

HILTON LANE PRESTWICH

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

Job Number: LKC 21 1545
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EXECUTIVE SUMMARY

Site Details

Site Location:	Southwest end of Butterstile Close, south of Hilton Lane, Prestwich, Manchester. Centred at approximate National Grid Reference 380930E 402410N.
Site Area:	2,000m ²
Current Land Use:	Vacant site comprising overgrown vegetation.
Proposed Development:	Residential housing with gardens / soft landscaping.
Purpose of Report:	Contamination and Geotechnical Assessment.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in October 2021. Ref: LKC 21 1545-01.
History:	Unreferenced buildings, embankments, refuse heap / landfill (continues offsite to the north).
Geology / Hydrogeology:	Hummocky Glacial Deposits (Secondary Aquifer) over Chester Formation (Principal Aquifer). Manchester Marls (Secondary B Aquifer) mapped in the north of site.
Landfills / Infilled Ground:	2no. recorded landfills within 250m of site, including 1no. on site. Potentially infilled ground identified on site and within 250m of site.
Preliminary Conceptual Model:	PL1 Direct Contact (Human Health): Moderate Risk (metals, PAHs, ACMs, other organic / inorganic contaminants). PL2 Inhalation of Vapours: Moderate / Low Risk (volatile contaminants). PL3 Gas: High Risk (hazardous gas). PL4 Controlled waters: Moderate Risk (mobile contaminants).
PL=Pollutant Linkage	
Recommendations:	Site Investigation was recommended to further assess all the above pollutant linkages.

Ground Investigation Work Undertaken

Date of Investigation:	7 th February 2021.
Intrusive Investigation Work Undertaken:	5no. window sample boreholes (WS101-WS105). 1no. cable percussion borehole (CP101).
Monitoring Wells:	Installed in all boreholes.
Soil Sampling:	6no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. 2no. samples tested for metals, speciated PAHs, cyanide, pH, sulphate, asbestos, phenol, TPHCWG, BTEX and SOM. 1no. sample tested for ethylene glycol. 1no. sample tested for asbestos identification. 2no. samples tested for dissolved organic carbon.
Groundwater Sampling:	2no samples tested for metals, speciated PAHs, cyanide, pH, sulphate, hardness, phenol, TPHCWG and BTEX.
Monitoring:	6no. gas monitoring visits.
Insitu and Laboratory Geotechnical Testing:	SPTs, PSDs, single stage triaxial and BRE SD1 Short Suite.

Ground Conditions and Geotechnical Assessment

General Ground conditions	Made Ground up to a depth of 7.0mbgl within are of former landfill. Loose SAND to medium dense SAND to at least 5.5mbgl. Sandy CLAY from a depth of 7.0 at CP101. Groundwater at 5.0mbgl
Allowable Bearing Pressure	Pile capacity of approximately 44 to 174kN at a depth of 3.0mbgl within the medium dense SAND.
Anticipated Foundation Type	Deep pile foundations.
Other Considerations	The effects of trees needs to be considered. Temporary supports of excavations may be required. Detailed design should be carried out by structural engineer. Concrete Requirements DS1-AC-1.

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 via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	Moderate	- Elevated PAHs and heavy metals identified in made ground. Recommendations: Remediation required in garden areas.
		Moderate / Low (localised)	- Chrysotile paper identified in localised area (historical landfill) and removed. Recommendations: Remediation required.
		Low	- No elevated TPH or ethylene glycol. Recommendations: No specific remediation required.
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	Moderate	- Elevated naphthalene in WS102 and WS104. Recommendations: Further investigation and assessment required.
3	Gas posing a risk to buildings and site users via the migration of gas into building causing explosion and asphyxiation.	Moderate	- Elevated CO ₂ in area of former landfill however low flow rates. Recommendations: Gas protection measures in line with CS2 / Amber 1 required.
		Moderate / Low	- Low gas concentrations and flow rates across remainder of the site. Recommendations: No remediation required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	- Slightly elevated arsenic and zinc not anticipated to pose a significant risk. Recommendations: 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.

PL	Phase	Remediation Requirements	Validation Requirements
1 & 2	Pre-Construction	<u>Earthworks Site Inspections</u> A watching brief (daily / weekly) should be maintained during earthworks to confirm the ground conditions and identify any unusual ground conditions. Should any unusual ground conditions be encountered, work should stop, and samples be collected for chemical analysis. Depending on the outcome of the chemical analysis further remediation may be required.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work (TBC).
2		<u>Naphthalene Delineation Work Area 2</u> Further sampling to be carried out to confirm the extent of contamination at a sampling density of approx. 1 sampling point per 5m square centres. Further assessment should be undertaken to confirm the risk to site users and the requirement for remediation.	TBC.
1 & 7	Build-Phase Construction	<u>Environmental Cover System</u> As made ground is relatively deep, it is unlikely to be viable to remove the contaminated soils. Therefore, an environmental cover system is recommended. The environmental cover system should be as follows: Private Gardens: 600mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 500mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 600mm comprising clean inert fill and sufficient topsoil for a growing medium. Shared Landscaping: 450mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 350mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 450mm comprising clean inert fill and sufficient topsoil for a growing medium.	Depth validation of environmental cover system: excavation of a trial hole through the environmental cover system in each soft landscaping area and collecting photographic evidence with a staff. Chemical validation of imported soils.
3		<u>Gas Protection Measures for Plots 1-5</u> In line with CS2 as per UK guidance ^{1,2} . This should include: • Passive subfloor or active subfloor ventilation system. • Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions. • Ventilation of confined spaces within the building. • Well-constructed reinforced suspended, raft or cast in situ ground slab. • 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.	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 ³

¹ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665

² BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for new buildings." BS8485:2015.

³ CIRIA (2014). "Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas". CIRIA C735.

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1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by Leo Prestwich Limited to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy for Hilton Lane, Prestwich. The investigation was undertaken in support of the redevelopment of the site for residential end use.

The following work has previously been undertaken:

- Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: CL-602-LKC 21 1545-01, dated October 2021). This report included a summary of a Phase 1 Desk Study Investigation Report undertaken by Geoinvestigate Ltd in 2017.

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.

1.2 Site Details

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

Location	Southwest end of Butterstile Close, south of Hilton Lane, Prestwich, Manchester. Centred at approximate National Grid Reference 380930E 402410N.
Area	2,000m ² .
Topography	67-69 metres Above Ordnance Datum (AOD). Site slopes gently from southeast-northwest. Hilton Lane situated higher than site.
Land Use	<u>Site</u> Vacant site comprising overgrown vegetation. <u>Surrounding Area</u> Southwest: Butterstile Lane and commercial properties. Northwest: Residential properties. Northeast: Garage. Southeast: Hilton Lane and residential properties.
Proposed Development	Residential housing with gardens / soft landscaping.

Table 1-1. Summary of site details.

2 Previous Work

2.1 Summary of Existing Information

A PRA report (Ref: CL-602-CL LKC 21 1545-01, dated October 2021) has previously been undertaken by LKC and is summarised in Section 2.2-2.3.

The conceptual model (Section 2.4) has been provided in line with LKC current risk assessment methodology.

2.2 Site Setting

The site setting is summarised in Table 2-1.

Main Historical Features	Onsite: unreferenced buildings, embankments, refuse heap / landfill (continues offsite to the north). Surrounding Area: sand pit, ponds, refuse heaps / landfill, electrical substation, embankment, burial ground.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Hummocky Glacial Deposits (sand and gravel). Secondary A Aquifer. Bedrock: Chester Formation (sandstone) underlying majority of site, Manchester Marls Formation (mudstone) underlying north of site, Lower Coal Measures. Principal Aquifer and Secondary B Aquifer.
Landfills / Infilled ground	2no. recorded landfills within 250m of site, including 1no. on site. Potentially infilled ground identified on site and within 250m of site.
Site Reconnaissance	Site is currently vacant and comprises overgrown land. Possible badger sett identified. Fly tipping noted across surface. Site access from Butterstile Close via padlocked gate. After the site reconnaissance the site was cleared of vegetation and ecology dealt with.

Table 2-1: Summary of site setting.

2.3 Contamination Sources / Pathways and Receptors

Potential contamination sources are detailed in Table 2-2.

Potential Source	Contaminants
On Site	
Made Ground below some or all of the site (e.g. general made ground, refuse heap, embankments, recorded landfill on site).	- Demolition rubble, ash and clinker: Asbestos, heavy metals, sulphates, PAHs ⁴ . - Other fill material sources: Unknown organic / inorganic compounds. - If organic / putrescible material: Hazardous gas (principally carbon dioxide and methane). - Fuel, glycol and oil from potential former domestic garages.
Demolished buildings	- Asbestos Containing Material (ACM).
Surrounding Area	
Adjacent Garage	- Petroleum hydrocarbons from fuels and oils. - Ethylene glycol (anti-freeze). - Risk expected to be localised to northeast of site (if present).
Electricity Sub Station	- PCBs and transistor oils. - Not considered to be significant source of contamination due to distance from site and given that feature is located at a lower level topographically to site and relative immobility of associated contaminants.

Table 2-2: Potential contamination sources.

⁴ Defra (2002). "Potential Contaminants for the Assessment of Land". R&D Publication CLR 8.

Potential Source	Contaminants
Surrounding Area	
Burial Ground	- Nitrates, sulphates, chlorides, heavy metals, non-ferrous metals, inorganic contaminants such as phosphorus and calcium⁵. - Hazardous gas (principally carbon dioxide and methane). - Pathogens are not considered to be a risk due to the short half-life in the environment. - Not considered to pose significant risk due to distance from site and as large residential development has occurred between feature and 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).

Table 2-2 (continued): Potential contamination sources.

Potential receptors are detailed in Table 2-3.

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

Table 2-3: Potential receptors.

Potential pathways are detailed in Table 2-4.

Pathways		
Soil	Human Health ⁶ (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	- 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 (sand and gravel) is likely to be relatively permeable. - Bedrock (mudstone) likely to be relatively permeable. - Bedrock (sandstone) likely to be relatively permeable. - No preferential pathways are anticipated.	
Gas	- Migration into buildings (e.g. via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).	

Table 2-4: Potential pathways.

⁵ Environment Agency (2004). "Potential Groundwater Pollutants from Cemeteries".

⁶ EA (2008). "Updated Technical Background to the CLEA Model". Science Report – SC050021/SR3.

2.4 LKC Preliminary Contamination Conceptual Model

The preliminary contamination conceptual model using contaminant-pathway-receptor linkages based on guidance in LCRM⁷ has been summarised in Table 2-5.

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.

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 C552⁸.

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.

The risk to buildings associated with elevated sulphate will be considered as part of the geotechnical assessment and will not be included in the contamination risk assessment.

A water pipeline risk assessment will be required for any new potable water supplies planned for the site. As this is a separate assessment agreed with the utility company it is not considered further within the contamination conceptual model.

Due to the minor consequence associated with the phytotoxic effect to flora (i.e. loss of plants in a landscaping scheme), the overall risk for the majority of sites will be very low to low. Where soils contain significant concentrations of heavy metals, in general there will other pollutant linkages (i.e. the risk to human health) that will trigger the requirement for remediation (e.g. a clean environmental cover system). As such the risk to flora associated with phytotoxic contaminants will not be considered further.

⁷ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

⁸ CIRIA (2001). "Contaminated land risk assessment: A guide to good practice". C552.

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 guidance⁹) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

2.5 Recommendations

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

⁹ 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. - Other organic / inorganic contaminants	Likely (given site history, site conditions and proposed end use)	Medium	Moderate	Intrusive investigation required. Soil analysis of CoC.
			- Petroleum hydrocarbons and glycol	Low Likelihood (Potential onsite domestic garages and NE boundary from offsite garage.)	Medium	Moderate / Low (localised) (Moderate assumed until ground conditions confirmed)	Targeted 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, naphthalene).	Low Likelihood (Potential onsite domestic garages and NE boundary from offsite garage.)	Medium	Moderate / Low (localised) (Moderate assumed until ground conditions confirmed)	Targeted 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.	- Hazardous gas (carbon dioxide, methane).	Likely (given viable gas source and viable pathway)	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 (Principal and Secondary A Aquifer).	- Mobile contaminants such as metals, PAHs, hydrocarbons, mobile compounds.	Likely (Mobile contamination possible with possible pathway and given sensitivity of underlying Principal Aquifer)	Medium	Moderate	Intrusive investigation required. Groundwater sampling, subject to ground conditions encountered. Analysis of CoC.

Table 2-5. 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 7th February 2021 and comprised the following:

- 5no. window sample boreholes drilled to 5.45-7.45 metres below ground level (mbgl) (ref. WS101 to WS105).
- 1no. cable percussion borehole drilled to 15.47mbgl (ref. CP101).

Due to potential deeper made ground in the south-western area of site (location of historical landfill), a cable percussion borehole was carried out to allow an assessment of the deeper ground conditions for contamination / geotechnical purposes.

All site investigation locations are shown in Figure 3 with historic features shown on the plan.

The locations were chosen to allow a good spread across the site as well as target areas of concern. Table 3-1 details the targeted and general coverage (non-targeted) site investigation locations.

Site Investigation Locations	Rationale
WS101 and CP101	Area of historical landfill and general site coverage.
WS102	Area of former garage cluster onsite and general site coverage.
WS103	General site coverage.
WS104 and WS105	In proximity to offsite garage and for general site coverage.

Table 3-1: Summary of sampling locations.

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 BS10175¹⁰ for a 'detailed investigation'.

All profile logs are provided in Appendix B and are in line with BS14688-1¹¹ and BS5930¹².

3.2 Well Installations

5no. boreholes (WS101-WS104 & CP101) were installed with monitoring wells for gas and groundwater monitoring and groundwater sampling. Monitoring wells were installed in accordance with BS10175 and CIRIA C665¹³ 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.

¹⁰ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.

¹¹ British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.

¹² British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹³ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

A dual monitoring well was installed in CP101 (ref. shallow and deep) in order to target both the made ground and natural strata. The response zones for the window sample boreholes were installed along the entire length of the borehole.
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 investigation¹⁴.

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 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 C665¹⁵ 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 3-2 shows the soil testing undertaken.

Contaminants	No. Samples	Location & Depth	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	6	WS101 0-0.5m WS101 3-4m WS102 0.9-1.5m WS103 0.3-0.6m WS104 0-0.6m WS105 0.4-1.4m	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 ash and coal) 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.	2	WS102 0-0.4m CP101 1.3-1.7m	Although no visual/olfactory evidence of contamination was identified in WS102 0-0.4mbgl (due to location of former garages, detailed suite undertaken. A slight hydrocarbon odour was noted in CP101 between 1.20-1.65mbgl therefore detailed suite undertaken to confirm contamination risk.
Dissolved organic carbon	2	WS101 3-4m WS102 0.9-1.5m	To ascertain potential for gas generating material.
Ethylene glycol	1	WS102 0-0.4m	Tested in area of former garage cluster.
Asbestos Identification	1	WS101 0.5m	Tested to confirm the presence of suspected asbestos.

Table 3-2. Summary of soil sample testing undertaken.

Notes: If asbestos present during screen identification and quantification will be undertaken.

¹⁴ EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

¹⁵ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

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, SOM=Soil Organic Matter.

3.3.2 Water Sampling

To establish the condition of groundwater LKC undertook 2no. groundwater samples.

The groundwater samples were collected a minimum of 1 week after drilling had finished and following well development. Sample collection was undertaken using a low flow sampling pump using thin walled tubing to encourage laminar flow and minimise the potential loss of volatiles during sampling. The borehole was purged of all standing water and the sample collected from the recharged water. The sample was collected in glass and plastic bottles and a glass vial. A water meter was used to test the pH, temperature and conductivity before sampling until equilibrium conditions were met, as per BS10175¹⁶ guidelines.

All water samples were placed in glass bottles, plastic bottles and septum topped vials and stored in ice packed cool boxes. The samples were sent to Chemtest on the same day for analysis.

No groundwater was encountered in the remaining boreholes.

Sampling was carried out in accordance with BS5930¹⁷ and BS5667-11¹⁸.

Many of the tests are UKAS or MCERTS accredited and further details are given in the Certificate of Analysis presented in Appendix E. Table 3-3 shows the groundwater / leachate testing undertaken.

Suites and Contaminants	No. Samples	Location	Justification
Metals / metalloids, pH, sulphate, cyanide suite, TPHCWG, BTEX, MTBE, speciated PAHs, phenol, ethylene glycol and hardness.	2	CP101 (deep) WS102	Detailed suite undertaken on the deep sample in CP101 to determine the quality of water beneath the deep made ground deposits. Detailed suite undertaken on sample from WS102 in area of former garage cluster on site.

Table 3-3. Summary of groundwater sampling tests undertaken.

Notes:

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.

3.4 Gas Monitoring

All the installed boreholes have been monitored for gas on six occasions between 16th February 2022 and 13th May 2022.

Monitoring was undertaken using a Geotechnical Instruments GA5000 in accordance with the monitoring protocol outlined in CIRIA C665¹⁹ (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.

¹⁶ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.

¹⁷ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹⁸ British Standard (2009). "Water Quality – Sampling. Part 11: Guidance on Sampling of Groundwaters". BS ISO 5667-11:2009.

¹⁹ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

The gas monitoring results are reproduced in full in Appendix F.

3.5 Site Investigation Scope

The scope of the contaminated land investigation was agreed with the Local Authority prior to undertaking the work (email titled '67816 Hilton Lane, Prestwich SI Scope (CL823)', dated 17th January 2022) This investigation was generally in line with the scope.

3.6 Geotechnical Testing

3.6.1 *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 and cable percussion boreholes at approximately 1m intervals, generally within the natural strata.

Due to granular nature of the ground pocket penetrometer readings for Undrained Shear Strength (USS) were not always possible.

The SPT and pocket penetrometer readings are provided within the profile logs (Appendix B).

3.6.2 *Laboratory Geotechnical Testing*

Soil samples taken during the investigation were collected in tubs, bulk bags and sealed U100 tubes 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 3-4 shows the geotechnical testing undertaken.

Suites Contaminants	No. Samples	Location	Justification
BRE SD1 Short Suite	2	WS101 0.3-1.9m WS102 3.2-4m	Undertaken to aid with concrete classification.
Single Stage Triaxial	1	CP101 11.5-11.95m	Undertaken to confirm the strength of the clay strata.
Particle Size Distribution (PSD)	5	WS101 5.5-6m WS102 3.2-4m WS103 2-3m WS104 1-2m CP101 7.7-8m	PSD undertaken to confirm grading of granular material.

Table 3-4. Summary of geotechnical testing undertaken.

4 Ground Conditions

4.1 Geology – Generalised Sequence

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

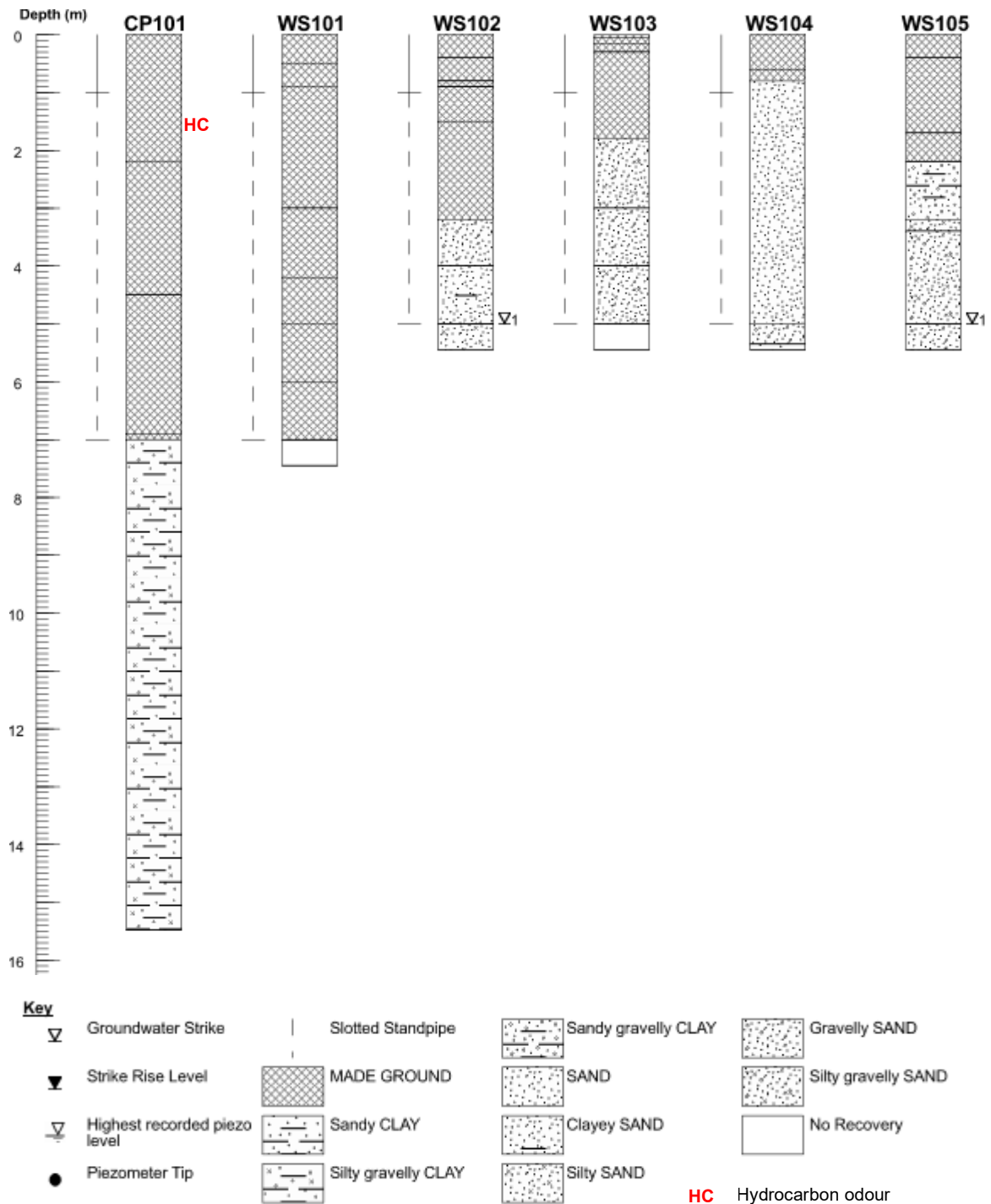


Plate 4-1: Summary of ground conditions.

Made ground generally comprised sand with ash, coal brick, pottery and glass fragments. A slight hydrocarbon odour was noted in CP101 (1.2-1.65mbgl).

4.2 Groundwater

Groundwater strikes were recorded during the investigation in boreholes. In addition, groundwater monitoring within the borehole wells has been undertaken on six occasions.

Results are summarised in Table 4-1.

BH	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	1.0-7.0 (MG)	6	Dry	Dry	6.72-6.78	N	N
WS102	5.0	1.0-5.0 (MG/S)	6	4.3	4.55	4.81-4.84	Y	N
WS103	Dry	1.0-5.0 (MG/S)	6	4.83	Dry	4.84-4.88	N	N
WS104	Dry	1.0-5.0 (S)	6	Dry	Dry	4.84-4.90	N	N
WS105	5.0	-	-	-	-	-	-	N
CP101	Dry	1.0-7.0 (MG)	6	6.85	Dry	6.55-6.87	N	N
		8.0-15.0 (C)	6	7.55	7.78	14.4-14.8	Y	N

Table 4-1: Summary of water strike depths within boreholes and trial pits.

Response Zones:

MG=Made Ground; S=Sand; C=Clay.

4.3 In-Situ Geotechnical Testing

4.3.1 Pocket Penetrometer Tests

Pocket penetrometer tests were undertaken between 2.50-3.00mbgl in WS105 giving an average reading of 54kPa. Clay was not encountered in the remainder of the window sample boreholes.

4.3.2 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	CP101
1-2	4 (MG)	8 (MG)	6 (MG)	8 (S)	8 (MG)	7 (MG)
2-3	3 (MG)	3 (MG)	5 (S)	8 (S)	4 (MG/C)	6 (MG)
3-4	7 (MG)	1 (MG/S)	19 (S)	8 (S)	6 (C/S)	4 (MG)
4-5	4 (MG)	0 (S)	12 (S)	16 (S)	10 (S)	6 (MG)
5-6	8 (MG)	0 (S)	24 (NR)	18 (S)	13 (S)	8 (MG)
6-7	6 (MG)	-	-	-	-	-
7-8	11 (NR)	-	-	-	-	5 (C)
8-9	-	-	-	-	-	6 (C)
9-10	-	-	-	-	-	-
10-11	-	-	-	-	-	40 (C)
11-12	-	-	-	-	-	-
13-14	-	-	-	-	-	50 over 255mm (C)
14-15	-	-	-	-	-	50 over 95mm (C)
15-16	-	-	-	-	-	50 over 220mm (C)
GW Level	Dry	4.3-5.0	4.83-Dry	Dry	5.0	6.85-Dry

Table 4-2: Summary of SPT (N) values.

Notes:

Mg=Made Ground; S=Sand; C=Clay; NR=No Recovery.

Groundwater level based on strikes during investigation and monitoring data.

4.4 Geotechnical Laboratory Testing

4.4.1 Single Stage Triaxial Test

Single stage triaxial testing has been undertaken on one samples of the natural clay strata. The results are presented in Appendix D and summarised in Table 4.3.

Location	Depth (mbgl)	Undrained Shear strength (kPa)
CP101	11.5-11.95	152

Table 4-3: Summary of single stage triaxial results.

4.4.2 Particle Size Distribution

Particle size distribution (PSDs) tests were carried out on granular strata to confirm the material type. Full results are presented in Appendix D and summarised below in Table 4-4.

Location	Depth (mbgl)	Material	Percent passing through sieve		
			63mm	2mm	0.063mm
WS101	5.5-6m	Brown slightly gravelly slightly silty SAND.	100%	85%	29%
WS102	3.2-4m	Brown slightly gravelly slightly silty SAND.	100%	94%	25%
WS103	2-3m	Brown slightly gravelly slightly silty SAND.	100%	98%	20%
WS104	1-2m	Brown slightly gravelly slightly silty SAND.	100%	99%	6%
CP101	7.7-8m	Brown slightly gravelly silty sandy CLAY.	100%	97%	54%

Table 4-4: Summary of particle size distribution results.

Notes:

% passing: 63mm = cobble / gravel boundary; 2mm = gravel / sand boundary; 0.063mm = sand / silt boundary

4.4.3 Sulphate and pH

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

Strata	pH		Sulphate	
	Soil	Groundwater	Soil (g/l)	Groundwater (mg/l)
Made Ground	7.5-8.8	6.8-8.0	0.026-0.27	62-67
Natural	6.7		0.022	

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

Chloride concentration in WS101 0.9-1.9m was 0.019g/l and nitrate concentration was 0.018g/l. Concentrations of chloride and nitrate in the sample from WS102 3.2-4.0m were below detection limits.

5 Geotechnical Assessment

5.1 Proposed Development

It is understood that the proposed development will comprise 8no. houses with associated landscaping. Details of the proposed loadings are not known and therefore a line loading of 75kN/m has been assumed for preliminary assessment purposes only. For cohesive soils, this assessment will be undertaken as undrained shear strength whereas for granular soils an Allowable Bearing Capacity will be considered.

