

MANCHESTER GRAMMAR SCHOOL, MANCHESTER

PHASE 1: PRELIMINARY RISK ASSESSMENT

Job Number: LKC 23 1086
Date: March 2023
Client: The Manchester Grammar School



INCREASING LAND VALUE

LK
GROUP

INCREASING LAND VALUE



LK
GROUP

LK Consult			
Document Verification			
Site Address	Manchester Grammar School Playing Field, Old Hall Lane, Manchester, M13 0XT		
Report Title	Phase 1: Preliminary Risk Assessment		
Job Number	LKC 23 1086	Document Ref.	LKC 23 1086-A1-PRA
Date Issued	27 th March 2023	Report Version	R0
Prepared By	Beth Ryder-Humphries	Reviewed By	Peter Dunn

Revision Record			
Revision No.	Date	Nature of Revision	Approved By

DISCLAIMER

This report has been prepared by LK Consult (LKC) who have exercised such professional skill, care and diligence as may reasonably be expected of a properly qualified and competent consultant, experienced in preparing reports of a similar scope.

However, to the extent that the report is based or relies upon information contained in records, reports or other materials provided to LKC, which have not been independently produced or verified, LKC gives no warranty, representation or assurance as to the accuracy or completeness of such information.

This report is prepared solely for the benefit of The Manchester Grammar School. It may not be relied upon by, or submitted to a third party for their reliance for the purposes of valuation, mortgage, insurance and regulatory approval, until all invoices have been settled in full.

Those using this information in subsequent assessments or evaluations do so at their own risk.

Contents

1	Introduction.....	1
2	Historical Review	2
3	Environmental Setting	3
4	Site Reconnaissance	4
5	Preliminary Contamination Conceptual Site Model.....	6
5.1	Introduction	6
5.2	Potential Contaminants.....	6
5.3	Potential Receptors.....	7
5.4	Potential Pathways	7
5.5	Preliminary Contamination Conceptual Model.....	8
6	Preliminary Geotechnical Risk Assessment.....	10
7	Summary Conclusions and Recommendations	11
7.1	Summary Conclusions	11
7.2	Recommendations	12

Figures

- Figure 1: Site Location and Boundary Plan
Figure 2: Proposed Site Plan

Appendices

- Appendix A: Historical Maps
Appendix B: Envirocheck Report
Appendix C: Zetica UXO Unexploded Bomb Risk Map and PDSA
Appendix D: Risk Evaluation

1 Introduction

LK Consult Ltd (LKC) has been commissioned to carry out a Phase 1 Preliminary Risk Assessment (PRA) for The Manchester Grammar School.

In accordance with current guidance (including LCRM¹ and the National Planning Policy Framework (NPPF)²), the PRA will include a site reconnaissance, site history, geology, hydrogeology, hydrology, mineral search and a landfill search. Information gathered from the desk study and site reconnaissance will be used to develop a contamination conceptual model for the site.

In addition, the information gathered will be used to identify potential geotechnical constraints associated with the redevelopment of the site.

Based on the findings of this report, an appropriate site investigation can be derived, if required.

Site details are provided in Table 1-1. Figure 1 shows the site location and boundary. Figure 2 shows the proposed development plan.

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	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.

Table 1-1: Summary of site details

¹ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

² "National Planning Policy Framework." The Ministry of Housing, Communities and Local Government. Published March 2012, Updated July 2021.

2 Historical Review

In compiling the site history, LKC consulted Envirocheck historical mapping (Appendix A) and aerial photography.

Table 2-1 summarises features on site. Table 2-2 summarises potentially contaminative land uses within approximately 50m and potentially infilled features within approximate 250m.

