6.30	0.10	4.90	6.30	98.00	3.00	0.00	88.70	1007	-7.60	1.80	3.80	CO intial peak 12
WS102	08/10/2021 10:53	0.00	2.10	17.00	0.50	2.10	0.00	0.00	0.00	80.90	1009	-1.90	0.80	1.50	CO intial peak 8
WS103	08/10/2021 10:59	0.00	3.90	15.50	0.00	3.90	0.00	1.00	0.00	80.60	1009	-0.10	1.52	3.90	CO initial peak 7
WS104	08/10/2021 11:09	0.00	1.80	18.70	0.00	1.80	0.00	1.00	0.00	79.50	1009	-2.20	1.78	4.70	CO intial peak 15
WS105	08/10/2021 11:21	0.00	0.10	20.80	0.00	0.60	0.00	1.00	0.00	79.10	1010	-1.20	0.90	2.70	CO intial peak 4

ABBREVIATIONS	
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
ppm	Parts per million
mb	Millibars
l/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air

NOTES

All monitoring is carried out in line with LK Consult Ltd procedures, with reference to CIRIA C665.

[1]Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.

[2]CH4 is explosive between the range of 5-15%v/v. 100% lower explosive limit is equal to 5%v/v CH4.

[3]Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr).

LK CONSULT LTD

GAS MONITORING RECORD

Site	Belgrave Road, Oldham
Job Number	LKC 20 1964
Date	28/10/2021
Engineer	MP
Visit	2 of 6

Equipment[1]		
Instrument	**Serial Number**	**Comments**
Gas Analyser GA5000	G502417	Serviced, calibrated, gas checked.
Geotech Dipmeter	0	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Falling
Weather Conditions	Dry, Slight breeze
Ground Conditions	Damp

Borehole ID	Date & Time	CH_4 (%v/v)	CO_2 (%v/v)	O_2 (%v/v)	Peak CH_4 (%v/v)	Peak CO_2 (%v/v)	% LEL[2]	CO Pod (ppm)	H_2S Pod (ppm)	Balance (%)	Barometric Pressure (mb)	Internal Flow[3] (l/hr)	Standing water level (mbgl)	Installation base depth (mbgl)	Notes
WS101	28/10/2021 09:01	0	0.7	19.7	0	1.3	0	0	0	79.6	985	0	1.72	3.78	Peak Co=4ppm, Peak Flow=0l/hr
WS102	28/10/2021 09:17	0	2.6	17.9	0	2.6	0	0	0	79.5	985	0	0.95	1.6	Peak Co=4ppm, Peak Flow=0l/hr
WS103	28/10/2021 09:31	0	4.2	13.4	0	4.2	0	0	0	82.4	985	0	1.14	3.85	Peak Co=4ppm, Peak Flow=0l/hr
WS104	28/10/2021 09:42	0	1.8	19.3	0	1.8	0	0	0	78.9	986	0	1.78	4.83	Peak Co=2ppm, Peak Flow=0l/hr
WS105	28/10/2021 09:53	0	0.1	20.9	0	0.3	0	0	0	79	986	0	0.62	2.8	Peak Co=0ppm, Peak Flow=0l/hr

ABBREVIATIONS	
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
ppm	Parts per million
mb	Millibars
l/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air

NOTES

All monitoring is carried out in line with LK Consult Ltd procedures, with reference to CIRIA C665.

[1]Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.

[2]CH4 is explosive between the range of 5-15%v/v. 100% lower explosive limit is equal to 5%v/v CH4.

[3]Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr).

LK CONSULT LTD

GAS MONITORING RECORD

Site	Belgrave Road
Job Number	LKC 21 1964
Date	17/11/2021
Engineer	JT
Visit	3 of 6

Equipment[1]		
Instrument	**Serial Number**	**Comments**
Gas Analyser GA5000	G502417	Serviced, calibrated, gas checked.
HydroTechnik	HT-01	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Rising
Weather Conditions	Overcast
Ground Conditions	Dry

Borehole ID	**Date & Time**	**CH_4 (%v/v)**	**CO_2 (%v/v)**	**O_2 (%v/v)**	**Peak CH_4 (%v/v)**	**Peak CO_2 (%v/v)**	**% LEL[2]**	**CO Pod (ppm)**	**H_2S Pod (ppm)**	**Balance (%)**	**Barometric Pressure (mb)**	**Internal Flow[3] (l/hr)**	**Standing water level (mbgl)**	**Installation base depth (mbgl)**	**Notes**
WS101	17/11/2021 13:45	2.70	3.60	10.40	3.30	4.20	54.00	0.00	0.00	83.30	1002	0.00	1.61	3.80	
WS102	17/11/2021 13:53	0.00	2.30	17.90	0.00	2.30	0.00	0.00	0.00	79.80	1003	0.00	1.70	1.60	
WS103	17/11/2021 14:05	0.00	2.60	18.10	0.00	3.10	0.00	0.00	0.00	79.30	1003	-0.70	1.09	3.89	
WS104															Well blocked by parked van
WS105	17/11/2021 14:14	0.00	0.40	21.10	0.00	1.40	0.00	0.00	0.00	78.50	1003	-0.10	1.60	4.90	

ABBREVIATIONS	
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
ppm	Parts per million
mb	Millibars
l/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air

NOTES

All monitoring is carried out in line with LK Consult Ltd procedures, with reference to CIRIA C665.

[1]Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.

[2]CH4 is explosive between the range of 5-15%v/v. 100% lower explosive limit is equal to 5%v/v CH4.

[3]Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr).

LK CONSULT LTD

GAS MONITORING RECORD

Site	Belgrave Road, Oldham
Job Number	LKC 20 1964
Date	01.12.2021
Engineer	FP
Visit	4 of 6

Equipment[1]		
Instrument	**Serial Number**	**Comments**
Gas Analyser GA5000	G502417	Serviced, calibrated, gas checked.
Geotech Dipmeter	79864	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Variable
Weather Conditions	Cold, still, slight rain
Ground Conditions	Damp

Borehole ID	**Date & Time**	**CH_4 (%v/v)**	**CO_2 (%v/v)**	**O_2 (%v/v)**	**Peak CH_4 (%v/v)**	**Peak CO_2 (%v/v)**	**% LEL[2]**	**CO Pod (ppm)**	**H_2S Pod (ppm)**	**Balance (%)**	**Barometric Pressure (mb)**	**Internal Flow[3] (l/hr)**	**Standing water level (mbgl)**	**Installation base depth (mbgl)**	**Notes**
WS101	01/12/2021 10:27	0	0.9	18.2	0	5.4	0	0	0	80.9	977	0	1.03	3.79	Peak Flow: 0.0 l/hr. CO Steady: 0.0 ppm. PID: 0.1 ppm.
WS102	01/12/2021 10:15	0	1	20.3	0	2.1	0	0	0	78.7	977	0.2	0.46	1.61	Peak Flow: 13.3 l/hr initially flow steadied to 0.2 after 6 minutes. CO Steady: 0.0 ppm. PID: <0.1 ppm
WS103	02/12/2021 11:05	0	0.4	21	0	0.4	0	0	0	78.6	977	0.1	0.63	3.86	Peak Flow: 0.2 l/hr. CO Steady: 0.0 ppm. PID: 0.2 ppm. Water drawn in after 63 seconds. Bung missing so replaced and measured after 30 minutes.
WS104	01/12/2021 09:45	0	2	19.3	0	2.2	0	0	0	78.7	976	0	1.09	4.83	Peak Flow: 0.0 l/hr. CO Steady: 0.0 ppm. PID: 0.1 ppm
WS105	01/12/2021 10:45	0	0.1	21.3	0	0.3	0	0	0	78.6	977	0	0.2	2.8	Peak Flow: 0.0 l/hr. CO Steady: 0.0 ppm. PID: 0.1 ppm. Bung missing so replaced and measured after 1 hour.