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 comments/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	Brown silty gravelly sand, locally organic OR gravelly sandy silt OR very sandy clay.	0.00	7.0	7.0
Granular	Very loose very silty / clayey SAND.	0.8	>5.45	3.2
	Medium dense slightly gravelly slightly silty SAND.	3.0	>5.45	>1.0
Cohesive	Firm consistency low strength sandy CLAY.	2.2	>5.45	1.0
	Very high strength gravelly silty CLAY.	7.0	>15.47	>8.47

Table 5-1: Summary of ground conditions at the proposed housing location.

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 have been encountered on site. These should be excavated from below the proposed development footprint with the resulting void backfilled.

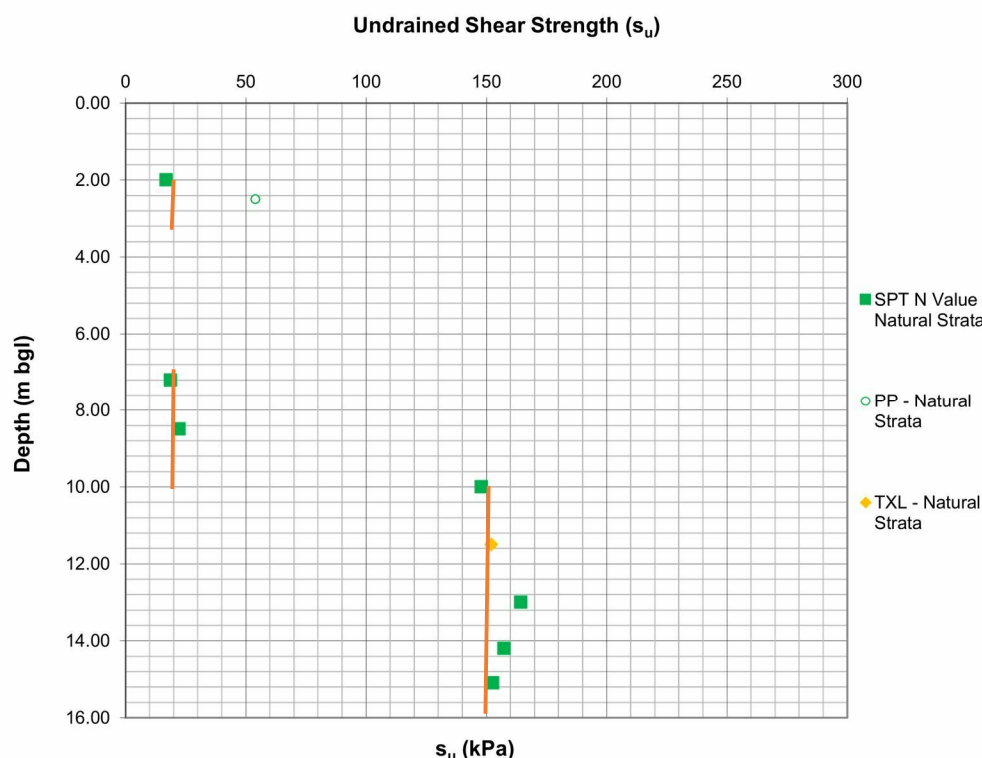
5.4 Foundation Conditions and Bearing Capacity

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. Foundation option is therefore:

- Deep pile foundations into the natural soils of the CLAY or SAND.

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

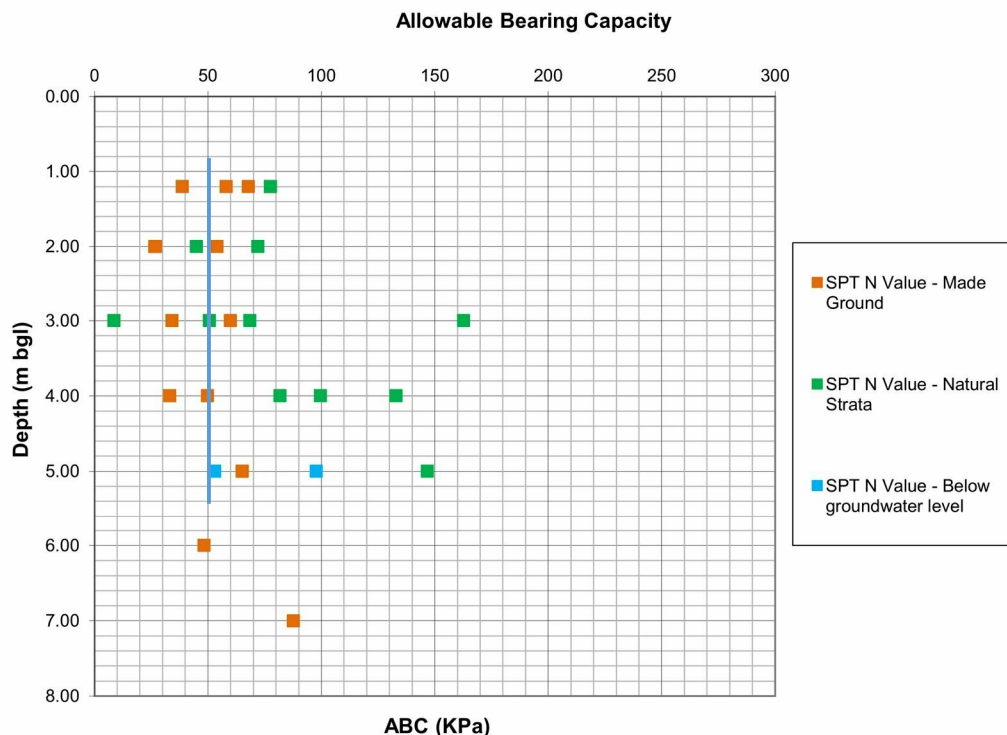


Graph 5-1: Summary of s_u vs depth from in-situ and laboratory testing results.

Graph 5-1 shows that the strength of the cohesive deposits typically increase with depth. The test results of the in-situ geotechnical testing are in agreement with those from the laboratory testing.

A conservative s_u of 20kPa is assigned to the cohesive soils at depth of 2.2 to 3.2mbgl and from a depth of 7.0 to 10.0mbgl and a s_u value of 150kPa is assigned from a depth of 10.0mbgl and returning an ABC value of 308kN/m².

Strength of the natural granular material has been assessed using in-situ testing by SPT. The results of the testing have been plotted against depth as is shown in Graph 5-2 below:



Graph 5-2: Summary of ABC vs depth from in-situ SPT testing for granular soils.

The density of the granular deposits is variable, with two main trends corresponding to the loose SAND and the medium dense SAND. If shallow foundations are considered, an ABC value of 50kN/m² is returned for the loose SAND (groundwater can reduce the bearing capacity of a granular material by as much as 50%).

Based on the results of the SPT tests the average angle of internal friction (ϕ) for the loose SAND has been calculated at 28°.

For the granular soils of the Made ground (MG), an ABC value of approximately 40kN/m² was assigned from a depth of 1.2mbgl. The site is located to the margins of the disused landfill and the thick MG is related to the landfill.

Due to the nature of the proposed development, it is deemed that MG and loose SAND of the natural strata are not suitable to withstand the load of the housing by using shallow foundations, including strip and pad foundations. It is recommended to use pile foundations into the CLAY or SAND of the natural strata. A preliminary assessment of deep foundations is undertaken in the following section.

5.4.2 Piled Foundations

For preliminary purposes the following initial pile carrying capacities have been calculated for varying diameters of pile. The pile capacity has been calculated considering loose SAND from a depth of 1.0mbgl to 3.0mbgl and medium dense SAND from a depth of 3.0mbgl to 15.0mbgl. When undertaking these preliminary calculations, the following parameters have been used:

- Internal angle of friction of 28° in the loose SAND and 32° in the dense SAND;
- Factors of safety of 1.5 on side resistance and 3 on base resistance; and,
- Global Factor of safety of 2.5.

Depth (mbgl)	Pile Carrying Capacity (kN)		
	300mm dia	450mm dia	600mm dia
1.0	11	27	49
3.0	44	100	174
5.0	127	290	505
7.0	162	354	638

Table 5-2: Preliminary Pile Carrying Capacity in granular soils.

At the site, the granular soils of the natural strata are described as loose SAND at least to a depth of 3.0mbgl, therefore consideration must be given to the potential for negative skin friction to have an effect on the design. The presence of thick Made ground in particularly on the SW area of the site should be assessed for negative skin friction.

In cohesive soils from a depth of 7.0mbgl, a preliminary pile assessment has been undertaken and the following parameters have been assumed:

- Internal angle of friction of 26° is assumed;
- Factors of safety of 1.5 on side resistance and 3 on base resistance; and,
- Global Factor of safety of 2.5.

Depth	Pile Carrying Capacity (kN)		
	300mm dia	450mm dia	600mm dia
7.0	32	72	127
9.0	89	162	254
11.0	93	159	238

Table 5-3: Preliminary Pile Carrying Capacity in cohesive soils.

Pile design should be undertaken by a specialist contractor to allow them to reduce the factor of safety based on their extensive pile testing data along with a suitable piling technique to minimise/negate any deleterious effects on neighbouring properties.

5.5 Ground Floor Slabs

Due to the presence of Made Ground thicker than 600mm, it is considered that a suspended floor slab should prove suitable for the proposed housing. Floor slabs should be designed by a suitably experienced structural engineer.

In addition, a piled structure will generally have a suspended or piled floor due to potential differential settlement between the floor and the shell.

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.

5.6 Drainage

The presence of substantial depths 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.

5.7 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).

5.8 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, however obstructions may be present in the near surface including former foundations and former floor slabs. It is anticipated that 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 R97²⁰.

5.9 Construction Activity and Inspection

The following activities and inspections should be incorporated into 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 R97 utilised;
- It is considered that de-watering may be required, especially following periods of heavy rainfall. 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;
- 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;
- 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).

²⁰ CIRIA Report 97 – Trenching Practice – Second 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 (LCRM²¹). Information gathered from the risk assessment has been collated in the revised contamination conceptual model in Section 6.6.

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^{22,23}. The recent change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))²⁴ 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 S4ULs²⁵. 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^{26,27,28,29}.

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs³⁰. 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

²¹ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

²² Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

²³ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

²⁴ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²⁵ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

²⁶ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

²⁷ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²⁸ EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

²⁹ EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

³⁰ CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

PAHs^{31,32} and naphthalene the most volatile and soluble³³. 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 negligible³⁴. For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)³⁵ 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.

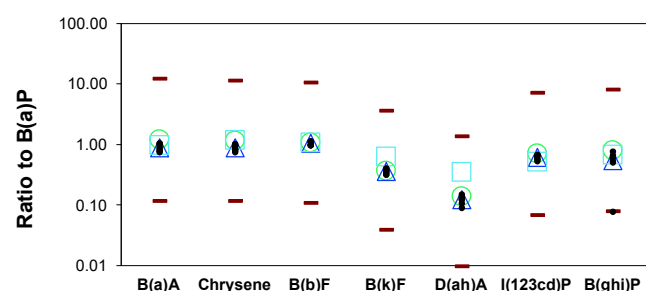
All criteria have been generated using the CLEA V1.06 model³⁶ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

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

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.*³⁷, 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 8no. 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)

³¹ EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.

³² USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

³³ EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.

³⁴ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

³⁵ HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.

³⁶ EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.

³⁷ 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.

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. Elevated and pertinent results are presented in Table 6-1.

Contaminant	Units	No. of samples	Elevated Results	Sample Location	Criteria (1%/2.5%/6%)	Source of Criteria
Metals						
Arsenic	mg/kg	8	39	WS102 (0.9-1.5m)	37	C4SL
Lead	mg/kg	8	300	WS101 (0.0-0.5m)	200	C4SL
			330	WS102 (0.9-1.5m)		
			480	WS105 (0.4-1.4m)		
PAHs						
Benzo(a)pyrene	mg/kg	8	14	WS101 (0.3-0.4m)	5	C4SL
			240	WS102 (0.9-1.5m)		
			16	WS104 (0.0-0.6m)		
			8.9	CP101 (1.3-1.7m)		
Naphthalene	mg/kg	8	100	WS102 (0.9-1.5m)	2.3/5.6/13	S4UL
			14	WS104 (0.0-0.6m)		
GENERAL						
pH	pH	8	Range 7.5 to 8.8			
SOM	%	8	Range 4.0 to 21			
Asbestos	N/A	9	Detected (see Table 6-2)			

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.

A discrete piece of ACM was identified, as detailed in Table 6-2.

Sample Location	ID	Type
WS101 (0.5m)	Chrysotile	Paper

Table 6-2: Details of asbestos identified.

6.2.3 Hazard Quotient

To examine the potential additivity of toxicological effects between the petroleum hydrocarbon fractions, a Hazard Index (HI) as described by the Environment Agency³⁸ technical report was calculated for the samples. This should be undertaken when there are no elevated petroleum hydrocarbons, when compared to assessment criteria of individual fractions. HI results are provided in full in Appendix H and are summarised in Table 6-3.

HI results are presented in Table 6-3.

Sample Location	Hazard Index	Further consideration required?
CP101 (1.3-1.7m)	0.23	N
WS102 (0.0-0.4m)	0.31	N

Table 6-3: Details of asbestos identified.

³⁸ EA (2005). "The UK Approach for Evaluating Human Health Risks from Petroleum Hydrocarbons in Soils." Science report P5-080/TR3.

6.2.4 Direct Contact Risk – Pollutant Linkage 1

Elevated PAHs and metals (arsenic and lead) have been identified on site, given the number and location of elevated samples, the contamination is considered to be site wide.

The source of the contamination is expected to be the ash, clinker and coal noted in the made ground. Although, given the high PAH concentrations it is possible fragments of bitumen / asphalt may be present which have not been seen during logging.

At the concentrations identified, the contaminants are 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 PAH and metal contamination affecting site users is likely. With a medium consequence, the risk is considered to be moderate and remediation is recommended.

No asbestos was identified in the soil samples collected from site. However, a discrete piece of chrysotile paper was identified in the soil in WS101 at 0.5mbgl.

LKC have utilised the Joint Industry Working Group (JIWG) Decision Support Tool for receptor risk ranking of ACM onsite. This model incorporates guidance from CL:AIRE CAR-SOIL³⁹ and CIRIA C733⁴⁰.

The model assumes 24 hour residential exposure of an infant. A medium respirable index was assumed based on the ACM identified onsite as per RIVM⁴¹. The assessment was carried out assuming 'low disturbance' based on ACM at a shallow depth.

For added conservatism, the model does not take into account moisture content, which can significantly reduce the potential for airborne fibre release from soil in a typical UK climate. AGS interim guidance⁴², based on work by Addison et al⁴³, notes that the addition of 10% water to soil decreases the risk of potential fibre release by a factor of between 2 and 10. The moisture content of the soil from this area was 21% making fibre release unlikely.

Data from Addison *et al* shows that a sandy soil with Chrysotile fibre concentrations of 0.01%w/w (1 order of magnitude lower recorded) when agitated in a moderately aggressive way, produced between 0.01fibres/ml and no recordable fibres at moisture contents of 5% and above. It should be noted that the clearance level is 0.01f/ml.

The JIWG model output sheet is presented in Appendix I. A medium risk was identified to key receptors based on general worst case scenario, such as some ground disturbance and track back into residential properties (24 hour exposure).

³⁹ CL:AIRE (2016). "CAR-SOIL Controlled Asbestos Regulations 2012: Interpretation for Managing and Working with Asbestos in Soil and Construction and Demolition Materials" Industry Guidelines.

⁴⁰ CIRIA (2014). "Asbestos in Soil and Made Ground: A guide to Understanding and Managing Risks." CIRIA C733.

⁴¹ RIVM (2003). "Assessment of the Risks of Soil Contamination with Asbestos" CIRIA C733." RIVM Report 711701034/2003.

⁴² AGS (2013). "Site Investigation Asbestos Risk Assessment." AGS Interim Guidance, Feb 2013, Ver 2.4.

⁴³ Addison et al (1988). "The Release of Dispersed Asbestos Fibres from Soils." Institute of Occupational Medicine Report No. TM/88/14.

Asbestos may affect site users in garden areas of the site in localised areas, via the inhalation of fibres. The probability is considered to be low given the limited asbestos encountered on site. With a medium consequence the risk as assumed to be moderate / low and localised remediation is recommended.

Additional consideration should also be given to the risk to workers and offsite receptors during groundworks and construction. This is discussed further in Section 9-1.

No elevated hydrocarbons or ethylene glycol were identified, therefore the probability of these contaminants posing a risk to site users is considered unlikely. With a medium consequence, the risk is considered to be moderate and no remediation is recommended.

6.2.5 Risk from Inhalation of Vapours – Pollutant Linkage 2

Naphthalene was elevated in WS102 (0.9-1.5m) and WS104 (0.0-0.6mm) at concentrations of 100mg/kg and 14mg/kg respectively. The SOM values for these samples are 17% (WS102) and 4% (WS104).

A source for these elevated naphthalene concentrations has not been identified and may be fragments of bitumen / asphalt present in the soil which have not been seen during logging.

LKC considers that further investigation is undertaken in these areas to determine the extent of the contamination identified and confirm remedial requirements.

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 F. Following guidance set out in CIRIA C665⁴⁴ and BS8485⁴⁵ 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 6-4.

Boreholes	Visit	CH ₄ (%v/v)	CO ₂ (%v/v)	O ₂ (%v/v)	H ₂ S (ppm)	CO (ppm)	Flow (l/h)	Groundwater (mbgl)	Pressure (mb)
CP101 (deep)	1	<0.1	2.7	18.1	<1.0	<1.0	<0.1	7.73	986 (v)
	2	0.1	1.6	19.5	<1.0	<1.0	<0.1	7.55	1013(f)
	3	<0.1	1.2	20.5	<1.0	<1.0	<0.1	7.61	1012 (s)
	4	<0.1	1.1	20.3	<1.0	2.0	<0.1	7.63	994 (r)
	5	0.1	3.3	19.9	<1.0	1.0	<0.1	7.78	1011 (r)
	6	<0.1	2.6	19.8	<1.0	<1.0	<0.1	7.5	1009 (f)

Table 6-4: Summary of gas monitoring.

Notes: If concentrations / flow is zero, then equipment detection limits are assumed.

Table shows peak concentrations of CH₄, CO₂, O₂, H₂S and CO.

Bold where CO₂ exceeds 5%v/v and CH₄ exceeds 1%v/v.

Atmospheric pressure (over past 24hrs): v=variable, f=falling, s=steady, r=rising.

⁴⁴ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

⁴⁵ 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.

Boreholes	Visit	CH ₄ (%v/v)	CO ₂ (%v/v)	O ₂ (%v/v)	H ₂ S (ppm)	CO (ppm)	Flow (l/h)	Groundwater (mbgl)	Pressure (mb)
CP101 (shallow)	1	<0.1	1.7	19.7	<1.0	<1.0	<0.1	Dry	986 (v)
	2	0.1	2.3	17.8	<1.0	1.0	-0.1	Dry	1013 (f)
	3	0.1	1.6	20.3	<1.0	<1.0	0.2	6.85	1012 (s)
	4	<0.1	1.3	19.2	<1.0	2.0	<0.1	Dry	994 (r)
	5	0.1	3.1	18.8	<1.0	<1.0	0.1	Dry	1011 (r)
	6	<0.1	2.3	18.6	<1.0	1.0	<0.1	Dry	1009 (f)
WS101	1	<0.1	9.2	9.6	<1.0	2.0	<0.1	Dry	986 (v)
	2	0.1	9.1	9.1	<1.0	<1.0	-0.1	Dry	1013 (f)
	3	<0.1	9.1	10.0	<1.0	<1.0	<0.1	Dry	1002 (s)
	4	0.1	9.5	10.6	<1.0	1.0	<0.1	Dry	993 (r)
	5	0.1	9.7	11.1	<1.0	<1.0	-0.1	Dry	1011 (r)
	6	<0.1	9.9	10.9	<1.0	<1.0	<0.1	Dry	1009 (f)
WS102	1	<0.1	2.1	20.0	<1.0	27.0	<0.1	4.5	986 (v)
	2	0.1	5.3	13.6	<1.0	15.0	<0.1	4.3	1012 (f)
	3	<0.1	3.6	18.5	<1.0	4.0	0.2	4.45	1012 (s)
	4	<0.1	2.8	17.0	<1.0	7.0	<0.1	4.45	994 (r)
	5	0.1	4.5	16.9	<1.0	2.0	<0.1	4.50	1011 (r)
	6	<0.1	5.1	15.8	<1.0	1.0	<0.1	4.55	1010 (f)
WS103	1	<0.1	5.6	12.6	<1.0	5.0	<0.1	Dry	986 (v)
	2	0.1	6.4	11.9	<1.0	<1.0	0.2	4.85	1013 (f)
	3	<0.1	5.6	14.5	<1.0	<1.0	0.2	4.83	1012 (s)
	4	<0.1	4.4	14.5	<1.0	2.0	<0.1	Dry	994 (r)
	5	0.1	5.2	15.7	<1.0	2.0	<0.1	Dry	1011 (r)
	6	<0.1	5.8	14.2	<1.0	<1.0	<0.1	Dry	1010 (f)
WS104	1	<0.1	3.8	16.2	<1.0	<1.0	<0.1	Dry	985 (v)
	2	0.1	3.8	15.6	<1.0	<1.0	0.1	Dry	1013 (f)
	3	<0.1	3.9	16.5	<1.0	<1.0	0.1	Dry	1012 (s)
	4	<0.1	3.4	16.3	<1.0	3.0	<0.1	Dry	995 (r)
	5	0.1	4.0	17.0	<1.0	<1.0	<0.1	Dry	1012 (r)
	6	<0.1	4.0	16.2	<1.0	<1.0	<0.1	Dry	1010 (f)

Table 6-4 (continued): Summary of gas monitoring.

Notes:

If concentrations / flow is zero, then equipment detection limits are assumed.

Table shows peak concentrations of CH₄, CO₂, O₂, H₂S and CO.

Bold where CO₂ exceeds 5%v/v and CH₄ exceeds 1%v/v.

Atmospheric pressure (over past 24hrs): v=variable, f=falling, s=steady, r=rising.

Carbon monoxide was >1ppm in all boreholes. The maximum concentration was recorded as 27ppm (WS102). 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).

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 C665⁴⁶, 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 6-5 shows the maximum GSV for each borehole and the appropriate characteristic situation (based on GSV only). An overall site assessment (WS101-WS106) has also been included (worst case values across the site).

Boreholes	Max GSV (l/hr)	CS / TL
CP101 (deep)	0.0027	CS1 / Green
CP102 (shallow)	0.0062	CS1 / Green
WS101	0.0099	CS1 / Green
WS102	0.0106	CS1 / Green
WS103	0.0128	CS1 / Green
WS104	0.0040	CS1 / Green
All boreholes	0.0002 (CH ₄) 0.0198(CO ₂)	CS1 / Green

Table 6-5: Summary of worst-case Gas Screening Values (GSV).

Notes:

CS – Characteristic Situation; TL= Traffic Light.

In accordance with CIRIA C665, 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.

The made ground identified onsite does not appear to be generating significant gas concentrations and is present at negligible flow rates, which will limit any migration to properties. Additionally, boreholes outside the main landfill are only marginally >5%v/v.

Although Soil Organic Matter (SOM) range from 4.0% to 21%, with an average SOM of 10.6% (equivalent Total Organic Carbon (TOC) of 6.1% and equivalent Dissolved Organic Carbon (DOC) of 4.5%). Under CL:AIRE RB17⁴⁸ guidelines would potentially put the site in CS3 if no gas monitoring had been undertaken.

However, it is well known that ash and clinker may skew the TOC results generating a false positive for degradable material and not necessarily generating gas. Assessing the potential degradable fraction based on the same subsample Dissolved Organic Carbon (DOC) was a maximum of 16mg/l (0.016% and equivalent TOC of 0.021%), which, although the material was not forensically analysed, does demonstrate material is not very degradable when just comparing SOM/TOC alone. If no gas monitoring had been undertaken this would equate to CS1, which matches the assessment of the gas monitoring.

However, considering the depth of made ground in the historical landfill is >5m (threshold in RB17) and that the site is likely in continuity with the historical landfill extent northwards, LKC considers the properties within the historical landfill (Plots 1-5) should be upgraded to CS2.

⁴⁶ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

⁴⁸ CL:AIRE Research Bulletin 17. "A Pragmatic Approach to Ground Gas Risk Assessment". November 2012.

Considering the gas concentrations and low flow rates outside the historical landfill, LKC does not consider it necessary to upgrade the characteristic situation and CS1 will be suitable for the Plots 6-8.

The gas can potentially migrate into buildings, accumulate in confined spaces and cause explosions (methane) and asphyxiation. LKC consider the probability of carbon dioxide and / or methane gas affecting site users and buildings as low likelihood (within the historical landfill). Assuming a severe consequence, there is a moderate risk. An unlikely likelihood (outside the footprint of the historical landfill) is concluded and a Moderate / Low risk presented.

6.4 Controlled Water Assessment

LKC considers the Principal Aquifer as the primary receptor.

LKC have compared results above Limits of Detection (LOD). Where relevant the review of priority substances takes precedence considering threshold values for groundwater cannot be used '*as part of site-specific investigations*'. The hierarchy is as follows:

- » River Basin District Standards⁴⁹ and updated Water Framework Directive⁵⁰ for Annual Average / Maximum Allowable Concentration Environmental Quality Standards (AA-MAC-EQS) for priority substances (surface water risk).
- » 2016 private water supply standards (UKDWS potable)⁵¹.
- » 2001 Environment Agency Values for Environmental Quality Standards (EQS) and UK Drinking Water Standard (UKDWS)⁵².

With regards to hydrocarbon mixtures (TPHCWG) for UKDWS, LKC will use the CL:AIRE guidance on petroleum hydrocarbons in groundwater⁵³ based on WHO guidelines.

No criteria values have been presented for surface waters (EQS) except the odour, visual evidence and taste test for fish⁵⁴. However, criteria for each banding has been presented by WHO within the CL:AIRE report for drinking water and will be used in the assessment.

The risk from List 2 compound (EC Dangerous Substance Directive 76/464/EEC) in a freshwater ecosystem is governed by the hardness of the water. Where applicable the hardness was taken into account for these contaminants. Additionally, to run the M-BAT⁵⁵ model to take into account bioaccessibility of copper, zinc and nickel the Dissolved Oxygen Concentration (DOC), pH and calcium concentrations will be used.

⁴⁹ Defra (2010). "The River Basin Districts Typology, Standards and Groundwater Threshold Values". Water Framework Directive (England and Wales) Directions 2010.

⁵⁰ Defra (2015). "Water Framework Directive (Standards and Classification) Directions (England and Wales) 2015".

⁵¹ Statutory Instruments (2016). "The Private Water Supplies Regulation 2016." No. 614

⁵² EA (2002). "Environment Agency technical advice to third parties on Pollution of Controlled Waters for Part IIA of the Environment Protection Act 1990."

⁵³ CL:AIRE (2017). "Petroleum Hydrocarbons in Groundwater: Guidance on Assessing Petroleum Hydrocarbons Using Existing Hydrological Risk Assessment Methodologies."