Site Features	Location on Site	Dates Present		Comments
		From	To	
Birch Hall / Manchester Grammar School	E	1848	1955	Site forms part of Birch Hall grounds between 1848-1922 mapping. Orchard present on site between 1848-1893 mapping. No longer present by 1894 mapping. Stream with sluice present in SW of site between 1907-1922 mapping. No longer present by 1924 mapping, potentially infilled. Forms part Grammar School with wooded area by 1934 mappings. 2no. embankments present by 1934 and 1957 mappings. School buildings present in N and SE of site by 1957 and 1984 mappings. Not annotated on 1985 mapping. Change of layout by 1990 mapping. Building extended to the west. Change of layout by 2016 mapping.

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

Surrounding Area Features	Distance (m)	Direction	Dates Present		Comments
			From	To	
Manchester Grammar School Playing Fields	Adj	S, W	1957	present	
2no. Ponds	139	NE	1848	1923	No longer present by 1934 mapping.
	238	SE	1848	1923	No longer present by 1934 mapping. Potentially infilled.
Graveyard	155	NW	1848	present	

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

3 Environmental Setting

A summary of environmental settings is presented in Table 3-1, based on a review of available environmental data.

Categories (data sources)		Details
Geology ^{1, 2}	Artificial	- No BGS recorded artificial.
	Superficial	- Glacial Till (diamicton).
	Bedrock	- Chester Formation (sandstone).
	BGS Logs (<50m)	- None.
Hydro-geology ¹	Aquifer Designation	- Superficial - Bedrock
	Source Protection Zone (SPZ)	- Secondary Undifferentiated Aquifer. - Principal Aquifer.
	Groundwater Abstractions (100m)	- Total Catchment (Zone 3).
	Surface Water Courses (100m)	- None.
Hydrology ¹	Flooding risk	- No risk from rivers and sea without defences. - Limited potential for groundwater flooding to occur
	Surface Water Abstractions (100m)	- None.
	Discharge Consents (onsite)	- None.
	Pollution Incidents (onsite)	- None.
	Coal Mining	- Not within a Coal Reporting Area.
Minerals & Mining ^{1,3}	Surface Mineral Extractions (250m)	- None.
	Cheshire Brine Compensation District	- Not within Compensation District.
	Non-Coal Mining Area	- No Hazard.
	Collapsible Ground	- Very low hazard.
Ground Stability ¹	Compressible Ground	- No hazard.
	Ground Dissolution	- No hazard.
	Landslide	- Very low hazard.
	Running Sand	- Very low hazard.
	Shrinking / Swelling Clay	- Very low hazard.
Landfill Sites (250m) ¹	Known / Registered	- None.
	Potentially Infilled Land (non-water and water), based on Envirocheck Report	- 1no. feature: 134m NE.
	Potentially infilled sites, based on LKC historical review	- 3no. features: See Table 2-1 and Table 2-2.
Radon Potential ¹		- <1% of homes above Action Level. No protective measures are necessary in the construction of new dwellings or extensions.
Designated Sites (50m) ¹		- None.
Contemporary Trade Directory (50m) ¹		- None.
Fuel Station Entries (50m) ¹		- None.
Unexploded Ordnance Risk (UXO) – Zetica Risk Map	Zetica Risk Map ⁴	- Bomb Risk: Low. - Strategic Targets: None identified within 100m
	Pre-Desk Study Assessment	- A detailed desk study, whilst always prudent, is not considered essential in this instance.

Table 3-1: Summary of the environmental setting.

Notes: Distance in brackets is the distance from site that features are included. Where no distance given, features relate to on site only.

Data Sources:

1 Envirocheck Report (Appendix A & B)

2 BGS Geoindex <http://mapapps2.bgs.ac.uk/geoindex/home.html>

3 The Coal Authority Web Mapping Services (WMS) /

Interactive Map Viewer <http://coal.decc.gov.uk/en/coal/cms/publications/data/map/map.aspx>

4 Zetica UXO Unexploded Bomb Risk Map and Preliminary Desk Study Assessment (PDSA) (Appendix C)

4 Site Reconnaissance

A site reconnaissance was carried out on 21st March 2023.

