

MANCHESTER GRAMMAR SCHOOL, MANCHESTER

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

Job Number: LKC 23 1086

Date: June 2023

Client: The Manchester Grammar School



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LK Consult Document Verification			
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EXECUTIVE SUMMARY

Site Details

Site Location:	Main school building located on Old Hall Lane, Manchester. Existing pavilion located in the southwest of the existing school footprint, adjacent northeast of the playing fields. Centred at approximate National Grid Reference 386010E, 394650N.
Site Area:	1,200m ² .
Current Land Use:	42-44 metres Above Ordnance Datum (AOD). Site is approximately level, with sloping ground adjacent south and west.
Proposed Development:	Demolition of existing pavilion building, construction of new pavilion building, to include classrooms, study spaces, toilet/changing rooms, staff room, dining hall and storage space.
Purpose of Report:	Contamination and Geotechnical Assessment.

Preliminary Risk Assessment

PRA Details:	Undertaken by LKC in March 2023, ref: LKC 23 1086-A1-PRA.
History:	Onsite: Birch Hall/Manchester Grammar School (including orchard, sluice/stream, embankments). Surrounding Area: playing fields, ponds, graveyard.
Geology / Hydrogeology:	Artificial: No BGS recorded artificial. Superficial: Glacial Till (diamicton), Secondary Undifferentiated Aquifer. Bedrock: Chester Formation (sandstone). Principal Aquifer.
Mining:	Not within Coal Authority Reporting Area.
Relevant Environmental Setting:	No recorded landfills. Potentially infilled ground identified. No risk of flooding from rivers and sea without defences. Limited potential for groundwater flooding to occur Zetica UXO Risk: Low (pre desk study assessment undertaken). No to very low risk from ground stability. No surface/groundwater abstractions within 100m of site. No pollution incidents of site. No discharge consents on site.
Preliminary Conceptual Model: PL=Pollutant Linkage	PL1 Direct Contact (Human Health): No viable human health pathways as no soft landscaping. No pollutant linkage therefore no further assessment required. PL2 Inhalation of Vapours: Low Risk (volatile contaminants). PL3 Gas: Moderate / Low (hazardous and ground gas). PL4 Controlled waters: Low Risk (mobile contaminants). PL5 Water Pipelines: Moderate / Low (organic contaminants).
Recommendations:	Site Investigation was recommended to further assess PL2, PL3, PL4, PL5.

Ground Investigation Work Undertaken

Date of Investigation:	14 th April 2023
Intrusive Investigation Work Undertaken:	3no. window sample boreholes (BH01-BH03). 2no. Manually excavated trial pits (TP101-TP102).
Monitoring Wells:	Installed in BH02.
Soil Sampling:	4no. samples tested for metals, speciated PAHs, pH, sulphate, asbestos and SOM. 2no. BRE short suit.
In-situ and Laboratory Geotechnical Testing:	SPTs, Pocket penetrometer, PSD, plasticity.

Ground Conditions and Geotechnical Assessment

Location	General Ground conditions	Allowable Bearing Pressure	Anticipated Foundation Type	Other Considerations
Whole Site	Made Ground encountered to depths of between 1.10 to 1.40mbgl. Firm becoming stiff and very stiff with depth, variably silt sandy gravelly CLAY. Organic SILT at 2.80m to 3.80mbgl at BH2 only Groundwater at 2.00 and 3.00mbgl.	108kN/m² at 1.50mbgl for raft. 69kN/m² at 1.50mbgl for strip.	Shallow foundation (raft or mini-pile). Pile or Ground Improvement technique for higher load.	Concrete Requirements DS-1 and AC-1. Groundwater sump pumping may be required. Basement can be found on shallow foundations (raft) or piles, depending on load. Recommended sheet pile or diaphragm walls, embedded permanently and watertight.

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	No viable pathways (dermal inhalation, ingestion).	-	- No viable human health pathways as no soft landscaping. - No pollutant linkage therefore no further assessment required.
2	Volatile contaminants posing a risk to site users future site users and offsite receptors via the inhalation of vapours.	Low	- No elevated volatile contaminants identified within soils analysed. - Recommendation: No remediation required.
3	Gas posing a risk to buildings and site users current site users, future site users, buildings, and offsite receptors via the migration of gas into building causing explosion and asphyxiation.	Moderate / Low	- It is unlikely the organic clay material is beneath the current and proposed footprint. - Recommendation: No further assessment required at this stage.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	- No elevated mobile contaminants identified - Recommendation: No remediation required.
5	Organic contaminants posing a risk to water pipes.	Low	- No elevated contaminants identified. - Recommendation: Barrier piping unlikely to be required. However, this will need to be confirmed once UU risk assessment undertaken.

Recommendations and Remedial Strategy

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

Phase	PL	Remediation Requirements	Validation Requirements
Pre-Construction	ALL	<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. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733¹.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
	5	<u>Potable Water Pipes</u> It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is unlikely that barrier pipe will be required.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.
Construction Phase	3	<u>Ground Gas Assessment</u> Given the position of the proposed basement area and the former infilled stream, it is likely all organic material beneath the proposed building will be removed during the pre-construction phase. If organic material is found to exceed 3.80mbgl or identified beneath existing building footprint, precautionary CS2 gas protection measures will be required.	Log of work undertaken including photographs.
	2,4	No remediation anticipated with respect to PL2 (inhalation of vapours) and PL4 (controlled waters).	TBC
Other Considerations		<u>Grubbing Out of In-Ground Structures</u> It is recommended that in-ground structures are grubbed out as part of the groundworks. In-ground structures expected on site associated with the existing pavilions building, to be demolished prior to proposed building construction.	
		<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 ²): 5,000 tonnes (c. 2,500m³) <u>treatment</u> of crushed concrete / stone. 1,000 tonnes (c. 500³) <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.	

¹ CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

² <https://www.gov.uk/guidance/waste-exemptions-using-waste>

	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>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 guidance³) should be adopted by all workers involved with site enabling and construction works. <u>Asbestos Survey</u> A Pre-Demolition and Major Refurbishment Asbestos Survey should be undertaken, and any ACMs removed and properly disposed of, prior to the demolition of the existing buildings, by a suitably qualified professional.
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The remediation recommended in the table above should be validated to ensure it has been carried out appropriately. This should be documented in a Completion/Validation Report and submitted to the local authority for completion.

³ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

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Appendix C:	Certificate of Analysis - Soil
Appendix D:	Certificate of Analysis - Geotechnical
Appendix E:	Generic Assessment Criteria Values
Appendix F:	Hazwaste™ Online Certificates

1 Introduction

1.1 Background

LK Consult Ltd (LKC) has been commissioned by The Manchester Grammar School to carry out a Phase 2 Geo-Environmental Investigation, Risk Assessment and Remediation Strategy for Manchester Grammar School, Manchester. The investigation was undertaken in support of a future planning application to develop the site for use as a school building.

The following work has previously been undertaken:

- » Preliminary Risk Assessment (PRA) report, undertaken by LKC (Ref: LKC 23 1086-A1-PRA, dated 17th March 2023).

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

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

The aims of this report are also to establish the feasibility of developing this site, to demonstrate to the Local Planning Authority that in accordance with the National Planning Policy Framework (NPPF)⁴ the site may be developed for a commercial end use and that appropriate site investigation and risk assessment works are in place to allow conditional approval of any future planning application.

1.2 Site Details

A summary of the site details is presented in Table 1-1. Figures 1 and 2 indicate the site location and boundary. Figure 3 indicates the proposed development.

Site Location	Main school building located on Old Hall Lane, Manchester. Existing pavilion located in the southwest of the existing school footprint, adjacent northeast of the playing fields. Centred at approximate National Grid Reference 386010E, 394650N.
Approximate Area	1,200m ² .
Topography	42-44 metres Above Ordnance Datum (AOD). Site is approximately level, with sloping ground adjacent south and west.
Current Site Use	Sports pavilion building with playing field.
Purpose of Report	Pre-planning.
Proposed Development	Demolition of existing pavilion building, construction of new pavilion building, to include classrooms, study spaces, toilet/changing rooms, staff room, dining hall and storage space. Single storey building with partial basement on the far western side of site.

Table 1-1. Summary of site details.

⁴ "National Planning Policy Framework." Ministry of Housing, Communities and Local Government. July 2021.

2 Review of Previous Work

2.1 Phase 1 Preliminary Risk Assessment (PRA)

A PRA report (Ref: LKC 23 1086-A1-PRA, dated 17th March 2023) has previously been undertaken by LKC.

Table 2-1 summarises the site details, historical review, environmental settings and site reconnaissance.

Current Site Use	School sports pavilions building with outdoor space.
Proposed Development	Demolition of existing pavilion building, construction of new pavilion building, to include classrooms, study spaces, toilet/changing rooms, staff room, dining hall and storage space.
Main Historical Features	Onsite: Birch Hall/Manchester Grammar School (including orchard, sluice/stream, embankments). Surrounding Area: playing fields, ponds, graveyard.
Geology / Hydrogeology	Artificial: No BGS recorded artificial. Superficial: Glacial Till (diamicton), Secondary Undifferentiated Aquifer. Bedrock: Chester Formation (sandstone). Principal Aquifer.
Landfills / Infilled ground	No recorded landfills. Potentially infilled ground identified.
Site walkover	2no. buildings on site with associated car parking. Tarmac is in good condition. There is a grassed area in the west of the site; part of the adjacent playing fields.. No evidence of contamination identified.

Table 2-1: Summary of site details, historical review, environmental settings and site reconnaissance.

The preliminary contamination conceptual model (PCCM) produced in the PRA is provided in Table 2-2.

Each pollutant linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552⁵. The risk matrix is provided in Appendix A.

The PCCM has been updated to take into account recent LKC changes to omit phytotoxicity, sulphate and potable water pipes pollutant linkages. Justification is provided below.

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 guidance⁶) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

⁵ CIRIA (2001). "Contaminated Land Risk Assessment: A Guide to Good Practice". C552.

⁶ 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	- No viable pathways (dermal inhalation, ingestion).	- Future site users. - Offsite receptors.	- ACM - Heavy metals - PAHs - Petroleum hydrocarbons	-	-	-	No viable human health pathways as no soft landscaping. No pollutant linkage therefore no further assessment required.
2	- Inhalation of vapours. - Migration via permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	Volatile contaminants: - No source identified	Unlikely (given site history, site conditions and proposed end use)	Medium	Low	Intrusive investigation required, to include PID testing.
3	- Inhalation of gas. - Migration via permeable strata and preferential pathways. - Explosion in confined spaces. - Exposure to radon.	- Future site users. - Buildings. - Offsite land users.	Ground / hazardous gas: - Carbon dioxide - Methane	Unlikely (no significant gas source identified)	Severe	Moderate / Low	Intrusive investigation to confirm ground conditions. If significant gas source and pathway identified, gas monitoring or gas protection measures required.
4	- Surface run-off. - Migration via permeable strata and preferential pathways. - Perched waters migration.	- Groundwater (Principal Aquifer, Secondary Undifferentiated Aquifer).	Mobile contaminants: - Heavy metals - PAHs.	Unlikely (no contamination source identified and limited pathway)	Medium	Low	Intrusive investigation required. Groundwater sampling, subject to ground conditions encountered. Analysis of CoC.
5	- Ingestion of tainted water supply.	- Future site users. - Water pipes.	Organic contaminants - Naphthalene associated with ash.	Low Likelihood (although some contamination may be present, significant contamination not expected at pipeline depth)	Medium	Moderate / Low (low risk assumed given anticipated limited made ground and contamination, current pipeline cast iron)	Intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered.

Table 2-2. 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 14th April 2023 and comprised the following:

- » 3no. window sample boreholes drilled to 4.10-4.45 metres below ground level (mbgl) (ref. BH1-BH3).
- » 2no. hand dug foundation pits (using hand auger / spade) excavated to 1.15-1.33mbgl (ref. TP01-TP02).

Hand dug trial pits were performed to find footings of existing pavilion (Ref. TP101-TP102).

All site investigation locations are shown in Figure 3.

The site investigation locations were proposed by project design team for The Manchester Grammar school, in line with their proposed scheme for the new pavilion building.

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 BS10175⁷ for a 'detailed investigation'.

All profile logs are provided in Appendix B and are in line with BS14688-1⁸ and BS5930⁹.

3.2 Well Installations

As per the design team specification, BH2 was installed with a monitoring well. The monitoring well was installed in accordance with BS10175 and CIRIA C665¹⁰ and comprised approximately 1m plain pipe over a length of slotted pipe surrounded by pea gravel and sealed at the top with bentonite and concrete.

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 investigation¹¹.

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

⁷ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice." BS10175:2017.

⁸ British Standards (2002) Geotechnical investigation and testing – Identification and Classification of Soil. Part 1: Identification and description. BS EN ISO 14688-1:2002.

⁹ British Standard (2015). "Code of Practice for Ground Investigations". BS5930:2015.

¹⁰ CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

¹¹ EA (2000). "Technical Aspects of Site Investigation. Volumes 1 & 2 Text Supplements Research and Development Technical Report." P5-065/Tr.

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 C665¹² 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 Deets laboratory 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 Deets.

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.

Suites and Contaminants	No. Samples	Location & Depth	Justification
Metals / metalloids, pH, water soluble sulphate, speciated PAHs, SOM and asbestos screen.	4	BH1 0.10-0.30m BH2 0.30-0.80m BH2 2.80-3.80m BH3 0.50-0.70m	A basic suite with a broad selection of contaminants tested on samples across the site where no significant evidence of contamination was identified (with the exception of occasional ash and coal) and no TVOCs identified from the PID tests.

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

Notes:

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

Metal/metalloids=arsenic, cadmium, chromium, (total and hexavalent), copper, lead, mercury, nickel, selenium, vanadium, zinc and boron; PAH=polycyclic aromatic hydrocarbons, SOM=Soil Organic Matter.

3.4 Gas Monitoring

A moderate / low risk was identified in the preliminary contamination conceptual model for gas (pollutant linkage 3) and further action was only recommended if significant organic / putrescible material was identified on site. Based on the ground conditions encountered, LKC did not consider gas monitoring to be required. This is discussed further in Section 6.3.

3.5 Geotechnical Testing

3.5.1 In-situ Onsite Geotechnical Testing

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

- » Standard Penetration Tests (SPTs) were performed in the window sample boreholes at approximately 1m intervals, generally within the natural strata.
- » Pocket penetrometer tests (to determine undrained shear strength) were performed in the window sample boreholes at approximately 1m intervals to a depth of 3.50mbgl, within the natural clay strata.

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

¹² CIRIA (2007). "Assessing Risks Posed by Hazardous Ground Gases to Buildings." CIRIA C665.

3.5.2 Laboratory Geotechnical Testing

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

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

Suites and Contaminants	No. Samples	Location
BRE SD1 Short Suite	2	BH1 0.30-1.10m BH2 2.00-2.80m
Atterberg Limits (plasticity testing)	3	BH1 1.50-2.00m BH2 2.80-3.80m BH3 2.50-3.00m
Particle Size Distribution (PSD)	1	BH1 3.60-4.00m

Table 3-2. Summary of geotechnical testing undertaken.

4 Ground Conditions

4.1 Geology – Generalised Sequence

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

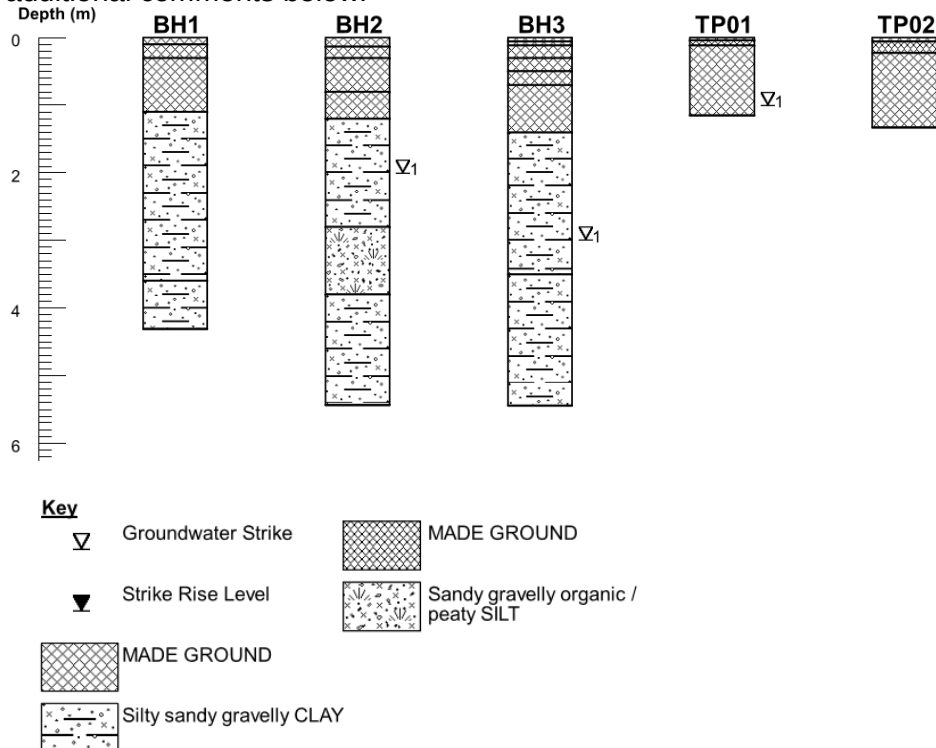


Plate 4-1: Summary of ground conditions.

Additional information on ground conditions:

Made Ground

Made Ground was encountered at all exploratory locations and comprises a thin layer of Tarmacadam in the Window Sampling locations (BH1 to BH3) or paving flag at the trial pits (TP101 and TP102).

Hardstanding was underlain by sandy gravel or slightly gravelly sandy silty clay or very gravelly silty sand to depth of 1.10 to 1.40mbgl.

BH3 borehole recorded a layer of paving block was present at depths of 0.30m to 0.50mbgl.

Natural

Natural strata underlying the Made Ground consists of Firm becoming stiff and very stiff with depth, variably silty, sandy, gravelly CLAY to the completion depths of the window sample holes. At 2.80mbgl in BH2, a 1.00m thick horizon of soft organic slightly gravelly sandy SILT was encountered. It is probable that this is representative of the historic course of the stream that ran through the site.

The extent of the Made Ground was not proven in either of the trial pits locations.

Contamination

With the exception of the anthropogenic material encountered in the Made Ground (as described above), no further contamination was identified.