⁵⁴ EA (2009). "Petroleum Hydrocarbons in Groundwater: Supplementary Guidance for Hydrological Risk Assessment."

⁵⁵ WFD (2014). "UKTAG River & Lake Assessment Method Specific Pollutants (Metal): Metal Bioavailability Assessment Tool (M-BAT)." Water Framework Directive.

Contaminant	Units	No. of samples	Elevated Result	Location	Assessment Criteria	Source of Criteria
Arsenic	µg/l	2	11	WS102	10	UKDWS
Zinc	µg/l	2	51.6	CP101 (deep)	50.41	M-BAT PNEC
General						
pH	pH	2	Range 6.8 to 8.0			
Hardness	mg/l CaCO ₃	2	Range 120 to 330			

Table 6-6: Summary of elevated and pertinent analytical results.

Notes:

² = Based on hardness

No free product was noted in any water samples.

Given the marginal exceedances of the assessment criteria and as there are no groundwater abstractions within 100m, LKC considers the probability of contaminants on site affecting the Principal Aquifer as unlikely. Given the medium consequence, a low risk is anticipated (Pollutant Linkage 4) and no remediation is required.

6.5 Revised Contamination Conceptual Model

The preliminary contamination conceptual model (Table 2-5) has been revised following the risk assessments undertaken in Sections 6.1-6.4. 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 6-7.

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.

Further details of the remedial proposals 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.	Arsenic, lead, PAHs	Likely	Medium	Moderate	-Likely probability as elevated metals (arsenic and lead) and PAHs identified in the made ground across the site which could come into contact with site users in gardens areas. -Recommendation: Remediation required. Likely to include an environmental cover system in areas.
			-Chrysotile	Low Likelihood	Medium	Moderate / Low (Localised)	-Chrysotile paper identified in one location within historical landfill (WS101) and assumed to be discreet. No ACM identified in soil samples. A localised medium risk identified in JIWG assessment. -Recommendation*1: Remediation in garden areas will mitigate the risk.
			Petroleum hydrocarbons and ethylene glycol	Unlikely	Medium	Low	-No elevated concentrations identified. -Recommendation: No specific remediation required.
PL2	-Inhalation of vapours. -Migration through permeable strata and preferential pathways.	-Future site users.	Volatile Contaminants (WS102 and WS104): - naphthalene	Likely	Medium	Moderate	-Elevated naphthalene encountered in these two sampling locations. -Recommendation: Further investigation and delineation works required.
			Volatile Contaminants; (remainder of site): - None identified.	Unlikely	Medium	Low	-No elevated volatile contaminants across remainder of 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. -Buildings. -Offsite land users.	- Carbon dioxide and methane	Low Likelihood	Severe	Moderate (localised)	-Elevated carbon dioxide identified (max. 9.9%v/v) within former landfill area however low flow rates. -Recommendation: Gas protection measures required in line with CS2 / Amber 1.
						Moderate / Low	-Low gas concentrations and flow rates identified outside of landfill area. -Recommendation: No remedial measures required.
PL4	-Surface Run-off. -Migration through permeable strata and preferential pathways -Perched waters migration.	-Groundwater (Principal and Secondary Aquifer).	- Mobile contaminants.	Unlikely	Medium	Low	-Slightly elevated arsenic and zinc. Although Principal Aquifer there are no groundwater abstractions within 100m. No significant risk to controlled waters identified. -Recommendation: No remediation required.

Table 6-7: Revised Contamination Conceptual Model.

Notes

*1 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.

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 HazWasteOnline™. This is a web-based facility that allows an assessment waste as either hazardous or non-hazardous waste based on relevant guidance and legislation^{56, 57, 58, 59, 60, 61, 62, 63, 64}.

HazWasteOnline™ 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 results show that all the soil samples tested are classified as NON-HAZARDOUS WASTE and LoW code "17-05-04 - soil and stones other than those mentioned in 17 05 03" is suitable. The HazWasteOnline™ output sheets are provided in Appendix J.

⁵⁶ EA (2018). "Guidance on the Classification and Assessment of Waste (1st Edition v1.1)". Technical Guidance WM3.

⁵⁷ CLP Regulation - Regulation 1272/2008/EC of 16 December 2008.

⁵⁸ 1st ATP - Regulation 790/2009/EC of 10 August 2009

⁵⁹ Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

⁶⁰ WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

⁶¹ Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014

⁶² 13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

⁶³ POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004

⁶⁴ 2nd ATP to POPs Regulation - Regulation 757/2010/EU of 24 August 2010

8 Conclusions

8.1 Geotechnical

It is considered that the Made Ground or Topsoil and loose granular soils of the natural strata are not suitable for a founding material due to the inherent variability of the material. The loading should be transferred to the medium dense SAND or firm consistency CLAY.

Foundation options will be dependent upon the location and types of structures which are proposed but are considered likely to comprise:

» Deeper pile foundations.

A conservative value of ABC of 50kN/m² can be used from approximately 1.2mbgl to 5.5mbgl within the loose SAND.

For the pile foundation, using a pile diameter of 0.3-0.6m, the pile capacity is in the order of 11-49kN at depth of 1.0mbgl within the loose SAND and 44-174kN at depth of 3.0mbgl within the medium dense SAND.

Groundwater strikes were recorded at depth of approximately 5.0mbgl within the granular soils of the natural strata.

The concrete classification in accordance with BRE Special Digest 1 (2005) is DS-1 AC1s, where no groundwater is present and the water table is static.

8.2 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-1 below (more detailed model provided in Section 6).

Pollutant Linkage		Risk	Recommendations
1	Contaminants posing a risk to site users via dermal contact, ingestion and inhalation (of soil, dust, fibres and vegetables).	Moderate	- Elevated PAHs and heavy metals identified in made ground. Recommendations: Remediation required in garden areas.
		Moderate / Low (localised)	- Chrysotile paper identified in localised area (historical landfill) and removed. Recommendations: Remediation required.
		Low	- No elevated TPH or ethylene glycol. Recommendations: No specific remediation required.
2	Volatile contaminants posing a risk to site users via the inhalation of vapours.	Moderate	- Elevated naphthalene in WS102 and WS104. Recommendations: Further investigation and assessment required.
3	Gas posing a risk to buildings and site users via the migration of gas into building causing explosion and asphyxiation.	Moderate (localised)	- Elevated CO ₂ in area of former landfill however low flow rates. Recommendations: Gas protection measures in line with CS2 / Amber 1 required.
		Moderate / Low	- Low gas concentrations and flow rates across remainder of the site. Recommendations: No remediation required.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	- Slightly elevated arsenic and zinc not anticipated to pose a significant risk. Recommendations: No remediation required.

Table 8-1: Summary Risk Table.

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	<u>Earthworks Inspections / Unexpected Contamination</u> 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.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
	2	<u>Naphthalene Delineation Work</u> Further sampling to be carried out to confirm the source and extent of contamination in the areas of WS102 and WS104 at a sampling density of approx. 1 sampling point per 5m square centres. Further assessment should be undertaken to confirm the risk to site users and the requirement for remediation. It is recommended that this work is carried before or during earthworks.	TBC (dependant on findings of additional work).

Table 9-1: Further work, remediation and validation requirements

Notes: See Table 6-7 for pollutant linkage (PL) details.

Build-Phase Construction	1 and 7	<u>Environmental Cover System</u> As made ground is relatively deep, it is unlikely to be viable to remove the contaminated soils. Therefore, an environmental cover system is recommended. The environmental cover system should be as follows: Private Back Gardens: 600mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 500mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 600mm comprising clean inert fill and sufficient topsoil for a growing medium. Private Front Garden / Shared Landscaping: 450mm thick environmental cover system comprising: <u>Either</u> 100mm physical break layer (MOT type 1 material, 20-30mm, minimal fines) and at least 350mm comprising clean inert fill and sufficient topsoil for a growing medium. <u>Or</u> geotextile membrane and at least 450mm comprising clean inert fill and sufficient topsoil for a growing medium. The subsoil layer can be replaced by additional topsoil. A diagram of a typical environmental cover system is shown in Appendix K.	Measuring depth of environmental cover system using a staff and providing photographic evidence. Photographic evidence of the granular physical break or geotextile layer will also be collected. Chemical validation of imported soils: See Table 9-2.
	3	<u>Gas Protection Measures for Plots 1-5</u> In line with CS2 as per UK guidance^{65,66}. This should include: • Passive subfloor or active subfloor ventilation system. • Methane and carbon dioxide resistant membrane installed as per manufacturer's instructions. • Ventilation of confined spaces within the building. • Well-constructed reinforced suspended, raft or cast in situ ground slab. • 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.	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 735⁶⁷

Table 9-1 (continued): Further work, remediation and validation requirements

Notes: See Table 6-7 for pollutant linkage (PL) details.

⁶⁵ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665

⁶⁶ BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for new buildings." BS8485:2015.

⁶⁷ CIRIA (2014). "Good Practice on the Testing and Verification of Protection Systems for Building Against Hazardous Ground Gas". CIRIA C735.

Other Considerations	<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 ⁶⁸): 5,000 tonnes (c. 2,500m³) <u>treatment of</u> crushed concrete / stone. 1,000 tonnes (c. 500m³) <u>use of</u> non-hazardous soil 5,000 tonnes (c. 2,500m³) <u>use of</u> clays, sand, gravel, brick, concrete, stone etc. 50,000 tonnes (c. 25,000m³) <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>Asbestos Management Plan</u> Due to the presence of asbestos containing material, it is recommended that additional precautions are taken during site clearance, earthworks and construction in the area of concern. The presence of asbestos in the made ground at the site presents a potential risk of generation of airborne fibres if this material is disturbed, such as for excavations to construct new foundations. This risk can be managed by careful procedures and site monitoring to reduce the risk of airborne fibres, and it is recommended that an appropriate 'Asbestos Management Strategy' is developed and adopted for all intrusive ground works which disturb the made ground in the area of concern. This should be carried out in line with CIRIA C733⁶⁹. A JIWG assessment was undertaken for ground workers during the development works and the risk was concluded as Low. This is presented in Appendix I. The work is deemed to be non-licensed work from the JIWG assessment and control measures such as awareness training for all site staff, provision of suitable personal and respiratory protective equipment, localised/manual dust suppression and decontamination facilities are recommended. With regards to cement bound asbestos, this can be handpicked, doubled bagged and disposed of appropriately to a licenced landfill. Guidance on removing asbestos cement is described in HSE (2012)⁷⁰. If ACM is identified in soil arisings then soil should be placed directly into covered skips and disposed of at a suitable licenced landfill, after further testing to quantify the extent of asbestos contamination of the soils. It should be considered that blue asbestos is notifiable and must be removed by a licenced contractor.
----------------------	--

Table 9-1 (continued): Further work, remediation and validation requirements

Notes: See Table 6-7 for pollutant linkage (PL) details.

⁶⁸ <https://www.gov.uk/guidance/waste-exemptions-using-waste>

⁶⁹ CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

⁷⁰ HSE (2012). "Removing Asbestos Cement (AC) Debris." A11 Asbestos Essential – Non-licensed Tasks.

Other Considerations	<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 ⁷³) should be adopted by all workers involved with site enabling and construction works.
	<u>Piling in Contaminated Land</u> It is understood that the building will be piled into the bedrock. This may provide a preferential pathway for contaminants to the Principal Aquifer. It may also provide a preferential pathway for upward gas migration. Once the method of piling has been determined, good practice for the drilling of piles on contaminated sites should be adhered to, such as guidance provided by the Environment Agency ⁷⁴ .

Table 9-1 (continued): Further work, remediation and validation requirements

Notes: See Table 6-7 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, with confirmatory sampling undertaken on importation to site. 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 50m³
	Brownfield / Unknown	Suite B	
Subsoil	Brownfield / Unknown	Suite B	1 sample per 50m³
	Site won natural material / greenfield	Suite A	
	Physical Stone Break Layer	First Generation i.e. quarried sand (subsoil) or stone (break layer)	
	Recycled Stone (6F2 / screened)	Suite B	1 sample per 500m³

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 BS3882⁷⁵). LKC advise this information is provided by the supplier before material is imported onto site.

⁷³ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

⁷⁴ Environment Agency (2001) Piling and Penetrative Ground Improvement Methods on Land Affected by Contamination: Guidance on Pollution Prevention.

⁷⁵ BS (2015). "Specifications for Topsoil and Requirements for use." BS3882:2015.

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 G.

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:

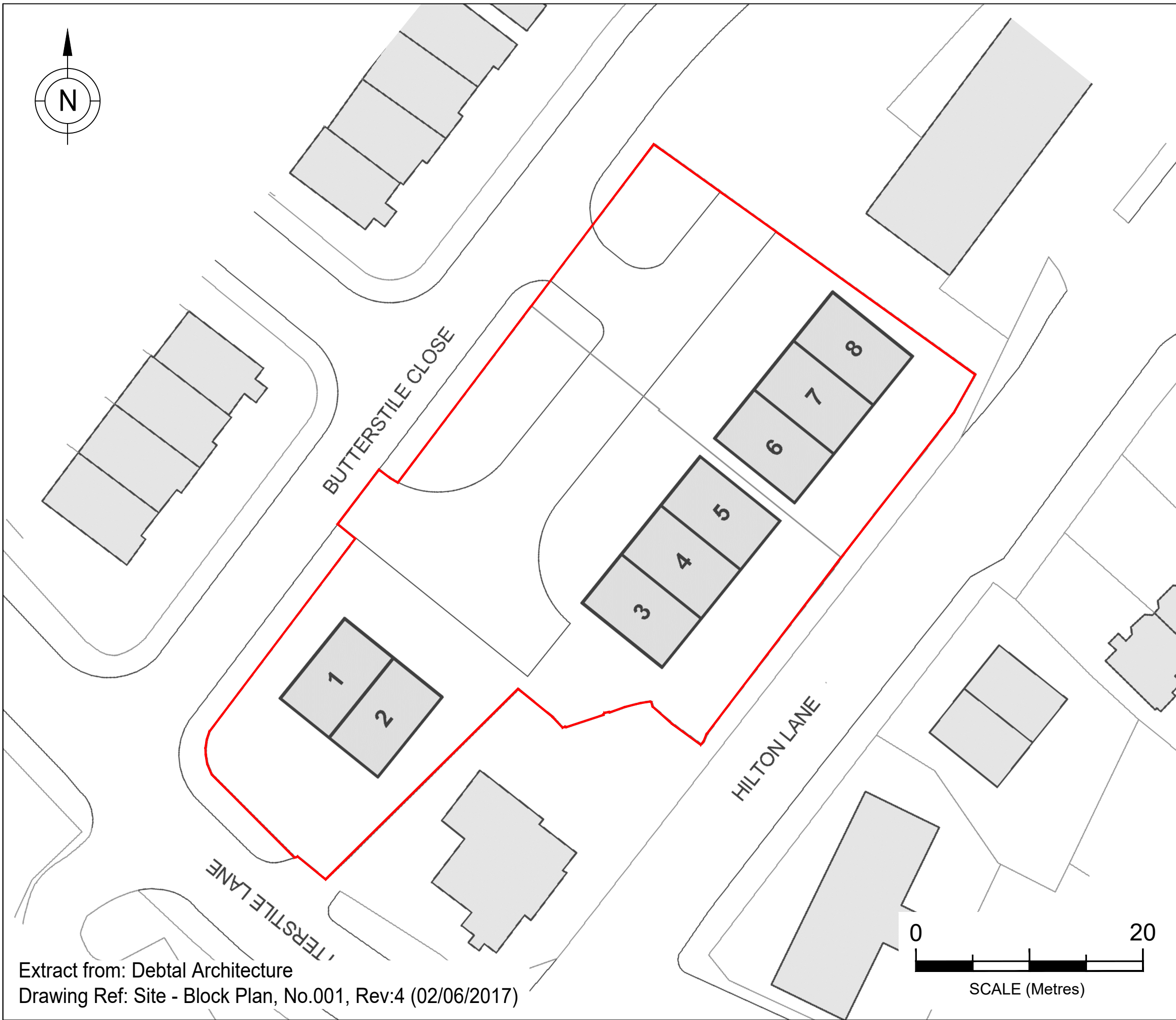
- » Validation of gas protection measures for Plots 1-5.
- » Further investigation and delineation of naphthalene hotspots.
- » Provision of waste transfer documents.
- » Validation of environmental cover system.
- » Verification testing of all imported soil for garden areas.
- » Details of any unexpected 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: Leo Property Ltd				Title: Site Location & Boundary Plan		LK CONSULT	
Site: Hilton Lane, Butterstile Close, Prestwich				Scale (see scale bar): 1:25,000 & 1:1,500 @ A4			
Job No.: LKC 21 1545	Drawn By: HM	Checked By: PQ	Drawn: Feb 2021	Figure: 1	Revision:		



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:

Leo Property Ltd

Site:

Hilton Lane, Butterstile Close, Prestwich

Title:

Proposed Development Plan

Job No.:

LKC 21 1545

Scale (See Scale Bar):

See Scale Bar

Figure:

2

Revision:

Drawn By:

AC

Checked By:

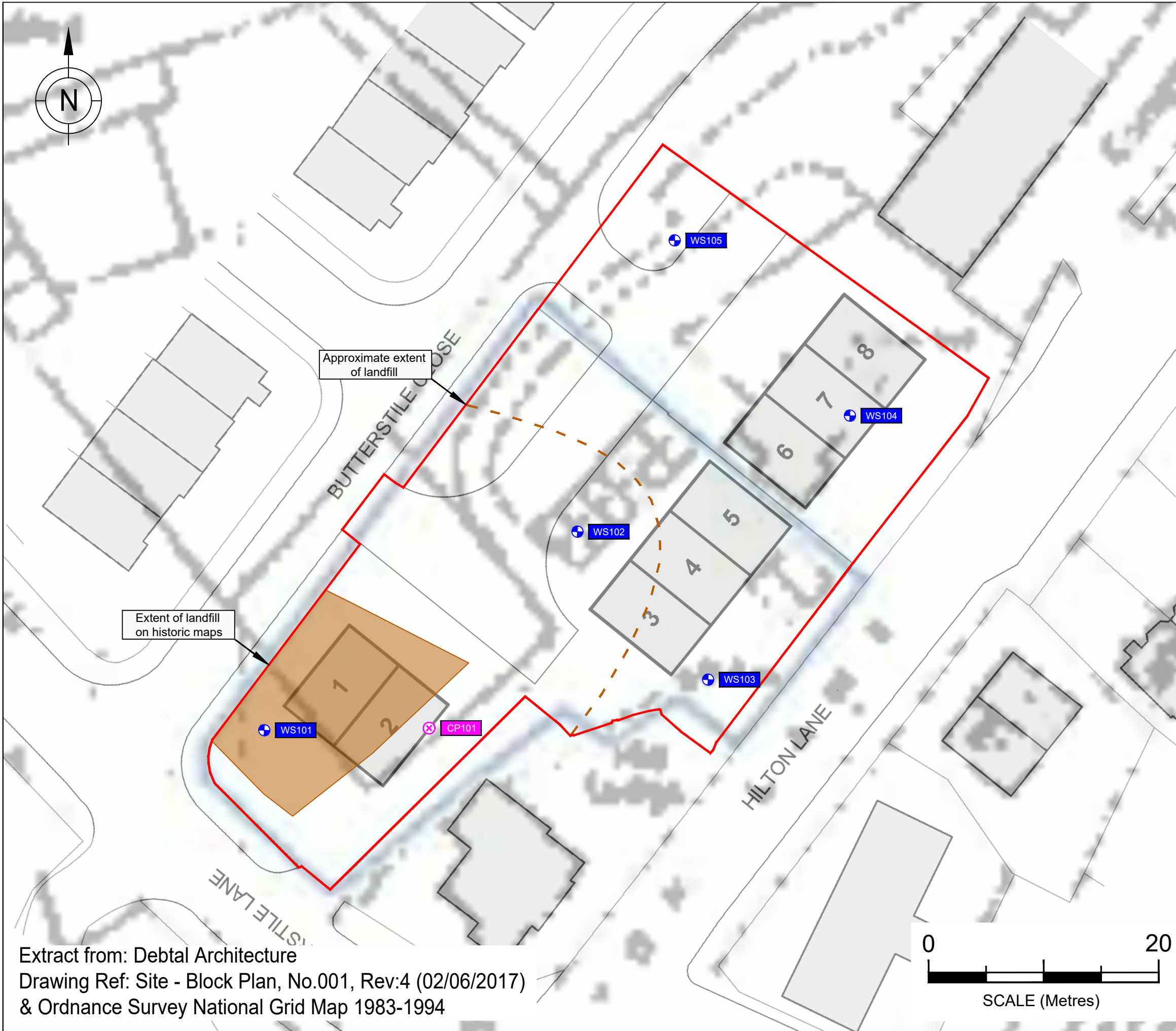
HM

Drawn:

Oct 2021

Extract from: Debtal Architecture

Drawing Ref: Site - Block Plan, No.001, Rev:4 (02/06/2017)



KEY

- Site Boundary
- Window Sample Borehole (WS)
- Cable Percussive Borehole (CP)
- Landfill (Ordnance Survey Map 1:2,500, 1953-1954)
- Approximate extent of landfill based on SI data.

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.



Client:		Leo Property Ltd	
Site:		Hilton Lane, Butterstile Close, Prestwich	
Title:		Site Investigation Location Plan	
Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 21 1545	See Scale Bar	3	A
Drawn By:	Checked By:	May 2022	
AC	MT		

Extract from: Debtal Architecture
Drawing Ref: Site - Block Plan, No.001, Rev:4 (02/06/2017)
& Ordnance Survey National Grid Map 1983-1994

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 552⁷⁶. It involves the classification of the:

- » Magnitude of the potential consequence (severity) of the risk occurring (Table A).
- » Magnitude of 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.

⁷⁶ 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 severe harm to a designated receptor is currently happening. - This risk, if realised, is likely to result in a substantial liability. - Urgent investigation (if not 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 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

Excavation Method

Drive-in Windowless Sampler
driven to 7.45mbgl.

Dimensions
Location (Handheld GPS)
380904 E 402397 N

Ground Level (mOD)

67.00

Client

Leo Prestwich Ltd

Job
Number
LKC 21 1545

Engineer

LKC

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=0.1ppm				(0.50)	MADE GROUND: Dark brown slightly gravelly very sandy clayey SILT with occasional brick fragments, ash, pottery, rare rootlets and plastic (wrappers). Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies. Possible asbestos-containing material (ACM) identified at 0.50mbgl.			
0.50-0.90	ES2 PID=0.1ppm			66.50	0.50 (0.40)				
0.90-1.90	ES3 PID<0.1ppm			66.10	0.90	MADE GROUND: Light brown very sandy CLAY with occasional brick fragments, coal and ash. Sand is fine to medium.			
1.20-1.65	SPT N=4		1,1/1,1,1,1			MADE GROUND: Light brown SAND with occasional brick fragments, glass, ash, rare concrete fragments and sandy clay lenses. Sand is fine to medium. Slightly silty between 1.00-1.40mbgl.			
2.00-2.45	SPT N=3		0,1/0,1,1,1		(2.10)				
3.00-3.45	SPT N=7			64.00	3.00	MADE GROUND: Blackish brown slightly silty SAND with frequent ash, occasional coal, brick fragments, glass. Increasing brick content with depth. Sand is fine to coarse.			
3.00-4.00	ES4 PID<0.1ppm		2,2/2,2,2,1		(1.20)				
4.00-4.45	SPT N=4		1,1/1,1,1,1	62.80	4.20	MADE GROUND: Light brown SAND with rare brick fragments. Sand is fine to medium.			
4.00-5.00	ES5 PID<0.1ppm				(0.80)				
5.00-5.45	SPT N=8		1,1/2,2,2,2	62.00	5.00	MADE GROUND: Light orangish brown fine to medium SAND (possible infilled material).			
5.00-6.00	ES6				(1.00)				
5.50-6.00	D7								
6.00-6.45	SPT N=6		1,1/1,1,2,2	61.00	6.00	MADE GROUND: Light orangish brown slightly gravelly SAND (possible infilled material). Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.			
6.00-7.00	D8				(1.00)				
7.00-7.45	SPT N=11		2,2/2,3,3,3	60.00	7.00	NO RECOVERY.			
					(0.45)				
				59.55	7.45	Complete at 7.45m			

Remarks

Possible ACM identified at 0.50mbgl.
Borehole dry and stable.
No recovery between 7.00-7.45mbgl.
Location estimated from handheld GPS, accurate to 3.00m.
Elevation estimated from <https://www.freemaptools.com/elevation-finder.htm>
Scale
(approx)
1:40

Logged
By
EM

Figure No.
LKC 21 1545.WS101

Excavation Method

Drive-in Windowless Sampler
driven to 5.45mbgl.

Dimensions
Location (Handheld GPS)
380930 E 402410 N

Ground Level (mOD)

67.00

Client

Leo Prestwich Ltd

Job
Number
LKC 21 1545

Dates

07/02/2022

Engineer

LKC

Sheet
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<0.1ppm				(0.40)	MADE GROUND: Dark brown silty SAND with occasional rootlets, brick fragments, coal, pottery, ash, rare glass and sub-angular sandstone cobbles. Sand is fine to coarse.			
0.40-0.80	ES2 PID<0.1ppm			66.60	0.40	MADE GROUND: Light brown SAND with rare coal and brick fragments. Sand is fine to medium.			
0.80-0.90	ES3 PID<0.1ppm			66.20	0.80	MADE GROUND: Greyish brown gravelly silty SAND with frequent coal, occasional ash and brick fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.			
0.90-1.50	ES4 PID=0.1ppm			66.10	0.90				
1.20-1.65	SPT N=8		2,2/2,2,2,2		(0.60)				
1.50-2.50	ES5			65.50	1.50	MADE GROUND: Black SAND and GRAVEL predominantly comprising ash, coal and clinker with rare glass and metal (nail). Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded.			
2.00-2.45	SPT N=3		2,3/2,1,0,0		(1.70)	MADE GROUND: Light brown fine to medium SAND with occasional brick fragments, rare ash and concrete. Frequent clay lenses between 1.50-2.00mbgl.			
3.00-3.45	SPT N=1		0,0/0,0,1,0						
3.20-4.00	ESD6			63.80	3.20	Very loose light orangish brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies including coal.			
4.00-4.45	SPT N=0		1,0/0,0,0,0	63.00	4.00	Very loose brown very clayey SAND. Very slight organic odour. Sand is fine to medium.			
4.00-5.00	D7				(1.00)				
5.00-5.45	D8		Water strike(1) at 5.00m.	62.00	5.00	Very loose light orange very silty SAND. Sand is fine to medium.		Σ1	
5.00-5.45	SPT N=0		1,0/0,0,0,0		(0.45)				
				61.55	5.45	Complete at 5.45m			

Remarks

Groundwater strike recorded at 5.00mbgl.
Borehole stable.
Location estimated from handheld GPS, accurate to 3.00m.
Elevation estimated from <https://www.freemaptools.com/elevation-finder.htm>
Scale
(approx)

1:40

Logged
By

EM

Figure No.