ABBREVIATIONS	
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
ppm	Parts per million
mb	Millibars
l/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air

NOTES

All monitoring is carried out in line with LK Consult Ltd procedures, with reference to CIRIA C665.

[1]Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.

[2]CH4 is explosive between the range of 5-15%v/v. 100% lower explosive limit is equal to 5%v/v CH4.

[3]Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr).

LK CONSULT LTD

GAS MONITORING RECORD

Site	Belgrave Road, Oldham
Job Number	LKC 20 1964
Date	20.12.2021
Engineer	FP
Visit	5 of 6

Equipment[1]		
Instrument	**Serial Number**	**Comments**
Gas Analyser GA5000	G502417	Serviced, calibrated, gas checked.
otech Oil-in-Water Interface Me	81454-14	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising then steady
Atmospheric pressure (prev 24hrs)	Falling
Weather Conditions	Cold, still, slight rain
Ground Conditions	Damp

Borehole ID	**Date & Time**	**CH_4 (%v/v)**	**CO_2 (%v/v)**	**O_2 (%v/v)**	**Peak CH_4 (%v/v)**	**Peak CO_2 (%v/v)**	**% LEL[2]**	**CO Pod (ppm)**	**H_2S Pod (ppm)**	**Balance (%)**	**Barometric Pressure (mb)**	**Internal Flow[3] (l/hr)**	**Standing water level (mbgl)**	**Installation base depth (mbgl)**	**Notes**
WS101	20/12/2021 09:56	0	0.6	20.3	0	3.6	0	0	0	79	1010	0	1.62	3.87	
WS102	20/12/2021 10:08	0	1.6	19.1	0	1.7	0	0	0	79.3	1011	0	1.18	1.67	
WS103	20/12/2021 10:25	0	2.5	18.2	0	2.6	0	1	0	79.3	1011	-1	0.76	3.93	Peak Flow: -9.4 l/hr steadying to -1.0 after 5 minutes.
WS104	20/12/2021 10:41	0	2	18.4	0	2	0	0	0	79.6	1011	0	1.3	4.91	
WS105	20/12/2021 10:52	0	0.1	22	0	0.3	0	0	0	77.9	1011	0	0.65	2.86	
WS103	20/12/2021 11:11	0	0.5	21.8	0	0.5	0	0	0	77.6	1011	1.3	1.03	3.93	Due to high standing water level WS103 was resampled after 50 minutes.
WS105	20/12/2021 11:22	0	0.1	22.1	0	0.2	0	0	0	77.7	1011	0.2	1.9	2.86	Due to high standing water level WS105 was resampled after 30 minutes.

ABBREVIATIONS	
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
ppm	Parts per million
mb	Millibars
l/hr	Litres per hour
mbgl	Metres below ground level
LEL	Lower explosive limit in air

NOTES

All monitoring is carried out in line with LK Consult Ltd procedures, with reference to CIRIA C665.

[1]Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.

[2]CH4 is explosive between the range of 5-15%v/v. 100% lower explosive limit is equal to 5%v/v CH4.

[3]Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr).

LK CONSULT LTD

GAS MONITORING RECORD

Site	Belgrave Road, Oldham
Job Number	LKC 20 1964
Date	07/01/2022
Engineer	MP
Visit	6 of 6

Equipment[1]		
Instrument	**Serial Number**	**Comments**
Gas Analyser GA5000	G502417	Serviced, calibrated, gas checked.
Geotech Dipmeter	HT-02	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Variable
Weather Conditions	Snowing, low wind speed, very cold
Ground Conditions	Dry

Borehole ID	**Date & Time**	**CH_4 (%v/v)**	**CO_2 (%v/v)**	**O_2 (%v/v)**	**Peak CH_4 (%v/v)**	**Peak CO_2 (%v/v)**	**% LEL[2]**	**CO Pod (ppm)**	**H_2S Pod (ppm)**	**Balance (%)**	**Barometric Pressure (mb)**	**Internal Flow[3] (l/hr)**	**Standing water level (mbgl)**	**Installation base depth (mbgl)**	**Notes**
WS101	07/01/2022 09:25	0	0.7	20.4	0	3.5	0	0	0	78.9	985	0	1.2	3.79	Peak CO= 0ppm, peak flow=0l/hr.
WS102	07/01/2022 09:47	0	1.5	20.4	0	1.6	0	0	0	78.1	985	0	1.05	1.61	Peak CO=0ppm, peak flow=0l/hr.
WS103	07/01/2022 10:06	0	2.8	18.7	0	3.1	0	0	0	78.5	986	3.9	0.7	3.85	Peak CO=0ppm, peak flow=10.7l/hr, flow was monitored for 3 minutes.
WS104	07/01/2022 10:13	0	2	20.5	0	2	0	0	0	77.5	986	0	0.25	4.83	Peak CO=2ppm, peak flow=0l/hr, water taken up by tubing after 30 seconds.
WS105	07/01/2022 10:22	0	0.3	22.5	0	1.3	0	0	0	77.2	986	0	0.81	2.79	Peak CO=0ppm, peak flow=0l/hr.

ABBREVIATIONS	
ND	Not detected
NR	Not recorded
UR	Unable to record
OS	Off recordable scale
N/A	Not applicable
ppm	Parts per million
mb	Millibars
l/hr	Litres per hour
mbgl	Metres below ground level
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NOTES

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[1]Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.

[2]CH4 is explosive between the range of 5-15%v/v. 100% lower explosive limit is equal to 5%v/v CH4.

[3]Flow readings are based on a 1 minute average value where flow is detected (equipment range of +/- 12 ltr/hr).