There was no visual / olfactory evidence of hydrocarbons or volatile contaminants in any locations. The PID recorded a maximum of 0.1ppm TVOC in the samples.

4.2 Groundwater

4.2.1 Groundwater Levels

Groundwater strikes were recorded during the investigation in 2no. boreholes. Results are summarised in Table 4-1.

BH/TP	Water Strike Depths (mbgl)	Well Response Zone (mbgl)	Evidence of Contam?
BH1	Dry	N/A	N
BH2	2.0	1.0-3.0 (MG/C)	N
BH3	3.0	N/A	N

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

Response Zones:

MG=Made Ground; C=Clay.

4.3 In-Situ Geotechnical Testing

4.3.1 Standard Penetration Tests

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

Approximate Depth (mbgl)	SPT 'N' Values		
	BH1	BH2	BH3
1-2	12 (C)	4 (MG/C)	6 (MG/C)
2-3	15 (C)	5 (C)	5 (C)
3-4	32 (C)	3 (Si)	9 (C)
4-5	50 (C)	31 (C)	32 (C)
5-6	-	50 (C)	50 (C)
GW Level	-	2.0	3.0

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

Notes:

MG=Made Ground; C=Clay; Si=Silt.

Groundwater level based on strikes during investigation.

4.3.2 Pocket Penetrometer

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

Approximate Depth (mbgl)	Average Undrained Shear Strength (kN/m ²)		
	BH1	BH2	BH3
1-2	152.00 (C)	41.90 (C)	93.28 (C)
2-3	206.00 (C)	39.80 (C)	73.60 (C)
3-4	-	40.90 (C)	-
GW Level	Dry	2.0	3.0

Table 4-3: Summary of average hand shear vane readings.

Notes:

Groundwater level based on strikes during investigation.
Pocket penetrometer readings can be influenced by coarse material including silt.

4.4 Geotechnical Laboratory Testing

4.4.1 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
BH1	3.60-4.00	Slightly gravelly very sandy CLAY.	100%	97%	57%

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

Notes:

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

4.4.2 Atterberg Limits

Representative samples of natural clay were subjected to Atterberg Limits (plasticity) and Moisture Content testing. Results are presented in Appendix D and summarised in Table 4-5.

Table 4-5 also includes the modified plasticity index as detailed in Chapter 4.2-D5 of the NHBC standards (modified plasticity index = plasticity index x % less than 425µm sieve / 100%).

Location	Depth (mbgl)	Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Class	Passing 425 micron (%)	Modified Plasticity Index (%)
BH1	1.50-2.00	29.6	43	19	24	CIM	85	20.40
BH2	2.80-3.80	35.6	45	22	23	CIM	81	18.63
BH3	2.50-3.00	42.4	47	20	27	CIM	98	26.46

Table 4-5: Summary of plasticity index testing.

Notes:

CIM = Intermediate Plasticity.

The cohesive soils are of intermediate plasticity. The modified plasticity index ranges between 19% and 26%. This characterises the CLAY as having low to medium volume change potential.

4.4.3 Sulphate and pH

Water soluble sulphate and pH tests were carried out on soil samples. Full results are presented in Appendix C and summarised in Table 4-6.

Strata	pH	Sulphate (g/l)
Made Ground	7.3-8.8	0.01-0.07
Natural Strata	7.0-8.0	<0.01-0.02

Table 4-6: Summary of pH and sulphate results.

5 Geotechnical Assessment

5.1 Proposed Development

It is understood that the proposed development will comprise demolition of the existing pavilion building and construction of a new one storey pavilion with partial basement to include classrooms, study spaces, toilet/change rooms, staff room, dining hall and storage space.

It is understood that the storage space will be in the basement, according to the Drawings no. L1003 and no.L1007 (dated February 2023), located to the western side of the new building. Details of the proposed loadings are not known at this stage and the preliminary geotechnical assessment will be undertaken in terms of undrained shear strength for the cohesive soils.

The finished ground levels have not been provided and it is therefore anticipated that they will not vary significantly from current levels. However, should the development proposals or finished levels be altered then the 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 7¹³.

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 and Foundation Inspection Pits

Ground conditions identified at the site are detailed in Section 4.1.

Made Ground was encountered at all exploratory locations and comprises a thin layer of Tarmacadam in the Window Sampling locations (BH1 to BH3) or paving flag at the trial pits (TP101 and TP102), underlain by various type of strata of sandy gravel or slightly gravelly sandy silty clay or very gravelly silty sand to depth of 1.10 to 1.40mbgl. At BH3 borehole location, a layer of paving block was present at depths of 0.30m to 0.50mbgl.

Natural strata comprises firm becoming stiff and very stiff, variably silty, sandy, gravelly CLAY to the completion depths of the window sample holes (max 5.44mbgl). At the location of BH2, a horizon of soft organic slightly gravelly sandy SILT was recorded between 2.80m and 3.80mbgl and is considered representative of the base of the historical stream which ran through the site.

The extent of the Made Ground was not proven in either of the trial pits locations.

Bedrock was not encountered within any of the exploratory holes during this investigation.

¹³ British Standard. Eurocode 7: Geotechnical design – Part 1: General rules. BS EN 1997-1:2004+A1:2013

No detailed ground conditions information is available for the proposed area of the storage basement and any preliminary assessment will be undertaken based on the available information described in this report.

Two foundation inspection pits were undertaken adjacent to the existing school building to expose the existing foundations. The two foundation pits were located on the southern side of the school building, where the new modular building is proposed to be built. The location of the foundations inspection pits (TP01 and TP02) is shown in Figure 3.

At TP01, a concrete slab base was found at 0.10mbgl and it was partially exposed above ground level. At TP02, the concrete slab base was at 0.17mbgl and partially exposed above ground level. At both pit locations, Made Ground was encountered to a depth of 0.50mbgl and it is considered that the foundation may lay directly over Made Ground of gravelly sandy silt.

All foundation inspection pits noted perched groundwater at the base of the pits.

Foundation sketches are included in the logs within Appendix A

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 Works¹⁴. 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 will be present from the demolition of the existing building. These should be excavated from below the proposed development foot print with the resulting void backfilled.

The near surface soils may potentially be disturbed by weathering and site traffic. Precautions should be taken to avoid this, as excessive disturbance may result in more onerous floor slab design, road cap thickness and increased amount of site disposal etc. Based on site observations the near surface soils, it is not anticipated that any treatment or reinforcing is required.

5.4 Foundation Conditions and Bearing Capacity

5.4.1 General

It is considered that the Made Ground is not suitable for a founding material due to the inherent variability of the material. The load of the new building should be transferred to the natural strata of the firm to stiff CLAY.

Foundation options are therefore:

- » Shallow foundations, raft, pad or strip for the main building.

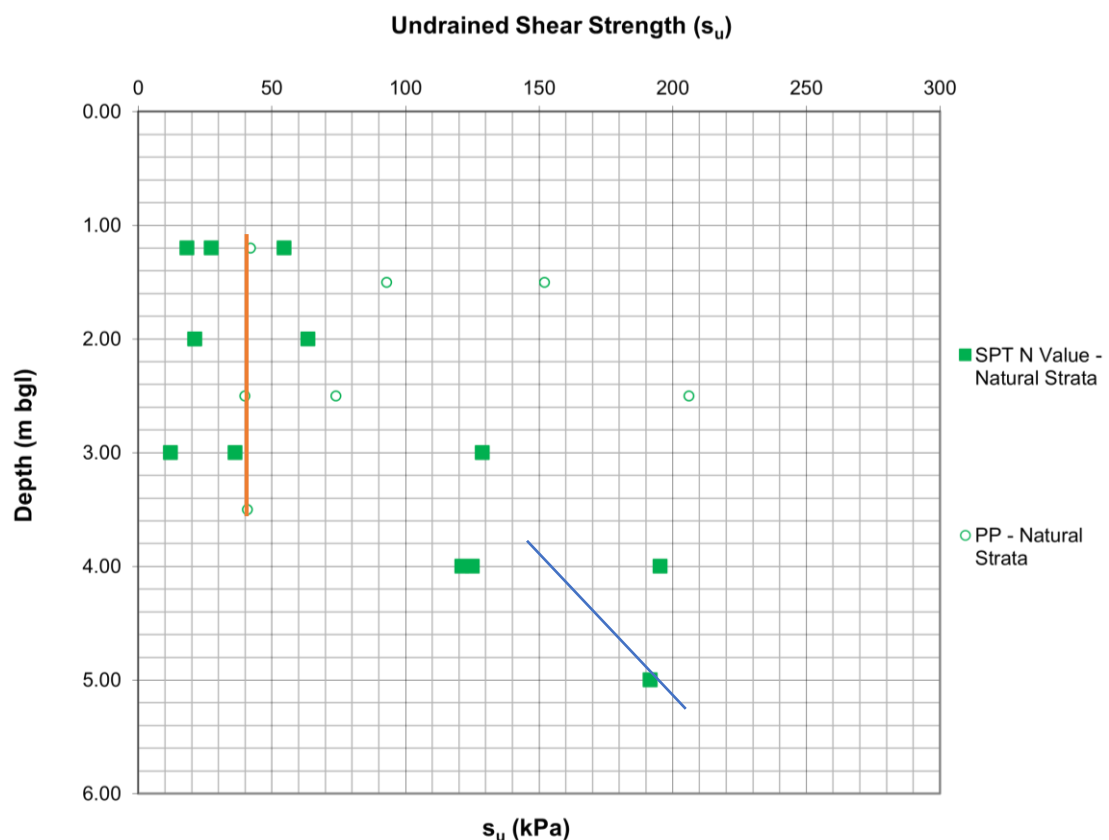
¹⁴ Specification for Highway Works, Volume 1. Series 200 – Site clearance. February 2016.

- » Shallow foundations, pad or raft for the proposed basement on the western side.

An assessment for deep foundations, including piles, and ground improvement technique has also been undertaken in case the proposed loads at the new building is higher than that supported by shallow foundations.

For the basement, it is unknown at which depth the basement level will be excavated. An assessment for shallow foundation has been undertaken at 2.50m below current ground level, assuming that the storage room basement will be excavated up to this depth.

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



Graph 5-1: Summary of s_u vs depth from in-situ geotechnical testing.

Note:

Design line as best fit lines in solid orange and blue. See text for explanation.

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

The pocket penetrometer readings, ranged between 39kPa and 206kPa.

The SPT N values for the natural cohesive soils ranged between N5 at low depths, increasing up to N>50 (refusal) at the base of the boreholes, generally showing an increase with strength with depth. The exception to this is BH2 which returned low SPT N values of N3 to N5 to a depth up to 4mbgl which is considered representative

of the historical stream that ran through this area of the site (as shown in Fig 4). Below 4mbgl in BH2, more competent N values were returned representative of the stiff to very stiff CLAY.

Within the natural firm to very stiff CLAY, undrained shear strengths (s_u) assessed from the SPTs range between 55kPa to 129kPa, increasing to 121kPa to 195kPa below 4mbgl.

At the location of BH2, the softer material associated with the presence of the historical stream return a reduced s_u of between 12kPa to 36kPa.

BH2 and BH3 were positioned close to the former sluice stream (refer to Figure 4), which is shown crossing the southern part of the proposed redevelopment up to 1922 mapping. The area of the proposed storage room basement is aligned with the former stream and low strength CLAY is expected to be present, similarly to those at BH2 and BH3 locations, to a depth of 3.50m – 3.80mbgl.

A conservative s_u value of 40kPa is assigned to the firm CLAY from a depth of 1.20m to 3.50mbgl, increasing to 155kPa at 4.00mbgl and 195kPa at 5.00mbgl. Where the soft organic CLAY is encountered at borehole location BH2, a conservative s_u value of 25kPa is assigned to this material up to a depth of 3.50mbgl.

5.4.2 *Strip Foundations*

Strip foundations bearing upon the firm to stiff CLAY will return an allowable bearing capacity (ABC) of 69kN/m². This has been calculated using a Factor of Safety (FoS) of 3 and an undrained shear strength of 40kN/m² taken from Graph 5-1, assumed soils are similar to those at BH1 location.

The presence of the historic sluice stream along the southern section of the proposed development will mean strip foundations would need to be stepped down to a depth of at least 3.80mbgl along the southern edge of the structure. This option would require detailed structural design and it is unlikely that this option would be economically viable.

Atterberg limits determinations, summarised in Table 4-5 show the CLAY to be of intermediate plasticity and low to intermediate volume change potential and as such the sides of the foundations may require protection using clay board or similar.

5.4.3 *Raft Foundations*

For the proposed new building, raft foundations may be the most appropriate cost-effective foundation option for the proposed development. Loads are not known at this stage.

Rafts are typically constructed using reinforced concrete, underlying the whole structure footprint and as such distributing the structures load over a larger area than other shallow foundation types. The use of a raft reduces potential differential settlements caused by soil variability in ground conditions and differential stiffness of the soils.

The ground conditions were considered consistent across the site in terms of soil types encountered, with the exception of BH2 where organic SILT is present between 2.80m and 3.80mbgl.

Raft foundations should be constructed on a compacted hardcore base of minimum thickness of 150mm. As Made Ground has been encountered up to a depth of 1.40mbgl, this should be excavated out and replaced with suitable compacted granular material placed in layers up to formation level.

It is anticipated that the bearing capacity based on a conservative average SPT value of N5 (averaging for the competent ground to allow bridging over the poorer weaker ground), is in the order of 108kN/m² for a raft foundation, assuming a breadth of 10m.

This bearing capacity value is preliminary and the design of the raft foundation must be undertaken by a qualified structural engineer.

5.4.4 *Piled Foundations*

As an alternative consideration may be given to the use of mini-piled foundations to transfer loadings through any deep Made Ground / poor ground conditions and bear upon the shallow competent stiff CLAY at depths encountered of c.2.50m.

Use of mini-piles will reduce the amount of offsite disposal of spoil generated from foundation trenches along with reducing the amount of concrete required for the development.

Up to 1.40m of Made Ground and up to 3.80m of soft organic SILT has been recorded within the exploratory holes and consideration must be given to the potential for negative skin friction to have an adverse effect upon the piles.

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.

Should a piled foundation solution be the preferred option then warranty providers, such as NHBC or LABC, may require further information on ground conditions to a minimum of 5m below the base of the pile.

5.4.5 *Ground Improvement*

The use of ground improvement techniques, such as vibro stone columns, will allow shallow foundations to be utilised within the Made Ground and soft natural strata and will depend on the proposed loads. Ground improvement techniques should provide a bearing capacity of around 150kN/m² but will also remove variability within the ground. Specialist advice should be sought from a suitably experienced contractor with regard to allowable bearing capacity and settlements and advising on the suitability of the technique.

As a general rule the NHBC¹⁵ recommend that these columns should not be used in granular soils with more than 10% of fine soils of clay or silt, or in cohesive soils with plasticity index above 40%, or undrained shear strength lower than 30kPa. It is recommended that this is discussed with a specialist contractor should this option be considered.

Recommendation

Deep strip foundations below 2.5m depth are generally not economic and whilst a piling ground improvement solution is viable it is considered that a raft foundation will provide the most reliable and cost effective option for the site.

¹⁵ National Housing Board Council (2022). Foundations. Part 4.

5.5 Basement

It is proposed to construct a basement at the far western end of the re-development. This basement is planned as a storage room. No information has been provided on the depth or type of construction of the basement and the material used.

There is limited ground investigation and laboratory data available for the proposed basement location. From the historical maps, the proposed basement appears to be located across the former stream (sluice) position, therefore the soils encountered at borehole locations BH2 and BH3 will be used for this preliminary assessment. It is anticipated that alluvium type deposits are present, associated with the historical stream which is shown running through the location of the proposed basement, organic cohesive soils and/or loose granular soils and potentially organic soil should be expected during excavation work. Organic SILT was encountered at a depth of 2.80mbgl at borehole BH2. At borehole BH2 and BH3, the Made Ground is underlain by soft to firm low to medium strength CLAY to a depth of 3.00-4.00mbgl, overlying firm very sandy silty CLAY to the base of the borehole. It is recommended that following the demolition of the existing building, further investigation is undertaken in this area.

Whilst this report is not a Basement Impact Assessment (BIA), the following comments are applicable. The proposed development is to be located nearby to an existing structure and it is unknown if these buildings have basements. As such, a BIA may become necessary. Further enquiries will therefore be required during detailed design, using Party Wall Act protocols if necessary, in order to determine the likely/actual relative levels of the ground floors and the depth of the basement. In order to construct the basement, excavation of the soils adjacent to existing foundations may be required. It is normal when excavating soils adjacent to foundations that the 45-degree rule is utilised whereby soils are not disturbed within this zone created by a line drawn down from the existing foundation at 45 degrees.

In view of the above, some ground movement is inevitable when basements are constructed. The magnitude of the movements in the ground being supported by the new basement walls is dependent primarily on:

- » The geology;
- » The adequacy of temporary support to both the excavations and the partially complete walls prior to installation of full permanent support; and
- » The quality of workmanship when constructing the permanent structure.

The following minimum temporary support requirements are recommended for any retaining walls:

- » Full face support must be installed as the excavations progress for all excavations (in the anticipated shallow and deeper natural CLAYs and organic SILTs) required for the basement.
- » Temporary support will be required to be maintained until full permanent support has been completed, including allowing time for the concrete to gain adequate strength.

All temporary support should use high stiffness systems installed in a timely manner with excavation limited in accordance with best practice, in order to minimise the ground movements. Full details of the temporary works should be provided in the contractor's method statements. In view of this careful support of existing soils and foundations would be required during the construction phase. A high quality of

workmanship and use of best practice methods of temporary support are therefore crucial to the satisfactory control of ground movements alongside basement excavations.

If constructing retaining walls in panels of limited width on a similar 'hit and miss' basis, it is inevitable that the ground will be unsupported or only partially supported for a short period during excavation of each pin/panel, even when support is installed sequentially as the excavation progresses. This means that the behaviour of the ground will depend on the quality of workmanship and suitability of the methods used.

Condition surveys should be undertaken of the adjacent structures before the works commence in order to provide a factual record of any pre-existing damage.

Precise movement monitoring should be undertaken weekly throughout the period during which the basement walls and slab are constructed with three sets of initial readings taken before excavation of the basement starts in order to obtain a baseline assessment of the current degree of movements in the building. Readings may revert to fortnightly once all the perimeter support is in place. It is recommended that a structural engineer is consulted to specify a suitable monitoring program.