LKC 21 1545.WS102

Excavation Method

Drive-in Windowless Sampler
driven to 5.45mbgl.

Dimensions
Location (Handheld GPS)
380944 E 402403 N

Ground Level (mOD)

67.00

Client

Leo Prestwich Ltd

Job
Number

LKC 21 1545

Engineer

LKC

Sheet

1/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.15-0.30	ES1 PID=0.1ppm			66.95	0.05 (0.10)	MADE GROUND: Brown slightly gravelly slightly silty SAND with occasional brick fragments, coal and ash. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.			
0.30-0.60	ES2 PID=0.1ppm			66.85	0.15 (0.15)				
				66.70	0.30	MADE GROUND: Brown sub-angular sandstone COBBLES. Tarmacadam between 0.05-0.07mbgl.			
0.60-1.60	ES3 PID<0.1ppm					MADE GROUND: Brown slightly gravelly slightly silty SAND with occasional brick fragments, coal and ash. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.			
1.20-1.65	SPT N=6		1,1/1,1,2,2		(1.50)	MADE GROUND: Light orangish brown slightly gravelly slightly silty SAND with rare brick fragments and ash. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.			
2.00-2.45	SPT N=5			65.20	1.80	Loose light orangish brown slightly gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies including coal.			
2.00-3.00	D4		1,1/1,1,1,2		(1.20)				
3.00-3.45	SPT N=19			64.00	3.00	Medium dense light brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies including coal.			
3.00-4.00	D5		3,4/4,5,5,5		(1.00)				
4.00-4.45	SPT N=12		3,3/3,3,3,3	63.00	4.00	Medium dense light brown slightly gravelly slightly silty SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies including coal.			
4.50-5.00	D6				(1.00)	Firm consistency orangish brown sandy CLAY between 4.40-4.50mbgl.			
5.00-5.45	SPT N=24		4,5/5,6,6,7						

Remarks

Location estimated from handheld GPS, accurate to 3.00m.
No recovery between 5.00-5.45mbgl.
Elevation estimated from <https://www.freemaptools.com/elevation-finder.htm>
Borehole dry and stable.

Scale
(approx)

1:25

Logged
By

EM

Figure No.

LKC 21 1545.WS103

Excavation Method Drive-in Windowless Sampler driven to 5.45mbgl.	Dimensions	Ground Level (mOD) 67.00	Client Leo Prestwich Ltd	Job Number LKC 21 1545
	Location (Handheld GPS) 380944 E 402403 N	Dates 07/02/2022	Engineer LKC	Sheet 2/2

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
				62.00	5.00	NO RECOVERY.			
					(0.45)				
				61.55	5.45	Complete at 5.45m			

Remarks

Location estimated from handheld GPS, accurate to 3.00m.
No recovery between 5.00-5.45mbgl.
Elevation estimated from <https://www.freemaptools.com/elevation-finder.htm>
Borehole dry and stable.

Scale (approx)

1:25

Logged
By

EM

Figure No.
LKC 21 1545.WS103

Excavation Method

Drive-in Windowless Sampler
driven to 5.45mbgl.

Dimensions
Location (Handheld GPS)
380952 E 402427 N

Ground Level (mOD)

67.00

Client

Leo Prestwich Ltd

Job
Number
LKC 21 1545

Engineer

LKC

Sheet
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				(0.60)	MADE GROUND: Brown slightly gravelly silty SAND with occasional coal, ash, rare brick fragments and rare rootlets. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.			
0.60-0.80	ES2 PID=0.1ppm			66.40	0.60 (0.20)	MADE GROUND: Light orangish brown slightly silty SAND with occasional concrete fragments and rare rootlets. Sand is fine to coarse.			
1.00-2.00	ESD3 PID<0.1ppm		1,1/1,2,2,3	66.20	0.80	Loose becoming medium dense light brown fine to coarse SAND. Sand is fine to medium grained between 1.00-2.50mbgl.			
1.20-1.65	SPT N=8								
2.00-2.45	SPT N=8		1,1/2,2,2,2						
2.00-3.00	D4								
3.00-3.45	SPT N=8		1,1/2,2,2,2		(4.20)	Sand is darker in colour between 2.80-3.20mbgl. Band of coal gravel between 3.30-3.35mbgl. Gravel is fine to medium, sub-angular.			
4.00-4.45	SPT N=16		3,3/3,4,4,5			Medium dense from 4.00mbgl. Sand is fine to medium grained between 4.00-5.00mbgl.			
4.00-4.45	D5								
5.00-5.45	SPT N=18		2,2/3,4,5,6	62.00	5.00 (0.35)	Medium dense light brown very gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded comprising mixed lithologies including coal.			
5.00-5.45	D6			61.65 (0.35) 61.55 (0.40)	5.35 (0.40)	Firm consistency brown sandy CLAY. Sand is fine to medium. Complete at 5.45m			

Remarks

Borehole dry and stable.
Location estimated from handheld GPS, accurate to 3.00m.
Elevation estimated from <https://www.freemaptools.com/elevation-finder.htm>
Scale
(approx)
1:40

Logged
By
EM

Figure No.
LKC 21 1545.WS104

Excavation Method

Drive-in Windowless Sampler
driven to 5.45mbgl.

Dimensions
Location (Handheld GPS)
380939 E 402440 N

Ground Level (mOD)

66.50

Client

Leo Prestwich Ltd

Job
Number
LKC 21 1545

Engineer

LKC

Sheet
1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.00-0.40	ES1 PID=0.1ppm				(0.40)	MADE GROUND: Dark brown silty SAND with occasional roots, rootlets, concrete fragments, rare whole bricks and concrete cobbles. Sand is fine to medium.		
0.40-1.40	ES2 PID<0.1ppm			66.10	0.40	MADE GROUND: Greyish brown clayey SAND with frequent brick fragments, coal, occasional ash, very sandy clay lenses, rare plastic and glass. Sand is fine to medium.		
1.20-1.65	SPT N=8		5,4/2,2,2,2		(1.30)			
1.70-2.20	ES3 PID<0.1ppm			64.80	1.70	MADE GROUND: Light brown very sandy CLAY with rare brick fragments and rare pottery fragments. Sand is fine to medium.		
2.00-2.45	SPT N=4		1,1/1,1,1,1		(0.50)	Occasional bands of sand between 2.00-2.20mbgl.		
2.50-2.78	ES4			64.30	2.20	Firm consistency medium strength light brown slightly gravelly sandy CLAY with occasional rootlets and sand lenses. Sand is fine to medium. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.		
2.50-3.00	PP 54kPa				(1.00)			
2.80-3.00	D5							
3.00-3.45	SPT N=6		1,1/1,1,2,2	63.30	3.20			
3.00-3.45	D6				(0.20)	Loose brown silty SAND. Sand is fine to medium.		
3.50-4.00	D7 PID=0.9ppm			63.10	3.40	Loose to Medium dense orange slightly gravelly slightly silty SAND, becoming light orangish brown in colour with depth. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.		
4.00-4.45	SPT N=10		1,1/2,2,3,3		(1.60)			
4.00-5.00	D8							
5.00-5.45	SPT N=13		Water strike(1) at 5.00m. 2,2/2,2,5,4	61.50	5.00	Medium dense brown very gravelly SAND. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising mixed lithologies.		
					(0.45)			
				61.05	5.45	Complete at 5.45m		

Remarks

Groundwater strike recorded at 5.00mbgl.
Borehole stable.
Location estimated from handheld GPS, accurate to 3.00m.
Elevation estimated from <https://www.freemaptools.com/elevation-finder.htm>
Scale
(approx)

1:40

Logged
By

EM

Figure No.

LKC 21 1545.WS105

Boring Method

Cable Percussion

Casing Diameter
Ground Level (mOD)

67.00

Client

Leo Prestwich Ltd

Job Number

LKC 21 1545

Location

380914 E 402397 N

Dates

04/02/2022-
07/02/2022

Engineer

LKC

Sheet

1/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.00-1.00	ES						MADE GROUND: Dark brown organic gravelly very silty SAND with frequent brick fragments roots, rare, pottery ash and concrete. Sand is fine to medium. Gravel is fine to medium, sub-angular comprising mixed lithologies.			
1.20-1.65 1.20-1.65 1.30-1.70	SPT N=7 ES ES			1,1/2,2,1,2		(2.20)	Slight hydrocarbon odour from 1.2mbgl to 1.65mbgl.			
2.20-2.65 2.20-2.65	SPT N=6 D			1,2/1,1,2,2	64.80	2.20	MADE GROUND: Brown slightly silty SAND with rare brick fragments and lenses of organic matter. Sand is fine to medium.			
3.00-3.50 3.30-3.75 3.30-3.75	D SPT N=4 D			1,1/1,0,1,2		(2.30)				
4.20-4.65 4.20-4.65 4.50-5.00	SPT N=6 D ES			1,1/2,2,1,1	62.50	4.50	MADE GROUND: Brown clayey SAND with rare coal and brick fragments. Sand is fine to medium.			
5.40-5.85 5.40-5.85	SPT N=8 D			1,2/2,2,2,2		(2.40)				
7.20-7.65 7.20-7.65	SPT N=5 D			1,1/1,2,1,1	60.10 60.00	6.90 7.00	MADE GROUND: Brown very sand CLAY with rare brick fragments. Strata noted to be wet. Sand is fine to medium.			
7.70-8.00	B						Stiff consistency brown slightly gravelly silty CLAY with gravel content increasing with depth and rare coal. Gravel is fine to medium, sub-rounded to sub-angular comprising mixed lithologies.			
8.30-8.95 8.50-8.95	D SPT N=6			1,2/1,1,2,2						
10.00-10.45	SPT N=40			4,4/8,10,11,11						

Remarks

Borehole stable. Strata noted to be wet between 6.90-7.00mbgl.
Grid reference estimated from www.gridreferencefinder.com
Elevation estimated from www.freemaptools.com/elevation-finder.htm

Scale (approx)

1:50

Logged By

RW

Figure No.

LKC 21 1545.CP101

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

Hilton Lane, Prestwich

Borehole**Number**
CP101

Boring Method Cable Percussion	Casing Diameter		Ground Level (mOD) 67.00	Client Leo Prestwich Ltd	Job Number LKC 21 1545
	Location 380914 E 402397 N		Dates 04/02/2022- 07/02/2022	Engineer LKC	Sheet 2/2

Depth (m)	Sample / Tests	Casing Depth (m)	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
10.00-10.45	D									
10.50-10.80	D									
11.50-11.95	U					(8.47)				
12.00-12.50	D									
13.00-13.41 13.00-13.40	SPT 55/255 D			6,10/16,14,15,10						
14.20-14.43 14.20-14.50	SPT 25*/135 50/95 D			10,15/38,12						
15.10-15.47 15.10-15.50	SPT 50/220 D			7,11/14,16,20	51.53	15.47	Complete at 15.47m			

RemarksBorehole stable. Strata noted to be wet between 6.90-7.00mbgl.
Grid reference estimated from www.gridreferencefinder.com
Elevation estimated from www.freemaptools.com/elevation-finder.htm
Chiselling from 13.00m to 15.00m for 1.45 hours.**Scale (approx)**

1:50

Logged By

RW

Figure No.

LKC 21 1545.CP101

Appendix C

Certificates of Analysis – Soil



Amended Report

Report No.:	22-04654-4		
Initial Date of Issue:	18-Feb-2022	Date of Re-Issue:	31-Mar-2022
Client	LK Consult		
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Contaminated Land Michelle Thorniley		
Project	LKC 21 1545 Hilton Lane, Prestwich		
Quotation No.:		Date Received:	09-Feb-2022
Order No.:	739988	Date Instructed:	14-Feb-2022
No. of Samples:	9		
Turnaround (Wkdays):	5	Results Due:	18-Feb-2022
Date Approved:	18-Feb-2022		
Approved By:			

Details: Stuart Henderson, Technical Manager

Bulk Identification Certificate

Client: LK Consult

Site Address:

Date Sampled: 08-Feb-2022

Date Received: 09-Feb-2022

Your Ref.:

Project: LKC 21 1545 Hilton Lane,
Prestwich

Job Number: 22-04654

No Samples:

Date Reported: 18-Feb-2022

Sample No.	Sample ID	Sample Ref.	Description	Top (m)	Bottom (m)	SOP	Accred.	Laboratory	Material	Result
1367993	WS101			0.50		2185	U	DURHAM	paper	Chrysotile

The in-house procedure SOP2185 is in accordance with the requirements of Appendix 2 of the Analyst Guide (HSG 248).

The results relate only to items tested as supplied by the client.

Comments and interpretations are beyond the scope of UKAS accreditation.

Samples associated with asbestos in building surveys are retained for six months (HSG 264 refers)

Results - Leachate

Project: LKC 21 1545 Hilton Lane, Prestwich

Client: LK Consult	Chemtest Job No.:					22-04654	22-04654
Quotation No.:	Chemtest Sample ID.:					1367985	1367988
	Client Sample ID.:					WS101	WS102
	Sample Type:					SOIL	SOIL
	Top Depth (m):					3.00	0.90
	Bottom Depth (m):					4.00	1.50
	Date Sampled:					08-Feb-2022	08-Feb-2022
Determinand	Accred.	SOP	Type	Units	LOD		
Dissolved Organic Carbon	U	1610	10:1	mg/l	2.0	15	16

Results - Soil

Project: LKC 21 1545 Hilton Lane, Prestwich

Client: LK Consult	Chemtest Job No.:				22-04654	22-04654	22-04654	22-04654	22-04654	22-04654	22-04654	22-04654
Quotation No.:	Chemtest Sample ID.:				1367984	1367985	1367987	1367988	1367989	1367990	1367991	1367992
	Client Sample ID.:				WS101	WS101	WS102	WS102	WS103	WS104	WS105	CP101
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.00	3.00	0.00	0.90	0.30	0.00	0.40	1.30
	Bottom Depth (m):				0.50	4.00	0.40	1.50	0.60	0.60	1.40	1.70
	Date Sampled:				08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022
	Asbestos Lab:				DURHAM	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	No Asbestos Detected
Moisture	N	2030	%	0.020	21	14	20	13	11	18	18	20
Soil Colour	N	2040		N/A	Brown	Brown	Brown	Brown	Brown	Brown	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones	Stones	Stones	Stones	Stones	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand	Sand	Sand	Sand	Sand	Sand	Sand
Chromatogram (TPH)	N			N/A			See Attached					See Attached
pH	M	2010		4.0	8.8	8.4	8.2	8.4	8.0	7.5	8.4	8.2
Boron (Hot Water Soluble)	M	2120	mg/kg	0.40			0.57					0.99
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.27	0.093	0.039	0.082	0.026	0.10	0.038	0.035
Cyanide (Free)	M	2300	mg/kg	0.50			< 0.50					< 0.50
Cyanide (Total)	M	2300	mg/kg	0.50			< 0.50					< 0.50
Arsenic	M	2450	mg/kg	1.0	23	21	20	39	14	17	36	20
Cadmium	M	2450	mg/kg	0.10	0.77	0.32	1.0	2.2	0.90	0.21	3.7	1.2
Chromium	M	2450	mg/kg	1.0	30	17	23	27	28	13	64	20
Copper	M	2450	mg/kg	0.50	150	68	220	210	120	37	230	230
Mercury	M	2450	mg/kg	0.10	0.54	0.22	0.23	2.3	0.27	0.33	2.2	0.29
Nickel	M	2450	mg/kg	0.50	14	9.8	15	24	12	9.3	47	18
Lead	M	2450	mg/kg	0.50	300	120	190	330	190	130	480	170
Selenium	M	2450	mg/kg	0.20	0.58	0.50	0.47	0.60	0.36	0.48	0.68	0.43
Vanadium	U	2450	mg/kg	5.0	38	32	35	49	35	22	57	26
Zinc	M	2450	mg/kg	0.50	260	110	210	360	270	63	380	130
Chromium (Hexavalent)	N	2490	mg/kg	0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50	< 0.50
Organic Matter	M	2625	%	0.40	11	7.1	21	17	6.2	4.0	11	7.8
Diesel Present	N	2670		N/A			False					False
Aliphatic TPH >C5-C6	N	2680	mg/kg	1.0			< 1.0					< 1.0
Aliphatic TPH >C6-C8	N	2680	mg/kg	1.0			< 1.0					< 1.0
Aliphatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0					< 1.0
Aliphatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0					< 1.0
Aliphatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0					< 1.0
Aliphatic TPH >C16-C21	M	2680	mg/kg	1.0			< 1.0					< 1.0
Aliphatic TPH >C21-C35	M	2680	mg/kg	1.0			120					< 1.0
Aliphatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0					< 1.0
Total Aliphatic Hydrocarbons	N	2680	mg/kg	5.0			120					< 5.0
Aromatic TPH >C5-C7	N	2680	mg/kg	1.0			< 1.0					< 1.0
Aromatic TPH >C7-C8	N	2680	mg/kg	1.0			< 1.0					< 1.0
Aromatic TPH >C8-C10	M	2680	mg/kg	1.0			< 1.0					< 1.0

Results - Soil

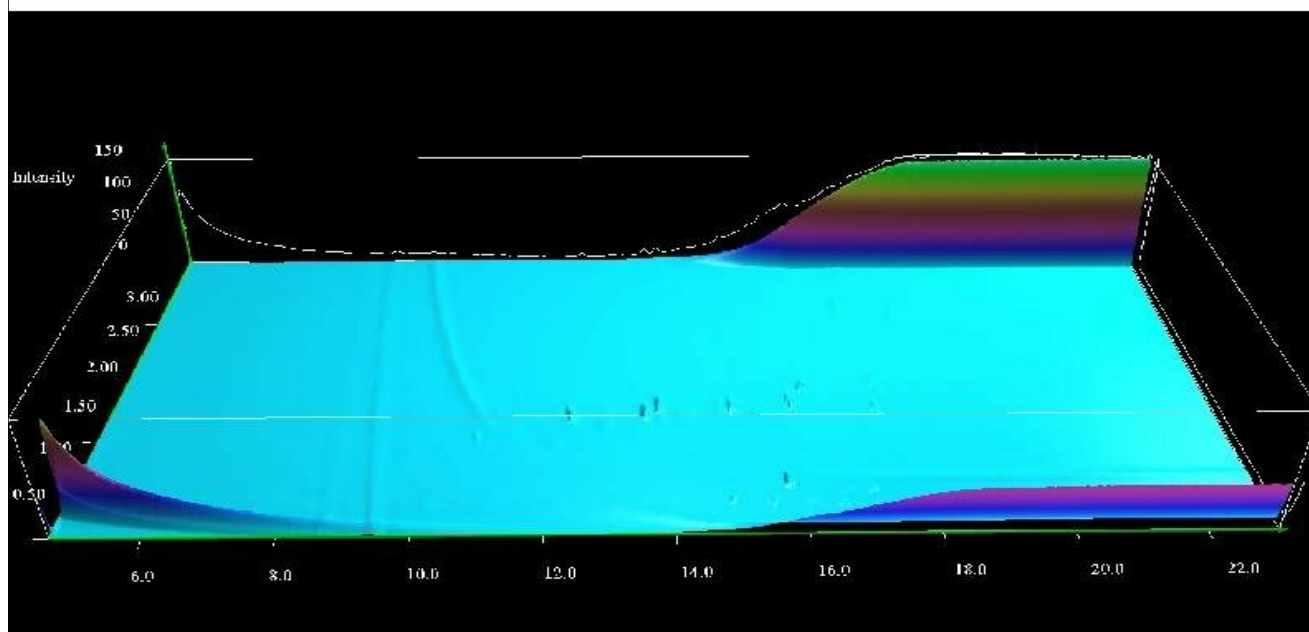
Project: LKC 21 1545 Hilton Lane, Prestwich

Client: LK Consult	Chemtest Job No.:				22-04654	22-04654	22-04654	22-04654	22-04654	22-04654	22-04654	22-04654
Quotation No.:	Chemtest Sample ID.:				1367984	1367985	1367987	1367988	1367989	1367990	1367991	1367992
	Client Sample ID.:				WS101	WS101	WS102	WS102	WS103	WS104	WS105	CP101
	Sample Type:				SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
	Top Depth (m):				0.00	3.00	0.00	0.90	0.30	0.00	0.40	1.30
	Bottom Depth (m):				0.50	4.00	0.40	1.50	0.60	0.60	1.40	1.70
	Date Sampled:				08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022	08-Feb-2022
	Asbestos Lab:				DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM	DURHAM
Determinand	Accred.	SOP	Units	LOD								
Aromatic TPH >C10-C12	M	2680	mg/kg	1.0			< 1.0					< 1.0
Aromatic TPH >C12-C16	M	2680	mg/kg	1.0			< 1.0					< 1.0
Aromatic TPH >C16-C21	U	2680	mg/kg	1.0			< 1.0					82
Aromatic TPH >C21-C35	M	2680	mg/kg	1.0			470					190
Aromatic TPH >C35-C44	N	2680	mg/kg	1.0			< 1.0					< 1.0
Total Aromatic Hydrocarbons	N	2680	mg/kg	5.0			470					280
Total Petroleum Hydrocarbons	N	2680	mg/kg	10.0			590					280
Benzene	M	2760	µg/kg	1.0			< 1.0					< 1.0
Toluene	M	2760	µg/kg	1.0			< 1.0					< 1.0
Ethylbenzene	M	2760	µg/kg	1.0			< 1.0					< 1.0
m & p-Xylene	M	2760	µg/kg	1.0			< 1.0					< 1.0
o-Xylene	M	2760	µg/kg	1.0			< 1.0					< 1.0
Methyl Tert-Butyl Ether	M	2760	µg/kg	1.0			< 1.0					< 1.0
Ethylene Glycol	N	2780	mg/kg	0.10			< 0.10					
Naphthalene	M	2800	mg/kg	0.10	1.7	2.8	< 0.10	100	2.1	14	< 0.10	5.7
Acenaphthylene	N	2800	mg/kg	0.10	< 0.10	0.15	< 0.10	1.6	0.12	0.13	< 0.10	0.12
Acenaphthene	M	2800	mg/kg	0.10	0.43	4.3	< 0.10	160	0.55	11	< 0.10	4.9
Fluorene	M	2800	mg/kg	0.10	0.23	2.4	< 0.10	110	0.48	9.0	< 0.10	3.6
Phenanthrene	M	2800	mg/kg	0.10	2.7	20	0.51	700	4.9	53	1.8	22
Anthracene	M	2800	mg/kg	0.10	0.60	3.4	0.11	170	1.2	11	0.41	5.4
Fluoranthene	M	2800	mg/kg	0.10	4.7	25	1.0	680	6.4	44	2.7	22
Pyrene	M	2800	mg/kg	0.10	4.2	22	0.90	560	5.5	34	2.4	18
Benzo[a]anthracene	M	2800	mg/kg	0.10	2.0	11	0.59	250	3.0	17	1.2	9.1
Chrysene	M	2800	mg/kg	0.10	2.1	12	0.58	250	2.9	16	1.2	8.3
Benzo[b]fluoranthene	M	2800	mg/kg	0.10	2.5	14	0.88	270	3.8	16	1.5	8.9
Benzo[k]fluoranthene	M	2800	mg/kg	0.10	0.85	5.0	0.25	100	1.3	6.3	0.48	3.1
Benzo[a]pyrene	M	2800	mg/kg	0.10	2.2	14	0.77	240	3.5	16	1.5	8.9
Indeno(1,2,3-c,d)Pyrene	M	2800	mg/kg	0.10	1.5	9.1	< 0.10	130	2.4	9.2	0.96	5.1
Dibenz(a,h)Anthracene	N	2800	mg/kg	0.10	0.31	1.5	< 0.10	22	0.53	2.0	0.20	1.1
Benzo[g,h,i]perylene	M	2800	mg/kg	0.10	1.7	9.3	< 0.10	19	2.2	8.2	0.94	4.8
Total Of 16 PAH's	N	2800	mg/kg	2.0	28	160	5.6	3800	41	270	15	130
Total Phenols	M	2920	mg/kg	0.10			< 0.10					< 0.10

TPH Chromatogram on Soil Sample: 1367987

\\NM-FILESERVER\Job Paperwork\SampData\SOIL\1367987.PDF

TPH Chromatogram on Soil Sample: 1367992



TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
22-04654	1367987	S			WS102	0.00	No	Heavy Oil
22-04654	1367992	S			CP101	1.30	No	PAH

Test Methods

SOP	Title	Parameters included	Method summary
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
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
2185	Asbestos	Asbestos	Polarised light microscopy
2192	Asbestos	Asbestos	Polarised light microscopy / Gravimetry
2300	Cyanides & Thiocyanate in Soils	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Alkaline 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.
2780	Glycols, Aldehydes, Amines, Ethers and Ketones	Glycols, Aldehydes, Amines, Ethers and Ketones	GCMS detection
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.
640	Characterisation of Waste (Leaching C10)	Waste material including soil, sludges and granular waste	ComplianceTest for Leaching of Granular Waste Material and Sludge

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

Appendix D

Certificates of Analysis - Geotechnical

TEST REPORT

Client LK Consult Ltd

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

Contract LKC 21 1545 -
Hilton Lane, Prestwich

Job Number MRN 4310/33
Date of Issue 08 March 2022
Pages 1 of 7

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.