Appendix F

Generic Assessment Criteria Values

Generic Assessment Criteria Values

LK CONSULT

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	^{POS}resi	^{POS}park	Source
Metals	Inorganic Arsenic	N/A	37	40	49	640	79	168	DEFRA C4SL
	Beryllium	N/A	1.7	1.7	35	12	2.2	63	LQM S4UL
	Boron	N/A	290	11,000	45	240,000	21,000	46,000	LQM S4UL
	Cadmium	N/A	26	149	4.9	410	220	880	DEFRA C4SL
	Chromium (III)	N/A	910	910	18,000	8,600	1,500	33,000	LQM S4UL
	Chromium (VI)	N/A	21.0	21.0	170.0	49	23.0	250	DEFRA C4SL
	Copper	N/A	2,400	7,100	520	68,000	12,000	44,000	LQM S4UL
	Lead	N/A	200	310	80	2,330	630	1,300	DEFRA C4SL
	Elemental Mercury	N/A	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}	LQM S4UL
	Inorganic Mercury	N/A	40	56	19	1,100	120	240	LQM S4UL
	Methylmercury	N/A	11	15	6.0	320	40	68	LQM S4UL
	Nickel	N/A	180	180	230	980	230	3,400	LQM S4UL
	Selenium	N/A	250	430	88	12,000	1,100	1,800	LQM S4UL
	Vanadium	N/A	410	1,200	91	9,000	2,000	5,000	LQM S4UL
	Zinc	N/A	3,700	40,000	620	730,000	81,000	170,000	LQM S4UL
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000	LQM S4UL
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000	LQM S4UL
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000	LQM S4UL
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000	LQM S4UL
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000	LQM S4UL
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000	LQM S4UL
		2.5%	5,400	35,000	950	540,000	74,000	150,000	LQM S4UL
		6%	11,000	37,000	2,200	540,000	74,000	150,000	LQM S4UL
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49	LQM S4UL
		2.5%	11	14	6.5	170	29	56	LQM S4UL
		6%	13	15	13	180	29	62	LQM S4UL
	Benzo(a)pyrene (only)	1%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		2.5%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
		6%	5.0	5.3	5.70	77	10.0	21	DEFRA C4SL
	Benzo(a)pyrene (surrogate marker Coal Tar)	1%	0.8	1.2	0.32	15	2.2	4	LQM S4UL
		2.5%	1.0	1.2	0.67	15	2.2	5	LQM S4UL
		6%	1.1	1.2	1.20	15	2.2	5	LQM S4UL
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13	LQM S4UL
		2.5%	3.3	4.0	2.1	44	7.2	15	LQM S4UL
		6%	3.7	4.0	3.9	45	7.2	16	LQM S4UL
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400	LQM S4UL
		2.5%	340	360	470	4,000	640	1,500	LQM S4UL
		6%	350	360	640	4,000	640	1,600	LQM S4UL
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370	LQM S4UL
		2.5%	93	110	75	1,200	190	410	LQM S4UL
		6%	100	110	130	1,200	190	440	LQM S4UL
	Chrysene	1%	15	30	4.1	350	57	93	LQM S4UL
		2.5%	22	31	9.4	350	57	110	LQM S4UL
		6%	27	32	19	350	57	120	LQM S4UL
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1	LQM S4UL
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3	LQM S4UL
		6%	0.3	0.32	0.43	3.6	0.58	1.4	LQM S4UL
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300	LQM S4UL
		2.5%	560	1,600	130	23,000	3,100	6,300	LQM S4UL
		6%	890	1,600	290	23,000	3,100	6,400	LQM S4UL
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000	LQM S4UL
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000	LQM S4UL
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000	LQM S4UL
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150	LQM S4UL
		2.5%	36	46	21	510	82	170	LQM S4UL
		6%	41	46	39	510	82	180	LQM S4UL
	Naphthalene	1%	2.3 ^{f}	2.3 ^{f}	4.1 ^{f}	190 ^{f} (76.4) ^{sol}	4,900 ^{f}	1,200 ^{f} (76.4) ^{sol}	LQM S4UL
		2.5%	5.6 ^{f}	5.6 ^{f}	10 ^{f}	460 ^{f} (183) ^{sol}	4,900 ^{f}	1,900 ^{f} (183) ^{sol}	LQM S4UL
		6%	13 ^{f}	13 ^{f}	24 ^{f}	1,100 ^{f} (432) ^{sol}	4,900 ^{f}	3,000	LQM S4UL
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200	LQM S4UL
		2.5%	220	1,500	38	22,000	3,100	6,200	LQM S4UL
		6%	440	1,500	90	22,000	3,100	6,300	LQM S4UL
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000	LQM S4UL
		2.5%	1,200	3,800	270	54,000	7,400	15,000	LQM S4UL
		6%	2,000	3,800	620	54,000	7,400	15,000	LQM S4UL
	Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	LQM S4UL
		2.5%	0.98	1.2	0.67	15	2.2	4.7	LQM S4UL
		6%	1.1	1.2	1.2	15	2.2	4.8	LQM S4UL

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	POSresi	POSpark	Source
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90	LQM S4UL
		2.5%	0.17	0.70	0.034	47	72	100	LQM S4UL
		6%	0.37	1.4	0.075	90	73	110	LQM S4UL
	Toluene	1%	130	880 (869) vap	22	56,000 (869) vap	56,000	87,000 (869) vap	LQM S4UL
		2.5%	290	1,900	51	110,000 (1,920) vap	56,000	95,000 (1,920) vap	LQM S4UL
		6%	660	3,900	120	180,000 (4,360) vap	56,000	100,000 (4,360)	LQM S4UL
	Ethylbenzene	1%	47	83	16	5,700 (518) vap	24,000	17,000 (518) vap	LQM S4UL
		2.5%	110	190	39	13,000 (1,220) vap	24,000	22,000 (1,220) vap	LQM S4UL
		6%	260	440	91	27,000 (2,840) vap	25,000	27,000 (2,840) vap	LQM S4UL
	o-xylene	1%	60	88	28	6,600 (478) sol	41,000	17,000 (478) sol	LQM S4UL
		2.5%	140	210	67	15,000 (1,120) sol	42,000	24,000 (1,120) sol	LQM S4UL
		6%	330	480	160	33,000 (2,620) sol	43,000	33,000 (2,620) sol	LQM S4UL
	m-xylene	1%	59	82	31	6,200 (625) vap	41,000	17,000 (625) vap	LQM S4UL
		2.5%	140	190	74	14,000 (1,470) vap	42,000	24,000 (1,470) vap	LQM S4UL
		6%	320	450	170	31,000 (3,460) vap	43,000	32,000 (3,460) vap	LQM S4UL
	p-xylene	1%	56	79	29	5,900 (576) sol	41,000	17,000 (576) sol	LQM S4UL
		2.5%	130	180	69	14,000 (1,350) sol	42,000	23,000 (1,350) sol	LQM S4UL
		6%	310	430	160	30,000 (3,170) sol	43,000	31,000 (3,170) sol	LQM S4UL
Petroleum Hydrocarbons	**Aliphatic**								
	EC 5-6	1%	42	42	730	3,200 (304) sol	570,000(304)sol	95,000 (304) sol	LQM S4UL
	EC>6-8	1%	100	100	2,300	7,800 (144) sol	600,000	150,000 (144) sol	LQM S4UL
	EC>8-10	1%	27	27	320	2,000 (78) sol	13,000	14,000 (78) vap	LQM S4UL
	EC>10-12	1%	130 (48) vap	130 (48) vap	2,200	9,700 (48) sol	13,000	21,000 (48) vap	LQM S4UL
	EC>12-16	1%	1,100 (24) sol	1,100 (24) sol	11,000	59,000 (24) sol	13,000	25,000 (24) sol	LQM S4UL
	EC>16-35	1%	65,000 (8.48)	65,000 (8.48) f,sol	260,000 f	160,000 f	250,000 f	450,000 f	LQM S4UL
	EC>35-44	1%	65,000 (8.48)	65,000 (8.48) f,sol	260,000 f	160,000 f	250,000 f	450,000 f	LQM S4UL
	Aliphatic								
	EC 5-6	2.5%	78	78	1,700	5,900 (558) sol	590,000	130,000 (558) sol	LQM S4UL
	EC>6-8	2.5%	230	230	5,600	17,000 (322) sol	610,000	220,000 (322) sol	LQM S4UL
	EC>8-10	2.5%	65	65	770	4,800 (190) vap	13,000	18,000 (190) vap	LQM S4UL
	EC>10-12	2.5%	330 (118) vap	330 (118) vap	4,400	23,000 (118) vap	13,000	23,000 (118) vap	LQM S4UL
	EC>12-16	2.5%	2,400 (59) sol	2,400 (59) sol	13,000	82,000 (59) sol	13,000	25,000 (59) sol	LQM S4UL
	EC>16-35	2.5%	92,000 (21)	92,000 (21) f,sol	270,000 f	1,700,000 f	250,000 f	480,000 f	LQM S4UL
	EC>35-44	2.5%	92,000 (21)	92,000 (21) f,sol	270,000 f	1,700,000 f	250,000 f	480,000 f	LQM S4UL
	Aliphatic								
	EC 5-6	6%	160	160	3,900	12,000 (1,150) sol	600,000	180,000 (1,150)	LQM S4UL
	EC>6-8	6%	530	530	13,000	40,000 (736) sol	620,000	320,000 (736) sol	LQM S4UL
	EC>8-10	6%	150	150	1,700	11,000 (451) vap	13,000	21,000 (451) vap	LQM S4UL
	EC>10-12	6%	760 (283) vap	760 (283) vap	7,300	47,000 (283) vap	13,000	24,000 (283) vap	LQM S4UL
	EC>12-16	6%	4,300 (142) sol	4,400 (142) sol	13,000	90,000 (142) sol	13,000	26,000 (142) sol	LQM S4UL
	EC>16-35	6%	110,000 f	110,000 f	270,000 f	1,800,000 f	250,000 f	490,000 f	LQM S4UL
	EC>35-44	6%	110,000 f	110,000 f	270,000 f	1,800,000 f	250,000 f	490,000 f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	1%	70	370	13	26,000 (1,220) sol	56,000	76,000 (1,220) sol	LQM S4UL
	EC>7-8(toluene)	1%	130	860	22	56,000 (869) vap	56,000	87,000 (869) vap	LQM S4UL
	EC>8-10	1%	34	47	8.6	3,500 (613) vap	5,000	7,200 (613) vap	LQM S4UL
	EC>10-12	1%	74	250	13	16,000 (364) sol	5,000	9,200 (364) sol	LQM S4UL
	EC>12-16	1%	140	1,800	23	36,000 (169) sol	5,100	10,000	LQM S4UL
	EC>16-21	1%	260 f	1,900 f	46 f	28,000 f	3,800 f	7,600 f	LQM S4UL
	EC>21-35	1%	1,100 f	1,900 f	370 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	EC>35-44	1%	1,100 f	1,900 f	370 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	2.5%	140	690	27	46,000 (2,260) sol	56,000	84,000 (2,260) sol	LQM S4UL
	EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) sol	56,000	95,000 (1,920) sol	LQM S4UL
	EC>8-10	2.5%	83	110	21	8,100 (1,500) vap	5,000	8,500 (1,500) vap	LQM S4UL
	EC>10-12	2.5%	180	590	31	28,000 (899) sol	5,000	9,700 (899) sol	LQM S4UL
	EC>12-16	2.5%	330	2,300 (419) sol	57	37,000	5,100	10,000	LQM S4UL
	EC>16-21	2.5%	540 f	1,900 f	110 f	28,000 f	3,800 f	7,700 f	LQM S4UL
	EC>21-35	2.5%	1,500 f	1,900 f	820 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	EC>35-44	2.5%	1,500 f	1,900 f	820 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	Aromatic								
	EC5-7(benzene as non-	6%	300	1,400	57	86,000 (4,710) sol	56,000	92,000 (4,710) sol	LQM S4UL
	EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) vap	56,000	100,000 (4,360)	LQM S4UL
	EC>8-10	6%	190	270	51	17,000 (3,580) vap	5,000	9,300 (3,580) vap	LQM S4UL
	EC>10-12	6%	380	1,200	4	34,000 (2,150) sol	5,000	10,000	LQM S4UL
	EC>12-16	6%	660	2,500	130	38,000	5,100	10,000	LQM S4UL
	EC>16-21	6%	930 f	1,900 f	260 f	28,000 f	3,800 f	7,800 f	LQM S4UL
	EC>21-35	6%	1,700 f	1,900 f	1,600 f	28,000 f	3,800 f	7,900 f	LQM S4UL
	EC>35-44	6%	1,700 f	1,900 f	1,600 f	28,000 f	3,800 f	7,900 f	LQM S4UL
	Aliphatic +Aromatic >EC44	1%	1,600 f	1,900 f	1,200 f	28,000 f	3,800 f	7,800 f	LQM S4UL
		2.5%	1,800 f	1,900 f	2,100 f	28,000 f	3,800 f	7,800 f	LQM S4UL
		6%	1,900 f	1,900 f	3,000 f	28,000 f	3,800 f	7,900 f	LQM S4UL