Relevant features identified on site are summarised below:

- 2no. buildings on site: a two-storey sports pavilion and single storey building to the north.
- There is a car parking area between the two buildings. Tarmac is in good condition.
- The western end of site is a grassed area, part of the adjacent playing fields. This slopes from site level downwards to the west.
- The site is level with the grounds to the north and east, however the fields to the south and west are at a lower ground level (approximately 2.00m).
- Current buildings are brick. No signs of subsidence or significant external damage. No evidence of contamination identified.
- Playing fields noted adjacent south and west of site.

The surrounding area comprises Manchester grammar school buildings and playing fields.

Relevant photographs are provided in Plate 4-1.

	
Photograph 1: View of site from S.	Photograph 2: View of site from N.
	
Photograph 3: Vehicle access on eastern boundary	Photograph 4: View of sloping ground to the south of site.

	
Photograph 5: services noted within current onsite building (to be demolished).	Photograph 6: services noted within proposed footprint of building.

Plate 4-1: Site photographs.

5 Preliminary Contamination Conceptual Site Model

5.1 Introduction

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

The Sections below are therefore divided into potential contaminant, potential pathway and potential receptor as described in LCRM³, on the premise that, if there is no pollutant linkage, then there will be no risk to the receptor. The final Section provides an assessment of the potential pollutant linkages that may still be present on the site if redevelopment were to occur.

5.2 Potential Contaminants

Potential viable contamination sources are detailed in Table 5-1. These are split into onsite sources, offsite sources and underlying geology.

Potential Source	Contaminants
On Site	
Shallow Made Ground below some or all of site (e.g. site levelling)	- Assuming predominantly reworked natural soils with possible demolition rubble, ash and clinker: Asbestos, heavy metals, sulphates, PAHs⁴. - Not expected to be a significant source of gas given anticipated depth and nature of Made Ground.
Playing Field	- Given time when present, assuming ash and clinker were used for drainage: PAHs and heavy metals.
Orchard	- No significant pesticide use expected due to time when present on site: No contamination source anticipated.
Surrounding Area	
Surrounding land uses (school, playing fields)	- Offsite sources not expected to be a significant as already present on site.
Surrounding area	- No significant contamination sources within influencing distance of the site.
Landfills / offsite potentially infilled features within 250m	- Infilled stream in SW of site not considered a significant risk due to time since infilling and building has been present since 1950s. - Given size, distance and age of offsite features, there is not considered to be a source of hazardous gas (principally carbon dioxide and methane).
Underlying Geology	
Superficial / Bedrock	- Glacial Till over Chester Sandstone Formation. - No significant contamination sources identified. - Although not identified as sulphate / sulphide bearing strata⁵ there could be some localised raised concentrations. This is considered further in the geotechnical assessment.

Table 5-1: Potential contamination sources.

³ Land Contamination Risk Management (LCRM) <https://www.gov.uk/government/publications/land-contamination-risk-management-lcrm>

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

⁵ BRE (2005). "Concrete in Aggressive Ground". SD1.

5.3 Potential Receptors

Potential receptors are detailed in Table 5-2.

Receptors	
Human Health	- Future site users (including staff/students, visitors and site workers). - Offsite land users.
Controlled Waters	- Principal Aquifer (bedrock). - Secondary Undifferentiated Aquifer (superficial). - No surface water within influencing distance.
Buildings.	
Potable water pipes.	

Table 5-2: Potential receptors.

5.4 Potential Pathways

Potential pathways are detailed in Table 5-3.