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

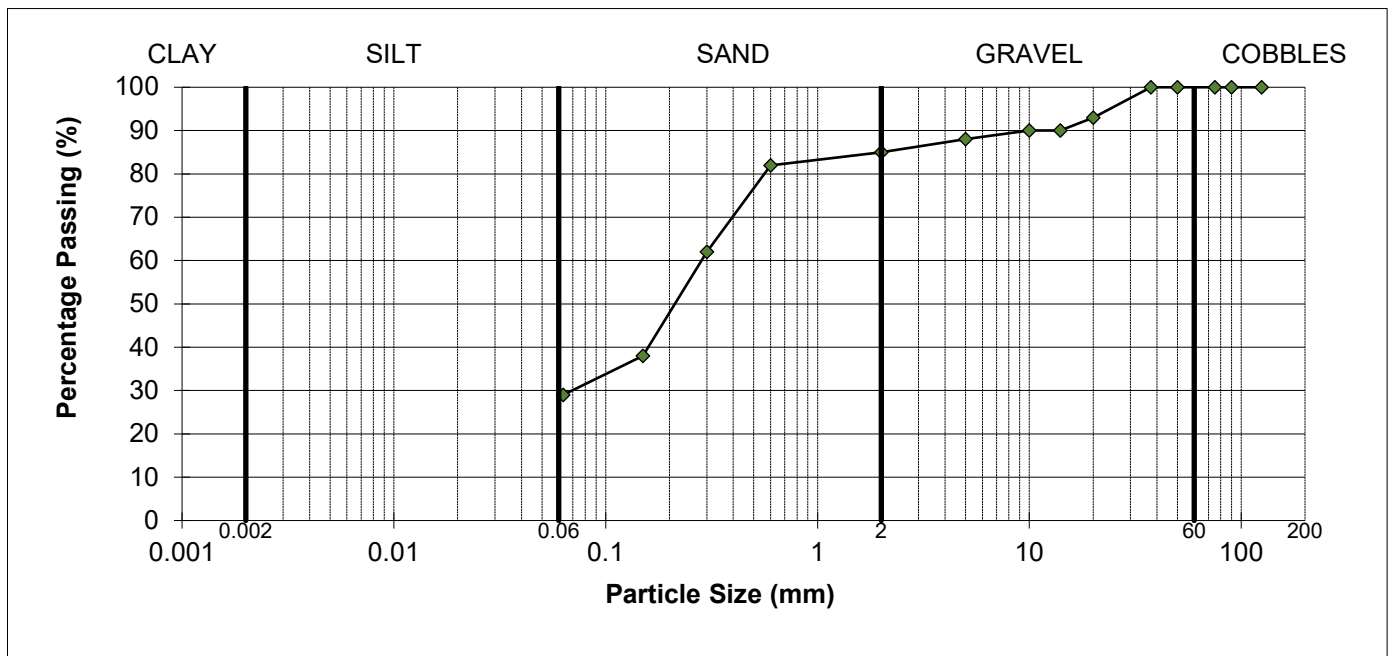
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 21 1545 - Hilton Lane, Prestwich
JOB NUMBER	MRN 4310/33

SAMPLE LABEL	WS101/D7/5.5-6m	DATE SAMPLED	08-Feb-22
LAB SAMPLE No	109551	DATE RECEIVED	16-Feb-22
DATE TESTED	24-Feb-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with occasional gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	90	
90	100		5	88	
75	100		2	85	
50	100		0.6	82	
37.5	100		0.3	62	
20	93		0.15	38	
14	90		0.063	29	



REMARKS

As received moisture content = 12%

SIGNED



NAME

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

DATE

08-Mar-22

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

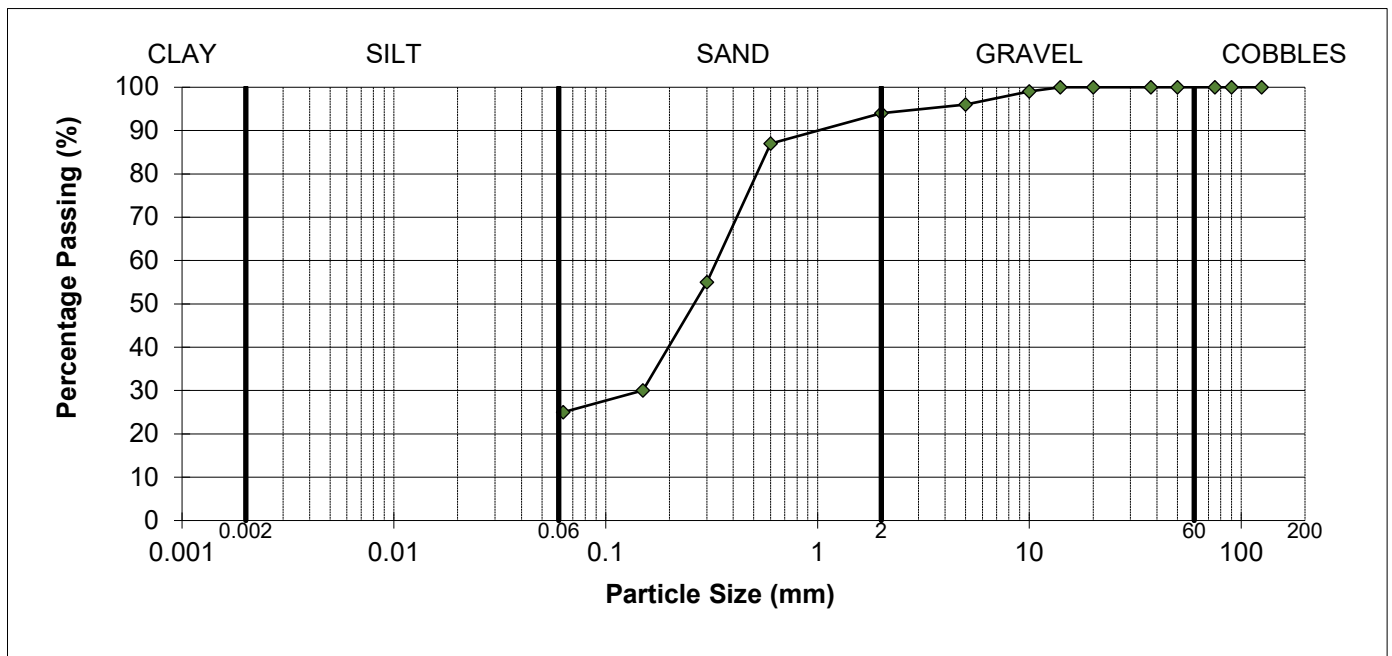
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 21 1545 - Hilton Lane, Prestwich
JOB NUMBER	MRN 4310/33

SAMPLE LABEL	WS102/D6/3.2-4m	DATE SAMPLED	08-Feb-22
LAB SAMPLE No	109552	DATE RECEIVED	16-Feb-22
DATE TESTED	24-Feb-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	99	
90	100		5	96	
75	100		2	94	
50	100		0.6	87	
37.5	100		0.3	55	
20	100		0.15	30	
14	100		0.063	25	



REMARKS

As received moisture content = 8.8%

SIGNED



NAME

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

DATE

08-Mar-22

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

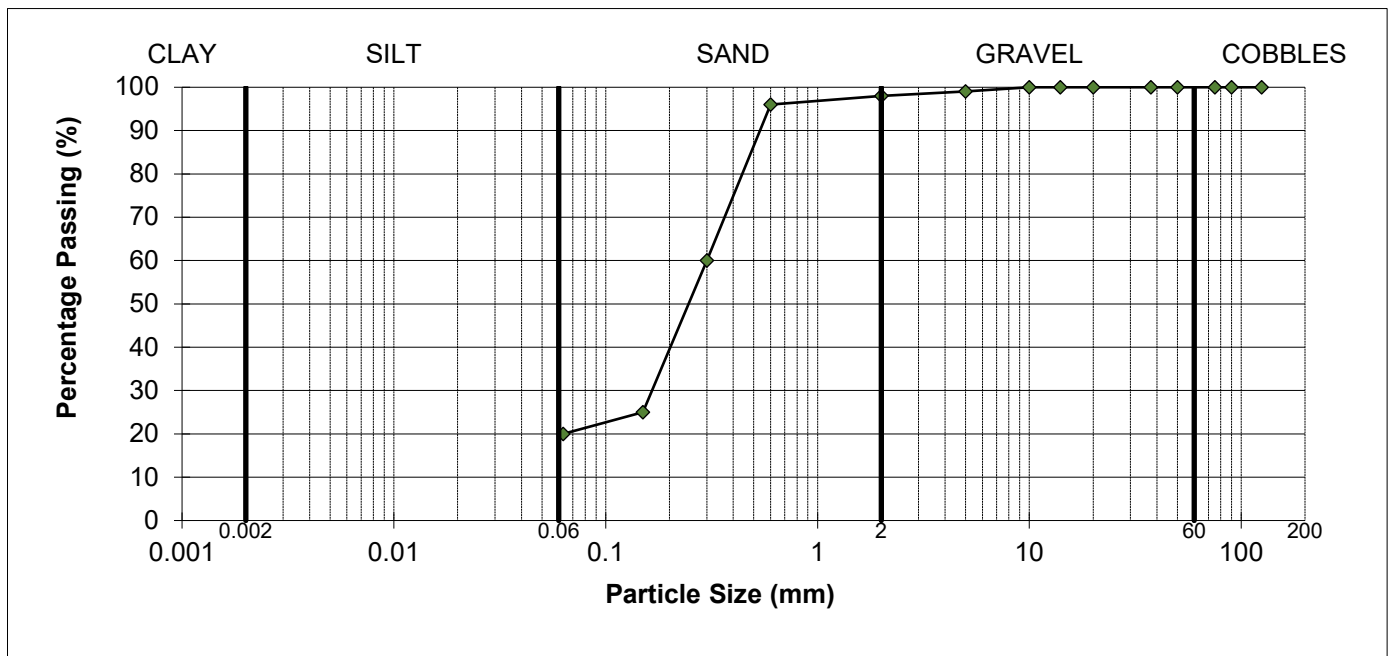
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 21 1545 - Hilton Lane, Prestwich
JOB NUMBER	MRN 4310/33

SAMPLE LABEL	WS103/D4/2-3m	DATE SAMPLED	08-Feb-22
LAB SAMPLE No	109553	DATE RECEIVED	16-Feb-22
DATE TESTED	24-Feb-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	99	
75	100		2	98	
50	100		0.6	96	
37.5	100		0.3	60	
20	100		0.15	25	
14	100		0.063	20	



REMARKS

As received moisture content = 9.5%

SIGNED



NAME

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

DATE

08-Mar-22

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

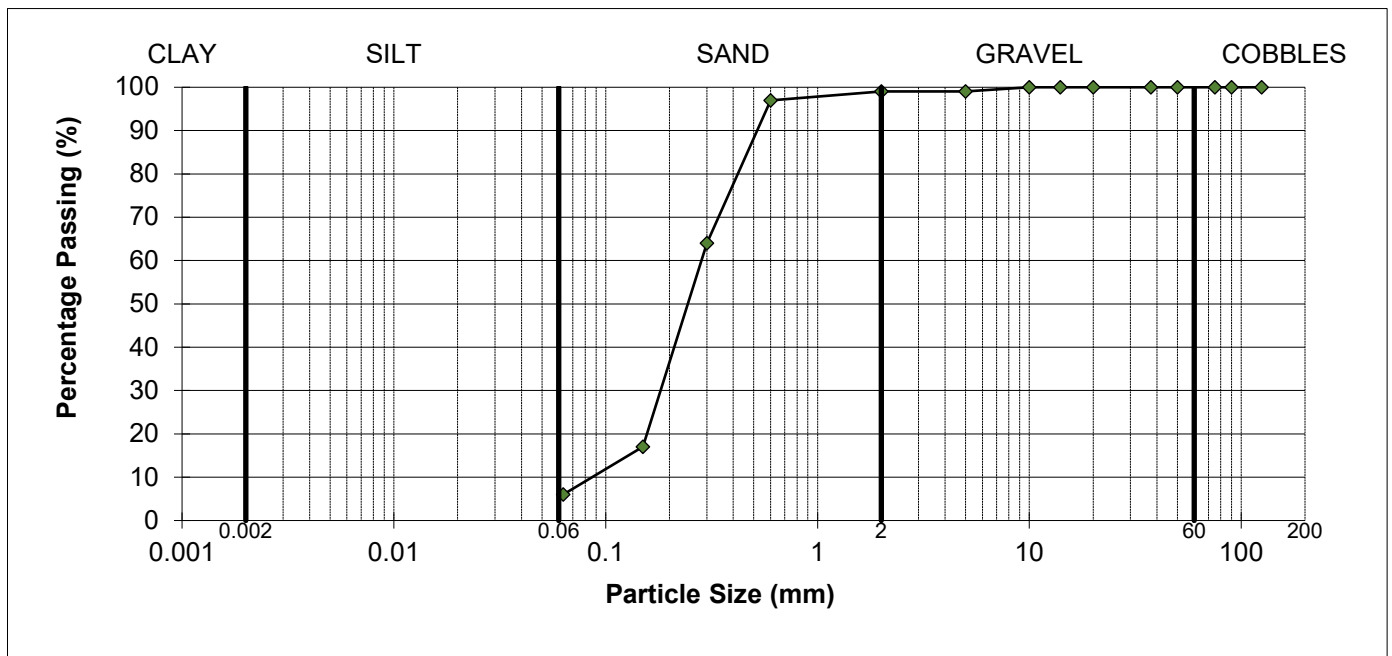
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 21 1545 - Hilton Lane, Prestwich
JOB NUMBER	MRN 4310/33

SAMPLE LABEL	WS104/D3/1-2m	DATE SAMPLED	08-Feb-22
LAB SAMPLE No	109554	DATE RECEIVED	16-Feb-22
DATE TESTED	24-Feb-22	SAMPLED BY	Client

MATERIAL	Brown silty SAND with rare gravel
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	100	
90	100		5	99	
75	100		2	99	
50	100		0.6	97	
37.5	100		0.3	64	
20	100		0.15	17	
14	100		0.063	6	



REMARKS

As received moisture content = 7.8%

SIGNED



NAME

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

DATE

08-Mar-22

TEST CERTIFICATE

PARTICLE SIZE DISTRIBUTION

BS 1377: PART 2: Clause 9.2: 1990

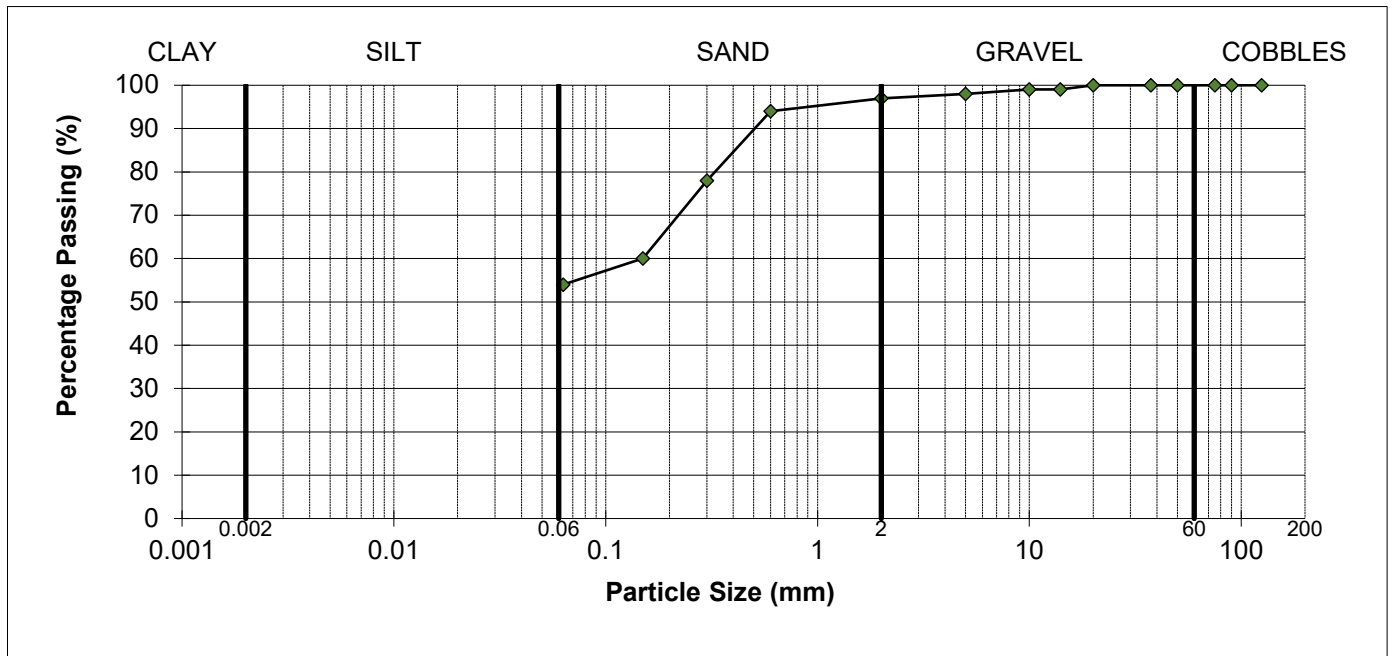
Determination of Moisture Content in accordance with BS 1377: PART 2: Clause 3: 1990 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 21 1545 - Hilton Lane, Prestwich
JOB NUMBER	MRN 4310/33

SAMPLE LABEL	CP101/7.7-8m	DATE SAMPLED	08-Feb-22
LAB SAMPLE No	109555	DATE RECEIVED	16-Feb-22
DATE TESTED	24-Feb-22	SAMPLED BY	Client

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

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		10	99	
90	100		5	98	
75	100		2	97	
50	100		0.6	94	
37.5	100		0.3	78	
20	100		0.15	60	
14	99		0.063	54	



REMARKS

As received moisture content = 22%

SIGNED



NAME

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

DATE

08-Mar-22

MURRAY RIX

ANDREW HOUSE, HADFIELD STREET,
DUKINFIELD, CHESHIRE SK16 4QX
TEL 0161 475 0870

TEST CERTIFICATE

UNDRAINED SHEAR STRENGTH IN TRIAXIAL COMPRESSION

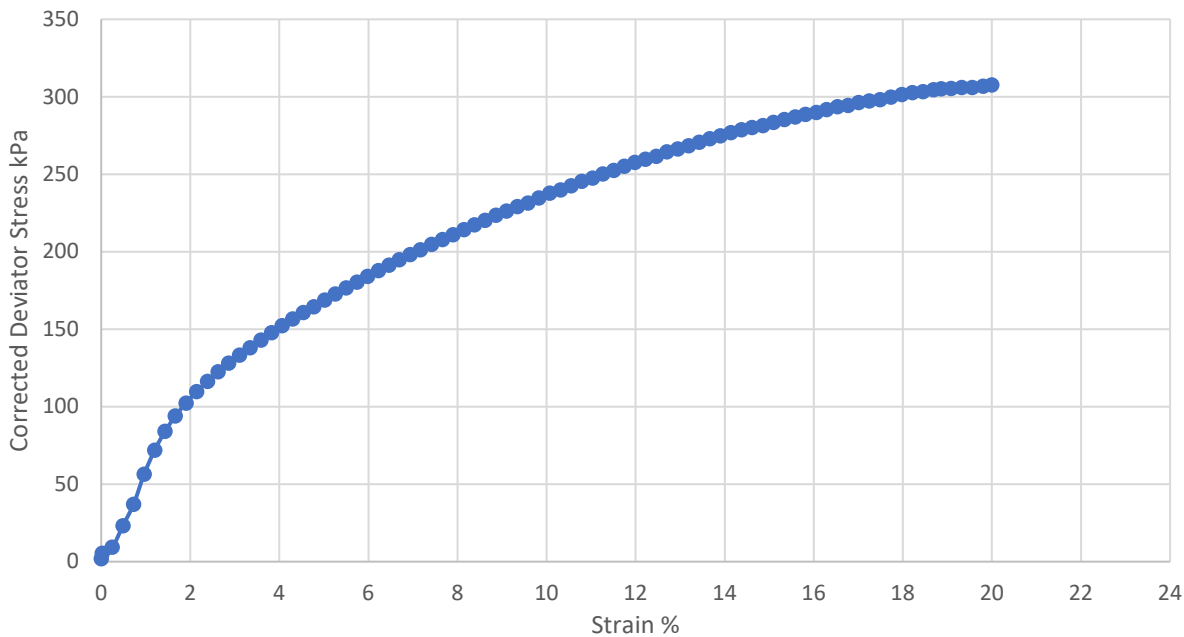
BS 1377 : PART 7: Clause 8 Single Stage

CLIENT	LK Consult Ltd
SITE	LKC 21 1545 - Hilton Lane, Prestwich
JOB NUMBER	MRN 4310/33

SAMPLE LABEL	CP101/U/11.5-11.95m	DATE SAMPLED	08-Feb-22
LAB SAMPLE No.	109556	DATE RECEIVED	16-Feb-22
DATE TESTED	01-Mar-22	SAMPLED BY	Client
MATERIAL			
ADVISED SOURCE	Site Investigation Sample		

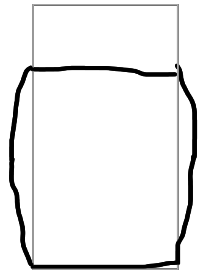
INITIAL CONDITIONS

Specimen Location		Sample Length (mm)	250	Specimen depth from top of Sample (mm)	25
		Sample Orientation	Vertical	Specimen Condition	Undisturbed
		Specimen Length (mm)	193	Specimen Moisture Content (%)	11
		Specimen Diameter (mm)	102	Specimen Bulk Density (Mg/m3)	2.15
		Membrane Thickness (mm)	0.4	Specimen Dry Density (Mg/m3)	1.93
		Membrane Correction	1.48		

CORRECTED DEVIATOR STRESS vs AXIAL STRAIN

TEST TYPE
SINGLE STAGE

SKETCH OF
SPECIMEN AT
FAILURE



PLASTIC

Cell Pressure (kPa)	Failure Strain (%)	Rate of Strain (%/min)	Corrected Deviator Stress (kPa)	Shear Strength C_u (kPa)
230	20	2	305	152

Remarks/Abnormalities

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

Signed



Date 08 March 2022



Final Report

Report No.: 22-05682-1

Initial Date of Issue: 22-Feb-2022

Client LK Consult

Client Address: Unit 29 Eton Business Park
Eton Hill Road
Radcliffe
Manchester
Lancashire
M26 2ZS

Contact(s): Contaminated Land
Michelle Thorniley

Project LKC 21 1545 Hilton Lane, Prestwich

Quotation No.: **Date Received:** 16-Feb-2022

Order No.: 740011 **Date Instructed:** 16-Feb-2022

No. of Samples: 2

Turnaround (Wkdays): 5 **Results Due:** 22-Feb-2022

Date Approved: 22-Feb-2022

Approved By:



Details: Stuart Henderson, Technical Manager

Results - Soil

Project: LKC 21 1545 Hilton Lane, Prestwich

Client: LK Consult	Chemtest Job No.:				22-05682	22-05682
Quotation No.:	Chemtest Sample ID.:				1373205	1373206
	Client Sample ID.:				WS101	WS102
	Sample Type:				SOIL	SOIL
	Top Depth (m):				0.9	3.2
	Bottom Depth (m):				1.9	4.0
	Date Sampled:				07-Feb-2022	07-Feb-2022
Determinand	Accred.	SOP	Units	LOD		
Moisture	N	2030	%	0.020	16	9.5
Soil Colour	N	2040		N/A	Brown	Brown
Other Material	N	2040		N/A	Stones	Stones
Soil Texture	N	2040		N/A	Sand	Sand
pH	M	2010		4.0	8.4	6.7
Magnesium (Water Soluble)	N	2120	g/l	0.010	< 0.010	< 0.010
Sulphate (2:1 Water Soluble) as SO4	M	2120	g/l	0.010	0.053	0.022
Chloride (Water Soluble)	M	2220	g/l	0.010	0.019	< 0.010
Nitrate (Water Soluble)	N	2220	g/l	0.010	0.018	< 0.010

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
2220	Water soluble Chloride in Soils	Chloride	Aqueous extraction and measurement by 'Aquakem 600' Discrete Analyser using ferric nitrate / mercuric thiocyanate.

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

Appendix E

Certificate of Analysis – Water



2183

Final Report

Report No.:	22-07497-1		
Initial Date of Issue:	07-Mar-2022		
Client	LK Consult		
Client Address:	Unit 29 Eton Business Park Eton Hill Road Radcliffe Manchester Lancashire M26 2ZS		
Contact(s):	Contaminated Land Michelle Thorniley		
Project	LKC 21 1545 Hilton lane, Prestwich		
Quotation No.:		Date Received:	01-Mar-2022
Order No.:	740056	Date Instructed:	01-Mar-2022
No. of Samples:	2		
Turnaround (Wkdays):	5	Results Due:	07-Mar-2022
Date Approved:	07-Mar-2022		
Approved By:			
Details:	Stuart Henderson, Technical Manager		

Results - Water

Project: LKC 21 1545 Hilton lane, Prestwich

Client: LK Consult	Chemtest Job No.:				22-07497	22-07497
Quotation No.:	Chemtest Sample ID.:				1381220	1381221
Order No.: 740056	Client Sample Ref.:				GW	GW
	Client Sample ID.:				CP101 Deep	WS102
	Sample Type:				WATER	WATER
	Date Sampled:				28-Feb-2022	28-Feb-2022
Determinand	Accred.	SOP	Units	LOD		
Diesel Present	N	1670		N/A	False	False
pH	U	1010		N/A	6.8	8.0
Sulphate	U	1220	mg/l	1.0	67	62
Cyanide (Total)	U	1300	mg/l	0.050	< 0.050	0.070
Cyanide (Free)	U	1300	mg/l	0.050	< 0.050	< 0.050
Calcium	U	1455	mg/l	2.00	81	34
Total Hardness as CaCO3	U	1270	mg/l	15	330	120
Arsenic (Dissolved)	U	1455	µg/l	0.20	1.9	11
Boron (Dissolved)	U	1455	µg/l	10.0	270	160
Cadmium (Dissolved)	U	1455	µg/l	0.11	0.41	0.41
Chromium (Dissolved)	U	1455	µg/l	0.50	0.64	2.3
Copper (Dissolved)	U	1455	µg/l	0.50	1.1	1.8
Nickel (Dissolved)	U	1455	µg/l	0.50	1.4	7.6
Lead (Dissolved)	U	1455	µg/l	0.50	4.4	6.2
Selenium (Dissolved)	U	1455	µg/l	0.50	2.5	3.1
Vanadium (Dissolved)	U	1455	µg/l	0.50	0.70	2.8
Zinc (Dissolved)	U	1455	µg/l	2.5	53	50
Mercury Low Level	U	1460	µg/l	0.010	0.12	0.14
Chromium (Hexavalent)	U	1490	µg/l	20	< 20	< 20
Dissolved Organic Carbon	U	1610	mg/l	2.0	59	110
Aliphatic TPH >C5-C6	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C6-C8	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10
Aliphatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10
Total Aliphatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0
Aromatic TPH >C5-C7	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C7-C8	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C8-C10	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C10-C12	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C12-C16	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C16-C21	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C21-C35	N	1675	µg/l	0.10	< 0.10	< 0.10
Aromatic TPH >C35-C44	N	1675	µg/l	0.10	< 0.10	< 0.10
Total Aromatic Hydrocarbons	N	1675	µg/l	5.0	< 5.0	< 5.0
Total Petroleum Hydrocarbons	N	1675	µg/l	10	< 10	< 10
Benzene	U	1760	µg/l	1.0	< 1.0	< 1.0

Results - Water

Project: LKC 21 1545 Hilton lane, Prestwich

Client: LK Consult	Chemtest Job No.: 22-07497					22-07497
Quotation No.:	Chemtest Sample ID.: 1381220					1381221
Order No.: 740056	Client Sample Ref.: GW					GW
	Client Sample ID.: CP101 Deep					WS102
	Sample Type: WATER					WATER
	Date Sampled: 28-Feb-2022					28-Feb-2022
Determinand	Accred.	SOP	Units	LOD		
Toluene	U	1760	µg/l	1.0	< 1.0	< 1.0
Ethylbenzene	U	1760	µg/l	1.0	< 1.0	< 1.0
m & p-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0
o-Xylene	U	1760	µg/l	1.0	< 1.0	< 1.0
Methyl Tert-Butyl Ether	N	1760	µg/l	1.0	< 1.0	< 1.0
Ethylene Glycol	N	1780	mg/l	0.10	< 0.10	< 0.10
Naphthalene	N	1800	µg/l	0.010	< 0.010	< 0.010
Acenaphthylene	N	1800	µg/l	0.010	< 0.010	< 0.010
Acenaphthene	N	1800	µg/l	0.010	< 0.010	< 0.010
Fluorene	N	1800	µg/l	0.010	< 0.010	< 0.010
Phenanthrene	N	1800	µg/l	0.010	< 0.010	< 0.010
Anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010
Fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010
Pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[a]anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010
Chrysene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[b]fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[k]fluoranthene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[a]pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010
Indeno(1,2,3-c,d)Pyrene	N	1800	µg/l	0.010	< 0.010	< 0.010
Dibenz(a,h)Anthracene	N	1800	µg/l	0.010	< 0.010	< 0.010
Benzo[g,h,i]perylene	N	1800	µg/l	0.010	< 0.010	< 0.010
Total Of 16 PAH's	N	1800	µg/l	0.20	< 0.20	< 0.20
Total Phenols	U	1920	mg/l	0.030	< 0.030	< 0.030