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	^{POS}resi	^{POS}park	Source
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	0.0071	0.0092	0.0046	0.67	29	21	LQM S4UL
		2.5%	0.0110	0.0130	0.0083	0.97	29	24	LQM S4UL
		6%	0.0190	0.0230	0.0160	1.7	29	28	LQM S4UL
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) [vap]	LQM S4UL
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) [vap]	LQM S4UL
		6%	39	40	240	3,000	140,000	100,000 (6,392)	LQM S4UL
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800	LQM S4UL
		2.5%	3.4	8.0	0.89	550	1,400	2,100	LQM S4UL
		6%	7.5	17	2.0	1,100	1,400	2,300	LQM S4UL
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500	LQM S4UL
		2.5%	2.8	3.5	1.9	250	1,400	1,800	LQM S4UL
		6%	6.4	8.2	4.4	560	1,400	2,100	LQM S4UL
	Tetrachloroethene (PCE)	1%	0.31	0.32	2.00	24	3,200	1400	DEFRA C4SL
		2.5%	0.70	0.71	4.8	55	3,300	1900	DEFRA C4SL
		6%	1.60	1.60	11.0	130	3,400	2,500	DEFRA C4SL
	Tetrachloromethane (carbon tetrachloride)	1%	0.03	0.03	0.45	2.9	890	190	LQM S4UL
		2.5%	0.06	0.06	1.0	6.3	920	270	LQM S4UL
		6%	0.13	0.13	2.4	14	950	400	LQM S4UL
	Trichloroethene (TCE)	1%	0.009	0.010	0.032	0.7	76.0	41.0	DEFRA C4SL
		2.5%	0.020	0.020	0.072	1.5	78.0	51.0	DEFRA C4SL
		6%	0.043	0.045	0.160	3.4	79.0	69.0	DEFRA C4SL
	cis 1,2-dichloroethene	1%	0.46	0.50	0.890	38	3,800	2,000	DEFRA C4SL
		2.5%	0.78	0.84	1.70	64	3,800	2,400	DEFRA C4SL
		6%	1.50	1.60	3.60	120	3,900	3,100	DEFRA C4SL
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600	LQM S4UL
		2.5%	1.7	2.1	0.83	170	2,500	2,800	LQM S4UL
		6%	3.4	4.2	1.7	350	2,500	3,100	LQM S4UL
	Trans-1,2 Dichloroethene	1%	0.9	0.9	3.7	69	13,000	5,600	DEFRA C4SL
		2.5%	1.6	1.7	7.5	120	13,000	7,000	DEFRA C4SL
		6%	3.3	3.4	16.0	260	13,000	9,100	DEFRA C4SL
	Chloroethene (vinyl chloride)	1%	0.006	0.015	0.0017	1.1E+00	7.8	18.0	DEFRA C4SL
		2.5%	0.010	0.019	0.0031	1.4E+00	7.8	19.0	DEFRA C4SL
		6%	0.017	0.029	0.0058	2.20	7.8	19.0	DEFRA C4SL
	2,4,6-Trinitritoluene (TNT)	1%	1.6	65	0.24	1,000	130	260	LQM S4UL
		2.5%	3.7	66	0.58	1,000	130	270	LQM S4UL
		6%	8.1	66	1.4	1,000	130	270	LQM S4UL
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) [sol]	LQM S4UL
		2.5%	250	13,000	38	210,000	26,000	51,000	LQM S4UL
		6%	540	13,000	85	210,000	27,000	53,000	LQM S4UL
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) [vap]	LQM S4UL
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) [vap]	LQM S4UL
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) [vap]	LQM S4UL
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30	LQM S4UL
		2.5%	6.6	7.4	6.1	170	18	31	LQM S4UL
		6%	7.1	7.5	9.8	170	18	31	LQM S4UL
	Dieldrin	1%	0.97	7.0	0.17	170	18	30	LQM S4UL
		2.5%	2.0	7.3	0.41	170	18	30	LQM S4UL
		6%	3.5	7.4	0.96	170	18	31	LQM S4UL
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300	LQM S4UL
		2.5%	7.8	620	1.2	9,400	1,200	2,400	LQM S4UL
		6%	17.4	620	2.7	9,400	1,200	2,400	LQM S4UL
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26	LQM S4UL
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26	LQM S4UL
		6%	0.14	6.6	2.2E-02	140	16	27	LQM S4UL
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) [vap]	1.2	5,600 (3.0E-03) [vap]	1,200	2,300	LQM S4UL
		2.5%	18	280 (7.0E-03) [vap]	2.9	7,400 (7.0E-03) [vap]	1,200	2,400	LQM S4UL
		6%	41	410 (1.6E-02) [vap]	6.8	8,400 (1.6E-02) [vap]	1,200	2,500	LQM S4UL
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15	LQM S4UL
		2.5%	0.2	3.8	3.2E-02	65	8.1	15	LQM S4UL
		6%	0.46	3.8	7.7E-02	65	8.1	16	LQM S4UL
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) [sol]	LQM S4UL
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) [sol]	LQM S4UL
		6%	2.4	2.4	32	290	14,000	2,900	LQM S4UL
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) [sol]	90,000	24,000 (571) [sol]	LQM S4UL
		2.5%	55	57	230	4,800 (1,370) [sol]	95,000	36,000 (1,370) [sol]	LQM S4UL
		6%	130	130	540	11,000 (3,240) [sol]	98,000	51,000 (3,270) [sol]	LQM S4UL
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) [vap]	LQM S4UL
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) [vap]	LQM S4UL
		6%	15	15	320	1,300	19,000	4,000 (1,880) [vap]	LQM S4UL
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) [vap]	78	110 (39) [vap]	LQM S4UL
		2.5%	1.6	1.9	0.90	120 (98.1) [vap]	79	120	LQM S4UL
		6%	3.7	4.3	2.2	240 (235) [vap]	79	130	LQM S4UL
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) [sol]	100	190	LQM S4UL
		2.5%	12	30	3.1	770 (107) [sol]	100	190	LQM S4UL
		6%	22	38	7.0	830	100	190	LQM S4UL
	Hexachlorobenzene	1%	1.8 (0.20) [vap]	4.1 (0.20) [vap]	0.47	110 (0.20) [vap]	16	30	LQM S4UL
		2.5%	3.3 (0.50) [vap]	5.7 (0.50) [vap]	1.1	120	16	30	LQM S4UL
		6%	4.9	6.7 (1.2) [vap]	2.5	120	16	30	LQM S4UL