If any structural cracks appear in the main loadbearing walls of the adjacent structures then the structural engineer should be immediately informed and those cracks should be monitored using the Demec system (or similar) on the same frequency as the target monitoring. The method of damage assessment should be specified by the structural engineer and consist of the limiting tensile strain approach as described by Burland et al (1977), Boscardin and Cording (1989) and Burland (2001); see Table 2.5 and Figure 2.18 in Ciria C580¹⁶.

5.6 Ground Floor Slabs

At the proposed school building, Made Ground was recorded up to a depth of 1.40mbgl. It is considered that if the sub-grade is prepared by a combination of excavation and replacement with engineered fill in suitably compacted thin layers, a ground bearing floor slab may prove suitable for the proposed development for shallow foundation option. Should a raft foundation be selected then this could incorporate the ground bearing floor slab.

Due to the differing depths of Made Ground encountered, it is not possible to recommend a uniform excavation depth, so a raft foundation will require detailed design to accommodate variability of the formation and account for differential settlement between the differing depths of engineered fill.

A piled structure will generally have a suspended or piled floor due to potential differential settlement between the floor and the shell. Suspended floor slab could be a viable solution also if ground improvement techniques are used for the foundations.

Where suspended floor slabs are employed ventilation of the under-floor void will be required to address condensation issues.

For the basement, the ground floor may consist of a simply slab or a combination of slab and beams, of a required thickness and rigidity, depending if a raft foundation is used. If any organic soils are encountered below the basement level, for shallow

¹⁶ CIRIA (C580) - Embedded retaining walls – guidance for economic design. July 2003.

foundation this soil type should be excavated and replaced with engineered granular fill.

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

5.7 Drainage

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

5.8 Concrete Durability

Based upon the results of the chemical analyses summarised in Table 4-6 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-1 in accordance with the recommendations provided in BRE Special Digest 1 (2005)¹⁷ for the Made Ground and the natural strata.

5.9 Excavations

Site observations indicated that excavations should be feasible in the near surface with normal plant, however obstructions, including former foundations and former floor slabs, are expected to be present during excavation for construction works. It is anticipated that any obstructions will be grubbed out during the reduced level dig for the sub structure works.

Groundwater seepage was recorded at borehole locations BH2 and BH3 at 2.00m and 3.00mbgl, respectively. Boreholes and trial pits were stable.

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 R97¹⁸. It is anticipated that the basement will be formed either with an open excavation, in which case the side slopes should be suitably battered, or the excavation will be supported with sheet pile or secant bored pile wall. Groundwater seepages may be present as perched water during construction works.

5.10 Construction Activity and Inspection

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

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

¹⁷ BRE (2005). "Concrete in Aggressive Ground." Special Digest 1.

¹⁸ CIRIA Report 97 – Trenching Practice – Second Edition (2001 revision)

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).

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 (LCRM¹⁹). 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^{20,21}. The change to the contaminated land guidance has changed the evaluation of risk from 'minimal' (referred to as Health Criteria values (HCVs))²² 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 S4ULs²³. 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^{24,25,26,27}.

If contaminants are not present as C4SLs and S4ULs then LKC will use ATRISK SSVs or CL:AIRE GACs²⁸. 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

¹⁹ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

²⁰ Defra (2014). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Policy Companion Document."

²¹ CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

²² EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²³ LQM (2014). "The LQM/CIEH S4ULs for Human Health Risk Assessment."

²⁴ EA (2008). "Updated Technical Background to the CLEA Model." Science Report – SC050021/SR3.

²⁵ EA (2008). "Human Health Toxicological Assessment of Contaminants in Soils." Science Report – SC050021/SR2.

²⁶ EA (2008). "A Review of Body Weight and Height Data used within the Contaminated Land Exposure Assessment Model (CLEA)." Project SC050021/Technical Review 1.

²⁷ EA (2009). "Compilation of Data for Priority Organic Pollutants for Derivation of Soil Guideline Values." Science report SC050021/SR7.

²⁸ CL:AIRE (2009). "The Soil Generic Assessment Criteria for Human Health Risk Assessment."

PAHs^{29,30} and naphthalene the most volatile and soluble³¹. 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 negligible³². For B(a)P to be used as a surrogate marker it should follow the profile described by the HPA (2008)³³ and CL:AIRE (2013). Naphthalene will be treated separately using the LQM S4ULs.

The proposed development is for a school building with no soft landscaping. Adopting a conservative approach, the assessment criteria for residential with plant uptake has been used.

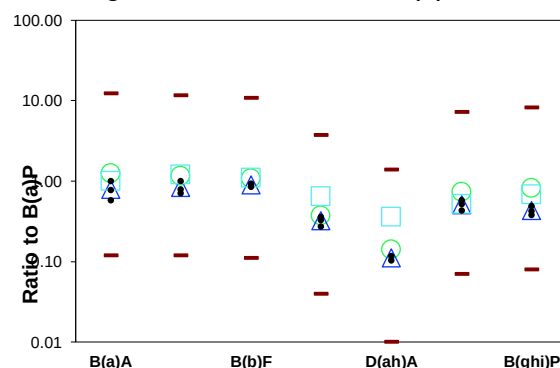
All criteria have been generated using the CLEA V1.06 model³⁴ based either on 1%, 2.5% and 6% Soil Organic matter (SOM). Results will be compared to the nearest appropriate SOM.

A summary of the generic assessment criteria is provided in Appendix E. 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*³⁵, 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 4 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)

²⁹ EA (2002). "Contaminants in Soils: Collation of Toxicological Data and Intake Values for Humans. Benzo[a]pyrene." R&D Publication TOX2.

³⁰ USEPA (1984). "Health Effects Assessment of Polycyclic Aromatic Hydrocarbons (PAHs). EPA 540/1-86-013."

³¹ EA (2003). "Review of the Fate and Transport of Selected Contaminants in the Soil Environment." Draft technical report P5- 079/TR1.

³² CL:AIRE (2013). "SP1010: Development of Category 4 Screening Levels and Assessment of Land Affected by Contamination – Final project Report."

³³ HPA (2010). "HPA Contaminated Land Information Sheet: Risk Assessment Approaches for Polycyclic Aromatic Hydrocarbons (PAHs)." Version 3.

³⁴ EA (2008). "CLEA Software (Version 1.05) Handbook." Science Report – SC050021/SR4.

³⁵ 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

Results have been compared to the relevant assessment criteria and no elevated contaminants were identified.

No asbestos was identified in any soil samples analysed.

6.2.3 Direct Contact Risk – Pollutant Linkage 1

As stated in the PRA report, there is no proposed soft landscaping, and the site will be fully covered by the proposed building.

No elevated concentrations of contaminants were identified within the soil samples analysed.

Given there are no elevated contaminants within the soils and no viable pathway has been identified, LKC consider the probability of metals, PAHs and ACM to be of low likelihood. No further assessment required.

6.2.4 Risk from Inhalation of Vapours – Pollutant Linkage 2

No visual / olfactory evidence of volatile contaminants was identified during the investigation. The PID did not detect any TVOCs. Confirmatory soil analysis did not detect any VOCs / SVOCs above detection limits.

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

6.3 Gas Risk Assessment

Gas monitoring was not carried out as part of this assessment. The PRA identified a moderate risk and recommended gas monitoring if a significant depth of organic / putrescible material was identified.

Guidance given in CL:AIRE RB17³⁶ has been used to assess the risk.

Organic / putrescible material was encountered on site between 2.80-3.80mbgl. Likely associated with the former stream on site (1907-1922). Made ground was recorded to 1.1-1.4mbgl, which comprised reworked natural ground with occasional/rare brick, coal, ash and brick.

The organic clay was encountered to the south of the proposed building (BH2) between 2.80-3.80mbgl. The other 2no. locations (BH1 and BH3) closer to building footprint did not identify the same organic material. Given the organic material was only identified within 1no. location, it is considered to be highly localised and within the former river channel only. The position of the former stream is shown in Figure 4.

³⁶ CL:AIRE Research Bulletin 17. "A Pragmatic Approach to Ground Gas Risk Assessment". November 2012.

The proposed basement in the western side of site is within the location of the former stream. However, given the depth of the organic material and the depth of proposed basement, it likely will be removed during the construction phase within this area. Figure 4 shows the position of the former stream in relation to the existing and proposed building.

With regards to the basement itself, LKC assume it will be tanked and waterproofed. According to the guidance BS8485: 2015 +A1:2015, this provides 2.5 points, which is suitable gas protection for a Type C building. The depth and extent of organic material beneath the proposed building will need to be confirmed during the construction phase.

If organic material is encountered beneath the existing building the following assessment must be considered:

CL:AIRE RB17 states: *"Alluvial soils can quite often give high concentrations of methane and carbon dioxide in monitoring wells, often methane concentrations can reach up to 90%. This is because the gas has been generated historically and is trapped in the pores due to limited transport (at low diffusion rates). The methane accumulates at increasing depth in peat columns, but this does not indicate high rates of production. There is no, or very little, current gas generation and the carbon dioxide has dissolved out of the gas trapped in the soil pores which causes a higher percentage of methane to be recorded. Experience on many dockland and similar sites has shown that sites on Alluvial soils do not generate sufficient hazardous gas flows to exceed Characteristic Situation 2 as defined in BS 8485: 2007). Therefore if gas monitoring is not undertaken it is acceptable to simply install Characteristic Situation 2 protection on sites where Alluvial soils are present."*

Based on the ground conditions on site, the extremely localised areas of organic material and likely reduced levels excavations, LKC consider the probability of gas affecting site users and buildings as unlikely. Assuming a severe consequence, there is a moderate / low risk associated with Pollutant Linkage 3 and no remedial measures are required. However if significant organic and / or putrescible material encountered beneath footprint of proposed building (exceeding 3.80mbgl), precautionary gas protection measures will be required.

6.4 Controlled Water Assessment

The PRA identified a low risk with respect to controlled waters as no significant source of mobile contamination was anticipated. Furthermore, although a Principal Aquifer is present below the site, no abstractions have been identified within influencing distance. The surface water is not considered to be a significant receptor.

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

6.5 Additional Risk Assessments

6.5.1 Potable Water Supply (Pollutant Linkage 5)

Soil results were compared to United Utilities (UU) guidelines for the selection of potable water pipes in land potentially affected by contamination³⁷. Only contaminants

³⁷ UU(2011). "United Utilities Water Supplementary Guidance for the Selection of Water Pipes in Land Potentially Affected by Contamination."

of concern, based on the preliminary conceptual model and ground conditions encountered, were analysed. The following contaminants were not considered to be a risk and therefore not included in the analysis suites: chlorinated compounds, BTEX compounds, phenols, cresols, ethers, nitrobenzene, ketones, aldehydes and amines.

No elevated contaminants were identified when compared to UU assessment criteria.

The probability of organic contaminants affecting potable water pipes is unlikely. Given the consequence is considered to be medium, the risk (Pollutant Linkage 6) is anticipated to be low and no remediation (i.e. barrier pipe) is likely to be required.

UU may require a Potable Waters Risk Assessment to be carried out prior to the connection of any new water supply. This should be carried out once details of the pipeline location and depths are known.

6.6 Revised Contamination Conceptual Model

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

The revised contamination conceptual model is presented in Table 6-1.

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

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

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

Pollutant Linkage	Pathway	Receptor	Contaminant	Probability	Consequence	Risk	Assessment
PL1	No viable pathways (dermal inhalation, ingestion).	-Future site users. -Offsite receptors.	-ACM -Heavy metals -PAHs -Petroleum hydrocarbons	-	-	-	-No elevated contaminants identified within soil samples analysed -No viable human health pathways as no soft landscaping. No pollutant linkage therefore no further assessment required.
PL2	- Inhalation of vapours. - Migration via permeable strata and preferential pathways.	- Future site users. - Offsite receptors.	Volatile contaminants - No elevated contaminants identified	Medium	Medium	Low	-No elevated volatile contaminants identified within soils analysed. - 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 - Methane	Low likelihood	Severe	Moderate / Low	-Organic material encountered to the south of the proposed building between 2.80-3.80mbgl. -Former stream in location of proposed basement area, organic material likely to be removed during construction phase given depth. - Recommendation: No further assessment required at this stage, however if significant organic and / or putrescible material encountered beneath footprint (exceeding 3.80mbgl) of proposed building during groundworks, precautionary gas protection measures may be required.
PL4	- Surface run-off. - Migration via permeable strata and preferential pathways. - Perched waters migration.	Groundwater (Principal Aquifer, Secondary Undifferentiated Aquifer).	Mobile contaminants: - No elevations identified.	Unlikely	Medium	Low	-No elevated mobile contaminants identified - Recommendation: No remediation required.
PL5	- Ingestion of tainted water supply.	-Future site users (via potable water).	Organic Contaminants: - No elevations identified.	Unlikely	Medium	Low	-No elevated contaminants identified. - Recommendation: Barrier piping unlikely to be required. However, this will need to be confirmed once UU risk assessment undertaken.

Table 6-1: Revised Contamination Conceptual Model.

Notes

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

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

7 Waste Disposal Assessment

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

As an initial screen the soil results were inputted into Hazwaste Online™. This is a web-based facility that allows an assessment waste as either hazardous or non-hazardous waste based on relevant guidance and legislation^{38, 39, 40, 41, 42, 43, 44, 45, 46}.

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

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

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

The results show that all the 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 Hazwaste Online™ output sheets are provided in Appendix F.

³⁸ EA (2018). "Guidance on the Classification and Assessment of Waste (1st Edition v1.1)". Technical Guidance WM3.

³⁹ CLP Regulation - Regulation 1272/2008/EC of 16 December 2008.

⁴⁰ 1st ATP - Regulation 790/2009/EC of 10 August 2009

⁴¹ Correction to 1st ATP - Regulation 758/2013/EU of 7 August 2013

⁴² WFD Annex III replacement - Regulation 1357/2014/EU of 18 December 2014

⁴³ Revised List of Wastes 2014 - Decision 2014/955/EU of 18 December 2014

⁴⁴ 13th ATP - Regulation (EU) 2018/1480 of 4 October 2018

⁴⁵ POPs Regulation 2004 - Regulation 850/2004/EC of 29 April 2004

⁴⁶ 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 is not suitable for a founding material due to the inherent variability of the material and its thickness. The loading should be transferred to the firm to very stiff CLAY for the proposed new building.

Foundation options will be dependent upon the proposed load and it is likely to comprise shallow foundations, including strip, raft, pile or ground improvement. It is considered that a raft foundation solution is the most reliable and cost effective option for the site

For the storage basement, excavation to a depth of 2.50mbgl is assumed. No data is available for the basement location and the strata encountered within boreholes BH2 and BH3 are anticipated to be present at the proposed basement location. The basement should be designed by a structural engineer with due consideration given to providing suitable support to the basement walls during construction and to the potential effects upon neighbouring properties.

The basement should be constructed with watertight walls, either of sheet piles or diaphragm wall, encased permanently within the structure.

Groundwater was encountered during site investigation at depths of 2.00m and 3.00mbgl at borehole locations BH2 and BH3. Conventional sump pumping should be adequate during construction works.

The concrete classification in accordance with BRE Special Digest 1 (2005) is DS-1 AC-1 for the Made Ground and the natural strata.

8.2 Contamination Assessment

A revised contamination conceptual model has been produced by LKC which is summarised in Table 8-2 below (more detailed model provided in Section 6.1).

Pollutant Linkage		Risk	Recommendations
1	No viable pathways (dermal inhalation, ingestion).	-	- No elevated concentrations identified. - No viable human health pathways as no soft landscaping. - No pollutant linkage therefore no further assessment required.
2	Volatile contaminants posing a risk to site users future site users and offsite receptors via the inhalation of vapours.	Low	- No elevated volatile contaminants identified within soils analysed. - Recommendation: No remediation required.
3	Gas posing a risk to buildings and site users current site users, future site users, buildings, and offsite receptors via the migration of gas into building causing explosion and asphyxiation.	Moderate / Low	- Evidence suggest organic material is not beneath current footprint, and will be removed during construction of basement area in west of site. - Recommendation: No further assessment required at this stage.
4	Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	- No elevated mobile contaminants identified - Recommendation: No remediation required.
5	Organic contaminants posing a risk to water pipes.	Low	- No elevated contaminants identified. - Recommendation: Barrier piping unlikely to be required. However, this will need to be confirmed once UU risk assessment undertaken.

Table 8-1: Summary Risk Table.

Remedial recommendations are presented in Section 9.

9 Recommendations and Remedial Strategy

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

9.1 Remediation and Validation Recommendations

Table 9-1 details the further works, 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. Should asbestos be identified during groundworks, precautions should be taken to ensure the safety of the construction workers and nearby land users. It would be advisable to introduce an asbestos management strategy in line with CIRIA C733⁴⁷.	Log of work undertaken including photographs. Details of any sampling undertaken and validation of any potential additional remedial work.
	5	<u>Potable Water Pipes</u> It is recommended that a Water Pipeline Assessment is undertaken once the location and depth of potable water pipes are known. It is unlikely that barrier pipe will be required.	Delivery Notes of Pipe Material. Photographs of the Installed Pipe.
Build Phase	3	<u>Gas Risk Assessment</u> Given the position of the proposed basement area and the former infilled stream, it is likely that organic material beneath the proposed building will be removed during the pre-construction phase. If organic material remains in-situ beneath existing building footprint, precautionary CS2 gas protection measures may be required. BS8485⁴⁸ states that a point score of 2.5 is required for a commercial building (Type C). Mitigation may comprise the following: The required 2.5 points of protection can be achieved with the use of: Cast In-situ ground-bearing floor slab = 0.5 points. Gas Resistant Membrane (installed as per BS8485 requirements (Table 7)) = 2 points.	Log of work undertaken including photographs.

⁴⁷ CIRIA (2014). "Asbestos in Soil and Made Ground: A Guide to Understanding and Managing Risks". C733.

⁴⁸ 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.

		Or Ventilation = 0.5-4 points (dependant of type of ventilation) It may be advisable to undertake a cost benefit analysis to establish the most cost effected solution.	
	2,4	No remediation anticipated with respect to PL2 (inhalation of vapours) and PL4 (controlled waters).	TBC
Other Considerations	<u>Grubbing Out of In-Ground Structures</u> It is recommended that in-ground structures are grubbed out as part of the groundworks. In-ground structures expected on site associated with the existing pavilions building, to be demolished prior to proposed building construction.		
	<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 ⁴⁹): ➤ 5,000 tonnes (c. 2,500m³) <u>treatment</u> of 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 before material movement starts onsite. If an MMP is required, this needs to be registered by a Qualified Person (QP) and there must be 'certainty of use' for any material re-used onsite or exported to site to ensure there is no 'sham recovery'. For all the above material will need to be tested at the rate and analytical suites presented in Table 9-2.		
	<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 guidance⁵⁰) should be adopted by all workers involved with site enabling and construction works.		
	<u>Asbestos Survey</u> A Pre-Demolition and Major Refurbishment Asbestos Survey should be undertaken, and any ACMs removed and properly disposed of, prior to the demolition of the existing buildings, by a suitably qualified professional.		