TPH Interpretation

Job	Sample	Matrix	Location	Sample Ref	Sample ID	Sample Depth (m)	Gasoline / Diesel Present	TPH Interpretation
22-07497	1381220	W		GW	CP101 Deep		No	N/A
22-07497	1381221	W		GW	WS102		No	N/A

Test Methods

SOP	Title	Parameters included	Method summary
1010	pH Value of Waters	pH	pH Meter
1220	Anions, Alkalinity & Ammonium in Waters	Fluoride; Chloride; Nitrite; Nitrate; Total; Oxidisable Nitrogen (TON); Sulfate; Phosphate; Alkalinity; Ammonium	Automated colorimetric analysis using 'Aquakem 600' Discrete Analyser.
1270	Total Hardness of Waters	Total hardness	Calculation applied to calcium and magnesium results, expressed as mg l-1 CaCO ₃ equivalent.
1300	Cyanides & Thiocyanate in Waters	Free (or easy liberatable) Cyanide; total Cyanide; complex Cyanide; Thiocyanate	Continuous Flow Analysis.
1455	Metals in Waters by ICP-MS	Metals, including: Antimony; Arsenic; Barium; Beryllium; Boron; Cadmium; Chromium; Cobalt; Copper; Lead; Manganese; Mercury; Molybdenum; Nickel; Selenium; Tin; Vanadium; Zinc	Filtration of samples followed by direct determination by inductively coupled plasma mass spectrometry (ICP-MS).
1460	Mercury low-level in Waters by AFS	Mercury	Atomic Fluorescence Spectrometry, with collimated UV source, wavelength 253.7 nm.
1490	Hexavalent Chromium in Waters	Chromium [VI]	Automated colorimetric analysis by 'Aquakem 600' Discrete Analyser using 1,5-diphenylcarbazine.
1610	Total/Dissolved Organic Carbon in Waters	Organic Carbon	TOC Analyser using Catalytic Oxidation
1670	Total Petroleum Hydrocarbons (TPH) in Waters by GC-FID	TPH (C ₆ –C ₄₀); optional carbon banding, e.g. 3-band – GRO, DRO & LRO	Pentane extraction / GC FID detection
1675	TPH Aliphatic/Aromatic split in Waters by GC-FID(cf. Texas Method 1006 / TPH CWG)	Aliphatics: >C ₅ –C ₆ , >C ₆ –C ₈ , >C ₈ –C ₁₀ , >C ₁₀ –C ₁₂ , >C ₁₂ –C ₁₆ , >C ₁₆ –C ₂₁ , >C ₂₁ –C ₃₅ , >C ₃₅ –C ₄₄ Aromatics: >C ₅ –C ₇ , >C ₇ –C ₈ , >C ₈ –C ₁₀ , >C ₁₀ –C ₁₂ , >C ₁₂ –C ₁₆ , >C ₁₆ –C ₂₁ , >C ₂₁ –C ₃₅ , >C ₃₅ –C ₄₄	Pentane extraction / GCxGC FID detection
1760	Volatile Organic Compounds (VOCs) in Waters by Headspace GC-MS	Volatile organic compounds, including BTEX and halogenated Aliphatic/Aromatics. (cf. USEPA Method 8260)	Automated headspace gas chromatographic (GC) analysis of water samples with mass spectrometric (MS) detection of volatile organic compounds.
1780	Alcohols	Alcohols	GCMS detection
1800	Speciated Polynuclear Aromatic Hydrocarbons (PAH) in Waters by GC-MS	Acenaphthene; Acenaphthylene; Anthracene; Benzo[a]Anthracene; Benzo[a]Pyrene; Benzo[b]Fluoranthene; Benzo[ghi]Perylene; Benzo[k]Fluoranthene; Chrysene; Dibenzo[a,h]Anthracene; Fluoranthene; Fluorene; Indeno[123cd]Pyrene; Naphthalene; Phenanthrene; Pyrene	Pentane extraction / GCMS detection
1920	Phenols in Waters by HPLC	Phenolic compounds including: Phenol, Cresols, Xylenols, Trimethylphenols Note: Chlorophenols are excluded.	Determination by High Performance Liquid Chromatography (HPLC) using electrochemical detection.

Report Information

Key

U	UKAS accredited
M	MCERTS and UKAS accredited
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T	This analysis has been subcontracted to an unaccredited laboratory
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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

Appendix F

Gas Monitoring Results



Site	Hilton Lane, Prestwich
Job Number	LKC 21 1545
Date	16/02/2022
Engineer	MP
Visit	1 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	Variable
Atmospheric pressure (prev 24hrs)	Variable
Weather Conditions	Dry, slight breeze, cold
Ground Conditions	Wet and boggy

[illegible]

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

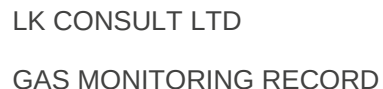
NOTES	
All monitoring is carried out in line with LK Consult Ltd procedures, with reference to CIRIA C665.	
¹ Equipment is serviced and checked as recommended by the manufacturer. Refer to calibration records and service certificates.	
² CH4 is explosive between the range of 5-15%v/v. 100% lower explosive 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).	



Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising then steady
Atmospheric pressure (prev 24hrs)	Falling
Weather Conditions	Cloudy, showers, still
Ground Conditions	Wet

[illegible]

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).

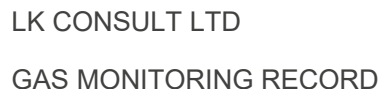


Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Steady
Atmospheric pressure (prev 24hrs)	Falling then steady
Weather Conditions	Dry, Slight breeze, Temperate
Ground Conditions	Damp

[illegible]

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).

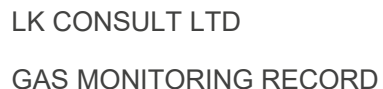


Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Steady then rising
Weather Conditions	Sunny, Light Breeze, Dry
Ground Conditions	Damp

[illegible]

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).	

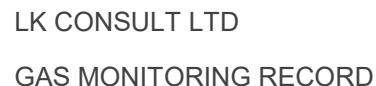


Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising
Atmospheric pressure (prev 24hrs)	Rising
Weather Conditions	Dry, Slight Breeze, Mild
Ground Conditions	Dry

[illegible]

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).	



Equipment ¹		
Instrument	Serial Number	Comments
Gas Analyser GA5000	G507783	Serviced, calibrated, gas checked.
HydroTechnik	HT-02	Operating normally.

Atmospheric / Ground Conditions	
Atmospheric pressure trend onsite	Rising then steady
Atmospheric pressure (prev 24hrs)	Steady then falling
Weather Conditions	Dry, Cloudy, Slight breeze
Ground Conditions	Damp

[illegible]

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).	

Appendix G

Generic Assessment Criteria Values

CATEGORY 4 SCREENING LEVELS

Substance	Residential (with home- grown produce)	Residential (without home- grown produce)	Allotments	Commercial	Public Open Space 1	Public Open Space 2
Arsenic	37 mg/kg	40 mg/kg	49 mg/kg	640 mg/kg	79 mg/kg	170 mg/kg
Benzene	0.87 mg/kg	3.3 mg/kg	0.18 mg/kg	98 mg/kg	140 mg/kg	230 mg/kg
Benzo(a)pyrene	5.0 mg/kg	5.3 mg/kg	5.7 mg/kg	77 mg/kg	10 mg/kg	21 mg/kg
Cadmium	22 mg/kg	150 mg/kg	3.9 mg/kg	410 mg/kg	220 mg/kg	880 mg/kg
Chromium VI	21 mg/kg	21 mg/kg	170 mg/kg	49 mg/kg	21 mg/kg	250 mg/kg
Lead	200 mg/kg	310 mg/kg	80 mg/kg	2300 mg/kg	630 mg/kg	1300 mg/kg

Tetrachlorethene (PCE) – 1% SOM	0.31 mg/kg	0.32 mg/kg	2.0 mg/kg	24 mg/kg	3,200 mg/kg	1,400 mg/kg
Tetrachlorethene (PCE) – 2.5% SOM	0.70 mg/kg	0.71 mg/kg	4.8 mg/kg	55 mg/kg	3,300 mg/kg	1,900 mg/kg
Tetrachlorethene (PCE) – 6% SOM	1.6 mg/kg	1.6 mg/kg	11 mg/kg	130 mg/kg	3,400 mg/kg	2,500 mg/kg
Trichlorethene (TCE) – 1% SOM	0.0093 mg/kg	0.0097 mg/kg	0.032 mg/kg	0.73 mg/kg	76 mg/kg	41 mg/kg
Trichlorethene (TCE) – 2.5% SOM	0.020 mg/kg	0.020 mg/kg	0.072 mg/kg	1.5 mg/kg	78 mg/kg	54 mg/kg
Trichlorethene (TCE) – 6% SOM	0.043 mg/kg	0.045 mg/kg	0.16 mg/kg	3.4 mg/kg	79 mg/kg	69 mg/kg
Vinyl Chloride (VC) – 1%SOM	0.0064 mg/kg	0.015 mg/kg	0.0017 mg/kg	1.1 mg/kg	7.8 mg/kg	18 mg/kg
Vinyl Chloride (VC) – 2.5%SOM	0.010 mg/kg	0.019 mg/kg	0.0031 mg/kg	1.4 mg/kg	7.8 mg/kg	19 mg/kg
Vinyl Chloride (VC) – 6%SOM	0.017 mg/kg	0.029 mg/kg	0.0058 mg/kg	2.2 mg/kg	7.8 mg/kg	19 mg/kg

Summary Table for the Generic Assessment Criteria for Human Health Risk Assessment Land Quality Management (LQM) S4ULs.

All GAC are based on sandy
loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Metals	Inorganic Arsenic	6%	37	40	43	640	79	170
	Beryllium	6%	1.7	1.7	35	12	2.2	63
	Boron	6%	290	11,000	45	240,000	21,000	46,000
	Cadmium	6%	11	85	1.9	190	120	532
	Chromium (III)	6%	910	910	18,000	8,600	1,500	33,000
	Chromium (VI)	6%	6.0	6.0	1.8	33	7.7	220
	Copper	6%	2,400	7,100	520	68,000	12,000	44,000
	Elemental Mercury	6%	1.2	1.2	21	58 (25.8) ^{vap}	16	30 (25.8) ^{vap}
	Inorganic Mercury	6%	40	56	19	1,100	120	240
	Methylmercury	6%	11	15	6.0	320	40	68
	Nickel (update 2015)	6%	126	181	53	983	231	804
	Selenium	6%	250	430	88	12,000	1,100	1,800
	Vanadium	6%	410	1,200	91	9,000	2,000	5,000
	Zinc	6%	3,700	40,000	620	730,000	81,000	170,000
BTEX Compounds	Benzene	1%	0.087	0.38	0.017	27	72	90
		2.5%	0.17	0.70	0.034	47	72	100
		6%	0.37	1.4	0.075	90	73	110
	Toluene	1%	130	880 (869) ^{vap}	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
		2.5%	290	1,900	51	110,000 (1,920) ^{vap}	56,000	95,000 (1,920) ^{vap}
		6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
	Ethylbenzene	1%	47	83	16	5,700 (518) ^{vap}	24,000	17,000 (518) ^{vap}
		2.5%	110	190	39	13,000 (1,220) ^{vap}	24,000	22,000 (1,220) ^{vap}
		6%	260	440	91	27,000 (2,840) ^{vap}	25,000	27,000 (2,840) ^{vap}
	o-xylene	1%	60	88	28	6,600 (478) ^{sol}	41,000	17,000 (478) ^{sol}
		2.5%	140	210	67	15,000 (1,120) ^{sol}	42,000	24,000 (1,120) ^{sol}
		6%	330	480	160	33,000 (2,620) ^{sol}	43,000	33,000 (2,620) ^{sol}
	m-xylene	1%	59	82	31	6,200 (625) ^{vap}	41,000	17,000 (625) ^{vap}
		2.5%	140	190	74	14,000 (1,470) ^{vap}	42,000	24,000 (1,470) ^{vap}
		6%	320	450	170	31,000 (3,460) ^{vap}	43,000	32,000 (3,460) ^{vap}
	p-xylene	1%	56	79	29	5,900 (576) ^{sol}	41,000	17,000 (576) ^{sol}
		2.5%	130	180	69	14,000 (1,350) ^{sol}	42,000	23,000 (1,350) ^{sol}
		6%	310	430	160	30,000 (3,170) ^{sol}	43,000	31,000 (3,170) ^{sol}

NOTES

^{sol} / ^{vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Polycyclic Aromatic Hydrocarbons (PAHs)	Acenaphthene	1%	210	3,000 (57.1) ^{sol}	34	84,000 (57.0) ^{sol}	15,000	29,000
		2.5%	510	4,700 (141) ^{sol}	85	97,000 (141) ^{sol}	15,000	30,000
		6%	1,100	6,000 (336) ^{sol}	200	100,000	15,000	30,000
	Acenaphthylene	1%	170	2,900 (86.1) ^{sol}	28	83,000 (86.1) ^{sol}	15,000	29,000
		2.5%	420	4,600 (212) ^{sol}	69	97,000 (212) ^{sol}	15,000	30,000
		6%	920	6,000 (506) ^{sol}	160	100,000	15,000	30,000
	Anthracene	1%	2,400	31,000 (1.17) ^{vap}	380	520,000	74,000	150,000
		2.5%	5,400	35,000	950	540,000	74,000	150,000
		6%	11,000	37,000	2,200	540,000	74,000	150,000
	Benz(a)anthracene	1%	7.2	11	2.9	170	29	49
		2.5%	11	14	6.5	170	29	56
		6%	13	15	13	180	29	62
	Benzo(a)pyrene (only)	1%	2.2	3.2	0.97	35	5.7	11
		2.5%	2.7	3.2	2.0	35	5.7	12
		6%	3.0	3.2	3.5	36	5.7	13
	Benzo(b)fluoranthene	1%	2.6	3.9	0.99	44	7.1	13
		2.5%	3.3	4.0	2.1	44	7.2	15
		6%	3.7	4.0	3.9	45	7.2	16
	Benzo(ghi)perylene	1%	320	360	290	3,900	640	1,400
		2.5%	340	360	470	4,000	640	1,500
		6%	350	360	640	4,000	640	1,600
	Benzo(k)fluoranthene	1%	77	110	37	1,200	190	370
		2.5%	93	110	75	1,200	190	410
		6%	100	110	130	1,200	190	440
	Chrysene	1%	15	30	4.1	350	57	93
		2.5%	22	31	9.4	350	57	110
		6%	27	32	19	350	57	120
	Dibenzo(ah)anthracene	1%	0.24	0.31	0.14	3.5	0.57	1.1
		2.5%	0.28	0.32	0.27	3.6	0.58	1.3
		6%	0.3	0.32	0.43	3.6	0.58	1.4
	Fluoranthene	1%	280	1,500	52	23,000	3,100	6,300
		2.5%	560	1,600	130	23,000	3,100	6,300
		6%	890	1,600	290	23,000	3,100	6,400
	Fluorene	1%	170	2,800 (36.0) ^{sol}	27	63,000 (30.9) ^{sol}	9,900	20,000
		2.5%	400	3,800 (76.5) ^{sol}	67	68,000	9,900	20,000
		6%	860	4,500 (183) ^{sol}	160	71,000	9,900	20,000
	Indeno(123-cd)pyrene	1%	27	45	9.5	500	82	150
		2.5%	36	46	21	510	82	170
		6%	41	46	39	510	82	180
	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}
		2.5%	5.6 ^f	5.6 ^f	10 ^f	460 ^f (183) ^{sol}	4,900 ^f	1,900 ^f (183) ^{sol}
		6%	13 ^f	13 ^f	24 ^f	1,100 ^f (432) ^{sol}	4,900 ^f	3,000
	Phenanthrene	1%	95	1,300 (36.0) ^{sol}	15	22,000	3,100	6,200
		2.5%	220	1,500	38	22,000	3,100	6,200
		6%	440	1,500	90	22,000	3,100	6,300
	Pyrene	1%	620	3,700	110	54,000	7,400	15,000
		2.5%	1,200	3,800	270	54,000	7,400	15,000
		6%	2,000	3,800	620	54,000	7,400	15,000
Coal Tar (B(a)P as surrogate marker)	1%	0.79	1.2	0.32	15	2.2	4.4	
	2.5%	0.98	1.2	0.67	15	2.2	4.7	
	6%	1.1	1.2	1.2	15	2.2	4.8	

NOTES

^{Sol / vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^f = naphthalene is based on comparison of inhalation exposure with TDI_{Inhal} for localised effect.

All GAC are based on sandy loam soils with a pH 7.

LQM Generic Assessment Criteria (mg/kg) Dry weight soil

Contaminant	SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Aliphatic							
EC 5-6	1%	42	42	730	3,200 (304) ^{sol}	570,000(304) ^{sol}	95,000 (304) ^{sol}
EC>6-8	1%	100	100	2,300	7,800 (144) ^{sol}	600,000	150,000 (144) ^{sol}
EC>8-10	1%	27	27	320	2,000 (78) ^{sol}	13,000	14,000 (78) ^{vap}
EC>10-12	1%	130 (48) ^{vap}	130 (48) ^{vap}	2,200	9,700 (48) ^{sol}	13,000	21,000 (48) ^{vap}
EC>12-16	1%	1,100 (24) ^{sol}	1,100 (24) ^{sol}	11,000	59,000 (24) ^{sol}	13,000	25,000 (24) ^{sol}
EC>16-35	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
EC>35-44	1%	65,000 (8.48) ^{f, sol}	65,000 (8.48) ^{f, sol}	260,000 ^f	160,000 ^f	250,000 ^f	450,000 ^f
Aliphatic							
EC 5-6	2.5%	78	78	1,700	5,900 (558) ^{sol}	590,000	130,000 (558) ^{sol}
EC>6-8	2.5%	230	230	5,600	17,000 (322) ^{sol}	610,000	220,000 (322) ^{sol}
EC>8-10	2.5%	65	65	770	4,800 (190) ^{vap}	13,000	18,000 (190) ^{vap}
EC>10-12	2.5%	330 (118) ^{vap}	330 (118) ^{vap}	4,400	23,000 (118) ^{vap}	13,000	23,000 (118) ^{vap}
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}
EC>16-35	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
EC>35-44	2.5%	92,000 (21) ^{f, sol}	92,000 (21) ^{f, sol}	270,000 ^f	1,700,000 ^f	250,000 ^f	480,000 ^f
Aliphatic							
EC 5-6	6%	160	160	3,900	12,000 (1,150) ^{sol}	600,000	180,000 (1,150) ^{sol}
EC>6-8	6%	530	530	13,000	40,000 (736) ^{sol}	620,000	320,000 (736) ^{sol}
EC>8-10	6%	150	150	1,700	11,000 (451) ^{vap}	13,000	21,000 (451) ^{vap}
EC>10-12	6%	760 (283) ^{vap}	760 (283) ^{vap}	7,300	47,000 (283) ^{vap}	13,000	24,000 (283) ^{vap}
EC>12-16	6%	4,300 (142) ^{sol}	4,400 (142) ^{sol}	13,000	90,000 (142) ^{sol}	13,000	26,000 (142) ^{sol}
EC>16-35	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
EC>35-44	6%	110,000 ^f	110,000 ^f	270,000 ^f	1,800,000 ^f	250,000 ^f	490,000 ^f
Aromatic							
EC5-7(benzene as non-threshold)	1%	70	370	13	26,000 (1,220) ^{sol}	56,000	76,000 (1,220) ^{sol}
EC>7-8(toluene)	1%	130	860	22	56,000 (869) ^{vap}	56,000	87,000 (869) ^{vap}
EC>8-10	1%	34	47	8.6	3,500 (613) ^{vap}	5,000	7,200 (613) ^{vap}
EC>10-12	1%	74	250	13	16,000 (364) ^{sol}	5,000	9,200 (364) ^{sol}
EC>12-16	1%	140	1,800	23	36,000 (169) ^{sol}	5,100	10,000
EC>16-21	1%	260 ^f	1,900 ^f	46 ^f	28,000 ^f	3,800 ^f	7,600 ^f
EC>21-35	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	1%	1,100 ^f	1,900 ^f	370 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	2.5%	140	690	27	46,000 (2,260) ^{sol}	56,000	84,000 (2,260) ^{sol}
EC>7-8(toluene)	2.5%	290	1,800	51	110,000 (1,920) ^{sol}	56,000	95,000 (1,920) ^{sol}
EC>8-10	2.5%	83	110	21	8,100 (1,500) ^{vap}	5,000	8,500 (1,500) ^{vap}
EC>10-12	2.5%	180	590	31	28,000 (899) ^{sol}	5,000	9,700 (899) ^{sol}
EC>12-16	2.5%	330	2,300 (419) ^{sol}	57	37,000	5,100	10,000
EC>16-21	2.5%	540 ^f	1,900 ^f	110 ^f	28,000 ^f	3,800 ^f	7,700 ^f
EC>21-35	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>35-44	2.5%	1,500 ^f	1,900 ^f	820 ^f	28,000 ^f	3,800 ^f	7,800 ^f
Aromatic							
EC5-7(benzene as non-threshold)	6%	300	1,400	57	86,000 (4,710) ^{sol}	56,000	92,000 (4,710) ^{sol}
EC>7-8(toluene)	6%	660	3,900	120	180,000 (4,360) ^{vap}	56,000	100,000 (4,360) ^{vap}
EC>8-10	6%	190	270	51	17,000 (3,580) ^{vap}	5,000	9,300 (3,580) ^{vap}
EC>10-12	6%	380	1,200	74	34,000 (2,150) ^{sol}	5,000	10,000
EC>12-16	6%	660	2,500	130	38,000	5,100	10,000
EC>16-21	6%	930 ^f	1,900 ^f	260 ^f	28,000 ^f	3,800 ^f	7,800 ^f
EC>21-35	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
EC>35-44	6%	1,700 ^f	1,900 ^f	1,600 ^f	28,000 ^f	3,800 ^f	7,900 ^f
Aliphatic +Aromatic >EC44	1%	1,600 ^f	1,900 ^f	1,200 ^f	28,000 ^f	3,800 ^f	7,800 ^f
	2.5%	1,800 ^f	1,900 ^f	2,100 ^f	28,000 ^f	3,800 ^f	7,800 ^f
	6%	1,900 ^f	1,900 ^f	3,000 ^f	28,000 ^f	3,800 ^f	7,900 ^f

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

f = oral, dermal and inhalation exposures compared to oral HCV.

All GAC are based on sandy loam soils with a pH 7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chloalkanes and Alkenes & Explosives	1,2 Dichloroethane (DCA)	1%	7.1E-03	9.2E-03	4.6E-03	0.67	29	21
		2.5%	1.1E-02	1.3E-02	8.3E-03	0.97	29	24
		6%	1.9E-02	2.3E-02	1.6E-02	1.7	29	28
	1,1,1 Trichloroethane (TCA)	1%	8.8	9.0	48	660	140,000	57,000 (1,425) ^{vap}
		2.5%	18	18	110	1,300	140,000	76,000 (2,915) ^{vap}
		6%	39	40	240	3,000	140,000	100,000 (6,392) ^{vap}
	1,1,2,2-Tetrachloroethanes (PCA)	1%	1.6	3.9	0.41	270	1,400	1,800
		2.5%	3.4	8.0	0.89	550	1,400	2,100
		6%	7.5	17	2.0	1,100	1,400	2,300
	1,1,1,2-Tetrachloroethanes (PCA)	1%	1.2	1.5	0.79	110	1,400	1,500
		2.5%	2.8	3.5	1.9	250	1,400	1,800
		6%	6.4	8.2	4.4	560	1,400	2,100
	Tetrachloroethene (PCE)	1%	0.18	0.18	0.65	19	1,400	810 (424) ^{sol}
		2.5%	0.39	0.40	1.5	42	1,400	1,100 (951) ^{sol}
		6%	0.90	0.92	3.6	95	1,400	1,500
	Tetrachloromethane (carbon tetrachloride)	1%	2.6E-02	2.6E-02	0.45	2.9	890	190
		2.5%	5.6E-02	5.6E-02	1.0	6.3	920	270
		6%	0.13	0.13	2.4	14	950	400
	Trichloroethene (TCE)	1%	1.6E-02	1.7E-02	4.1E-02	1.2	120	70
		2.5%	3.4E-02	3.6E-02	9.1E-02	2.6	120	91
		6%	7.5E-02	8.0E-02	0.21	5.7	120	120
	Trichloromethane (chloroform)	1%	0.91	1.2	0.42	99	2,500	2,600
		2.5%	1.7	2.1	0.83	170	2,500	2,800
		6%	3.4	4.2	1.7	350	2,500	3,100
	Chloroethene (vinyl chloride)	1%	6.4E-04	7.7E-04	5.5E-04	5.9E-02	3.5	4.8
		2.5%	8.7E-04	1.0E-03	1.0E-03	7.7E-02	3.5	5.0
		6%	1.4E-03	1.5E-03	1.8E-03	0.12	3.5	5.4
	2,4,6-Trinitrotoluene (TNT)	1%	1.6	65	0.24	1,000	130	260
		2.5%	3.7	66	0.58	1,000	130	270
		6%	8.1	66	1.4	1,000	130	270
	RDX	1%	120	13,000	17	210,000	26,000	49,000 (18.7) ^{sol}
		2.5%	250	13,000	38	210,000	26,000	51,000
		6%	540	13,000	85	210,000	27,000	53,000
	HMX	1%	5.7	6,700	0.86	110,000	13,000	23,000 (0.35) ^{vap}
		2.5%	13	6,700	1.9	110,000	13,000	23,000 (0.39) ^{vap}
		6%	26	6,700	3.9	110,000	13,000	24,000 (0.48) ^{vap}
Pesticides	Aldrin	1%	5.7	7.3	3.2	170	18	30
		2.5%	6.6	7.4	6.1	170	18	31
		6%	7.1	7.5	9.8	170	18	31
	Dieldrin	1%	0.97	7.0	0.17	170	18	30
		2.5%	2.0	7.3	0.41	170	18	30
		6%	3.5	7.4	0.96	170	18	31
	Atrazine	1%	3.3	610	0.5	9,300	1,200	2,300
		2.5%	7.8	620	1.2	9,400	1,200	2,400
		6%	17.4	620	2.7	9,400	1,200	2,400
	Dichlorvos	1%	3.2E-02	6.4	4.9E-03	140	16	26
		2.5%	6.6E-02	6.5	1.0E-02	140	16	26
		6%	0.14	6.6	2.2E-02	140	16	27
	Endosulfanns (2 isomers)	1%	7.4	160 (3.0E-03) ^{vap}	1.2	5,600 (3.0E-03) ^{vap}	1,200	2,300
		2.5%	18	280 (7.0E-03) ^{vap}	2.9	7,400 (7.0E-03) ^{vap}	1,200	2,400
		6%	41	410 (1.6E-02) ^{vap}	6.8	8,400 (1.6E-02) ^{vap}	1,200	2,500
	Hexachlorocyclohexane (3 isomers), inc Lindane	1%	8.5E-02	3.7	1.3E-02	65	8.1	15
		2.5%	0.2	3.8	3.2E-02	65	8.1	15
		6%	0.46	3.8	7.7E-02	65	8.1	16

NOTES

Sol / vap = solubility / vapour limit (potentially use if free product identified, although highly conservative).