	Contaminant	SOM	Res +	Res -	Allot.	Comm.	POSresi	POSpark	Source
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 [g]	94	0.13 [g]	3,500	620	1,100	LQM S4UL
		2.5%	2.0	150	0.30	4,000	620	1,100	LQM S4UL
		6%	4.5	210	0.70	4,300	620	1,100	LQM S4UL
	Pentachlorophenol	1%	0.22	27 (16.4) [vap]	3.0E-02	400	60	110	LQM S4UL
		2.5%	0.52	29	8.0E-02	400	60	120	LQM S4UL
		6%	1.2	31	0.19	400	60	120	LQM S4UL
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300	LQM S4UL
		2.5%	0.29	0.29	10	22	11,000	1,900	LQM S4UL
		6%	0.62	0.62	23	47	11,000	2,700	LQM S4UL
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48	LQM S4UL
		2.5%	0.7	0.78	0.61	66	25	50	LQM S4UL
		6%	1.6	1.8	1.4	120	25	51	LQM S4UL
	Phenol	1%	280	750	66	760 [dir] (31,000)	760 [dir] (11,000)	760 [dir] (8,600)	LQM S4UL
		2.5%	550	1,300	140	1,500 [dir] (35,000)	1,500 [dir] (11,000)	1,500 [dir] (9,700)	LQM S4UL
		6%	1,100	2,300	280	3,200 [dir] (37,000)	3,200 [dir] (11,000)	3,200 [dir] (11,000)	LQM S4UL

sol/vap = solubility/vapour limit (potenitally use if free product identified, although highly conservative)
f=naphthalene is based on comparison of inhalation exposure with TDI(inhal) for localised effect
f = oral, dermal and inhalation exposures compared to oral HCV
dir = S4ULs based on threshold protective of direct skin contact with phenol)brackets long term exposure for illustration purposes)
g = derived based on 2,3,4-tetrachlorophenol

Appendix A: Classifier defined and non CLP 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

- **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

Appendix G

HazWaste Online Output Sheets

HazWasteOnline™

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:

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

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

0HMAX-K0KHS-9GJUE

Job name

LKC 20 1964[2]

Description/Comments

Project

LKC 20 1964

Site

Belgrave Road, Oldham

Classified by

Name:
Peter Dunn
Company:
LK Group
Date:
19 Oct 2021 15:11 GMT
Telephone:
0161 763 7200

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: **CERTIFIED**

Course	Date
Hazardous Waste Classification	18 Sep 2019

Next 3 year Refresher due by Sep 2022

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS102-16/09/2021-0.00	0.00-0.50	Non Hazardous		2
2	WS101-16/09/2021-0.00	0.00-0.60	Non Hazardous		4
3	WS101-16/09/2021-0.0	0.0-1.00	Non Hazardous		6
4	WS101-16/09/2021-1.70	1.70-1.80	Non Hazardous		9
5	WS102-16/09/2021-1.50	1.50-1.60	Non Hazardous		10
6	WS102-16/09/2021-2.00	2.00-2.10	Non Hazardous		12
7	WS103-16/09/2021-0.00	0.00-0.40	Non Hazardous		13
8	WS104-16/09/2021-0.00	0.00-0.30	Hazardous	HP 14	15
9	WS104-16/09/2021-1.00	1.00-2.00	Non Hazardous		17
10	WS105-16/09/2021-0.00	0.00-0.30	Non Hazardous		18

Related documents

#	Name	Description
1	HWOL_21-32697-20210924 195140.hwol[2]	.hwol[2] file used to create the Job
2	HWOL_21-32613-20210924 190504.hwol[2]	.hwol[2] file used to create the Job
3	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Peter Dunn
Created date: 19 Oct 2021 15:11 GMT

Classification of sample: WS102-16/09/2021-0.00

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

Sample details

Sample name:
WS102-16/09/2021-0.00
Sample Depth:
0.00-0.50 m
Moisture content:
12%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 12% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		17	mg/kg	1.32	19.752	mg/kg	0.00198 %	✓	
2		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.32	mg/kg	1.142	0.322	mg/kg	0.0000322 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		22	mg/kg	1.462	28.296	mg/kg	0.00283 %	✓	
4		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
5		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		72	mg/kg	1.126	71.336	mg/kg	0.00713 %	✓	
6		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	64	mg/kg	1.56	87.849	mg/kg	0.00563 %	✓	
7		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
8		nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		36	mg/kg	2.976	94.288	mg/kg	0.00943 %	✓	
9		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		0.25	mg/kg	2.554	0.562	mg/kg	0.0000562 %	✓	
10		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		160	mg/kg	1.245	175.256	mg/kg	0.0175 %	✓	
11		pH			PH		8.1	pH		8.1	pH	8.1 pH		
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.46	mg/kg		0.405	mg/kg	0.0000405 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.1	mg/kg		0.088	mg/kg	0.0000088 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.14	mg/kg		0.123	mg/kg	0.0000123 %	✓	
15		fluorene		201-695-5	86-73-7		0.14	mg/kg		0.123	mg/kg	0.0000123 %	✓	
16		phenanthrene		201-581-5	85-01-8		1.6	mg/kg		1.408	mg/kg	0.000141 %	✓	