Table 9-1: Remediation and validation requirements

Notes: See Table 6-1 for pollutant linkage (PL) details.

⁴⁹ <https://www.gov.uk/guidance/waste-exemptions-using-waste>

⁵⁰ HSE (1991). "Protection of Workers and the General Public During Development of Contaminated Land" London HMSO.

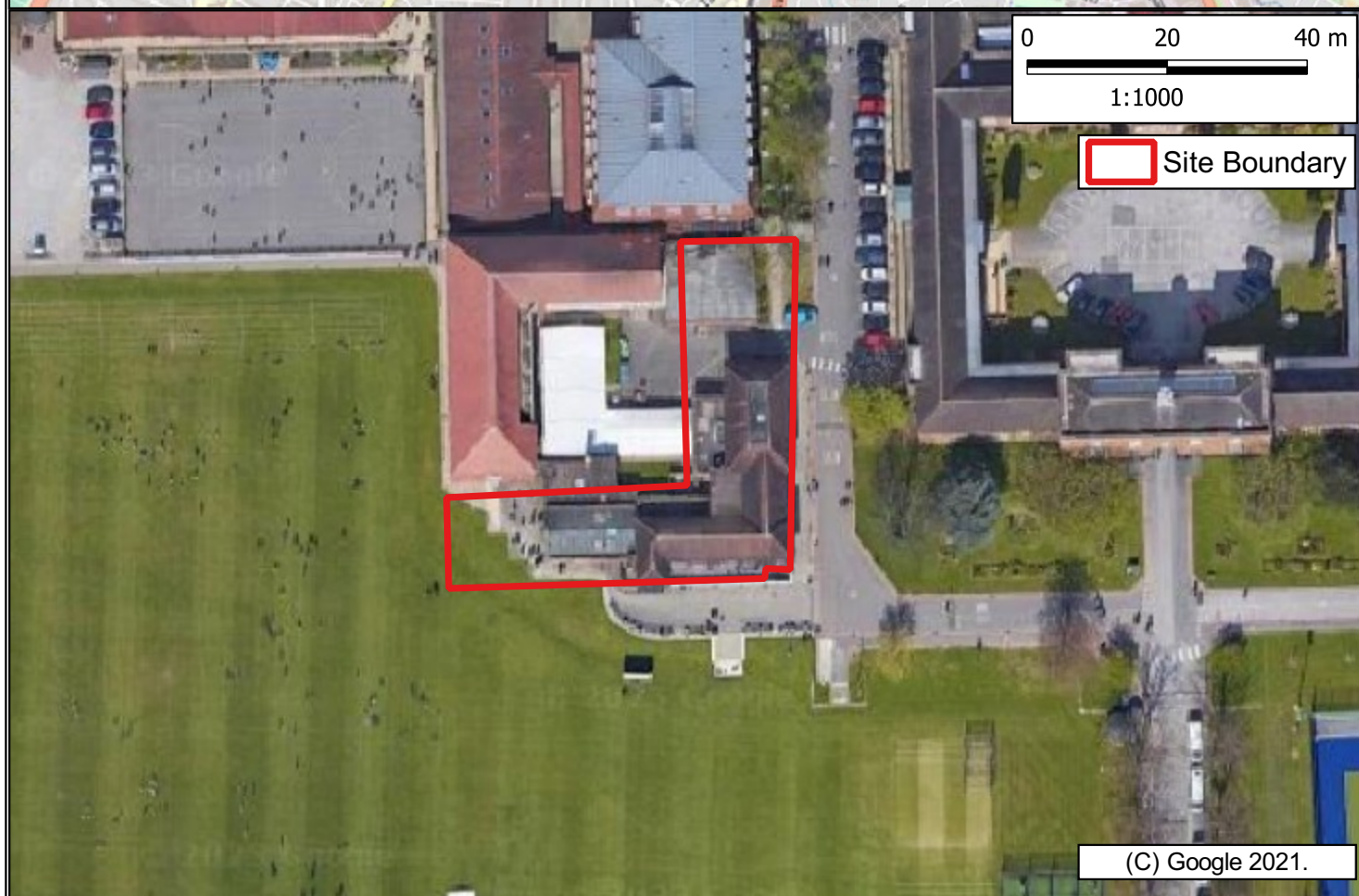
9.2 Site Completion Report

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:

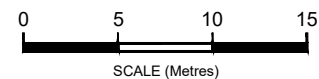
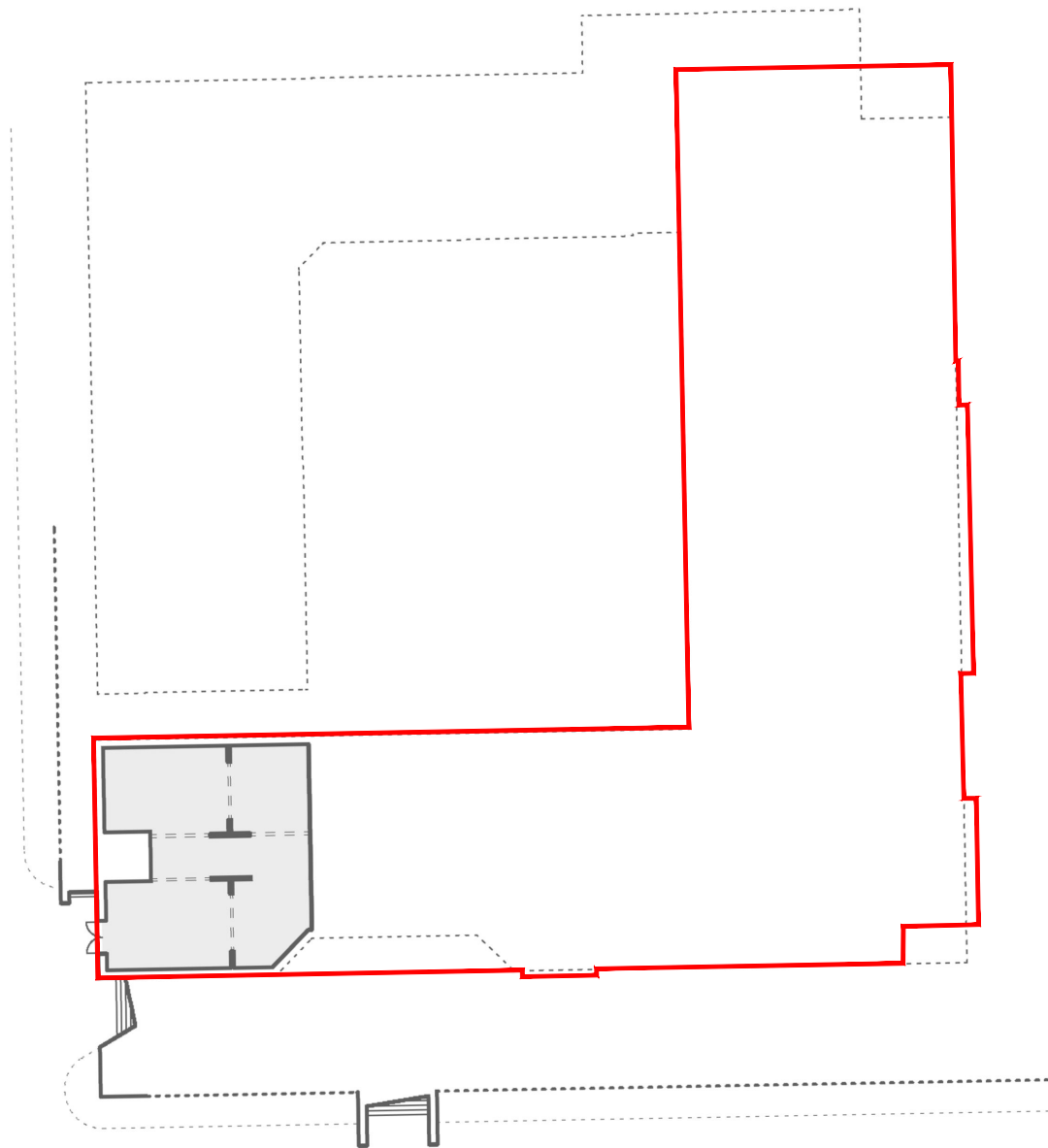
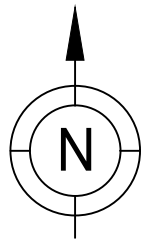
- » Validation of gas protection measures installed (if required).
- » Details of the demolition of the current sports pavilion building within a Pre-Demolition and Major Refurbishment Asbestos Survey.
- » Provision of waste transfer documents.
- » Information on the installation of protective pipes and / or sterile trenches.
- » Details of any unexpected contamination identified onsite, suitably risk assessed and / or validated.

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

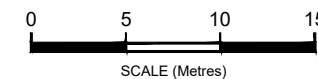
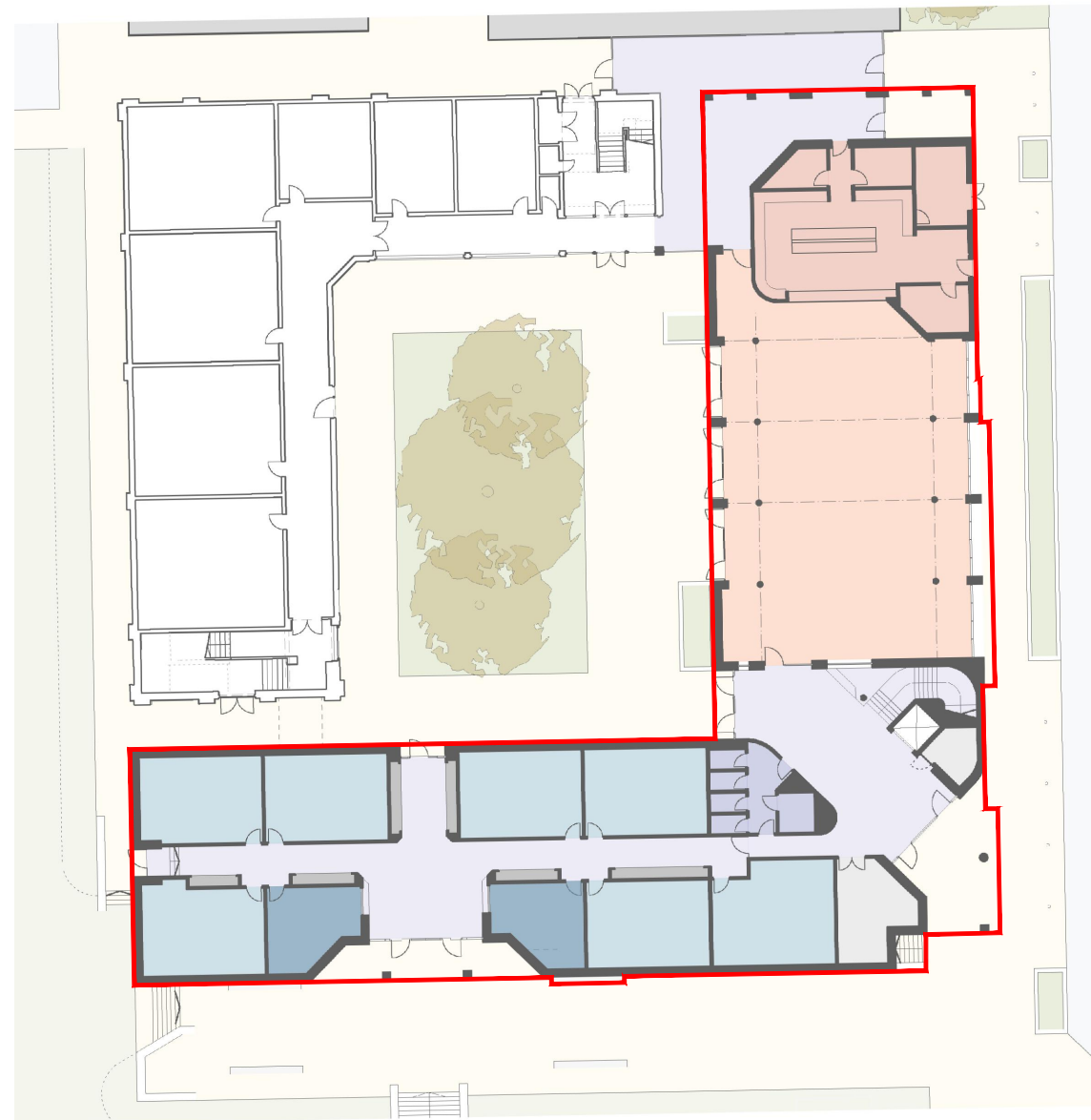
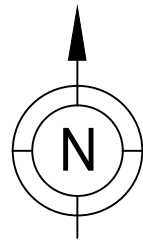
Figures



Client: The Manchester Grammar School				Title: Site Location & Boundary Plan		
Site: Manchester Grammar School, Manchester						
Job No.: LKC 23 1086	Drawn By: CK	Checked By: BRH	Drawn: March 2023	Scale (see scale bar): 1:25,000 & 1:1000 @ A4	Figure: 1	



Extract from: OMI Architects
Drawing Ref: Proposed Basement GA Plan-LEVEL B1, No.L1003 (February 2023)



Extract from: OMI Architects
Drawing Ref: Proposed Ground Floor GA Plan-LEVEL 00, No.L1004 (February 2023)

KEY



- Changing Room
- Medical Room/Sport Staff Room
- Dining Hall
- Kitchen + Deliveries
- Classroom
- Sixth Form Staff Office
- Meeting Room
- Study Space
- Circulation
- WC
- Store
- Bag Storage

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.

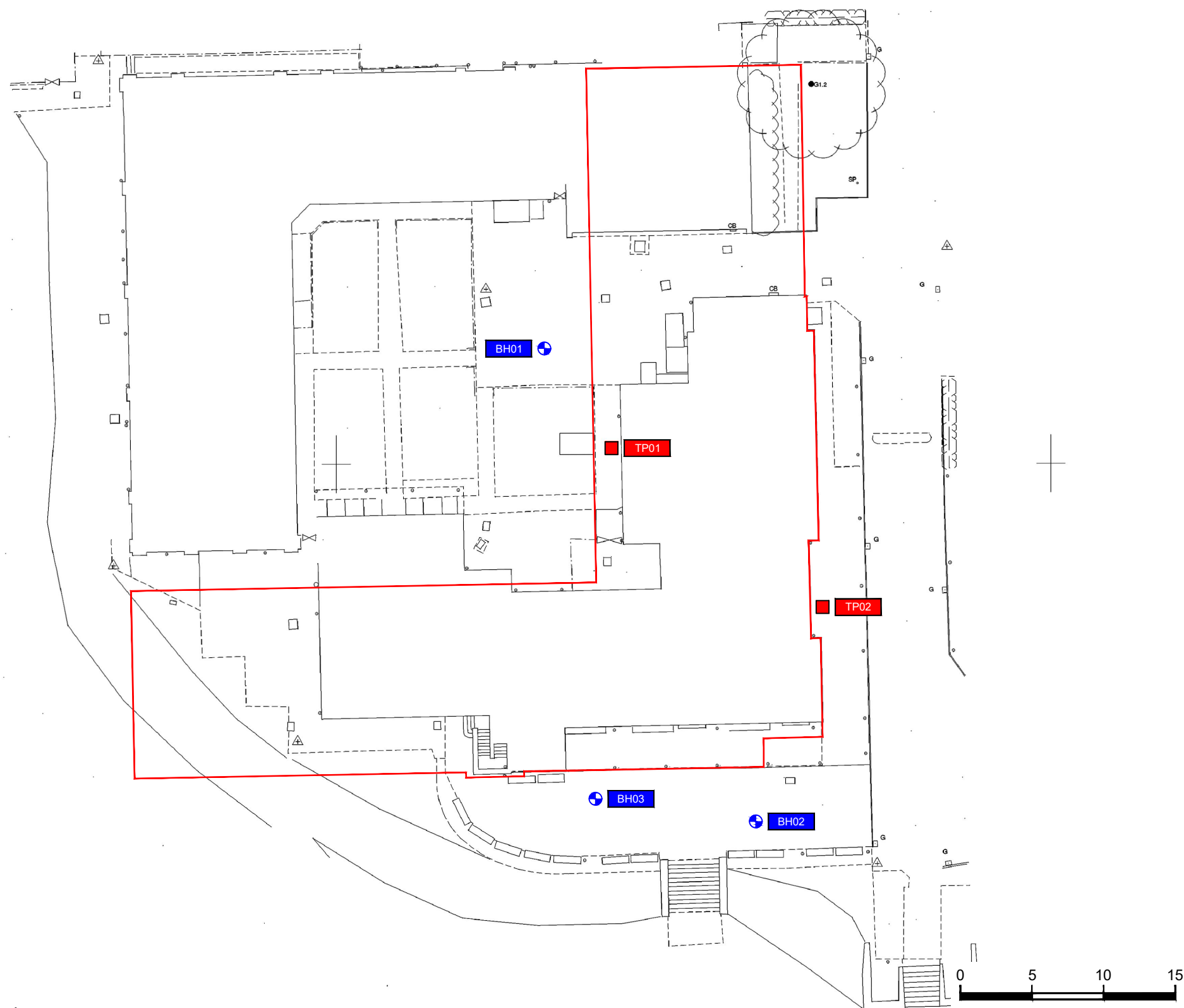
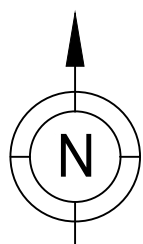


Client:
The Manchester Grammar School

Site:
Manchester Grammar School, Manchester

Title:
Proposed Site Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 23 1086	See Scale Bar	2	
Drawn By:	Checked By:	Drawn:	
AC	BR	Mar 2023	



KEY

-  Site Boundary
-  Borehole (BH)
-  Trial Pit (TP)

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.