Pathways		
Soil	Human Health (school with no soft landscaping)	- Inhalation of vapours outside. - Inhalation of vapours inside. - Omitted: ingestion of soil, ingestion of soil-derived indoor dust, dermal contact with soil, dermal contact with soil-derived indoor dust, inhalation of soil-derived outdoor dust, inhalation of soil-derived indoor dust, ingestion of contaminated home-grown produce and ingestion of soil attached to home-grown produce.
		- Direct contact with receptors (services).
Water	- Surface run-off over impermeable surface.	
	- Site is entirely covered by a building; therefore, no infiltration anticipated.	
Water and Gas	- Migration through potentially permeable strata and preferential pathways. - Superficial (Till) likely to be low permeability. - Bedrock (sandstone) likely to be relatively permeable. - Preferential pathways: services.	
Gas	- Migration into buildings (e.g. via services) and accumulation of gases in confined spaces (potentially causing explosion if methane is present).	

Table 5-3: Potential pathways.

5.5 Preliminary Contamination Conceptual Model

The Preliminary Contamination Conceptual Site Model (PCCSM) is illustrated in Table 5-4 and has identified five generic potential pollutant linkages.

Each linkage is described along with an assessment of the risk based upon guidance on probabilities and consequences outlined in CIRIA C552⁶.

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

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

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

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

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

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

It should be noted that there may be risk from short term exposure from contaminated soil to site workers. The Preliminary Contamination Conceptual Model deals with long term exposure to key receptors. Acute risks can be easily mitigated by good environmental management of the site during site works. Standard health and safety precautions (as per HSE guidance⁷) should be adopted by all workers involved with site enabling and construction works. Therefore, this receptor is not considered in the contamination conceptual model.

⁶ CIRIA (2001). "Contaminated Land Risk Assessment: A Guide to Good Practice". C552.

⁷ 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 source of contamination 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 5-4: Preliminary Contamination Conceptual Site Model.

Notes: PL = Pollutant Linkage. Contaminant of Concern (CoC) - See Table 5-1 for contamination sources. Site conditions based on observations during site reconnaissance.

6 Preliminary Geotechnical Risk Assessment

Table 6-1 summarises the possible geotechnical constraints of the site, based on the site history, environmental settings, and site reconnaissance. Investigation work will be required to confirm the risks and provide a detailed geotechnical assessment and foundation design.

Coal Mining	Not within Coal Authority Reporting Area.
Slope Stability	Site is relatively flat, however slope identified adjacent south and west of the proposed building. No visible evidence of topsoil slippage and no evidence of movement or external fractures in the current onsite building. No further assessment required.
Envirocheck Ground Stability Hazards	No to low hazard identified. No further action required.
Made Ground	Unknown depth and constituent of made ground across the site. Initial information indicates relatively shallow made ground across the majority of site. Historically infilled surface water may produce a deeper made ground. Possible in-ground structures from previous developments. Unlikely to be a suitable founding strata unless engineering work is undertaken.
Superficial	Unknown strength of soils for foundation design. Clay anticipated below the site.
Bedrock	Unknown depth to bedrock.
Groundwater	Unknown depth and variability of groundwater. Shallow / fluctuating groundwater can affect the strength of the soil, particularly in granular ground. Shallow groundwater can also affect construction works.
Plasticity	Plasticity of clay deposits should be confirmed, particularly where trees are present or proposed, to identify the shrink / swell risk. Clay recorded on site.
Sulphate	Unknown sulphate content of the made ground and natural.
Road / Pavement Design	Unknown CBR values for footpath design.

Table 6-1: Summary of geotechnical constraints.

7 Summary Conclusions and Recommendations

7.1 Summary Conclusions

Table 7-1 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 7-1: Summary of site details, historical review, environmental settings and site reconnaissance.

A preliminary contamination conceptual site model has been produced by LKC, which is summarised in Table 7-2.