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
17		anthracene				0.47	mg/kg		0.414	mg/kg	0.0000414 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				2.8	mg/kg		2.464	mg/kg	0.000246 %	✓	
			205-912-4	206-44-0									
19		pyrene				2.6	mg/kg		2.288	mg/kg	0.000229 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				1.4	mg/kg		1.232	mg/kg	0.000123 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				1.6	mg/kg		1.408	mg/kg	0.000141 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				2	mg/kg		1.76	mg/kg	0.000176 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.69	mg/kg		0.607	mg/kg	0.0000607 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				1.6	mg/kg		1.408	mg/kg	0.000141 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				1.1	mg/kg		0.968	mg/kg	0.0000968 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.28	mg/kg		0.246	mg/kg	0.0000246 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				1.1	mg/kg		0.968	mg/kg	0.0000968 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				42	mg/kg	1.785	65.98	mg/kg	0.0066 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
										Total:	0.0529 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS101-16/09/2021-0.00

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

Sample details

Sample name:
WS101-16/09/2021-0.00
Sample Depth:
0.00-0.60 m
Moisture content:
6.5%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 6.5% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1		arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		16	mg/kg	1.32	19.752	mg/kg	0.00198 %	✓	
2		cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.4	mg/kg	1.142	0.427	mg/kg	0.0000427 %	✓	
3		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		13	mg/kg	1.462	17.765	mg/kg	0.00178 %	✓	
4		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		**<LOD**
5		copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		52	mg/kg	1.126	54.741	mg/kg	0.00547 %	✓	
6		lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	120	mg/kg	1.56	175.011	mg/kg	0.0112 %	✓	
7		mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.13	mg/kg	1.353	0.165	mg/kg	0.0000165 %	✓	
8		nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		22	mg/kg	2.976	61.222	mg/kg	0.00612 %	✓	
9		selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		0.25	mg/kg	2.554	0.597	mg/kg	0.0000597 %	✓	
10		zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		78	mg/kg	1.245	90.777	mg/kg	0.00908 %	✓	
11		pH			PH		9	pH		9	pH	9pH		
12		naphthalene	601-052-00-2	202-049-5	91-20-3		0.65	mg/kg		0.608	mg/kg	0.0000608 %	✓	
13		acenaphthylene		205-917-1	208-96-8		0.2	mg/kg		0.187	mg/kg	0.0000187 %	✓	
14		acenaphthene		201-469-6	83-32-9		0.19	mg/kg		0.178	mg/kg	0.0000178 %	✓	
15		fluorene		201-695-5	86-73-7		0.23	mg/kg		0.215	mg/kg	0.0000215 %	✓	
16		phenanthrene		201-581-5	85-01-8		2.1	mg/kg		1.964	mg/kg	0.000196 %	✓	

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
17		anthracene				0.72	mg/kg		0.673	mg/kg	0.0000673 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				4.8	mg/kg		4.488	mg/kg	0.000449 %	✓	
			205-912-4	206-44-0									
19		pyrene				4.8	mg/kg		4.488	mg/kg	0.000449 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				3	mg/kg		2.805	mg/kg	0.000281 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				3.1	mg/kg		2.899	mg/kg	0.00029 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				4.3	mg/kg		4.021	mg/kg	0.000402 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				1.9	mg/kg		1.777	mg/kg	0.000178 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				3.5	mg/kg		3.273	mg/kg	0.000327 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				2.4	mg/kg		2.244	mg/kg	0.000224 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.87	mg/kg		0.813	mg/kg	0.0000813 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				2.3	mg/kg		2.15	mg/kg	0.000215 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				30	mg/kg	1.785	50.074	mg/kg	0.00501 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
										Total:	0.0442 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS101-16/09/2021-0.0

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

Sample details

Sample name:
WS101-16/09/2021-0.0
Sample Depth:
0.0-1.00 m
Moisture content:
16%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 16% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		21 mg/kg	1.32	23.291 mg/kg	0.00233 %	✓	
2	boron { diboron trioxide; boric oxide }	005-008-00-8	215-125-8	1303-86-2		1.3 mg/kg	3.22	3.516 mg/kg	0.000352 %	✓	
3	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1 mg/kg	1.142	<0.114 mg/kg	<0.0000114 %		<LOD
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		16 mg/kg	1.462	19.643 mg/kg	0.00196 %	✓	
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
6	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		61 mg/kg	1.126	57.691 mg/kg	0.00577 %	✓	
7	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	110 mg/kg	1.56	144.127 mg/kg	0.00924 %	✓	
8	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.18 mg/kg	1.353	0.205 mg/kg	0.0000205 %	✓	
9	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		23 mg/kg	2.976	57.501 mg/kg	0.00575 %	✓	
10	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		0.7 mg/kg	2.554	1.502 mg/kg	0.00015 %	✓	
11	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		60 mg/kg	1.245	62.734 mg/kg	0.00627 %	✓	
12	TPH (C6 to C40) petroleum group			TPH		410 mg/kg		344.4 mg/kg	0.0344 %	✓	
13	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
14	benzene	601-020-00-8	200-753-7	71-43-2		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
15	toluene	601-021-00-3	203-625-9	108-88-3		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
16	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
17		xylene				0.0034	mg/kg		0.0028	mg/kg	0.000000286 %	✓	
		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]									
18		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 }				0.5	mg/kg	1.884	0.791	mg/kg	0.0000791 %	✓	
		006-007-00-5											
19		pH				8.5	pH		8.5	pH	8.5 pH		
				PH									
20		naphthalene				1.1	mg/kg		0.924	mg/kg	0.0000924 %	✓	
		601-052-00-2	202-049-5	91-20-3									
21		acenaphthylene				0.24	mg/kg		0.202	mg/kg	0.0000202 %	✓	
			205-917-1	208-96-8									
22		acenaphthene				0.54	mg/kg		0.454	mg/kg	0.0000454 %	✓	
			201-469-6	83-32-9									
23		fluorene				0.48	mg/kg		0.403	mg/kg	0.0000403 %	✓	
			201-695-5	86-73-7									
24		phenanthrene				3.1	mg/kg		2.604	mg/kg	0.00026 %	✓	
			201-581-5	85-01-8									
25		anthracene				1.4	mg/kg		1.176	mg/kg	0.000118 %	✓	
			204-371-1	120-12-7									
26		fluoranthene				7.9	mg/kg		6.636	mg/kg	0.000664 %	✓	
			205-912-4	206-44-0									
27		pyrene				7.2	mg/kg		6.048	mg/kg	0.000605 %	✓	
			204-927-3	129-00-0									
28		benzo[a]anthracene				4.4	mg/kg		3.696	mg/kg	0.00037 %	✓	
		601-033-00-9	200-280-6	56-55-3									
29		chrysene				4.3	mg/kg		3.612	mg/kg	0.000361 %	✓	
		601-048-00-0	205-923-4	218-01-9									
30		benzo[b]fluoranthene				4.8	mg/kg		4.032	mg/kg	0.000403 %	✓	
		601-034-00-4	205-911-9	205-99-2									
31		benzo[k]fluoranthene				1.9	mg/kg		1.596	mg/kg	0.00016 %	✓	
		601-036-00-5	205-916-6	207-08-9									
32		benzo[a]pyrene; benzo[def]chrysene				4	mg/kg		3.36	mg/kg	0.000336 %	✓	
		601-032-00-3	200-028-5	50-32-8									
33		indeno[123-cd]pyrene				2.4	mg/kg		2.016	mg/kg	0.000202 %	✓	
			205-893-2	193-39-5									
34		dibenz[a,h]anthracene				0.67	mg/kg		0.563	mg/kg	0.0000563 %	✓	
		601-041-00-2	200-181-8	53-70-3									
35		benzo[ghi]perylene				2.2	mg/kg		1.848	mg/kg	0.000185 %	✓	
			205-883-8	191-24-2									
36		vanadium { divanadium pentaoxide; vanadium pentoxide }				34	mg/kg	1.785	50.985	mg/kg	0.0051 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
37		monohydric phenols				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
				P1186									
										Total:	0.0755 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
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 at less than 1.0% are "unlikely to be flammable". Flammability of soils is unlikely to result in a hazardous classification in soils (AGS Waste Classification – A Practitioner's Guide).