All GAC are based on
sandy loam soils with a pH
7.

All GAC are based on sandy loam soils with a pH 7.			LQM Generic Assessment Criteria (mg/kg) Dry weight soil					
Contaminant		SOM	Res +	Res -	Allot.	Comm.	POS _{resi}	POS _{park}
Chlorobenzenes	Chlorobenzene	1%	0.46	0.46	5.9	56	11,000	1,300 (675) ^{sol}
		2.5%	1.0	1.0	14	130	13,000	2,000 (1,520) ^{sol}
		6%	2.4	2.4	32	290	14,000	2,900
	Dichlorobenzenes (3 isomers)	1%	23	24	94	2,000 (571) ^{sol}	90,000	24,000 (571) ^{sol}
		2.5%	55	57	230	4,800 (1,370) ^{sol}	95,000	36,000 (1,370) ^{sol}
		6%	130	130	540	11,000 (3,240) ^{sol}	98,000	51,000 (3,270) ^{sol}
	Trichlorobenzenes (3 isomers)	1%	2.6	2.6	55	220	15,000	1,700 (318) ^{vap}
		2.5%	6.4	6.4	140	530	17,000	2,600 (786) ^{vap}
		6%	15	15	320	1,300	19,000	4,000 (1,880) ^{vap}
	Tetrachlorobenzenes (3 isomers)	1%	0.66	0.75	0.38	49 (39.4) ^{vap}	78	110 (39) ^{vap}
		2.5%	1.6	1.9	0.90	120 (98.1) ^{vap}	79	120
		6%	3.7	4.3	2.2	240 (235) ^{vap}	79	130
	Pentachlorobenzene	1%	5.8	19	1.2	640 (43.0) ^{sol}	100	190
		2.5%	12	30	3.1	770 (107) ^{sol}	100	190
		6%	22	38	7.0	830	100	190
	Hexachlorobenzene	1%	1.8 (0.20) ^{vap}	4.1 (0.20) ^{vap}	0.47	110 (0.20) ^{vap}	16	30
		2.5%	3.3 (0.50) ^{vap}	5.7 (0.50) ^{vap}	1.1	120	16	30
		6%	4.9	6.7 (1.2) ^{vap}	2.5	120	16	30
Chlorophenol	Chlorophenols (4 congeners)	1%	0.87 ^g	94	0.13 ^g	3,500	620	1,100
		2.5%	2.0	150	0.30	4,000	620	1,100
		6%	4.5	210	0.70	4,300	620	1,100
	Pentachlorophenol	1%	0.22	27 (16.4) ^{vap}	3.0E-02	400	60	110
		2.5%	0.52	29	8.0E-02	400	60	120
		6%	1.2	31	0.19	400	60	120
Others	Carbon Disulphide	1%	0.14	0.14	4.8	11	11,000	1,300
		2.5%	0.29	0.29	10	22	11,000	1,900
		6%	0.62	0.62	23	47	11,000	2,700
	Hexachlorobutadiene	1%	0.29	0.32	0.25	31	25	48
		2.5%	0.7	0.78	0.61	66	25	50
		6%	1.6	1.8	1.4	120	25	51
	Phenol	1%	280	750	66	760 ^{dir} (31,000)	760 ^{dir} (11,000)	760 ^{dir} (8,600)
		2.5%	550	1,300	140	1,500 ^{dir} (35,000)	1,500 ^{dir} (11,000)	1,500 ^{dir} (9,700)
		6%	1,100	2,300	280	3,200 ^{dir} (37,000)	3,200 ^{dir} (11,000)	3,200 ^{dir} (11,000)

NOTES

^{Sol / vap} = solubility / vapour limit (potentially use if free product identified, although highly conservative).

^{dir} = S4uls based on threshold protective of direct skin contact with phenol (brackets long term exposure for illustration purposes).

^g = derived based on 2,3,4,6-tetrachlorophenol.

Appendix H

Hazard Index Spreadsheets

$$HI = \sum_{Fi=1}^{16} HQ_{Fi} = \frac{\text{Measured concentration } Fi \text{ (mg/kg)}}{S4UL \text{ } Fi \text{ (mg/kg)}}$$

where: HI = Hazard Index
 HQ = Hazard Quotient
 Fi = Fraction I
 S4UL = LQM Sutable 4 Use Levels (S4ULs)

Job Hilton Lane, Prestwich
Job No. LKC 21 1545
SOM 6.0
Comment CP101 1.3-1.7m

Residential With Plant Uptake

	1% S4UL	2.50% S4UL	6% S4UL	Max Soil concn.	HQ (1%SOM)	HQ (2.5%SOM)	HQ (6% SOM)
Aliphatic							
EC5-EC6	42	78	160	1	0.0238095	0.0128205	0.00625
EC6-EC8	100	230	530	1	0.01	0.0043478	0.0018868
EC8-EC10	27	65	150	1	0.037037	0.0153846	0.0066667
EC10-EC12	130	330	760	1	0.0076923	0.0030303	0.0013158
EC12-EC16	1100	2400	4300	1	0.0009091	0.0004167	0.0002326
EC16-EC21	65000	92000	110000	1	1.538E-05	1.087E-05	9.091E-06
EC21-EC35							
EC35-EC44	65000	92000	110000	1	1.538E-05	1.087E-05	9.091E-06
Aromatic							
EC5-EC7 (benzene)	70	140	300	1	0.0142857	0.0071429	0.0033333
EC7-EC8 (tolulene)	130	290	660	1	0.0076923	0.0034483	0.0015152
EC8-EC10	34	83	190	1	0.0294118	0.0120482	0.0052632
EC10-EC12	74	180	380	1	0.0135135	0.0055556	0.0026316
EC12-EC16	140	330	660	1	0.0071429	0.0030303	0.0015152
EC16-EC21	260	540	930	82	0.3153846	0.1518519	0.088172
EC21-EC35	1100	1500	1700	190	0.1727273	0.1266667	0.1117647
EC35-EC44	1100	1500	1700	1	0.0009091	0.0006667	0.0005882

HI	0.64	0.35	0.23
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$$HI = \sum_{Fi=1}^{16} HQ_{Fi} = \frac{\text{Measured concentration } Fi \text{ (mg/kg)}}{S4UL \text{ } Fi \text{ (mg/kg)}}$$

where: HI = Hazard Index
 HQ = Hazard Quotient
 Fi = Fraction I
 S4UL = LQM Sutable 4 Use Levels (S4ULs)

Job Hilton Lane, Prestwich
Job No. LKC 21 1545
SOM 6.0
Comment WS102 0.0-0.4m

Residential With Plant Uptake

	1% S4UL	2.50% S4UL	6% S4UL	Max Soil concn.	HQ (1%SOM)	HQ (2.5%SOM)	HQ (6% SOM)
Aliphatic							
EC5-EC6	42	78	160	1	0.0238095	0.0128205	0.00625
EC6-EC8	100	230	530	1	0.01	0.0043478	0.0018868
EC8-EC10	27	65	150	1	0.037037	0.0153846	0.0066667
EC10-EC12	130	330	760	1	0.0076923	0.0030303	0.0013158
EC12-EC16	1100	2400	4300	1	0.0009091	0.0004167	0.0002326
EC16-EC21	65000	92000	110000	120	0.0018462	0.0013043	0.0010909
EC21-EC35							
EC35-EC44	65000	92000	110000	1	1.538E-05	1.087E-05	9.091E-06
Aromatic							
EC5-EC7 (benzene)	70	140	300	1	0.0142857	0.0071429	0.0033333
EC7-EC8 (tolulene)	130	290	660	1	0.0076923	0.0034483	0.0015152
EC8-EC10	34	83	190	1	0.0294118	0.0120482	0.0052632
EC10-EC12	74	180	380	1	0.0135135	0.0055556	0.0026316
EC12-EC16	140	330	660	1	0.0071429	0.0030303	0.0015152
EC16-EC21	260	540	930	1	0.0038462	0.0018519	0.0010753
EC21-EC35	1100	1500	1700	470	0.4272727	0.3133333	0.2764706
EC35-EC44	1100	1500	1700	1	0.0009091	0.0006667	0.0005882

HI	0.59	0.38	0.31
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Appendix I

JIWG Assessments

Decision Support Tool for Receptor Risk Ranking

Stage 1		Score
Hazard Identification		
Select ACM type (run model for each type to generate 'Worst Case' output)	Woven textiles, string, rope, paper, felt, gaskets etc.	1
Extent of degradation of ACMs	Weathered (Slight degradation in ACM; material still retains its basic integrity)	2
Friability and degree of bonding by matrix (ACM matrix, not ground materials)	Friable ACM or ACM with fibres not firmly linked in a matrix	2
Distribution of Visible Asbestos Across Affected Area	Occasional/random occurrences of visible contamination by ACMs	1
Asbestos fibre type	Chrysotile alone	0
Sub-total		6
Hazard ranking		Low

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.

It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.



Stage 2		
Emission Factors		Score
Amount of asbestos fibre in selected ACM/fibre type as % of host material	Large quantities - ≥ 0.1 %wt/wt	4
Respirable fibre index for ACM - RIVM report 711701034 (2003)	Medium	3
Activity type and effect on deterioration of ACMs	Low disturbance, minimal deterioration expected	2
Best description of primary host material matrix	Made Ground - Recycled Aggregate, Track Ballast	4
Sub-total		13
Exposure ranking		Medium

Stage 3		Score	
Pathway and Receptor Sensitivity			
Receptor category	Residential	No score required	
Age of Receptor	Infant (under 5)	4	
Duration of exposure/site occupancy	>> 10 hours per day (e.g. 24 hour residential exposure)	4	
Receptor ranking		8	High
Combined hazard, exposure and receptor ranking			Medium
Pathway: Distance of Receptor from Source	In or within 10m of area of disturbance	4	
Pathway: Depth to impacted material	Material present near the surface, potential to be disturbed during non-construction/routine use of land	D	
Pathway ranking		4D	Medium
Overall ranking			Medium



Joint Industry **Working Group**

Asbestos in Soil and Construction & Demolition Materials

Project Reference	LKC 21 1545
Site Name	Hilton Lane
Client	Leo Prestwich Ltd
Run by	MT
Date	28.3.22
Reviewed by	PQ
Characterisation of scenario being evaluated	ACM paper in garden area
Interpretation of scenario ranking by DST	



Joint Industry **Working Group**

Asbestos in Soil and Construction & Demolition Materials

Project Reference	LKC 21 1545
Site Name	Hilton Lane
Client	Leo Prestwich Ltd
Run by	MT
Date	28.3.22
Scenario details	Risk during earthworks

Decision Support Tool for CAR2012 Work Categories

Stage 1

Hazard Factors

Score

Select ACM type (run model for each type to generate 'Worst Case' output)

Woven textiles, string, rope, paper, felt, gaskets etc.

1

Extent of degradation of ACMs at outset of work

Weathered (Slight degradation in ACM; material still retains its basic integrity)

2

Friability and degree of bonding by matrix (ACM matrix, not ground materials)

Non-friable ACM or ACM with fibres firmly linked in a matrix

0

Distribution of Visible Asbestos Across Affected Area

Occasional/random occurrences of visible contamination by ACMs

1

Amount of asbestos fibre in selected ACM/fibre type as % of host material

Large quantities - >0.1 %wt/wt

4

Sub-total

8

Note: the asbestos licensing regime is unaffected by the type of asbestos fibre present in ACMs

Hazard ranking

Low

No warranty, expressed or implied, or reliance, is provided in relation to the use of this tool.

It is contingent on users to satisfy themselves that the output from the tool is relevant and appropriate to the assessment being made.



Stage 2

Exposure Factors

Score

Anticipated airborne fibre concentration - Control Limit or SALI?
Anticipated duration of exposure to asbestos
Activity type and effect on deterioration of ACMs during work
Best description of primary host material matrix (soil/made ground)
Respirable fibre index for ACM - RIVM report 711701034 (2003)

<0.1 fibres/ml (4 Hr TWA) or <0.6 fibres/ml (10 minute STEL)	2
> 2 hours in a 7 day period and Up to 10 hours in a day (e.g. full time occupational exposure)	4
Sampling, manual or mechanical (no or minimal deterioration expected)	0
Made Ground - Recycled Aggregate, Track Ballast	4
Very low	1

Sub-total

11

Exposure ranking

Medium

Combined hazard and exposure ranking

19

Low

Stage 3

Risk Assessment Outputs

Probable Licensing Status	Non-Licensed Work
RPE*	EN149 type FFP3 disposable
Dust Suppression**	Manual/localised dust suppression
Hygiene/Decontamination***	Localised and basic personal decontamination facilities

*Where RPE has to be worn continuously for long periods (e.g. more than 1-hour), then powered RPE may be necessary.

**Reduction in control measures possible if natural mitigation factors are present (e.g. raining, wet ground)

***Guide only; suitability of selected personal hygiene measures may be reviewed on a site/contamination-specific basis

Appendix J

HazWasteOnline Output Sheets

Waste Classification Report

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

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



WIQZG-ZJO41-VAXWC

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

Job name

LKC 21 1545

Description/Comments

Project

LKC 21 1545

Site

Hilton Lane, Prestwich

Classified by

Name: **Peter Dunn**
Company: **LK Group**
Date: **18 Mar 2022 11:24 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

Hazardous Waste Classification

Date

18 Sep 2019

Next 3 year Refresher due by Sep 2022

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	WS101-08/02/2022-0.00	0.00-0.50	Non Hazardous		2
2	WS101-08/02/2022-0.30	0.30-0.40	Non Hazardous		4
3	WS102-08/02/2022-0.00	0.00-0.40	Non Hazardous		6
4	WS102-08/02/2022-0.90	0.90-1.50	Non Hazardous		9
5	WS103-08/02/2022-0.30	0.30-0.60	Non Hazardous		11
6	WS104-08/02/2022-0.00	0.00-0.60	Non Hazardous		13
7	WS105-08/02/2022-0.40	0.40-1.40	Non Hazardous		15
8	CP101-08/02/2022-1.30	1.30-1.70	Non Hazardous		17

Related documents

#	Name	Description
1	HWOL_22-04654-20220218 135426.hwol	.hwol file used to create the Job
2	Example waste stream template for contaminated soils	waste stream template used to create this Job

Report

Created by: Peter Dunn

Created date: 18 Mar 2022 11:24 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	20
Appendix B: Rationale for selection of metal species	21
Appendix C: Version	22

Classification of sample: WS101-08/02/2022-0.00

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

Sample details

Sample name:	LoW Code:
WS101-08/02/2022-0.00	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.50 m	
Moisture content:	
21%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 21% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	 arsenic { arsenic trioxide }				23 mg/kg	1.32	23.99	mg/kg	0.0024 %	✓	
	033-003-00-0	215-481-4	1327-53-3								
2	 cadmium { cadmium oxide }				0.77 mg/kg	1.142	0.695	mg/kg	0.0000695 %	✓	
	048-002-00-0	215-146-2	1306-19-0								
3	 chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				30 mg/kg	1.462	34.639	mg/kg	0.00346 %	✓	
		215-160-9	1308-38-9								
4	 chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135	mg/kg	<0.000113 %		<LOD
	024-017-00-8										
5	 copper { dicopper oxide; copper (I) oxide }				150 mg/kg	1.126	133.418	mg/kg	0.0133 %	✓	
	029-002-00-X	215-270-7	1317-39-1								
6	 lead { lead chromate }			1	300 mg/kg	1.56	369.676	mg/kg	0.0237 %	✓	
	082-004-00-2	231-846-0	7758-97-6								
7	 mercury { mercury dichloride }				0.54 mg/kg	1.353	0.577	mg/kg	0.0000577 %	✓	
	080-010-00-X	231-299-8	7487-94-7								
8	 nickel { nickel chromate }				14 mg/kg	2.976	32.917	mg/kg	0.00329 %	✓	
	028-035-00-7	238-766-5	14721-18-7								
9	 selenium { nickel selenate }				0.58 mg/kg	2.554	1.17	mg/kg	0.000117 %	✓	
	028-031-00-5	239-125-2	15060-62-5								
10	 zinc { zinc chromate }				260 mg/kg	2.774	569.81	mg/kg	0.057 %	✓	
	024-007-00-3	236-878-9	13530-65-9								
11	 pH				8.8 pH		8.8	pH	8.8 pH		
			PH								
12	naphthalene				1.7 mg/kg		1.343	mg/kg	0.000134 %	✓	
	601-052-00-2	202-049-5	91-20-3								
13	 acenaphthylene				<0.1 mg/kg		<0.1	mg/kg	<0.00001 %		<LOD
		205-917-1	208-96-8								
14	 acenaphthene				0.43 mg/kg		0.34	mg/kg	0.000034 %	✓	
		201-469-6	83-32-9								
15	 fluorene				0.23 mg/kg		0.182	mg/kg	0.0000182 %	✓	
		201-695-5	86-73-7								
16	 phenanthrene				2.7 mg/kg		2.133	mg/kg	0.000213 %	✓	
		201-581-5	85-01-8								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
17	anthracene	204-371-1	120-12-7		0.6 mg/kg		0.474 mg/kg	0.0000474 %	✓	
18	fluoranthene	205-912-4	206-44-0		4.7 mg/kg		3.713 mg/kg	0.000371 %	✓	
19	pyrene	204-927-3	129-00-0		4.2 mg/kg		3.318 mg/kg	0.000332 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	2 mg/kg		1.58 mg/kg	0.000158 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	2.1 mg/kg		1.659 mg/kg	0.000166 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	2.5 mg/kg		1.975 mg/kg	0.000198 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.85 mg/kg		0.671 mg/kg	0.0000671 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	2.2 mg/kg		1.738 mg/kg	0.000174 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		1.5 mg/kg		1.185 mg/kg	0.000119 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.31 mg/kg		0.245 mg/kg	0.0000245 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		1.7 mg/kg		1.343 mg/kg	0.000134 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1	38 mg/kg	1.785	53.591 mg/kg	0.00536 %	✓	
Total:								0.111 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
•	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS101-08/02/2022-0.30

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

Sample details

Sample name:	LoW Code:
WS101-08/02/2022-0.30	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.30-0.40 m	
Moisture content:	
14%	
(wet weight correction)	

Hazard properties

None identified

Determinands

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

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				21 mg/kg	1.32	23.845 mg/kg	0.00238 %		✓	
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				0.32 mg/kg	1.142	0.314 mg/kg	0.0000314 %		✓	
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				17 mg/kg	1.462	21.368 mg/kg	0.00214 %		✓	
		215-160-9	1308-38-9								
4	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %			<LOD
	024-017-00-8										
5	copper { dicopper oxide; copper (I) oxide }				68 mg/kg	1.126	65.842 mg/kg	0.00658 %		✓	
	029-002-00-X	215-270-7	1317-39-1								
6	lead { lead chromate }			1	120 mg/kg	1.56	160.973 mg/kg	0.0103 %		✓	
	082-004-00-2	231-846-0	7758-97-6								
7	mercury { mercury dichloride }				0.22 mg/kg	1.353	0.256 mg/kg	0.0000256 %		✓	
	080-010-00-X	231-299-8	7487-94-7								
8	nickel { nickel chromate }				9.8 mg/kg	2.976	25.084 mg/kg	0.00251 %		✓	
	028-035-00-7	238-766-5	14721-18-7								
9	selenium { nickel selenate }				0.5 mg/kg	2.554	1.098 mg/kg	0.00011 %		✓	
	028-031-00-5	239-125-2	15060-62-5								
10	zinc { zinc chromate }				110 mg/kg	2.774	262.434 mg/kg	0.0262 %		✓	
	024-007-00-3	236-878-9	13530-65-9								
11	pH				8.4 pH		8.4 pH	8.4 pH			
			PH								
12	naphthalene				2.8 mg/kg		2.408 mg/kg	0.000241 %		✓	
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				0.15 mg/kg		0.129 mg/kg	0.0000129 %		✓	
		205-917-1	208-96-8								
14	acenaphthene				4.3 mg/kg		3.698 mg/kg	0.00037 %		✓	
		201-469-6	83-32-9								
15	fluorene				2.4 mg/kg		2.064 mg/kg	0.000206 %		✓	
		201-695-5	86-73-7								
16	phenanthrene				20 mg/kg		17.2 mg/kg	0.00172 %		✓	
		201-581-5	85-01-8								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
17	anthracene	204-371-1	120-12-7		3.4 mg/kg		2.924 mg/kg	0.000292 %	✓	
18	fluoranthene	205-912-4	206-44-0		25 mg/kg		21.5 mg/kg	0.00215 %	✓	
19	pyrene	204-927-3	129-00-0		22 mg/kg		18.92 mg/kg	0.00189 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	11 mg/kg		9.46 mg/kg	0.000946 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	12 mg/kg		10.32 mg/kg	0.00103 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	14 mg/kg		12.04 mg/kg	0.0012 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	5 mg/kg		4.3 mg/kg	0.00043 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	14 mg/kg		12.04 mg/kg	0.0012 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		9.1 mg/kg		7.826 mg/kg	0.000783 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	1.5 mg/kg		1.29 mg/kg	0.000129 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		9.3 mg/kg		7.998 mg/kg	0.0008 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1	32 mg/kg	1.785	49.128 mg/kg	0.00491 %	✓	
Total:								0.0688 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
•	Determinand defined or amended by HazWasteOnline (see Appendix A)
•	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
•	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS102-08/02/2022-0.00

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

Sample details

Sample name:	LoW Code:
WS102-08/02/2022-0.00	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.40 m	
Moisture content:	
20%	
(wet weight correction)	

Hazard properties

None identified

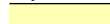
Determinands

Moisture content: 20% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				20 mg/kg	1.32	21.125 mg/kg	0.00211 %		✓	
	033-003-00-0	215-481-4	1327-53-3								
2	boron { diboron trioxide; boric oxide }				0.57 mg/kg	3.22	1.468 mg/kg	0.000147 %		✓	
	005-008-00-8	215-125-8	1303-86-2								
3	cadmium { cadmium oxide }				1 mg/kg	1.142	0.914 mg/kg	0.0000914 %		✓	
	048-002-00-0	215-146-2	1306-19-0								
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				23 mg/kg	1.462	26.893 mg/kg	0.00269 %		✓	
		215-160-9	1308-38-9								
5	chromium in chromium(VI) compounds { chromium(VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %			<LOD
	024-017-00-8										
6	copper { dicopper oxide; copper (I) oxide }				220 mg/kg	1.126	198.156 mg/kg	0.0198 %		✓	
	029-002-00-X	215-270-7	1317-39-1								
7	lead { lead chromate }			1	190 mg/kg	1.56	237.092 mg/kg	0.0152 %		✓	
	082-004-00-2	231-846-0	7758-97-6								
8	mercury { mercury dichloride }				0.23 mg/kg	1.353	0.249 mg/kg	0.0000249 %		✓	
	080-010-00-X	231-299-8	7487-94-7								
9	nickel { nickel chromate }				15 mg/kg	2.976	35.715 mg/kg	0.00357 %		✓	
	028-035-00-7	238-766-5	14721-18-7								
10	selenium { nickel selenate }				0.47 mg/kg	2.554	0.96 mg/kg	0.000096 %		✓	
	028-031-00-5	239-125-2	15060-62-5								
11	zinc { zinc chromate }				210 mg/kg	2.774	466.057 mg/kg	0.0466 %		✓	
	024-007-00-3	236-878-9	13530-65-9								
12	TPH (C6 to C40) petroleum group		TPH		590 mg/kg		472 mg/kg	0.0472 %		✓	
13	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
	603-181-00-X	216-653-1	1634-04-4								
14	benzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
	601-020-00-8	200-753-7	71-43-2								
15	toluene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
	601-021-00-3	203-625-9	108-88-3								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
16	ethylbenzene 601-023-00-4	202-849-4	100-41-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
17	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
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 } 006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %			<LOD
19	pH		PH		8.2 pH		8.2 pH	8.2 pH			
20	naphthalene 601-052-00-2	202-049-5	91-20-3		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
21	acenaphthylene 205-917-1		208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
22	acenaphthene 201-469-6		83-32-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
23	fluorene 201-695-5		86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
24	phenanthrene 201-581-5		85-01-8		0.51 mg/kg		0.408 mg/kg	0.0000408 %	✓		
25	anthracene 204-371-1		120-12-7		0.11 mg/kg		0.088 mg/kg	0.0000088 %	✓		
26	fluoranthene 205-912-4		206-44-0		1 mg/kg		0.8 mg/kg	0.00008 %	✓		
27	pyrene 204-927-3		129-00-0		0.9 mg/kg		0.72 mg/kg	0.000072 %	✓		
28	benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		0.59 mg/kg		0.472 mg/kg	0.0000472 %	✓		
29	chrysene 601-048-00-0	205-923-4	218-01-9		0.58 mg/kg		0.464 mg/kg	0.0000464 %	✓		
30	benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		0.88 mg/kg		0.704 mg/kg	0.0000704 %	✓		
31	benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		0.25 mg/kg		0.2 mg/kg	0.00002 %	✓		
32	benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		0.77 mg/kg		0.616 mg/kg	0.0000616 %	✓		
33	indeno[123-cd]pyrene 205-893-2		193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
34	dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
35	benzo[ghi]perylene 205-883-8		191-24-2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
36	vanadium { divanadium pentaoxide; vanadium pentoxide } 023-001-00-8	215-239-8	1314-62-1		35 mg/kg	1.785	49.985 mg/kg	0.005 %	✓		
37	ethanediol; ethylene glycol 603-027-00-1	203-473-3	107-21-1		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
38	monohydric phenols P1186				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
Total:									0.143 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<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:

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

Because of determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0472%)

Classification of sample: WS102-08/02/2022-0.90

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

Sample details

Sample name:	LoW Code:
WS102-08/02/2022-0.90	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.90-1.50 m	
Moisture content:	
13%	
(wet weight correction)	

Hazard properties

None identified

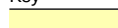
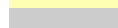
Determinands