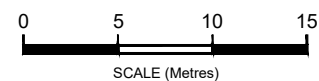
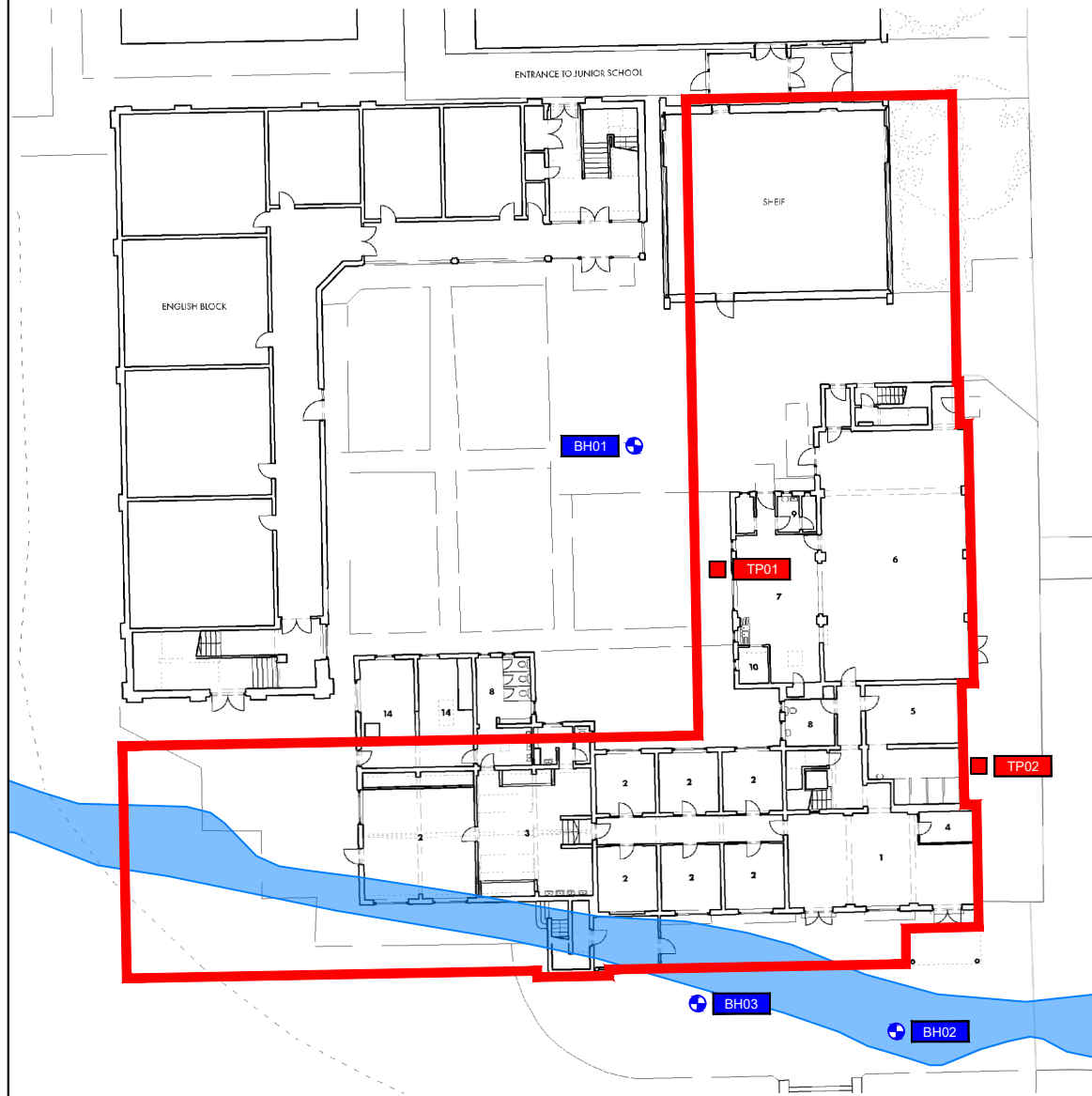
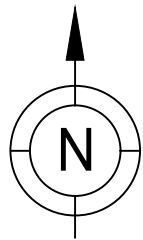


Client:
The Manchester Grammar School

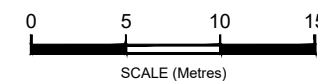
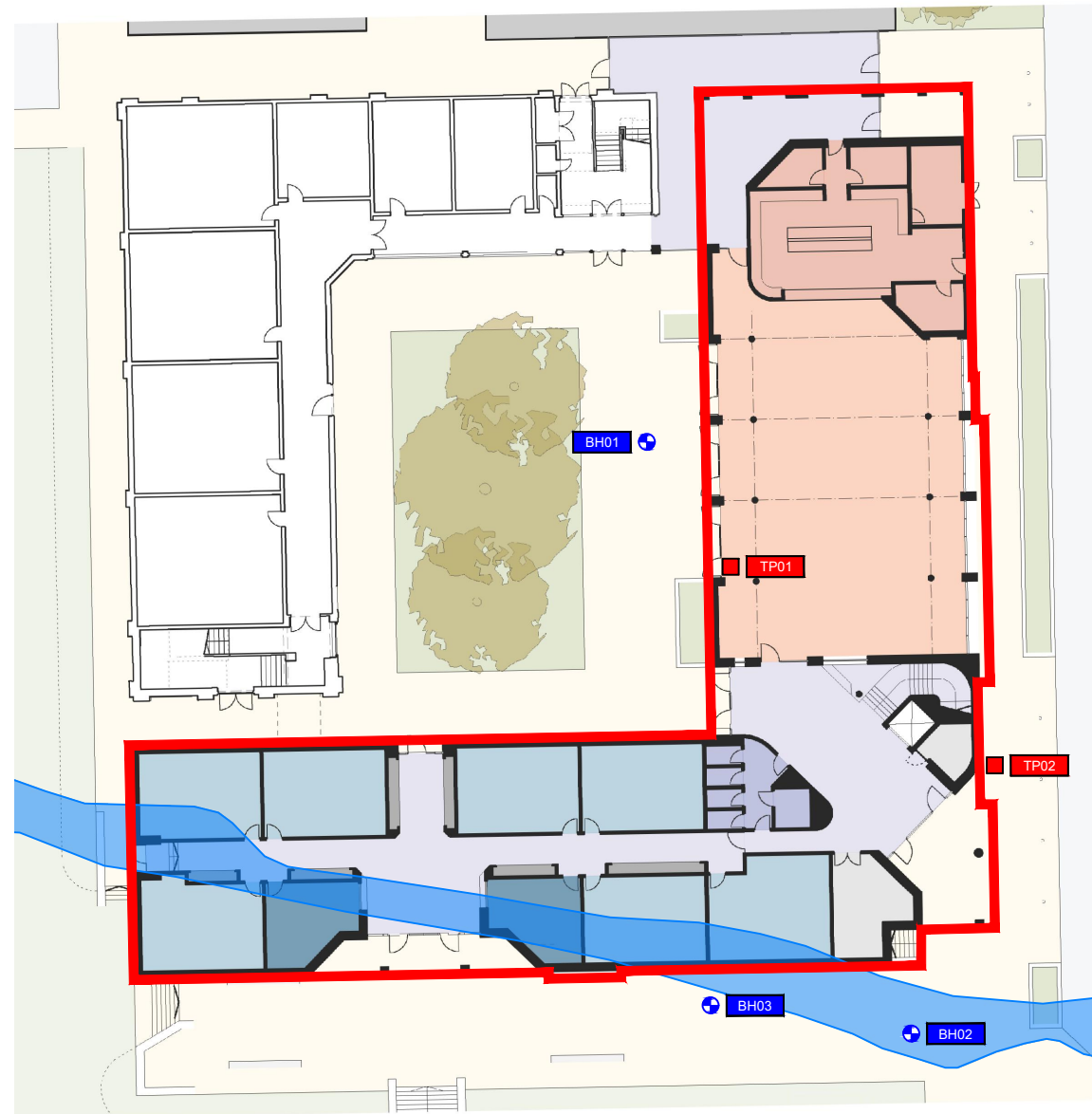
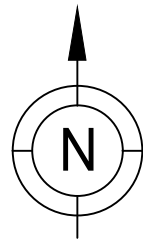
Site:
Manchester Grammar School, Manchester

Title:
Sampling Location Plan

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 23 1086	See Scale Bar	3	
Drawn By:	Checked By:	Drawn:	
AC	LD	Apr 2023	



Extract from: OMI Architects
Drawing Ref: Existing Plan-LEVEL 00, No.L0101 (January 2023)



Extract from: OMI Architects
Drawing Ref: Proposed Ground Floor GA Plan-LEVEL 00, No.L1004 (February 2023)

KEY

-  Site Boundary
-  Historical Course of River
(Ordnance Survey Map - 1:2500, 1922)
-  Borehole
(BH)
-  Trial Pit
(TP)

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:
The Manchester Grammar School

Site:
Manchester Grammar School, Manchester

Title:
Location of Former Stream

Job No.:	Scale (See Scale Bar):	Figure:	Revision:
LKC 23 1086	See Scale Bar	4	B
Drawn By:	Checked By:	Drawn:	
AC	BR	Jun 2023	

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 552⁵¹. 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.

⁵¹ 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

Window Sample Logs Foundation Pit Logs

Excavation Method

Broke out Tarmacadam with follow on window sample to 4.305mbgl.

Dimensions
Location (Observed measurements)

Ground Level (mOD)
Dates

14/04/2023

Client

The Manchester Grammar School

**Job
Number**

LKC 23 1086

Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.10-0.30 0.10-0.30 0.30-1.10 0.30-1.10	D ES PID: 0.3ppm D ES PID: 0.2ppm				(0.10) (0.20) 0.30	MADE GROUND: TARMACADAM. MADE GROUND: Light brown sandy silty GRAVEL with rare coal fragments and clinker. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.	 	
					(0.80)	MADE GROUND: Dark brown to black slightly gravelly sandy silty CLAY with occasional brick and coal fragments, rare clinker and ceramic. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
1.20-1.65 1.20-1.50 1.50 1.50-2.00	SPT N=12 ES PID: 0.3ppm PP 152kPa D		2,2/2,3,3,4		1.10	Firm to very stiff consistency very high strength light brown slightly gravelly sandy silty CLAY with rare coal fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone Clay becomes stiff very high strength at 1.50mbgl.		
2.00-2.45	SPT N=15		2,2/3,4,4,4					
2.50 2.50-3.00	PP 206kPa D				(2.50)	Clay becomes very stiff very high strength at 2.50mbgl.		
3.00-3.45	SPT N=32		6,6/6,7,8,11					
3.60-4.00	D				3.60	Very stiff consistency brown slightly gravelly very sandy silty CLAY with occasional sand lenses. Sand is fine to coarse. Gravel is fine to medium, sub-rounded comprising quartz and sandstone.		
4.00-4.31	SPT 25*/125 50/180		11,14/20,21,9		(0.71) 4.31	Complete at 4.31m		

Remarks

Borehole dry and stable.
Complete at 4.31mbgl.

**Scale
(approx)**

1:40

**Logged
By**

LD

Figure No.

LKC 23 1086.BH1

Excavation Method

Broke out tarmacadam with follow on window sample to 5.425mbgl.

Dimensions
Location (Observed measurements)

Ground Level (mOD)
Dates

14/04/2023

Client

The Manchester Grammar School

Engineer

LKC

**Job
Number**

LKC 23 1086

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water	Instr
0.13-0.30 0.13-0.30 0.30-0.80 0.30-0.80	D ES PID: 0.4ppm D ES PID: 0.3ppm				(0.13) 0.13 (0.17) 0.30	MADE GROUND: TARMACADAM. Good condition.			
					(0.50)	MADE GROUND: Dark brown to black sandy GRAVEL with occasional ash, rare brick fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.			
0.80-1.20 0.80-1.20	D ES PID: 0.4ppm				0.80 (0.40)	MADE GROUND: Soft consistency very gravelly sandy silty CLAY with occasional brick fragments, rare coal fragments and clinker. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.			
1.20 1.20-1.65	PP 41.9kPa SPT N=4		1,1/1,0,1,2		1.20	MADE GROUND: Light brown very gravelly silty SAND with rare coal fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.			
2.00-2.80 2.00-2.45	D PID: 0.1ppm SPT N=5		Water strike(1) at 2.00m. 1,0/1,1,1,2		(1.60)	Firm consistency low to medium strength light brown gravelly sandy silty CLAY with rare coal fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		▽1	
2.50	PP 39.8kPa								
2.80-3.80 2.80-3.80 3.00-3.45	D ES PID: 0.1ppm SPT N=3		1,0/0,0,1,2		2.80 (1.00)	Soft consistency medium strength black organic slightly gravelly sandy SILT. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone. Moderate organic odour noted.			
3.50	PP 40.9kPa								
3.80-4.50 4.00-4.45	D SPT N=31		4,4/7,7,7,10		3.80 (1.63)	Firm consistency brown slightly gravelly very sandy silty CLAY with occasional land lenses. Sand is fine to coarse. Gravel is fine to medium, sub-rounded comprising quartz and sandstone.			
5.00-5.43	SPT 50/275		10,10/14,15,11,10		5.43	Complete at 5.43m			

Remarks

Borehole wet and stable.
Waterstrike at 2.00mbgl.
Complete at 5.43mbgl.

Scale (approx)

1:40

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Figure No.

LKC 23 1086.BH2

Excavation Method

Broke out Tarmacadam with follow on window sampling to 5.44mbgl

Dimensions
Location (Observed measurements)

Ground Level (mOD)
Dates

14/04/2023

Client

The Manchester Grammar School

**Job
Number**

LKC 23 1086

Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
0.12-0.30 0.12-0.30 0.30-0.50 0.30-0.50 0.50-0.70 0.50-0.70 0.70-1.40 0.70-1.40	D ES PID: 0.2ppm D ES PID: 0.3ppm D ES PID: 0.4ppm D ES PID 0.1ppm				0.06 (0.12) (0.30) (0.20) 0.50 (0.20) 0.70	MADE GROUND: TARMACADAM. Good condition. MADE GROUND: Black slightly sandy GRAVEL with rare brick and coal fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone. Possible tarmacadam fallen in borehole from above strata. MADE GROUND: BLOCK PAVING. MADE GROUND: Firm consistency dark brown to black gravelly sandy silty CLAY with occasional coal and brick fragments, rare ceramic. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
1.20-1.65	SPT N=6		1,1/1,2,2,1		(0.70)			
1.40-2.00 1.50	D PID: 0.2ppm PP 93.28kPa				1.40	MADE GROUND: Firm consistency light brown gravelly sandy silty CLAY with rare coal and brick fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
2.00-2.45	SPT N=5		1,2/1,2,1,1			MADE GROUND: Dark brown gravelly sandy silty CLAY with occasional brick and coal fragments, rare clinker. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
2.50 2.50-3.00	PP 73.6kPa D PID 0.1ppm				(2.10)	Stiff to very stiff consistency medium strength light grey slightly gravelly sandy silty CLAY with rare coal fragments. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
3.00-3.50 3.00-3.45 3.00-3.50	D SPT N=9 ES PID: 0.1ppm		Water strike(1) at 3.00m. 1,1/1,2,3,3			Lens of sandy gravel at 3.00mbgl to 3.20mbgl. Clay becomes stiff at 3.20mbgl.		
4.00-4.45	SPT N=32		4,5/7,7,8,10		3.50	Very stiff consistency brown slightly gravelly very sandy silty CLAY with occasional sand lenses. Sand is fine to coarse. Gravel is fine to medium, sub-rounded comprising quartz and sandstone.		
4.50-5.00	D				(1.94)			
5.00-5.44	SPT 50/285		12,13/12,10,11,17		5.44	Complete at 5.44m		

Remarks

Borehole wet but stable.
Waterstrike at 3.0mbgl.
Complete at 5.44mbgl.

Scale (approx)

1:40

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Figure No.

LKC 23 1086.BH3

Excavation Method

Paving flag removed with follow on hand excavated trial pit to 1.15mbgl to identify footing of building.

Dimensions

0.20m x 0.20m x 1.15m

Ground Level (mOD)
Client

The Manchester Grammar School

**Job
Number**

LKC 23 1086

Location (Observed measurements)

Dates

14/04/2023

Engineer

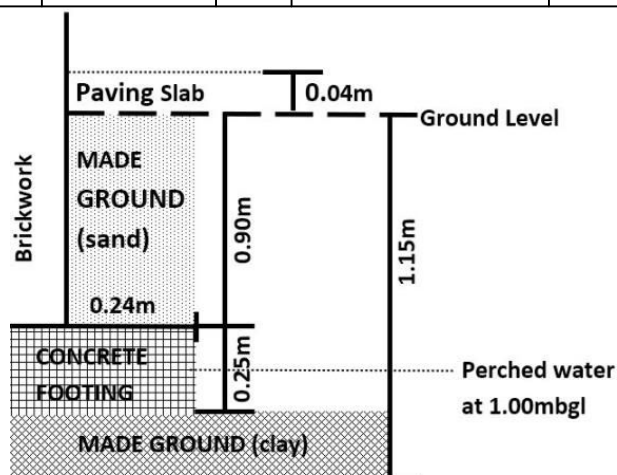
LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					0.04 (0.08) 0.12	MADE GROUND: Paving flag.		
						MADE GROUND: Light brown slightly gravelly SAND. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded comprising sandstone.		
					(1.03)	MADE GROUND: Soft consistency light brown very gravelly sandy silty CLAY with frequent brick and concrete fragments, rare whole brick and ceramic. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
			Fast(1) at 1.00m.		1.15	Complete at 1.15m		

V1


Remarks

Scale (approx)

1:20

Logged By

LD

Figure No.

LKC 23 1086.TP01

Excavation Method

Paving flag removed with follow on hand excavated trial pit to 1.33mbgl to identify footing of building.

Dimensions

0.20m x 0.20m x 1.33m

Ground Level (mOD)
Client

The Manchester Grammar School

**Job
Number**

LKC 23 1086

Location (Observed measurements)

Dates

14/04/2023

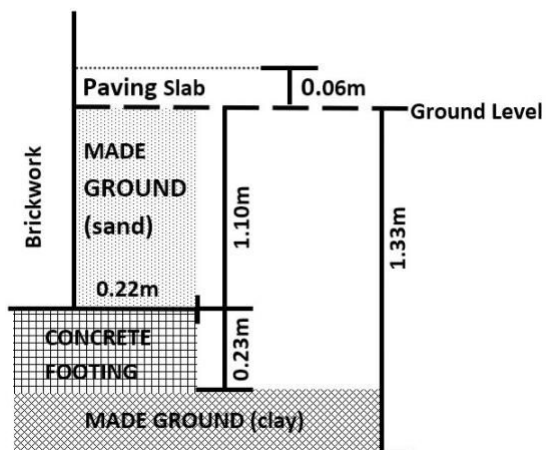
Engineer

LKC

Sheet

1/1

Depth (m)	Sample / Tests	Water Depth (m)	Field Records	Level (mOD)	Depth (m) (Thickness)	Description	Legend	Water
					(0.06) 0.06	MADE GROUND: PAVING FLAG		
					(0.17) 0.23	MADE GROUND: Light brown slightly gravelly SAND with rare brick fragments. Sand is fine to coarse. Gravel is fine to medium, sub-angular to sub-rounded comprising sandstone.		
					(1.10)	MADE GROUND: Soft consistency light brown very gravelly sandy silty CLAY with frequent brick and concrete fragments, rare whole brick and ceramic. Sand is fine to coarse. Gravel is fine to coarse, sub-angular to sub-rounded comprising sandstone.		
					1.33	Complete at 1.33m		


Remarks

Scale (approx)

1:20

Logged By

LD

Figure No.