Pollutant Linkage	Risk	Recommendations
PL1: Contaminants posing a risk to future site users via dermal contact, ingestion and inhalation (of soil, dust and fibres).	-	No viable human health pathways as no soft landscaping. No pollutant linkage therefore no further assessment required.
PL2: Volatile contaminants posing a risk to future site users via the inhalation of vapours.	Low	Intrusive investigation required, to include PID testing. Soil analysis of CoC, subject to ground conditions encountered and PID testing.
PL3: Gas (carbon dioxide and methane) posing a risk to buildings and future site users via the migration of gas into building causing explosion and asphyxiation.	Moderate / Low	Intrusive investigation to confirm ground conditions. If significant gas source and pathway identified, gas monitoring or gas protection measures required.
PL4: Mobile contamination posing a risk to controlled waters via the migration through permeable strata.	Low	Intrusive investigation required. Groundwater sampling, subject to ground conditions encountered. Analysis of CoC.
PL5: Organic contaminants posing a risk to water pipes.	Moderate / Low	Intrusive investigation required. Soil analysis of CoC, subject to ground conditions encountered. If new pipeline proposed a water pipeline assessment will be required.

Table 7-2: Summary risk table.

Where moderate / low risk had been identified, the assumed risk is shown in bold.

A preliminary geotechnical assessment has been carried out by LKC. Table 7-3 summarises the geotechnical constraints.

Coal Mining	Not within Coal Authority Reporting Area.
Slope Stability	No further assessment required.
Made Ground	Unknown depth and constituent of made ground across the site.
Superficial	Unknown strength of soils for foundation design.
Bedrock	Unknown depth to bedrock.
Groundwater	Unknown depth and variability of groundwater.
Plasticity	Plasticity of clay deposits should be confirmed.
Sulphate	Unknown sulphate content of the made ground and natural.
Road / Pavement Design	Unknown CBR values for footpath design should be calculated.

Table 7-3: Summary of geotechnical constraints.

7.2 Recommendations

Recommendations are provided in Table 7-4.

Contamination status	There is sufficient information on the potential contaminative status of the site to allow conditional approval of a planning application, based on the proposed end use detailed in the PRA.
Further assessment recommendations	Phase 2 intrusive investigation required. Phase 2 investigation to be carried out in line with current guidance, including BS10175 ⁸ , BS5930 ⁹ CIRIA C665 ¹⁰ , RB17 ¹¹ and BS8485 ¹² . Either 'exploratory investigation': 1 sample per 25-50m square centres. Or 'detailed investigation': 1 sample per 10-25m square centres. Plus targeted investigation locations in areas of concern (contamination and geotechnical). To be agreed with the local authority.
Type of investigation work	Boreholes and / or trial pits.
PL 1, 2, 5, 6, 7	Intrusive investigation work recommended to confirm ground conditions across the site. Testing of contaminants of concern based on preliminary conceptual model and field observations (PID tests and visual / olfactory evidence).
PL 3	Intrusive investigation to confirm ground conditions. If significant gas source and pathway identified, gas monitoring or gas protection measures required. Gas monitoring: monitoring wells to be installed in boreholes, monitoring frequency and period subject to anticipated risk. Precautionary gas protection measures: type of measures to be determined once ground conditions established.
PL 4	No further assessment required.
Reporting	Information from the above can be used to carry out a contamination and geotechnical assessment and provide a remediation strategy for the site.

Table 7-4: Recommendations.

Further Considerations are summarised in Table 7-5.

⁸ British Standard (2017). "Investigation of Potentially Contaminated Sites – Code of Practice". BS10175:2017.

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 CL:AIRE Research Bulletin RB17 (November 2012) "A Pragmatic Approach to Ground Gas Risk Assessment".

¹² BSI (2015). "Code of Practice for the Design of Protective Measures for Methane and Carbon Dioxide Ground Gases for New Buildings". BS8485:2015.

Asbestos	Even though no asbestos was identified externally on the existing buildings, given the age, there may be areas inside that have Asbestos Containing Materials (ACMs). Therefore, we would advise that a Pre-Demolition and Major Refurbishment Asbestos Survey is undertaken prior to demolition by a professional contractor. The LK Group have a designated Asbestos Department who can advise on the appropriate steps to take in order to have the building suitably surveyed.
-----------------	--

Table 7-5: Further considerations.