Hazard Statements hit:

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

Because of determinands:

TPH (C6 to C40) petroleum group: (conc.: 0.0344%)
xylene: (conc.: 2.86e-07%)

Classification of sample: WS101-16/09/2021-1.70

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

Sample details

Sample name:
WS101-16/09/2021-1.70
Sample Depth:
1.70-1.80 m
Moisture content:
13%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 13% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1	●	pH		PH		8.3 pH		8.3 pH	8.3 pH		
								Total:	0%		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: WS102-16/09/2021-1.50

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

Sample details

Sample name:
WS102-16/09/2021-1.50
Sample Depth:
1.50-1.60 m
Moisture content:
16%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 16% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number / EC Number / CAS Number							
1	•	TPH (C6 to C40) petroleum group TPH		<10 mg/kg		<10 mg/kg	<0.001 %		<LOD
2		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane 603-181-00-X / 216-653-1 / 1634-04-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
3		benzene 601-020-00-8 / 200-753-7 / 71-43-2		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
4		toluene 601-021-00-3 / 203-625-9 / 108-88-3		0.0034 mg/kg		0.0028 mg/kg	0.000000286 %	✓	
5	•	ethylbenzene 601-023-00-4 / 202-849-4 / 100-41-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
6		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]		0.0031 mg/kg		0.0026 mg/kg	0.00000026 %	✓	
						Total:	0.001 %		

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)
<LOD	Below limit of detection
ND	Not detected

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 at less than 1.0% are "unlikely to be flammable". Flammability of soils is unlikely to result in a hazardous classification in soils (AGS Waste Classification – A Practitioner's Guide).

Hazard Statements hit:

Flam. Liq. 2; H225 "Highly flammable liquid and vapour."

Because of determinand:

toluene: (conc.: 2.86e-07%)

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

Because of determinand:

xylene: (conc.: 2.6e-07%)

Classification of sample: WS102-16/09/2021-2.00

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

Sample details

Sample name:
WS102-16/09/2021-2.00
Sample Depth:
2.00-2.10 m
Moisture content:
14%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 14% Wet Weight Moisture Correction applied (MC)

#		Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
1	●	TPH (C6 to C40) petroleum group			TPH		<10 mg/kg		<10 mg/kg	<0.001 %		<**LOD**
2		tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane	603-181-00-X	216-653-1	1634-04-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<**LOD**
3		benzene	601-020-00-8	200-753-7	71-43-2		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<**LOD**
4		toluene	601-021-00-3	203-625-9	108-88-3		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<**LOD**
5	●	ethylbenzene	601-023-00-4	202-849-4	100-41-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<**LOD**
6		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]		<0.002 mg/kg		<0.002 mg/kg	<0.0000002 %		<**LOD**
									Total:	0.001 %		

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)
<LOD	Below limit of detection
ND	Not detected

Classification of sample: WS103-16/09/2021-0.00

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

Sample details

Sample name:
WS103-16/09/2021-0.00
Sample Depth:
0.00-0.40 m
Moisture content:
9.5%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 9.5% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		10	mg/kg	1.32	11.949	mg/kg	0.00119 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.15	mg/kg	1.142	0.155	mg/kg	0.0000155 %	✓	
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		13	mg/kg	1.462	17.195	mg/kg	0.00172 %	✓	
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<**LOD**
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		37	mg/kg	1.126	37.7	mg/kg	0.00377 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	49	mg/kg	1.56	69.17	mg/kg	0.00443 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<**LOD**
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		18	mg/kg	2.976	48.483	mg/kg	0.00485 %	✓	
9	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<0.2	mg/kg	2.554	<0.511	mg/kg	<0.0000511 %		<**LOD**
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		92	mg/kg	1.245	103.635	mg/kg	0.0104 %	✓	
11	pH			PH		8.2	pH		8.2	pH	8.2 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		0.33	mg/kg		0.299	mg/kg	0.0000299 %	✓	
13	acenaphthylene		205-917-1	208-96-8		0.28	mg/kg		0.253	mg/kg	0.0000253 %	✓	
14	acenaphthene		201-469-6	83-32-9		0.3	mg/kg		0.271	mg/kg	0.0000271 %	✓	
15	fluorene		201-695-5	86-73-7		0.39	mg/kg		0.353	mg/kg	0.0000353 %	✓	
16	phenanthrene		201-581-5	85-01-8		3.4	mg/kg		3.077	mg/kg	0.000308 %	✓	

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
17		anthracene				0.88	mg/kg		0.796	mg/kg	0.0000796 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				4.4	mg/kg		3.982	mg/kg	0.000398 %	✓	
			205-912-4	206-44-0									
19		pyrene				3.8	mg/kg		3.439	mg/kg	0.000344 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				2	mg/kg		1.81	mg/kg	0.000181 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				2.1	mg/kg		1.901	mg/kg	0.00019 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				2.5	mg/kg		2.263	mg/kg	0.000226 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.87	mg/kg		0.787	mg/kg	0.0000787 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				2	mg/kg		1.81	mg/kg	0.000181 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				1.3	mg/kg		1.177	mg/kg	0.000118 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.31	mg/kg		0.281	mg/kg	0.0000281 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				1.2	mg/kg		1.086	mg/kg	0.000109 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				16	mg/kg	1.785	25.849	mg/kg	0.00258 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
										Total:	0.0315 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS104-16/09/2021-0.00

Hazardous Waste
Classified as **17 05 03 ***
in the List of Waste

Sample details

Sample name:
WS104-16/09/2021-0.00
Sample Depth:
0.00-0.30 m
Moisture content:
9.2%
(wet weight correction)

LoW Code:
Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Entry: 17 05 03 * (Soil and stones containing hazardous substances)

Hazard properties

HP 14: Ecotoxic "waste which presents or may present immediate or delayed risks for one or more sectors of the environment"

Hazard Statements hit:

Aquatic Chronic 1; H410 "Very toxic to aquatic life with long lasting effects."