LKC 23 1086.TP02

Appendix C

Certificates of Analysis – Soil



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Manchester
M26 2ZS

Derwentside Environmental Testing Services Ltd
Unit 1
Rose Lane Industrial Estate
Rose Lane
Lenham Heath
Kent
ME17 2JN
t: 01622 850410

DETS Report No: 23-05169

Site Reference: Manchester Grammar School

Project / Job Ref: LKC 23 1086

Order No: LKC231086-BR

Sample Receipt Date: 18/04/2023

Sample Scheduled Date: 18/04/2023

Report Issue Number: 1

Reporting Date: 26/04/2023

Authorised by:

Kevin Old
Operations Director

Dates of laboratory activities for each tested analyte are available upon request.

Opinions and interpretations are outside the laboratory's scope of ISO 17025 accreditation. This certificate is issued in accordance with the accreditation requirements of the United Kingdom Accreditation Service. The results reported herein relate only to the material supplied to the laboratory. This certificate shall not be reproduced except in full, without the prior written approval of the laboratory.



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Soil Analysis Certificate						
DETS Report No: 23-05169	Date Sampled	14/04/23	14/04/23	14/04/23	14/04/23	14/04/23
LK Consult Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Manchester Grammar School	TP / BH No	BH1	BH1	BH2	BH2	BH2
Project / Job Ref: LKC 23 1086	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied	None Supplied
Order No: LKC231086-BR	Depth (m)	0.10 - 0.30	0.30 - 1.10	0.30 - 0.80	2.00 - 2.80	2.80 - 3.80
Reporting Date: 26/04/2023	DETS Sample No	647365	647366	647367	647368	647369

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected		Not Detected	Not Detected
pH	pH Units	N/a	MCERTS	8.8	7.4	7.3	8.0
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	13	71	11	< 10
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.01	0.07	0.01	< 0.01
Organic Matter (SOM)	%	< 0.1	MCERTS	3.7		1.6	5.7
W/S Chloride (2:1)	mg/kg	< 1	MCERTS		39		40
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS		19.6		20
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS		5		< 3
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS		2.3		< 1.5
Arsenic (As)	mg/kg	< 2	MCERTS	3		6	13
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	0.3		< 0.2	< 0.2
Chromium (Cr)	mg/kg	< 2	MCERTS	8		13	13
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2		< 2	< 2
Copper (Cu)	mg/kg	< 4	MCERTS	10		15	49
Lead (Pb)	mg/kg	< 3	MCERTS	22		32	123
W/S Magnesium	mg/l	< 0.1	NONE		1.1		1.9
Mercury (Hg)	mg/kg	< 1	MCERTS	< 1		< 1	< 1
Nickel (Ni)	mg/kg	< 3	MCERTS	7		10	15
Selenium (Se)	mg/kg	< 2	MCERTS	< 2		< 2	< 2
Vanadium (V)	mg/kg	< 1	MCERTS	11		17	20
Zinc (Zn)	mg/kg	< 3	MCERTS	55		34	83

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)



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Soil Analysis Certificate						
DETS Report No: 23-05169	Date Sampled	14/04/23				
LK Consult Limited	Time Sampled	None Supplied				
Site Reference: Manchester Grammar School	TP / BH No	BH3				
Project / Job Ref: LKC 23 1086	Additional Refs	None Supplied				
Order No: LKC231086-BR	Depth (m)	0.50 - 0.70				
Reporting Date: 26/04/2023	DETS Sample No	647370				

Determinand	Unit	RL	Accreditation				
Asbestos Screen ^(S)	N/a	N/a	ISO17025	Not Detected			
pH	pH Units	N/a	MCERTS	7.6			
W/S Sulphate as SO ₄ (2:1)	mg/l	< 10	MCERTS	15			
W/S Sulphate as SO ₄ (2:1)	g/l	< 0.01	MCERTS	0.02			
Organic Matter (SOM)	%	< 0.1	MCERTS	2			
W/S Chloride (2:1)	mg/kg	< 1	MCERTS				
W/S Chloride (2:1)	mg/l	< 0.5	MCERTS				
Water Soluble Nitrate (2:1) as NO ₃	mg/kg	< 3	MCERTS				
Water Soluble Nitrate (2:1) as NO ₃	mg/l	< 1.5	MCERTS				
Arsenic (As)	mg/kg	< 2	MCERTS	9			
Cadmium (Cd)	mg/kg	< 0.2	MCERTS	< 0.2			
Chromium (Cr)	mg/kg	< 2	MCERTS	16			
Chromium (hexavalent)	mg/kg	< 2	NONE	< 2			
Copper (Cu)	mg/kg	< 4	MCERTS	30			
Lead (Pb)	mg/kg	< 3	MCERTS	74			
W/S Magnesium	mg/l	< 0.1	NONE				
Mercury (Hg)	mg/kg	< 1	MCERTS	3.5			
Nickel (Ni)	mg/kg	< 3	MCERTS	18			
Selenium (Se)	mg/kg	< 2	MCERTS	< 2			
Vanadium (V)	mg/kg	< 1	MCERTS	22			
Zinc (Zn)	mg/kg	< 3	MCERTS	58			

Analytical results are expressed on a dry weight basis where samples are assisted-dried at less than 30°C. The Method Description page describes if the test is performed on the dried or as-received portion
 Subcontracted analysis (S)



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Soil Analysis Certificate - Speciated PAHs					
DETS Report No: 23-05169	Date Sampled	14/04/23	14/04/23	14/04/23	14/04/23
LK Consult Limited	Time Sampled	None Supplied	None Supplied	None Supplied	None Supplied
Site Reference: Manchester Grammar School	TP / BH No	BH1	BH2	BH2	BH3
Project / Job Ref: LKC 23 1086	Additional Refs	None Supplied	None Supplied	None Supplied	None Supplied
Order No: LKC231086-BR	Depth (m)	0.10 - 0.30	0.30 - 0.80	2.80 - 3.80	0.50 - 0.70
Reporting Date: 26/04/2023	DETS Sample No	647365	647367	647369	647370

Determinand	Unit	RL	Accreditation					
Naphthalene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthylene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	< 0.1	< 0.1	
Acenaphthene	mg/kg	< 0.1	MCERTS	< 0.1	0.16	0.46	< 0.1	
Fluorene	mg/kg	< 0.1	MCERTS	< 0.1	< 0.1	0.39	< 0.1	
Phenanthrene	mg/kg	< 0.1	MCERTS	0.28	0.79	2.84	< 0.1	
Anthracene	mg/kg	< 0.1	MCERTS	< 0.1	0.18	0.55	< 0.1	
Fluoranthene	mg/kg	< 0.1	MCERTS	1.01	1.27	4.98	0.12	
Pyrene	mg/kg	< 0.1	MCERTS	1.11	1.38	5.24	0.12	
Benzo(a)anthracene	mg/kg	< 0.1	MCERTS	0.54	0.59	2.13	< 0.1	
Chrysene	mg/kg	< 0.1	MCERTS	0.66	0.60	2.16	< 0.1	
Benzo(b)fluoranthene	mg/kg	< 0.1	MCERTS	0.85	0.65	2	< 0.1	
Benzo(k)fluoranthene	mg/kg	< 0.1	MCERTS	0.31	0.27	0.58	< 0.1	
Benzo(a)pyrene	mg/kg	< 0.1	MCERTS	0.94	0.76	2.14	< 0.1	
Indeno(1,2,3-cd)pyrene	mg/kg	< 0.1	MCERTS	0.54	0.39	0.93	< 0.1	
Dibenz(a,h)anthracene	mg/kg	< 0.1	MCERTS	0.11	< 0.1	0.22	< 0.1	
Benzo(ghi)perylene	mg/kg	< 0.1	MCERTS	0.46	0.32	0.81	< 0.1	
Total EPA-16 PAHs	mg/kg	< 1.6	MCERTS	6.8	7.4	25.4	< 1.6	



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Soil Analysis Certificate - Sample Descriptions

DETS Report No: 23-05169	
LK Consult Limited	
Site Reference: Manchester Grammar School	
Project / Job Ref: LKC 23 1086	
Order No: LKC231086-BR	
Reporting Date: 26/04/2023	

DETS Sample No	TP / BH No	Additional Refs	Depth (m)	Moisture Content (%)	Sample Matrix Description
647365	BH1	None Supplied	0.10 - 0.30	5.8	Brown gravelly sand with stones and concrete
647366	BH1	None Supplied	0.30 - 1.10	21.1	Black loamy sand with stones
647367	BH2	None Supplied	0.30 - 0.80	15	Black sandy clay with stones
647368	BH2	None Supplied	2.00 - 2.80	16.7	Brown sandy clay
647369	BH2	None Supplied	2.80 - 3.80	31	Brown sandy clay with stones
647370	BH3	None Supplied	0.50 - 0.70	14	Brown sandy clay with stones

Moisture content is part of procedure E003 & is not an accredited test

Insufficient Sample ^{I/S}

Unsuitable Sample ^{U/S}



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Soil Analysis Certificate - Methodology & Miscellaneous Information

DETS Report No: 23-05169

LK Consult Limited

Site Reference: Manchester Grammar School

Project / Job Ref: LKC 23 1086

Order No: LKC231086-BR

Reporting Date: 26/04/2023

Matrix	Analysed On	Determinand	Brief Method Description	Method No
Soil	D	Boron - Water Soluble	Determination of water soluble boron in soil by 2:1 hot water extract followed by ICP-OES	E012
Soil	AR	BTEX	Determination of BTEX by headspace GC-MS	E001
Soil	D	Cations	Determination of cations in soil by aqua-regia digestion followed by ICP-OES	E002
Soil	D	Chloride - Water Soluble (2:1)	Determination of chloride by extraction with water & analysed by ion chromatography	E009
Soil	AR	Chromium - Hexavalent	Determination of hexavalent chromium in soil by extraction in water then by acidification, addition of 1,5 diphénylcarbazide followed by colorimetry	E016
Soil	AR	Cyanide - Complex	Determination of complex cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Free	Determination of free cyanide by distillation followed by colorimetry	E015
Soil	AR	Cyanide - Total	Determination of total cyanide by distillation followed by colorimetry	E015
Soil	D	Cyclohexane Extractable Matter (CEM)	Gravimetrically determined through extraction with cyclohexane	E011
Soil	AR	Diesel Range Organics (C10 - C24)	Determination of hexane/acetone extractable hydrocarbons by GC-FID	E004
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of saturated calcium sulphate followed by electrometric measurement	E022
Soil	AR	Electrical Conductivity	Determination of electrical conductivity by addition of water followed by electrometric measurement	E023
Soil	D	Elemental Sulphur	Determination of elemental sulphur by solvent extraction followed by GC-MS	E020
Soil	AR	EPH (C10 - C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH Product ID	Determination of acetone/hexane extractable hydrocarbons by GC-FID	E004
Soil	AR	EPH TEXAS (C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C40)	Determination of acetone/hexane extractable hydrocarbons by GC-FID for C8 to C40. C6 to C8 by headspace GC-MS	E004
Soil	D	Fluoride - Water Soluble	Determination of Fluoride by extraction with water & analysed by ion chromatography	E009
Soil	D	Fraction Organic Carbon (FOC)	Determination of TOC by combustion analyser.	E027
Soil	D	Organic Matter (SOM)	Determination of TOC by combustion analyser.	E027
Soil	D	TOC (Total Organic Carbon)	Determination of TOC by combustion analyser.	E027
Soil	AR	Exchangeable Ammonium	Determination of ammonium by discrete analyser.	E029
Soil	D	FOC (Fraction Organic Carbon)	Determination of fraction of organic carbon by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	D	Loss on Ignition @ 450°C	Determination of loss on ignition in soil by gravimetrically with the sample being ignited in a muffle furnace	E019
Soil	D	Magnesium - Water Soluble	Determination of water soluble magnesium by extraction with water followed by ICP-OES	E025
Soil	D	Metals	Determination of metals by aqua-regia digestion followed by ICP-OES	E002
Soil	AR	Mineral Oil (C10 - C40)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge	E004
Soil	AR	Moisture Content	Moisture content; determined gravimetrically	E003
Soil	D	Nitrate - Water Soluble (2:1)	Determination of nitrate by extraction with water & analysed by ion chromatography	E009
Soil	D	Organic Matter	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	PAH - Speciated (EPA 16)	Determination of PAH compounds by extraction in acetone and hexane followed by GC-MS with the use of surrogate and internal standards	E005
Soil	AR	PCB - 7 Congeners	Determination of PCB by extraction with acetone and hexane followed by GC-MS	E008
Soil	D	Petroleum Ether Extract (PEE)	Gravimetrically determined through extraction with petroleum ether	E011
Soil	AR	pH	Determination of pH by addition of water followed by electrometric measurement	E007
Soil	AR	Phenols - Total (monohydric)	Determination of phenols by distillation followed by colorimetry	E021
Soil	D	Phosphate - Water Soluble (2:1)	Determination of phosphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Total	Determination of total sulphate by extraction with 10% HCl followed by ICP-OES	E013
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of sulphate by extraction with water & analysed by ion chromatography	E009
Soil	D	Sulphate (as SO4) - Water Soluble (2:1)	Determination of water soluble sulphate by extraction with water followed by ICP-OES	E014
Soil	AR	Sulphide	Determination of sulphide by distillation followed by colorimetry	E018
Soil	D	Sulphur - Total	Determination of total sulphur by extraction with aqua-regia followed by ICP-OES	E024
Soil	AR	SVOC	Determination of semi-volatile organic compounds by extraction in acetone and hexane followed by GC-MS	E006
Soil	AR	Thiocyanate (as SCN)	Determination of thiocyanate by extraction in caustic soda followed by acidification followed by addition of ferric nitrate followed by colorimetry	E017
Soil	D	Toluene Extractable Matter (TEM)	Gravimetrically determined through extraction with toluene	E011
Soil	D	Total Organic Carbon (TOC)	Determination of organic matter by oxidising with potassium dichromate followed by titration with iron (II) sulphate	E010
Soil	AR	TPH CWG (all: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C34, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C35. C5 to C8 by headspace GC-MS	E004
Soil	AR	TPH LQM (all: C5-C6, C6-C8, C8-C10, C10-C12, C12-C16, C16-C35, C35-C44, aro: C5-C7, C7-C8, C8-C10, C10-C12, C12-C16, C16-C21, C21-C35, C35-C44)	Determination of hexane/acetone extractable hydrocarbons by GC-FID fractionating with SPE cartridge for C8 to C44. C5 to C8 by headspace GC-MS	E004
Soil	AR	VOCs	Determination of volatile organic compounds by headspace GC-MS	E001
Soil	AR	VPH (C6-C8 & C8-C10)	Determination of hydrocarbons C6-C8 by headspace GC-MS & C8-C10 by GC-FID	E001

D Dried
AR As Received



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Tel : 01622 850410



List of HWOL Acronyms and Operators	
DETS Report No:	23-05169
LK Consult Limited	
Site Reference:	Manchester Grammar School
Project / Job Ref:	LKC 23 1086
Order No:	LKC231086-BR
Reporting Date:	26/04/2023

Acronym	Description
HS	Headspace analysis
EH	Extractable Hydrocarbons - i.e. everything extracted by the solvent
CU	Clean-up - e.g. by florisil, silica gel
1D	GC - Single coil gas chromatography
2D	GC-GC - Double coil gas chromatography
Total	Aliphatics & Aromatics
AL	Aliphatics only
AR	Aromatics only
#1	EH_2D_Total but with humics mathematically subtracted
#2	EH_2D_Total but with fatty acids mathematically subtracted
—	Operator - underscore to separate acronyms (exception for +)
+	Operator to indicate cumulative eg. EH+HS_Total or EH_CU+HS_Total

Det - Acronym

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 23 1086 -
Manchester Grammar School

Job Number MRN 4606/53
Date of Issue 18 May 2023
Page 1 of 2

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.