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
		EU CLP index number	EC Number	CAS Number								
1		arsenic { arsenic trioxide }				39 mg/kg	1.32	44.799 mg/kg	0.00448 %	✓		
		033-003-00-0	215-481-4	1327-53-3								
2		cadmium { cadmium oxide }				2.2 mg/kg	1.142	2.186 mg/kg	0.000219 %	✓		
		048-002-00-0	215-146-2	1306-19-0								
3		chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				27 mg/kg	1.462	34.332 mg/kg	0.00343 %	✓		
			215-160-9	1308-38-9								
4		chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD	
		024-017-00-8										
5		copper { dicopper oxide; copper (I) oxide }				210 mg/kg	1.126	205.7 mg/kg	0.0206 %	✓		
		029-002-00-X	215-270-7	1317-39-1								
6		lead { lead chromate }			1	330 mg/kg	1.56	447.823 mg/kg	0.0287 %	✓		
		082-004-00-2	231-846-0	7758-97-6								
7		mercury { mercury dichloride }				2.3 mg/kg	1.353	2.708 mg/kg	0.000271 %	✓		
		080-010-00-X	231-299-8	7487-94-7								
8		nickel { nickel chromate }				24 mg/kg	2.976	62.144 mg/kg	0.00621 %	✓		
		028-035-00-7	238-766-5	14721-18-7								
9		selenium { nickel selenate }				0.6 mg/kg	2.554	1.333 mg/kg	0.000133 %	✓		
		028-031-00-5	239-125-2	15060-62-5								
10		zinc { zinc chromate }				360 mg/kg	2.774	868.863 mg/kg	0.0869 %	✓		
		024-007-00-3	236-878-9	13530-65-9								
11		pH		PH		8.4 pH		8.4 pH	8.4 pH			
12		naphthalene				100 mg/kg		87 mg/kg	0.0087 %	✓		
		601-052-00-2	202-049-5	91-20-3								
13		acenaphthylene				1.6 mg/kg		1.392 mg/kg	0.000139 %	✓		
			205-917-1	208-96-8								
14		acenaphthene				160 mg/kg		139.2 mg/kg	0.0139 %	✓		
			201-469-6	83-32-9								
15		fluorene				110 mg/kg		95.7 mg/kg	0.00957 %	✓		
			201-695-5	86-73-7								
16		phenanthrene				700 mg/kg		609 mg/kg	0.0609 %	✓		
			201-581-5	85-01-8								

#	Determinand			CLP Note	User entered data		Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number									
17	anthracene	204-371-1	120-12-7		170	mg/kg		147.9	mg/kg	0.0148 %	✓	
18	fluoranthene	205-912-4	206-44-0		680	mg/kg		591.6	mg/kg	0.0592 %	✓	
19	pyrene	204-927-3	129-00-0		560	mg/kg		487.2	mg/kg	0.0487 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	250	mg/kg		217.5	mg/kg	0.0217 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	250	mg/kg		217.5	mg/kg	0.0217 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	270	mg/kg		234.9	mg/kg	0.0235 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	100	mg/kg		87	mg/kg	0.0087 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	240	mg/kg		208.8	mg/kg	0.0209 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		130	mg/kg		113.1	mg/kg	0.0113 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	22	mg/kg		19.14	mg/kg	0.00191 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		19	mg/kg		16.53	mg/kg	0.00165 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1	49	mg/kg	1.785	76.102	mg/kg	0.00761 %	✓	
Total:										0.486 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: WS103-08/02/2022-0.30

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

Sample details

Sample name:	LoW Code:
WS103-08/02/2022-0.30	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.30-0.60 m	
Moisture content:	
11%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 11% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic trioxide }				14 mg/kg	1.32	16.451 mg/kg	0.00165 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
2	cadmium { cadmium oxide }				0.9 mg/kg	1.142	0.915 mg/kg	0.0000915 %	✓	
	048-002-00-0	215-146-2	1306-19-0							
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				28 mg/kg	1.462	36.422 mg/kg	0.00364 %	✓	
		215-160-9	1308-38-9							
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
	024-017-00-8									
5	copper { dicopper oxide; copper (I) oxide }				120 mg/kg	1.126	120.245 mg/kg	0.012 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
6	lead { lead chromate }			1	190 mg/kg	1.56	263.765 mg/kg	0.0169 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
7	mercury { mercury dichloride }				0.27 mg/kg	1.353	0.325 mg/kg	0.0000325 %	✓	
	080-010-00-X	231-299-8	7487-94-7							
8	nickel { nickel chromate }				12 mg/kg	2.976	31.787 mg/kg	0.00318 %	✓	
	028-035-00-7	238-766-5	14721-18-7							
9	selenium { nickel selenate }				0.36 mg/kg	2.554	0.818 mg/kg	0.0000818 %	✓	
	028-031-00-5	239-125-2	15060-62-5							
10	zinc { zinc chromate }				270 mg/kg	2.774	666.627 mg/kg	0.0667 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
11	pH				8 pH		8 pH	8pH		
			PH							
12	naphthalene				2.1 mg/kg		1.869 mg/kg	0.000187 %	✓	
	601-052-00-2	202-049-5	91-20-3							
13	acenaphthylene				0.12 mg/kg		0.107 mg/kg	0.0000107 %	✓	
		205-917-1	208-96-8							
14	acenaphthene				0.55 mg/kg		0.49 mg/kg	0.000049 %	✓	
		201-469-6	83-32-9							
15	fluorene				0.48 mg/kg		0.427 mg/kg	0.0000427 %	✓	
		201-695-5	86-73-7							
16	phenanthrene				4.9 mg/kg		4.361 mg/kg	0.000436 %	✓	
		201-581-5	85-01-8							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
17	anthracene	204-371-1	120-12-7		1.2 mg/kg		1.068 mg/kg	0.000107 %	✓	
18	fluoranthene	205-912-4	206-44-0		6.4 mg/kg		5.696 mg/kg	0.00057 %	✓	
19	pyrene	204-927-3	129-00-0		5.5 mg/kg		4.895 mg/kg	0.000489 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	3 mg/kg		2.67 mg/kg	0.000267 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	2.9 mg/kg		2.581 mg/kg	0.000258 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	3.8 mg/kg		3.382 mg/kg	0.000338 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	1.3 mg/kg		1.157 mg/kg	0.000116 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	3.5 mg/kg		3.115 mg/kg	0.000312 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		2.4 mg/kg		2.136 mg/kg	0.000214 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.53 mg/kg		0.472 mg/kg	0.0000472 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		2.2 mg/kg		1.958 mg/kg	0.000196 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1	35 mg/kg	1.785	55.609 mg/kg	0.00556 %	✓	
Total:								0.114 %		

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- This determinand is defined in the EU CLP Table 3
- <LOD Below limit of detection
- ND Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Classification of sample: WS104-08/02/2022-0.00

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

Sample details

Sample name:	LoW Code:
WS104-08/02/2022-0.00	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
0.00-0.60 m	
Moisture content:	
18%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 18% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic trioxide }				17 mg/kg	1.32	18.405 mg/kg	0.00184 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
2	cadmium { cadmium oxide }				0.21 mg/kg	1.142	0.197 mg/kg	0.0000197 %	✓	
	048-002-00-0	215-146-2	1306-19-0							
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				13 mg/kg	1.462	15.58 mg/kg	0.00156 %	✓	
		215-160-9	1308-38-9							
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
	024-017-00-8									
5	copper { dicopper oxide; copper (I) oxide }				37 mg/kg	1.126	34.159 mg/kg	0.00342 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
6	lead { lead chromate }			1	130 mg/kg	1.56	166.276 mg/kg	0.0107 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
7	mercury { mercury dichloride }				0.33 mg/kg	1.353	0.366 mg/kg	0.0000366 %	✓	
	080-010-00-X	231-299-8	7487-94-7							
8	nickel { nickel chromate }				9.3 mg/kg	2.976	22.697 mg/kg	0.00227 %	✓	
	028-035-00-7	238-766-5	14721-18-7							
9	selenium { nickel selenate }				0.48 mg/kg	2.554	1.005 mg/kg	0.000101 %	✓	
	028-031-00-5	239-125-2	15060-62-5							
10	zinc { zinc chromate }				63 mg/kg	2.774	143.312 mg/kg	0.0143 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
11	pH				7.5 pH		7.5 pH	7.5 pH		
			PH							
12	naphthalene				14 mg/kg		11.48 mg/kg	0.00115 %	✓	
	601-052-00-2	202-049-5	91-20-3							
13	acenaphthylene				0.13 mg/kg		0.107 mg/kg	0.0000107 %	✓	
		205-917-1	208-96-8							
14	acenaphthene				11 mg/kg		9.02 mg/kg	0.000902 %	✓	
		201-469-6	83-32-9							
15	fluorene				9 mg/kg		7.38 mg/kg	0.000738 %	✓	
		201-695-5	86-73-7							
16	phenanthrene				53 mg/kg		43.46 mg/kg	0.00435 %	✓	
		201-581-5	85-01-8							

#		Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used	
		EU CLP index number	EC Number	CAS Number									
17	●	anthracene				11	mg/kg		9.02	mg/kg	0.000902 %	✓	
			204-371-1	120-12-7									
18	●	fluoranthene				44	mg/kg		36.08	mg/kg	0.00361 %	✓	
			205-912-4	206-44-0									
19	●	pyrene				34	mg/kg		27.88	mg/kg	0.00279 %	✓	
			204-927-3	129-00-0									
20		benzo[a]anthracene				17	mg/kg		13.94	mg/kg	0.00139 %	✓	
		601-033-00-9	200-280-6	56-55-3									
21		chrysene				16	mg/kg		13.12	mg/kg	0.00131 %	✓	
		601-048-00-0	205-923-4	218-01-9									
22		benzo[b]fluoranthene				16	mg/kg		13.12	mg/kg	0.00131 %	✓	
		601-034-00-4	205-911-9	205-99-2									
23		benzo[k]fluoranthene				6.3	mg/kg		5.166	mg/kg	0.000517 %	✓	
		601-036-00-5	205-916-6	207-08-9									
24		benzo[a]pyrene; benzo[def]chrysene				16	mg/kg		13.12	mg/kg	0.00131 %	✓	
		601-032-00-3	200-028-5	50-32-8									
25	●	indeno[123-cd]pyrene				9.2	mg/kg		7.544	mg/kg	0.000754 %	✓	
			205-893-2	193-39-5									
26		dibenz[a,h]anthracene				2	mg/kg		1.64	mg/kg	0.000164 %	✓	
		601-041-00-2	200-181-8	53-70-3									
27	●	benzo[ghi]perylene				8.2	mg/kg		6.724	mg/kg	0.000672 %	✓	
			205-883-8	191-24-2									
28	🧑🏻‍🔬	vanadium { divanadium pentaoxide; vanadium pentoxide }				22	mg/kg	1.785	32.205	mg/kg	0.00322 %	✓	
		023-001-00-8	215-239-8	1314-62-1									
									Total:	0.0594 %			

Key

- User supplied data
- Determinand values ignored for classification, see column 'Conc. Not Used' for reason
- Determinand defined or amended by HazWasteOnline (see Appendix A)
- Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
- This determinand is defined in the EU CLP Table 3
- <LOD Below limit of detection
- ND Not detected
- CLP: Note 1 Only the metal concentration has been used for classification

Classification of sample: WS105-08/02/2022-0.40

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

Sample details

Sample name:	LoW Code:
WS105-08/02/2022-0.40	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.40-1.40 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
18%	
(wet weight correction)	

Hazard properties

None identified

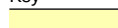
Determinands

Moisture content: 18% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
1	arsenic { arsenic trioxide }				36 mg/kg	1.32	38.976 mg/kg	0.0039 %	✓		
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				3.7 mg/kg	1.142	3.466 mg/kg	0.000347 %	✓		
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				64 mg/kg	1.462	76.702 mg/kg	0.00767 %	✓		
		215-160-9	1308-38-9								
4	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %			<LOD
	024-017-00-8										
5	copper { dicopper oxide; copper (I) oxide }				230 mg/kg	1.126	212.343 mg/kg	0.0212 %	✓		
	029-002-00-X	215-270-7	1317-39-1								
6	lead { lead chromate }			1	480 mg/kg	1.56	613.943 mg/kg	0.0394 %	✓		
	082-004-00-2	231-846-0	7758-97-6								
7	mercury { mercury dichloride }				2.2 mg/kg	1.353	2.442 mg/kg	0.000244 %	✓		
	080-010-00-X	231-299-8	7487-94-7								
8	nickel { nickel chromate }				47 mg/kg	2.976	114.705 mg/kg	0.0115 %	✓		
	028-035-00-7	238-766-5	14721-18-7								
9	selenium { nickel selenate }				0.68 mg/kg	2.554	1.424 mg/kg	0.000142 %	✓		
	028-031-00-5	239-125-2	15060-62-5								
10	zinc { zinc chromate }				380 mg/kg	2.774	864.424 mg/kg	0.0864 %	✓		
	024-007-00-3	236-878-9	13530-65-9								
11	pH				8.4 pH		8.4 pH	8.4 pH			
			PH								
12	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	601-052-00-2	202-049-5	91-20-3								
13	acenaphthylene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
		205-917-1	208-96-8								
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				1.8 mg/kg		1.476 mg/kg	0.000148 %	✓		
		201-581-5	85-01-8								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
17	anthracene	204-371-1	120-12-7		0.41 mg/kg		0.336 mg/kg	0.0000336 %	✓	
18	fluoranthene	205-912-4	206-44-0		2.7 mg/kg		2.214 mg/kg	0.000221 %	✓	
19	pyrene	204-927-3	129-00-0		2.4 mg/kg		1.968 mg/kg	0.000197 %	✓	
20	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	1.2 mg/kg		0.984 mg/kg	0.0000984 %	✓	
21	chrysene	601-048-00-0	205-923-4	218-01-9	1.2 mg/kg		0.984 mg/kg	0.0000984 %	✓	
22	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	1.5 mg/kg		1.23 mg/kg	0.000123 %	✓	
23	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.48 mg/kg		0.394 mg/kg	0.0000394 %	✓	
24	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	1.5 mg/kg		1.23 mg/kg	0.000123 %	✓	
25	indeno[123-cd]pyrene	205-893-2	193-39-5		0.96 mg/kg		0.787 mg/kg	0.0000787 %	✓	
26	dibenz[a,h]anthracene	601-041-00-2	200-181-8	53-70-3	0.2 mg/kg		0.164 mg/kg	0.0000164 %	✓	
27	benzo[ghi]perylene	205-883-8	191-24-2		0.94 mg/kg		0.771 mg/kg	0.0000771 %	✓	
28	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1	57 mg/kg	1.785	83.44 mg/kg	0.00834 %	✓	
Total:								0.181 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<LOD	Below limit of detection
ND	Not detected
CLP: Note 1	Only the metal concentration has been used for classification

Classification of sample: CP101-08/02/2022-1.30

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

Sample details

Sample name:	LoW Code:
CP101-08/02/2022-1.30	Chapter: 17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
Sample Depth:	Entry: 17 05 04 (Soil and stones other than those mentioned in 17 05 03)
1.30-1.70 m	
Moisture content:	
20%	
(wet weight correction)	

Hazard properties

None identified

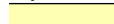
Determinands

Moisture content: 20% Wet Weight Moisture Correction applied (MC)

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
1	arsenic { arsenic trioxide }				20 mg/kg	1.32	21.125 mg/kg	0.00211 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
2	boron { diboron trioxide; boric oxide }				0.99 mg/kg	3.22	2.55 mg/kg	0.000255 %	✓	
	005-008-00-8	215-125-8	1303-86-2							
3	cadmium { cadmium oxide }				1.2 mg/kg	1.142	1.097 mg/kg	0.00011 %	✓	
	048-002-00-0	215-146-2	1306-19-0							
4	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				20 mg/kg	1.462	23.385 mg/kg	0.00234 %	✓	
		215-160-9	1308-38-9							
5	chromium in chromium(VI) compounds { chromium (VI) compounds, with the exception of barium chromate and of compounds specified elsewhere in this Annex }				<0.5 mg/kg	2.27	<1.135 mg/kg	<0.000113 %		<LOD
	024-017-00-8									
6	copper { dicopper oxide; copper (I) oxide }				230 mg/kg	1.126	207.163 mg/kg	0.0207 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
7	lead { lead chromate }			1	170 mg/kg	1.56	212.135 mg/kg	0.0136 %	✓	
	082-004-00-2	231-846-0	7758-97-6							
8	mercury { mercury dichloride }				0.29 mg/kg	1.353	0.314 mg/kg	0.0000314 %	✓	
	080-010-00-X	231-299-8	7487-94-7							
9	nickel { nickel chromate }				18 mg/kg	2.976	42.858 mg/kg	0.00429 %	✓	
	028-035-00-7	238-766-5	14721-18-7							
10	selenium { nickel selenate }				0.43 mg/kg	2.554	0.879 mg/kg	0.0000879 %	✓	
	028-031-00-5	239-125-2	15060-62-5							
11	zinc { zinc chromate }				130 mg/kg	2.774	288.511 mg/kg	0.0289 %	✓	
	024-007-00-3	236-878-9	13530-65-9							
12	TPH (C6 to C40) petroleum group		TPH		280 mg/kg		224 mg/kg	0.0224 %	✓	
13	tert-butyl methyl ether; MTBE; 2-methoxy-2-methylpropane				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	603-181-00-X	216-653-1	1634-04-4							
14	benzene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-020-00-8	200-753-7	71-43-2							
15	toluene				<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %		<LOD
	601-021-00-3	203-625-9	108-88-3							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.		Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number								
16	ethylbenzene 601-023-00-4	202-849-4	100-41-4		<0.001 mg/kg		<0.001 mg/kg	<0.0000001 %			<LOD
17	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
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 } 006-007-00-5				<0.5 mg/kg	1.884	<0.942 mg/kg	<0.0000942 %			<LOD
19	pH		PH		8.2 pH		8.2 pH	8.2 pH			
20	naphthalene 601-052-00-2	202-049-5	91-20-3		5.7 mg/kg		4.56 mg/kg	0.000456 %		✓	
21	acenaphthylene 205-917-1	208-96-8			0.12 mg/kg		0.096 mg/kg	0.0000096 %		✓	
22	acenaphthene 201-469-6	83-32-9			4.9 mg/kg		3.92 mg/kg	0.000392 %		✓	
23	fluorene 201-695-5	86-73-7			3.6 mg/kg		2.88 mg/kg	0.000288 %		✓	
24	phenanthrene 201-581-5	85-01-8			22 mg/kg		17.6 mg/kg	0.00176 %		✓	
25	anthracene 204-371-1	120-12-7			5.4 mg/kg		4.32 mg/kg	0.000432 %		✓	
26	fluoranthene 205-912-4	206-44-0			22 mg/kg		17.6 mg/kg	0.00176 %		✓	
27	pyrene 204-927-3	129-00-0			18 mg/kg		14.4 mg/kg	0.00144 %		✓	
28	benzo[a]anthracene 601-033-00-9	200-280-6	56-55-3		9.1 mg/kg		7.28 mg/kg	0.000728 %		✓	
29	chrysene 601-048-00-0	205-923-4	218-01-9		8.3 mg/kg		6.64 mg/kg	0.000664 %		✓	
30	benzo[b]fluoranthene 601-034-00-4	205-911-9	205-99-2		8.9 mg/kg		7.12 mg/kg	0.000712 %		✓	
31	benzo[k]fluoranthene 601-036-00-5	205-916-6	207-08-9		3.1 mg/kg		2.48 mg/kg	0.000248 %		✓	
32	benzo[a]pyrene; benzo[def]chrysene 601-032-00-3	200-028-5	50-32-8		8.9 mg/kg		7.12 mg/kg	0.000712 %		✓	
33	indeno[123-cd]pyrene 205-893-2	193-39-5			5.1 mg/kg		4.08 mg/kg	0.000408 %		✓	
34	dibenz[a,h]anthracene 601-041-00-2	200-181-8	53-70-3		1.1 mg/kg		0.88 mg/kg	0.000088 %		✓	
35	benzo[ghi]perylene 205-883-8	191-24-2			4.8 mg/kg		3.84 mg/kg	0.000384 %		✓	
36	vanadium { divanadium pentaoxide; vanadium pentoxide } 023-001-00-8	215-239-8	1314-62-1		26 mg/kg	1.785	37.132 mg/kg	0.00371 %		✓	
37	monohydric phenols P1186				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
Total:									0.109 %		

Key

	User supplied data
	Determinand values ignored for classification, see column 'Conc. Not Used' for reason
	Determinand defined or amended by HazWasteOnline (see Appendix A)
	Speciated Determinand - Unless the Determinand is Note 1, the Conversion Factor is used to calculate the compound concentration
	This determinand is defined in the EU CLP Table 3
<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 determinand:

TPH (C6 to C40) petroleum group: (conc.: 0.0224%)

Appendix A: Classifier defined and non GB MCL determinands

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

Description/Comments: Data from C&L Inventory Database
Data source: <https://echa.europa.eu/information-on-chemicals/cl-inventory-database/-/discli/details/33806>
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H332 , Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Resp. Sens. 1; H334 , Skin Sens. 1; H317 , Repr. 1B; H360FD , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

■ pH (CAS Number: PH)

Description/Comments: Appendix C4
Data source: WM3 1st Edition 2015
Data source date: 25 May 2015
Hazard Statements: None.

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

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Acute Tox. 4; H302 , Acute Tox. 1; H330 , Acute Tox. 1; H310 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315

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

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Aquatic Chronic 2; H411

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

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 06 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Carc. 2; H351 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410 , Skin Irrit. 2; H315

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

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 17 Jul 2015
Hazard Statements: Eye Irrit. 2; H319 , STOT SE 3; H335 , Skin Irrit. 2; H315 , Skin Sens. 1; H317 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Acute Tox. 4; H302 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

Description/Comments: Data from C&L Inventory Database; SDS Sigma Aldrich 2014
Data source: <http://echa.europa.eu/web/guest/information-on-chemicals/cl-inventory-database>
Data source date: 21 Aug 2015
Hazard Statements: Skin Irrit. 2; H315 , Eye Irrit. 2; H319 , STOT SE 3; H335 , Aquatic Acute 1; H400 , Aquatic Chronic 1; H410

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

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

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

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

▪ **divanadium pentaoxide; vanadium pentoxide** (EC Number: 215-239-8, CAS Number: 1314-62-1)

EU CLP index number: 023-001-00-8
Description/Comments:
Data source: Regulation 1272/2008/EC - Classification, labelling and packaging of substances and mixtures. (CLP)
Hazard Statements: Muta. 2; H341 , Repr. 2; H361d , STOT RE 1; H372 , Acute Tox. 4; H332 , Acute Tox. 4; H302 , STOT SE 3; H335 , Aquatic Chronic 2; H411

▪ **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)

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

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

GB MCL index number: 006-007-00-5
Description/Comments: Conversion factor based on a worst case compound: sodium cyanide
Additional Hazard Statement(s): EUH032 >= 0.2 %
Reason for additional Hazards Statement(s):
20 Nov 2021 - EUH032 >= 0.2 % hazard statement sourced from: WM3, Table C12.2

▪ **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: Muta. 2; H341 , Acute Tox. 3; H331 , Acute Tox. 3; H311 , Acute Tox. 3; H301 , STOT RE 2; H373 , Skin Corr. 1B; H314 , Skin Corr. 1B; H314 >= 3 % , Skin Irrit. 2; H315 1 £ conc. < 3 % , Eye Irrit. 2; H319 1 £ conc. < 3 % , 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 chromate}

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

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 v1.2.GB - Oct 2021**

HazWasteOnline Classification Engine Version: 2022.25.4995.9469 (25 Jan 2022)

HazWasteOnline Database: 2022.25.4995.9469 (25 Jan 2022)

This classification utilises the following guidance and legislation:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

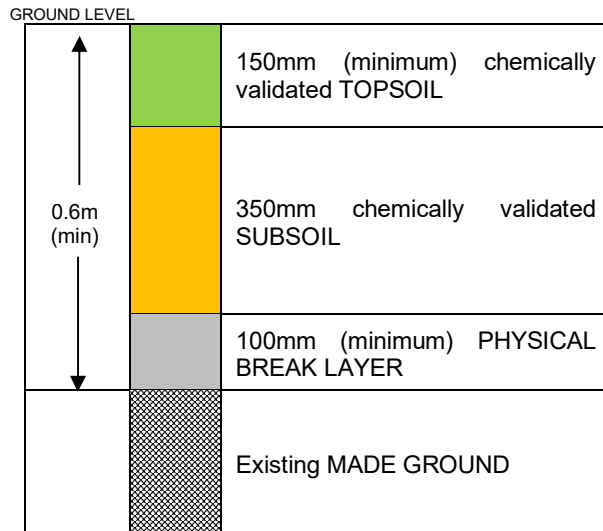
Appendix K

Environmental Cover System Construction

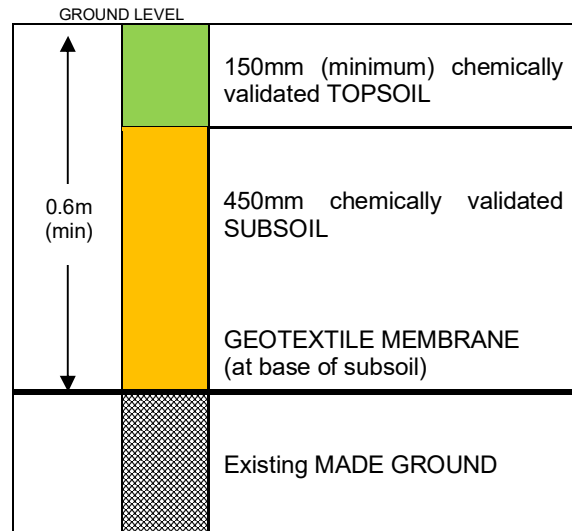
Private Gardens

PRIVATE BACK GARDENS:

Either (physical break layer)

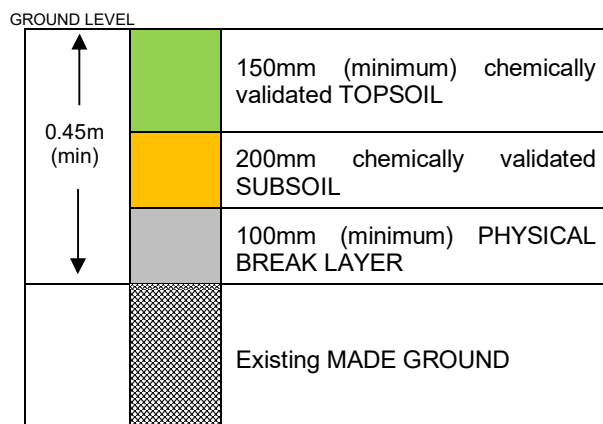


Or (geotextile membrane)

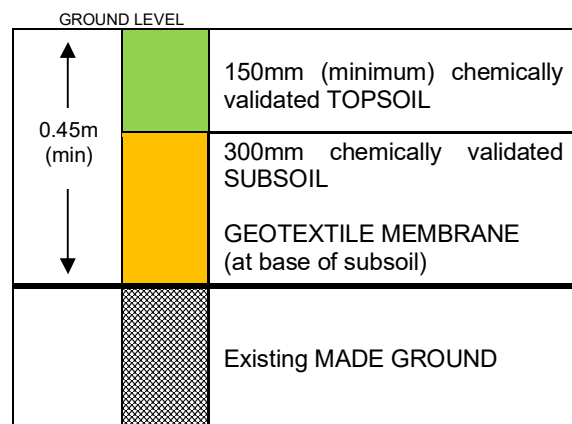


PRIVATE FRONT GARDENS:

Either (physical break layer)



Or (geotextile membrane)



Hardstood Areas – No Remediation Required

Based across the UK with
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