Because of determinand:

zinc oxide: (compound conc.: 0.723%)

Determinands

Moisture content: 9.2% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		6.4	mg/kg	1.32	7.673	mg/kg	0.000767 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		0.11	mg/kg	1.142	0.114	mg/kg	0.0000114 %	✓	
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		12	mg/kg	1.462	15.925	mg/kg	0.00159 %	✓	
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		25	mg/kg	1.126	25.558	mg/kg	0.00256 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	29	mg/kg	1.56	41.073	mg/kg	0.00263 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		<0.1	mg/kg	1.353	<0.135	mg/kg	<0.0000135 %		<LOD
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		35	mg/kg	2.976	94.586	mg/kg	0.00946 %	✓	
9	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<0.2	mg/kg	2.554	<0.511	mg/kg	<0.0000511 %		<LOD
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		6400	mg/kg	1.245	7233.282	mg/kg	0.723 %	✓	
11	pH			PH		8.3	pH		8.3	pH	8.3 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
13	acenaphthylene		205-917-1	208-96-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
14		acenaphthene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-469-6	83-32-9									
15		fluorene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-695-5	86-73-7									
16		phenanthrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			201-581-5	85-01-8									
17		anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			204-371-1	120-12-7									
18		fluoranthene				0.33	mg/kg		0.3	mg/kg	0.00003 %	✓	
			205-912-4	206-44-0									
19		pyrene				0.35	mg/kg		0.318	mg/kg	0.0000318 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				0.19	mg/kg		0.173	mg/kg	0.0000173 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				0.26	mg/kg		0.236	mg/kg	0.0000236 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				0.37	mg/kg		0.336	mg/kg	0.0000336 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				0.14	mg/kg		0.127	mg/kg	0.0000127 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				0.29	mg/kg		0.263	mg/kg	0.0000263 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				13	mg/kg	1.785	21.072	mg/kg	0.00211 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
										Total:	0.743 %		

Key

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

Classification of sample: WS104-16/09/2021-1.00

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

Sample details

Sample name:
WS104-16/09/2021-1.00
Sample Depth:
1.00-2.00 m
Moisture content:
10%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 10% Wet Weight Moisture Correction applied (MC)

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number							
1	●	pH		PH		8.3 pH		8.3 pH	8.3 pH		
								Total:	0%		

Key

	User supplied data
●	Determinand defined or amended by HazWasteOnline (see Appendix A)

Classification of sample: WS105-16/09/2021-0.00

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

Sample details

Sample name:
WS105-16/09/2021-0.00
Sample Depth:
0.00-0.30 m
Moisture content:
9.9%
(wet weight correction)

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

Hazard properties

None identified

Determinands

Moisture content: 9.9% Wet Weight Moisture Correction applied (MC)

#	Determinand	CLP index number	EC Number	CAS Number	CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
1	arsenic { arsenic trioxide }	033-003-00-0	215-481-4	1327-53-3		9.2	mg/kg	1.32	10.944	mg/kg	0.00109 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0		<0.1	mg/kg	1.142	<0.114	mg/kg	<0.0000114 %		<**LOD**
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }		215-160-9	1308-38-9		9.1	mg/kg	1.462	11.983	mg/kg	0.0012 %	✓	
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }	024-017-00-8				<0.5	mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<**LOD**
5	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1		27	mg/kg	1.126	27.389	mg/kg	0.00274 %	✓	
6	lead { lead chromate }	082-004-00-2	231-846-0	7758-97-6	1	40	mg/kg	1.56	56.216	mg/kg	0.0036 %	✓	
7	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7		0.11	mg/kg	1.353	0.134	mg/kg	0.0000134 %	✓	
8	nickel { nickel chromate }	028-035-00-7	238-766-5	14721-18-7		19	mg/kg	2.976	50.951	mg/kg	0.0051 %	✓	
9	selenium { nickel selenate }	028-031-00-5	239-125-2	15060-62-5		<0.2	mg/kg	2.554	<0.511	mg/kg	<0.0000511 %		<**LOD**
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2		47	mg/kg	1.245	52.71	mg/kg	0.00527 %	✓	
11	pH			PH		8.3	pH		8.3	pH	8.3 pH		
12	naphthalene	601-052-00-2	202-049-5	91-20-3		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
13	acenaphthylene		205-917-1	208-96-8		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
14	acenaphthene		201-469-6	83-32-9		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
15	fluorene		201-695-5	86-73-7		<0.1	mg/kg		<0.1	mg/kg	<0.00001 %		<**LOD**
16	phenanthrene		201-581-5	85-01-8		12	mg/kg		10.812	mg/kg	0.00108 %	✓	

#		Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
		CLP index number	EC Number	CAS Number									
17		anthracene				3.4	mg/kg		3.063	mg/kg	0.000306 %	✓	
			204-371-1	120-12-7									
18		fluoranthene				11	mg/kg		9.911	mg/kg	0.000991 %	✓	
			205-912-4	206-44-0									
19		pyrene				9.6	mg/kg		8.65	mg/kg	0.000865 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				4.7	mg/kg		4.235	mg/kg	0.000423 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				4.8	mg/kg		4.325	mg/kg	0.000432 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				5.1	mg/kg		4.595	mg/kg	0.00046 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				2.1	mg/kg		1.892	mg/kg	0.000189 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				4.2	mg/kg		3.784	mg/kg	0.000378 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25		indeno[123-cd]pyrene				2.5	mg/kg		2.253	mg/kg	0.000225 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				0.57	mg/kg		0.514	mg/kg	0.0000514 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27		benzo[ghi]perylene				2.4	mg/kg		2.162	mg/kg	0.000216 %	✓	
			205-883-8	191-24-2									
28		vanadium { divanadium pentaoxide; vanadium pentoxide }				20	mg/kg	1.785	32.169	mg/kg	0.00322 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
										Total:	0.0281 %		

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 Deteminand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

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

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

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

CLP index number: 601-023-00-4
Description/Comments:
Data source: Commission Regulation (EU) No 605/2014 – 6th Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP6)
Additional Hazard Statement(s): Carc. 2 H351
Reason for additional Hazards Statement(s):
03 Jun 2015 - Carc. 2 H351 hazard statement sourced from: IARC Group 2B (77) 2000

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

CLP index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Data source: Commission Regulation (EC) No 790/2009 - 1st Adaptation to Technical Progress for Regulation (EC) No 1272/2008. (ATP1)
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
14 Dec 2015 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

monohydric phenols (CAS Number: P1186)

Description/Comments: Combined hazards statements from harmonised entries in CLP for phenol, cresols and xylenols (604-001-00-2, 604-004-00-9, 604-006-00-X)
Data source: CLP combined data
Data source date: 26 Mar 2019
Hazard Statements: Acute Tox. 3 H301 , Acute Tox. 3 H311 , Acute Tox. 3 H331 , Skin Corr. 1B H314 , Skin Corr. 1B H314 >= 3 %, Skin Irrit. 2 H315 1 £ conc. < 3 %, Eye Irrit. 2 H319 1 £ conc. < 3 %, Muta. 2 H341 , STOT RE 2 H373 , 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)

chromium in chromium(VI) compounds {chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex}

Worst case species based on hazard statements/molecular weight (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 {nickel selenate}

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

zinc {zinc oxide}

Concentrations at less than 1.0% are "unlikely to be flammable". Flammability of soils is unlikely to result in a hazardous classification in soils (AGS Waste Classification – A Practitioner's Guide).

vanadium {divanadium pentaoxide; vanadium pentoxide}

worst case/most likely scenario

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)

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)

Appendix C: Version

HazWasteOnline Classification Engine: WM3 1st Edition v1.1, May 2018
HazWasteOnline Classification Engine Version: 2021.246.4869.9247 (05 Sep 2021)
HazWasteOnline Database: 2021.246.4869.9247 (05 Sep 2021)

This classification utilises the following guidance and legislation:
WM3 v1.1 - Waste Classification - 1st Edition v1.1 - May 2018
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 2019 - UK: 2019 No. 720 of 27th March 2019
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
POPs Regulation 2019 - Regulation (EU) 2019/1021 of 20 June 2019

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