Andrew House, Hadfield Street, Dukinfield, Cheshire SK16 4QX Tel: 0161 475 0870
Email: enquiries@murrayrix.com Website: www.murrayrix.com

Also at: London: 020 8523 1999

Murray Rix is the trading name of Murray Rix (Northern) Limited. Registered in England 2878361

TEST CERTIFICATE
PARTICLE SIZE DISTRIBUTION

BS EN ISO 17892-4:2016

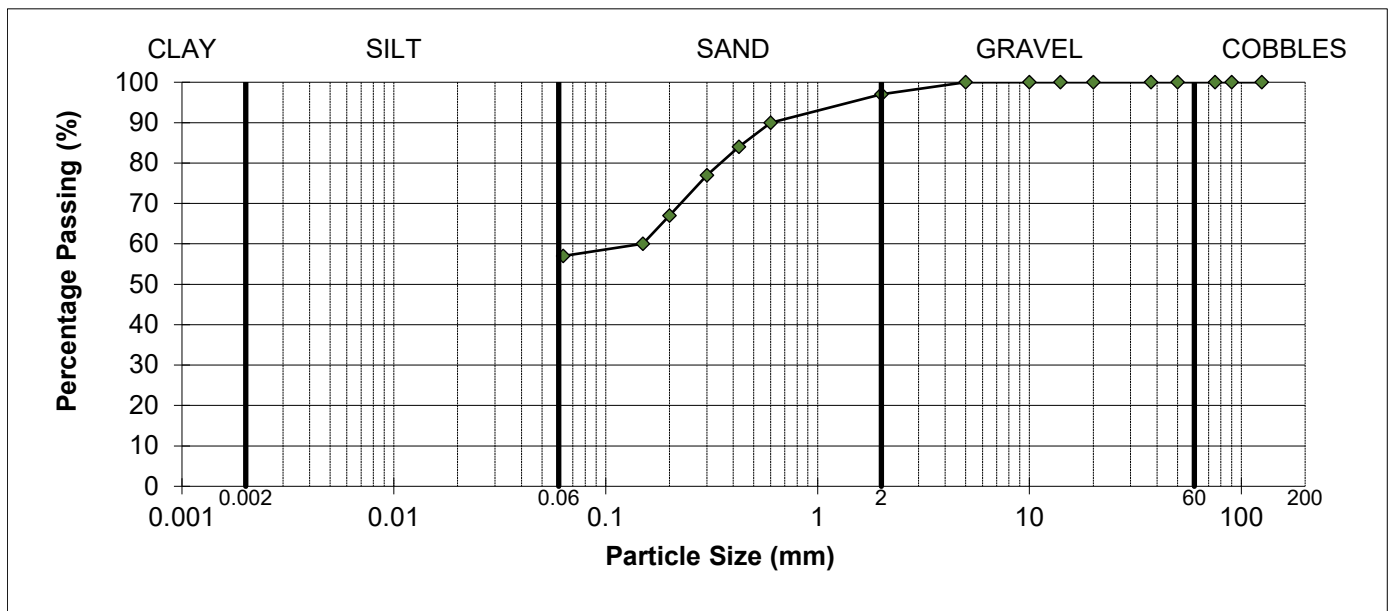
Determination of Water Content in accordance with BS EN ISO 17892-1:2014 (Oven Dry)

CLIENT	LK Consult Ltd
SITE	LKC 23 1086 - Manchester Grammar School
JOB NUMBER	MRN 4606/53

SAMPLE LABEL	BH1 3.60-4.00	DATE SAMPLED	Not advised
LAB SAMPLE No	124958	DATE RECEIVED	03-May-23
DATE TESTED	10-May-23	SAMPLED BY	Client

MATERIAL	Stiff brown silty slightly sandy slightly gravelly CLAY
ADVISED SOURCE	Site Investigation Sample

Sieve Size (mm)	% Passing (%)	Specification (%)	Sieve Size (mm)	% Passing (%)	Specification (%)
125	100		5	100	
90	100		2	97	
75	100		0.6	90	
50	100		0.425	84	
37.5	100		0.3	77	
20	100		0.2	67	
14	100		0.15	60	
10	100		0.063	57	



REMARKS

As received water content = 12.7%

SIGNED



NAME

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

DATE

18-May-23

TEST REPORT

Client LK Consult Ltd

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

Contract LKC 23 1086 -
Manchester Grammar School

Job Number MRN 4606/51
Date of Issue 15 May 2023
Page 1 of 4

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.
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MURRAY RIX

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



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014

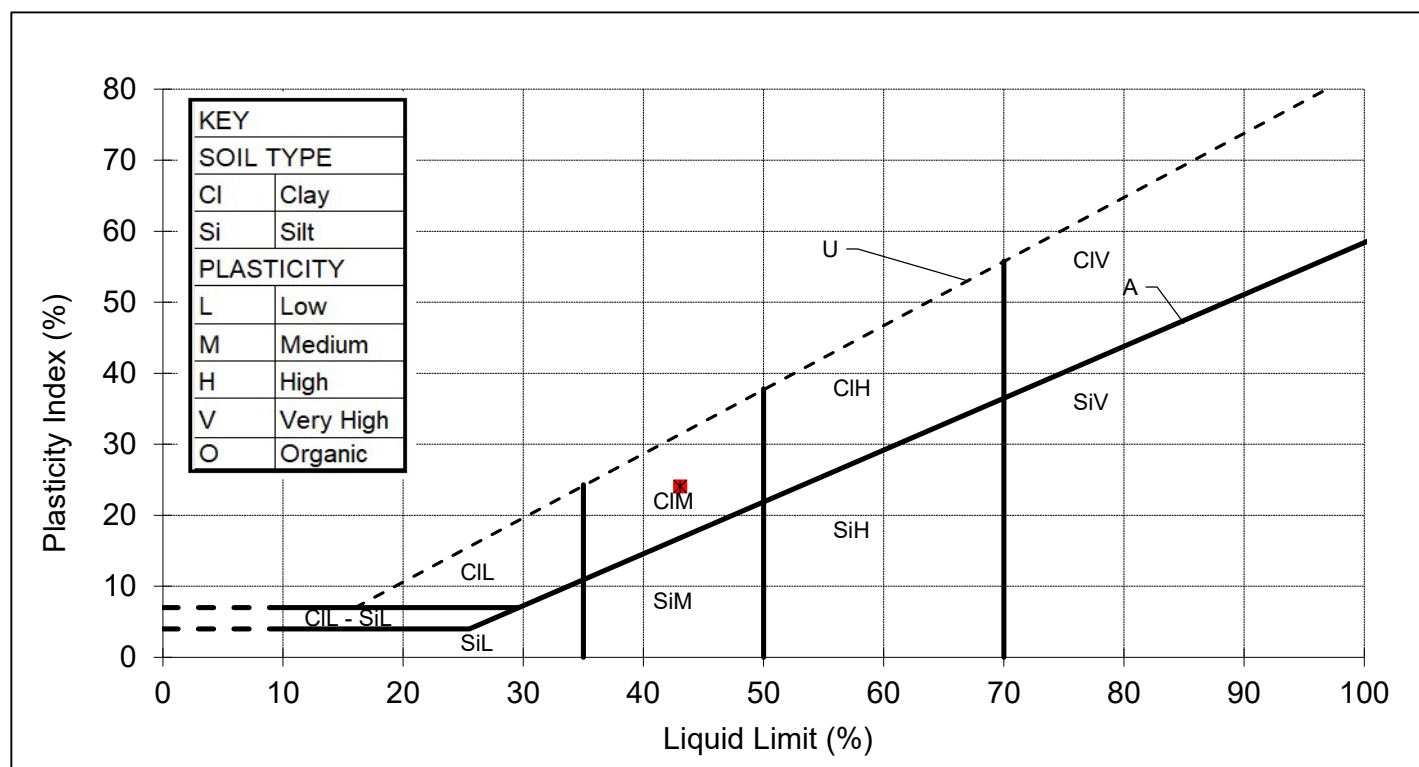
CLIENT	LK Consult Ltd
SITE	LKC 23 1086 - Manchester Grammar School
JOB NUMBER	MRN 4606/51

SAMPLE LABEL	BH1 1.50-2.00	DATE SAMPLED	Not advised
SAMPLE No.	124664	DATE RECEIVED	27-Apr-23
DATE TESTED	28-Apr-23	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	22.1	44.5	0.967	
Determination 2 (avg)	22.1	44.5		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
29.6	43	19	24	85



REMARKS

SIGNED

NAME

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

DATE

15-May-23

MURRAY RIX

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



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014

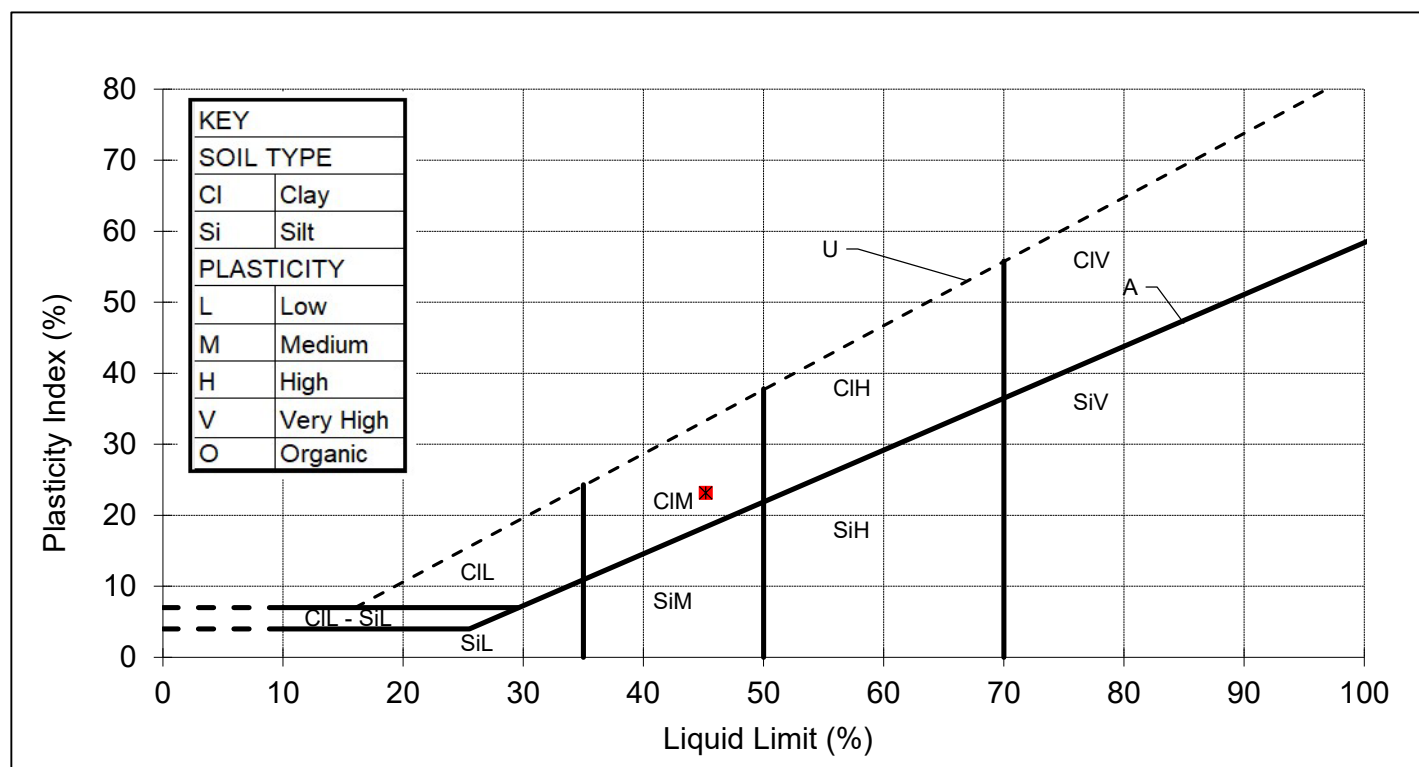
CLIENT	LK Consult Ltd
SITE	LKC 23 1086 - Manchester Grammar School
JOB NUMBER	MRN 4606/51

SAMPLE LABEL	BH2 2.80-3.80	DATE SAMPLED	Not advised
SAMPLE No.	124665	DATE RECEIVED	27-Apr-23
DATE TESTED	28-Apr-23	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	21.4	46.2	0.979	
Determination 2 (avg)	21.4	46.1		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
35.6	45	22	23	81



REMARKS

SIGNED

NAME

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

DATE

15-May-23

MURRAY RIX

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



TEST CERTIFICATE

LIQUID LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.3 (30° FALL CONE) 1 POINT METHOD

PLASTIC LIMIT BS EN ISO 17892-12:2018+A1:2021 Clause 5.5

WATER CONTENT METHOD BS EN ISO 17892-1:2014

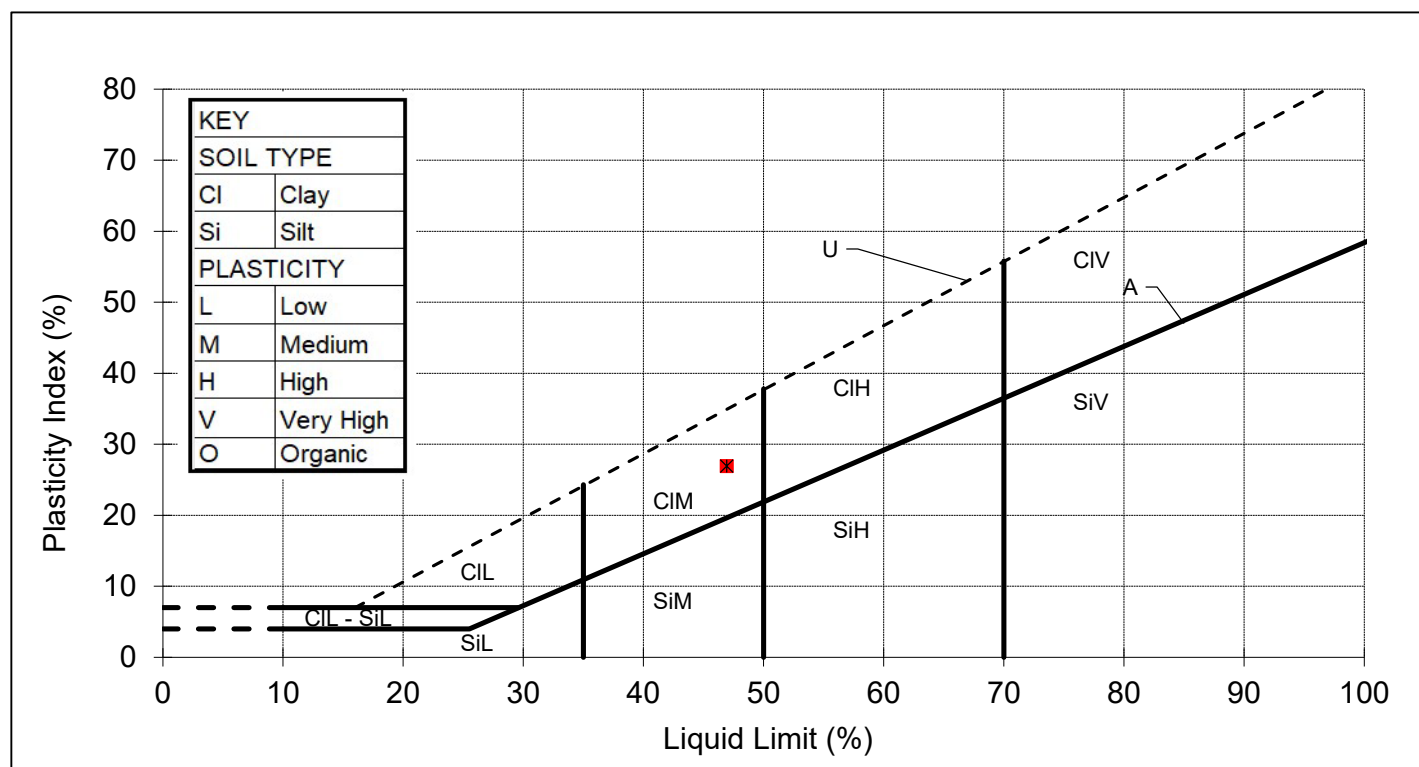
CLIENT	LK Consult Ltd
SITE	LKC 23 1086 - Manchester Grammar School
JOB NUMBER	MRN 4606/51

SAMPLE LABEL	BH3 2.50-3.00	DATE SAMPLED	Not advised
SAMPLE No.	124666	DATE RECEIVED	27-Apr-23
DATE TESTED	28-Apr-23	SAMPLED BY	Client

MATERIAL	Brown silty slightly sandy slightly gravelly CLAY		
ADVISED SOURCE	Site Investigation Sample	WATER CONTENT	Increasing
SAMPLE HISTORY	Natural State	% RET. 425um BY	Wet Sieved

Test Readings mm (average)		Moisture Content %	Correction Factor	Correction factor from Clayton and Jukes 1978
Determination 1 (avg)	20.2	47.0	0.998	
Determination 2 (avg)	20.1	47.0		

Natural Moisture Content (%)	Liquid Limit (%)	Plastic Limit (%)	Plasticity Index (%)	Passing 425 micron (%)
42.4	47	20	27	98



REMARKS

SIGNED

NAME

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

DATE

15-May-23

Appendix E

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.

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.

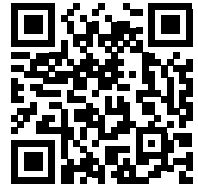
Appendix F

Haz-Waste Online Certificates

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)



OQ614-CHDT1-Z7MCY

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

Job name

LKC 23 1086

Description/Comments

Project

LKC 23 1086

Site

Manchester Grammar School

Classified by

Name: **Peter Dunn**
 Date: **14 Jun 2023 16:22 GMT**
 Telephone: **0161 763 7200**

Company: **LK Group**

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
 Most recent 3 year Refresher

Date

18 Sep 2019
 02 Aug 2022

Next 3 year Refresher due by Aug 2025

Purpose of classification

2 - Material Characterisation

Address of the waste

Old Hall Lane, Manchester

Post Code **m13 0XT**

SIC for the process giving rise to the waste

Description of industry/producer giving rise to the waste

Redvelopment

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

Construction

Description of the waste

Made Ground and Soil

Job summary

#	Sample name	Depth [m]	Classification Result	Hazard properties	Page
1	BH1-0.10 - 0.30-14/04/2023	0.10 - 0.30	Non Hazardous		3
2	BH1-0.30 - 1.10-14/04/2023	0.30 - 1.10	Non Hazardous		5
3	BH2-0.30 - 0.80-14/04/2023	0.30 - 0.80	Non Hazardous		6
4	BH2-2.00 - 2.80-14/04/2023	2.00 - 2.80	Non Hazardous		8
5	BH2-2.80 - 3.80-14/04/2023	2.80 - 3.80	Non Hazardous		9
6	BH3-0.50 - 0.70-14/04/2023	0.50 - 0.70	Non Hazardous		11

Related documents

#	Name	Description
1	23-05169.1.hwol	DETS South .hwol file used to populate the Job
2	LK SUITE 1 - 5	waste stream template used to create this Job

Report

Created by: Peter Dunn

Created date: 14 Jun 2023 16:22 GMT

Appendices	Page
Appendix A: Classifier defined and non GB MCL determinands	13
Appendix B: Rationale for selection of metal species	14
Appendix C: Version	15

Classification of sample: BH1-0.10 - 0.30-14/04/2023

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

Sample details

Sample name:	LoW Code:
BH1-0.10 - 0.30-14/04/2023	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.10 - 0.30 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
5.8%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 5.8% 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 }				3 mg/kg	1.32	3.731 mg/kg	0.000373 %	✓	
	033-003-00-0	215-481-4	1327-53-3							
2	cadmium { cadmium oxide }				0.3 mg/kg	1.142	0.323 mg/kg	0.0000323 %	✓	
	048-002-00-0	215-146-2	1306-19-0							
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				8 mg/kg	1.462	11.014 mg/kg	0.0011 %	✓	
		215-160-9	1308-38-9							
4	copper { dicopper oxide; copper (I) oxide }				10 mg/kg	1.126	10.606 mg/kg	0.00106 %	✓	
	029-002-00-X	215-270-7	1317-39-1							
5	mercury { mercury dichloride }				<1 mg/kg	1.353	<1.353 mg/kg	<0.000135 %		<LOD
	080-010-00-X	231-299-8	7487-94-7							
6	nickel { nickel(II) oxide (nickel monoxide) }				7 mg/kg	1.273	8.391 mg/kg	0.000839 %	✓	
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]							
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	22 mg/kg		20.724 mg/kg	0.00207 %	✓	
	082-001-00-6									
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<2 mg/kg	1.405	<2.81 mg/kg	<0.000281 %		<LOD
	034-002-00-8									
9	vanadium { divanadium pentaoxide; vanadium pentoxide }				11 mg/kg	1.785	18.498 mg/kg	0.00185 %	✓	
	023-001-00-8	215-239-8	1314-62-1							
10	zinc { zinc oxide }				55 mg/kg	1.245	64.489 mg/kg	0.00645 %	✓	
	030-013-00-7	215-222-5	1314-13-2							
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<2 mg/kg	1.923	<3.846 mg/kg	<0.000385 %		<LOD
	024-001-00-0	215-607-8	1333-82-0							
12	pH				8.8 pH		8.8 pH	8.8 pH		
			PH							
13	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
	601-052-00-2	202-049-5	91-20-3							

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
14	acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
15	acenaphthene	201-469-6	83-32-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
17	phenanthrene	201-581-5	85-01-8		0.28 mg/kg		0.264 mg/kg	0.0000264 %	✓	
18	anthracene	204-371-1	120-12-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
19	fluoranthene	205-912-4	206-44-0		1.01 mg/kg		0.951 mg/kg	0.0000951 %	✓	
20	pyrene	204-927-3	129-00-0		1.11 mg/kg		1.046 mg/kg	0.000105 %	✓	
21	benzo[a]anthracene	601-033-00-9	200-280-6		0.54 mg/kg		0.509 mg/kg	0.0000509 %	✓	
22	chrysene	601-048-00-0	205-923-4		0.66 mg/kg		0.622 mg/kg	0.0000622 %	✓	
23	benzo[b]fluoranthene	601-034-00-4	205-911-9		0.85 mg/kg		0.801 mg/kg	0.0000801 %	✓	
24	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.31 mg/kg		0.292 mg/kg	0.0000292 %	✓	
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		0.94 mg/kg		0.885 mg/kg	0.0000885 %	✓	
26	indeno[123-cd]pyrene	205-893-2	193-39-5		0.54 mg/kg		0.509 mg/kg	0.0000509 %	✓	
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.11 mg/kg		0.104 mg/kg	0.0000104 %	✓	
28	benzo[ghi]perylene	205-883-8	191-24-2		0.46 mg/kg		0.433 mg/kg	0.0000433 %	✓	
Total:								0.0153 %		

Key

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

Classification of sample: BH1-0.30 - 1.10-14/04/2023

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

Sample details

Sample name:	LoW Code:	
BH1-0.30 - 1.10-14/04/2023	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 - 1.10 m		
Moisture content:		
21.1%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 21.1% 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	• pH				7.4 pH		7.4 pH	7.4 pH		
			PH							
Total:								0%		

Key

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

Classification of sample: BH2-0.30 - 0.80-14/04/2023

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

Sample details

Sample name:	LoW Code:
BH2-0.30 - 0.80-14/04/2023	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 - 0.80 m	
Moisture content:	
15%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 15% 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 }	033-003-00-0	215-481-4	1327-53-3	6 mg/kg	1.32	6.734 mg/kg	0.000673 %	✓	
2	cadmium { cadmium oxide }	048-002-00-0	215-146-2	1306-19-0	<0.2 mg/kg	1.142	<0.228 mg/kg	<0.0000228 %		<LOD
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }	215-160-9	1308-38-9		13 mg/kg	1.462	16.15 mg/kg	0.00162 %	✓	
4	copper { dicopper oxide; copper (I) oxide }	029-002-00-X	215-270-7	1317-39-1	15 mg/kg	1.126	14.355 mg/kg	0.00144 %	✓	
5	mercury { mercury dichloride }	080-010-00-X	231-299-8	7487-94-7	<1 mg/kg	1.353	<1.353 mg/kg	<0.000135 %		<LOD
6	nickel { nickel(II) oxide (nickel monoxide) }	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]	10 mg/kg	1.273	10.817 mg/kg	0.00108 %	✓	
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }	082-001-00-6			32 mg/kg		27.2 mg/kg	0.00272 %	✓	
8	selenium { selenium compounds with the exception of cadmium selenosulfide and those specified elsewhere in this Annex }	034-002-00-8			<2 mg/kg	1.405	<2.81 mg/kg	<0.000281 %		<LOD
9	vanadium { divanadium pentaoxide; vanadium pentoxide }	023-001-00-8	215-239-8	1314-62-1	17 mg/kg	1.785	25.796 mg/kg	0.00258 %	✓	
10	zinc { zinc oxide }	030-013-00-7	215-222-5	1314-13-2	34 mg/kg	1.245	35.972 mg/kg	0.0036 %	✓	
11	chromium in chromium(VI) compounds { chromium(VI) oxide }	024-001-00-0	215-607-8	1333-82-0	<2 mg/kg	1.923	<3.846 mg/kg	<0.000385 %		<LOD
12	pH		PH		7.3 pH		7.3 pH	7.3 pH		
13	naphthalene	601-052-00-2	202-049-5	91-20-3	<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
14	acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
15	acenaphthene	201-469-6	83-32-9		0.16 mg/kg		0.136 mg/kg	0.0000136 %	✓	
16	fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
17	phenanthrene	201-581-5	85-01-8		0.79 mg/kg		0.672 mg/kg	0.0000672 %	✓	
18	anthracene	204-371-1	120-12-7		0.18 mg/kg		0.153 mg/kg	0.0000153 %	✓	
19	fluoranthene	205-912-4	206-44-0		1.27 mg/kg		1.08 mg/kg	0.000108 %	✓	
20	pyrene	204-927-3	129-00-0		1.38 mg/kg		1.173 mg/kg	0.000117 %	✓	
21	benzo[a]anthracene	601-033-00-9	200-280-6	56-55-3	0.59 mg/kg		0.501 mg/kg	0.0000501 %	✓	
22	chrysene	601-048-00-0	205-923-4	218-01-9	0.6 mg/kg		0.51 mg/kg	0.000051 %	✓	
23	benzo[b]fluoranthene	601-034-00-4	205-911-9	205-99-2	0.65 mg/kg		0.553 mg/kg	0.0000553 %	✓	
24	benzo[k]fluoranthene	601-036-00-5	205-916-6	207-08-9	0.27 mg/kg		0.23 mg/kg	0.000023 %	✓	
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5	50-32-8	0.76 mg/kg		0.646 mg/kg	0.0000646 %	✓	
26	indeno[123-cd]pyrene	205-893-2	193-39-5		0.39 mg/kg		0.331 mg/kg	0.0000331 %	✓	
27	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
28	benzo[ghi]perylene	205-883-8	191-24-2		0.32 mg/kg		0.272 mg/kg	0.0000272 %	✓	
Total:								0.0152 %		

Key

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

Classification of sample: BH2-2.00 - 2.80-14/04/2023



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

Sample details

Sample name:	LoW Code:	
BH2-2.00 - 2.80-14/04/2023	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)
2.00 - 2.80 m		
Moisture content:		
16.7%		
(wet weight correction)		

Hazard properties

None identified

Determinands

Moisture content: 16.7% 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	pH		PH		8 pH		8 pH	8pH		
Total:								0%		

Key

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

Classification of sample: BH2-2.80 - 3.80-14/04/2023

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

Sample details

Sample name:	LoW Code:
BH2-2.80 - 3.80-14/04/2023	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
2.80 - 3.80 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
31%	
(wet weight correction)	

Hazard properties

None identified

Determinands

Moisture content: 31% 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 }				13 mg/kg	1.32	11.843 mg/kg	0.00118 %	✓		
		033-003-00-0	215-481-4	1327-53-3								
2		cadmium { cadmium oxide }				<0.2 mg/kg	1.142	<0.228 mg/kg	<0.0000228 %		<LOD	
		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	13.11 mg/kg	0.00131 %	✓		
			215-160-9	1308-38-9								
4		copper { dicopper oxide ; copper (I) oxide }				49 mg/kg	1.126	38.066 mg/kg	0.00381 %	✓		
		029-002-00-X	215-270-7	1317-39-1								
5		mercury { mercury dichloride }				<1 mg/kg	1.353	<1.353 mg/kg	<0.000135 %		<LOD	
		080-010-00-X	231-299-8	7487-94-7								
6		nickel { nickel(II) oxide (nickel monoxide) }				15 mg/kg	1.273	13.171 mg/kg	0.00132 %	✓		
		028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]								
7		lead {  lead compounds with the exception of those specified elsewhere in this Annex }			1	123 mg/kg		84.87 mg/kg	0.00849 %	✓		
		082-001-00-6										
8		selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<2 mg/kg	1.405	<2.81 mg/kg	<0.000281 %		<LOD	
		034-002-00-8										
9		vanadium {  divanadium pentaoxide; vanadium pentoxide }				20 mg/kg	1.785	24.636 mg/kg	0.00246 %	✓		
		023-001-00-8	215-239-8	1314-62-1								
10		zinc { zinc oxide }				83 mg/kg	1.245	71.285 mg/kg	0.00713 %	✓		
		030-013-00-7	215-222-5	1314-13-2								
11		chromium in chromium(VI) compounds { chromium(VI) oxide }				<2 mg/kg	1.923	<3.846 mg/kg	<0.000385 %		<LOD	
		024-001-00-0	215-607-8	1333-82-0								
12		pH				7 pH		7 pH	7pH			
				PH								
13		naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD	
		601-052-00-2	202-049-5	91-20-3								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
14	• acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
15	• acenaphthene	201-469-6	83-32-9		0.46 mg/kg		0.317 mg/kg	0.0000317 %	✓	
16	• fluorene	201-695-5	86-73-7		0.39 mg/kg		0.269 mg/kg	0.0000269 %	✓	
17	• phenanthrene	201-581-5	85-01-8		2.84 mg/kg		1.96 mg/kg	0.000196 %	✓	
18	• anthracene	204-371-1	120-12-7		0.55 mg/kg		0.38 mg/kg	0.000038 %	✓	
19	• fluoranthene	205-912-4	206-44-0		4.98 mg/kg		3.436 mg/kg	0.000344 %	✓	
20	• pyrene	204-927-3	129-00-0		5.24 mg/kg		3.616 mg/kg	0.000362 %	✓	
21	benzo[a]anthracene	601-033-00-9	200-280-6		2.13 mg/kg		1.47 mg/kg	0.000147 %	✓	
22	chrysene	601-048-00-0	205-923-4		2.16 mg/kg		1.49 mg/kg	0.000149 %	✓	
23	benzo[b]fluoranthene	601-034-00-4	205-911-9		2 mg/kg		1.38 mg/kg	0.000138 %	✓	
24	benzo[k]fluoranthene	601-036-00-5	205-916-6		0.58 mg/kg		0.4 mg/kg	0.00004 %	✓	
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		2.14 mg/kg		1.477 mg/kg	0.000148 %	✓	
26	• indeno[123-cd]pyrene	205-893-2	193-39-5		0.93 mg/kg		0.642 mg/kg	0.0000642 %	✓	
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8		0.22 mg/kg		0.152 mg/kg	0.0000152 %	✓	
28	• benzo[ghi]perylene	205-883-8	191-24-2		0.81 mg/kg		0.559 mg/kg	0.0000559 %	✓	
Total:								0.0283 %		

Key

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

Classification of sample: BH3-0.50 - 0.70-14/04/2023

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

Sample details

Sample name:	LoW Code:
BH3-0.50 - 0.70-14/04/2023	Chapter:
Sample Depth:	17: Construction and Demolition Wastes (including excavated soil from contaminated sites)
0.50 - 0.70 m	Entry:
Moisture content:	17 05 04 (Soil and stones other than those mentioned in 17 05 03)
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 }				9 mg/kg	1.32	10.219 mg/kg	0.00102 %	✓		
	033-003-00-0	215-481-4	1327-53-3								
2	cadmium { cadmium oxide }				<0.2 mg/kg	1.142	<0.228 mg/kg	<0.0000228 %			<LOD
	048-002-00-0	215-146-2	1306-19-0								
3	chromium in chromium(III) compounds { chromium(III) oxide (worst case) }				16 mg/kg	1.462	20.111 mg/kg	0.00201 %	✓		
		215-160-9	1308-38-9								
4	copper { dicopper oxide; copper (I) oxide }				30 mg/kg	1.126	29.048 mg/kg	0.0029 %	✓		
	029-002-00-X	215-270-7	1317-39-1								
5	mercury { mercury dichloride }				3.5 mg/kg	1.353	4.074 mg/kg	0.000407 %	✓		
	080-010-00-X	231-299-8	7487-94-7								
6	nickel { nickel(II) oxide (nickel monoxide) }				18 mg/kg	1.273	19.7 mg/kg	0.00197 %	✓		
	028-003-00-2	215-215-7 [1] 234-323-5 [2] - [3]	1313-99-1 [1] 11099-02-8 [2] 34492-97-2 [3]								
7	lead { lead compounds with the exception of those specified elsewhere in this Annex }			1	74 mg/kg		63.64 mg/kg	0.00636 %	✓		
	082-001-00-6										
8	selenium { selenium compounds with the exception of cadmium sulphoselenide and those specified elsewhere in this Annex }				<2 mg/kg	1.405	<2.81 mg/kg	<0.000281 %			<LOD
	034-002-00-8										
9	vanadium { divanadium pentaoxide; vanadium pentoxide }				22 mg/kg	1.785	33.776 mg/kg	0.00338 %	✓		
	023-001-00-8	215-239-8	1314-62-1								
10	zinc { zinc oxide }				58 mg/kg	1.245	62.086 mg/kg	0.00621 %	✓		
	030-013-00-7	215-222-5	1314-13-2								
11	chromium in chromium(VI) compounds { chromium(VI) oxide }				<2 mg/kg	1.923	<3.846 mg/kg	<0.000385 %			<LOD
	024-001-00-0	215-607-8	1333-82-0								
12	pH				7.6 pH		7.6 pH	7.6 pH			
			PH								
13	naphthalene				<0.1 mg/kg		<0.1 mg/kg	<0.00001 %			<LOD
	601-052-00-2	202-049-5	91-20-3								

#	Determinand			CLP Note	User entered data	Conv. Factor	Compound conc.	Classification value	MC Applied	Conc. Not Used
	EU CLP index number	EC Number	CAS Number							
14	• acenaphthylene	205-917-1	208-96-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
15	• acenaphthene	201-469-6	83-32-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
16	• fluorene	201-695-5	86-73-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
17	• phenanthrene	201-581-5	85-01-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
18	• anthracene	204-371-1	120-12-7		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
19	• fluoranthene	205-912-4	206-44-0		0.12 mg/kg		0.103 mg/kg	0.0000103 %	✓	
20	• pyrene	204-927-3	129-00-0		0.12 mg/kg		0.103 mg/kg	0.0000103 %	✓	
21	benzo[a]anthracene	601-033-00-9	200-280-6		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
22	chrysene	601-048-00-0	205-923-4		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
23	benzo[b]fluoranthene	601-034-00-4	205-911-9		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
24	benzo[k]fluoranthene	601-036-00-5	205-916-6		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
25	benzo[a]pyrene; benzo[def]chrysene	601-032-00-3	200-028-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
26	• indeno[123-cd]pyrene	205-893-2	193-39-5		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
27	dibenz[a,h]anthracene	601-041-00-2	200-181-8		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
28	• benzo[ghi]perylene	205-883-8	191-24-2		<0.1 mg/kg		<0.1 mg/kg	<0.00001 %		<LOD
Total:								0.0251 %		

Key

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

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

• **lead compounds with the exception of those specified elsewhere in this Annex**

GB MCL index number: 082-001-00-6

Description/Comments: Least-worst case: IARC considers lead compounds Group 2A; Probably carcinogenic to humans; Lead REACH Consortium, following MCL protocols, considers many simple lead compounds to be Carcinogenic category 2

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 2A (Sup 7, 87) 2006; Lead REACH Consortium

www.reach-lead.eu/substanceinformation.html. Review date 29/09/2015

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

GB MCL index number: 023-001-00-8

Description/Comments: Hazard statements H301, H330, H350 added by HazWasteOnline due to ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be Carc. 1B; H350. The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List]. Substance has therefore been self-classified.

Additional Hazard Statement(s): Carc. 1B; H350 , Acute Tox. 3; H301 , Acute Tox. 2; H330

Reason for additional Hazards Statement(s):

20 Sep 2022 - Carc. 1B; H350 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be Carc. 1B; H350. The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List].

Substance has therefore been self-classified.

28 Sep 2022 - Acute Tox. 3; H301 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 3; H301". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List].

Substance has therefore been self-classified.

28 Sep 2022 - Acute Tox. 2; H330 hazard statement sourced from: ATP 18 (Regulation (EU) 2022/692) considers vanadium pentoxide to be "Acute tox 2; H330". The GB MCL Agency has reached the same opinion [but is yet to formerly make this change to the MCL List].

Substance has therefore been self-classified.

• **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

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

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.

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

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. Worse case copper sulphate is very soluble and likely to have been leached away if ever present and/or not enough soluble sulphate detected.

mercury {mercury dichloride}

Worst case CLP species based on hazard statements/molecular weight

nickel {nickel(II) oxide (nickel monoxide)}

Worst case compound based on absence of CrVI and assumed metal oxides from a combustion, ash based source.

lead {lead compounds with the exception of those specified elsewhere in this Annex}

Worst case compound based on absence of CrVI and assumed metal oxides from a combustion, ash based source.

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

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

vanadium {divanadium pentaoxide; vanadium pentoxide}

Most conservative species.

zinc {zinc oxide}

Worst case compound based on absence of CrVI and assumed metal oxides from a combustion, ash based source.

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

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

Appendix C: Version

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

HazWasteOnline Classification Engine Version: 2023.111.5569.10274 (13 Jun 2023)

HazWasteOnline Database: 2023.111.5569.10274 (22 Apr 2023)

This classification utilises the following guidance and legislation:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

The Waste and Environmental Permitting etc. (Legislative Functions and Amendment etc.) (EU Exit) Regulations 2020 - UK: 2020 No. 1540 of 16th December 2020

GB MCL List - version 1.1 of 09 June 2021

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